

**STATUS OF CHILDHOOD IMMUNIZATION IN BIHAR:
A COMPARATIVE STUDY OF JAMUI AND AURANGABAD
DISTRICTS**

*Thesis Submitted to the Jawaharlal Nehru University in Fulfilment
of the Requirements for the Degree of*

DOCTOR OF PHILOSOPHY

LAXMI KANT PREM PRAKASH



**Centre for the Study of Regional Development
School of Social Sciences
Jawaharlal Nehru University
New Delhi -110067
2017**



जवाहरलाल नेहरू विश्वविद्यालय
JAWAHARLAL NEHRU UNIVERSITY
Centre for the Study of Regional Development
School of Social Sciences
New Delhi-110067

Date 21 July 2017

DECLARATION

I, LAXMIKANT PREM PRAKASH, hereby declare that the thesis entitled "STATUS OF CHILDHOOD IMMUNIZATION IN BIHAR: A COMPARATIVE STUDY OF JAMUI AND AURANGABAD DISTRICTS" submitted by me for the award of DOCTOR OF PHILOSOPHY is my bonafide work and that it has not been submitted so far in part or in full, for any degree or diploma of this university or any other university.

Laxmikant


Laxmikant Prem Prakash

CERTIFICATE

It is hereby recommended that the thesis may be placed before the examiners for evaluation.

B. S. Butola
Prof. B. S. Butola 21-7-17

Chairperson

 Chairperson
Centre for the Study of Reg. Dev.
School of Social Sciences
Jawaharlal Nehru University
New Delhi - 110067

Anuradha Banerjee
21/07/17

Prof. (Dr.) Anuradha Banerjee

Supervisor

 **Dr. Anuradha Banerjee**
Professor
Centre for the Study of Regional Dev.
School of Social Sciences
Jawaharlal Nehru University
New Delhi-110067

Tel: 91-11-26704466/4463/4103 Fax: 91-11-26742586 Email - chair_csrd@mail.jnu.ac.in

Acknowledgements

This difficult and challenging work would not have been possible for me without the great support of my teachers, friends, staffs, parents and family members who have given me valuable assistance, cooperation and moral support at various stages of my work in preparing and presenting my thesis over the last five years. I wish to express my sincere gratitude to them.

First and foremost, I wish to express my sincere thanks and heartfelt gratitude to my supervisor Prof. (Dr.) Anuradha Banerjee who has given me regular guidance and suggestions. Without her help, cooperation, encouragement and motivation this work would not have taken its present shape.

I am fortunate to have received guidance and suggestions from wonderful faculties of the Centre. I extend my sincere gratitude to the centre's chairperson Prof. B.S. Butola, and others faculties Prof. P.M. Kulkarni, Prof. M.D.Vemuri, Prof. B. Zutshi, Dr.Bhaswati Das, Prof. DipendraNath Das for shaping and making my academic carrier in this institution since I joined the centre as an M.Phil student. I am also grateful to Dr.SrinivasGoli, and Mr. Varghese who have always encouraged and assisted my SPSS work for extraction and analysing of various data sets during the entire research work. I also would like to thank the academic staff members like Dr.M.TamilSelvam, Mr.Hemant, Mr. Rajesh, Mr.Rakesh and Mr.Ashish for providing support in Arc GIS work.

I want to express my heart felt thanks to the key informants, health functionaries and respondents in Jamui and Aurangabad districts, Bihar, for providing me with treasured information and inputs for my primary survey. They had taken out their valuable time amidst their busy schedule and had patiently answered all my queries with utmost sincerity.

I can never forget my seniors i.e.Dr. Mala Mukhrjee, Dr.Sunita Chaube, Dr.Anita Bhargava, Dr.ChandraniDatta, Dr.Vidyasagar, Dr.Mashkhor, Dr.Vinod Mishra, Dr.Chandreyi, Dr.Yatish, Dr.Gaurav, Dr.Motilal, Dr.Ruchira Bhattacharya, Dr.ArvindPandey, Mrs.SudiptaSarkar, Dr.Ajitkumar, and Mr.Keshari Prasad who have been supporting me since my M.Phil course work and made me technically capable to complete this difficult job.

I cannot restrict myself to express thanks to my classmates, juniors and friends Bidisha, Meenakshi, Avijit, Yogendra Musahar, Vinod, Om Prakash who always stood by my side, to assist and encourage me till the last moment. I express my thanks to Md. Shahid Jafar, Deepika, Ritesh, Jogendra Singh Chauhan, Joydeep, Rabiul, Shamistha, Rayhan, Veronica, Anita Verma, Shaukat, Prakriti, Madhubani, Dipsita, Tej Chand, Mehebab, Arkapratim and Arvind for their constant encouragement and moral support.

I cannot forget my friend Mr. Pradeep Kumar who has assisted me in admission process and had provided accommodation to me until I got the hostel. My heartfelt gratitude also goes to Mr. Piyush Raj, Om Prasad, Vijay Kumar and other friends who had always helped and encouraged me.

It is impossible for me to survive and continue research work at JNU without fellowship. Therefore, I also owe my gratitude and big thanks to UGC and ICSSR for providing me fellowship for research work.

I am also indebted to all the staff members of JNU Central Library and Documentation Unit of CSRD for constantly helping me to access books and documents related to the research work. I would like to express my special thank to previous and present CSRD staffs like Mrs. Neeru, Mr. Pradeep, Mr. Mahesh, Mr. Hanif, Mr. Tarun, Mr. R.C Sharma, Mr. Dayanand, Mr. Jagadishand, Mr. Krishna Mahto and others for giving me all kind of support and cooperation during my entire research work. I am also thankful to the school and administrative block staffs.

I am very grateful to all doctors, nurses and health staff of JNU health centre, especially Dr. Sudarsan and Dr. Gautam Parta who have provided me all kinds of medical care and support throughout the research work.

I express my thanks to Babu Lal, Upendra Kumar, Rajkishor and Sanjay for their generous help and support during field work.

Last but not the least, I want to extend my special thanks to my parents, grand-father, brothers, sisters, cousins, uncle-aunty and friends from my village such as Uday, Sanjay, Subhash, Abhinandan, Ramchandra, Santosh, Daya and other relatives for their blessings and moral support.

Laxmi Kant Prem Prakash

CSRD

JNU

New Delhi – 110067.

Tital	Page No.
List of Tables	XIII-XVI
List of Figures	XVII-XIX
List of Maps	XX
Abberviations	XXI
Chapter: I Introducation	1-41
1. Introduction	2
2. Statement of the Problem	4
3. Literature Survey	6
3.1. Socio-economic and Demographic Determinants	7
3.1.1 Sex of Child	7
3.1.2 Birth Order	8
3.1.3 Age of Mother	8
3.1.4 Type of Fmaily	9
3.1.5. Wealth Index	9
3.1.6 Mother's Education	10
3.1.7 Work Status of Mother	11
3.1.8 Role of Father and Educational Level	12
3.1.9 Religion	13
3.1.10 Social Group	13
3.2 Others Factors	14
3.2.1 Utilisation of Antenatal Care	14
3.2.2 Exposure to Mass Media	15
3.2.3 Place of Residence	15
3.2.4 Distance of Health Centre	15
3.2.5 Knowledge, Attitudes, Cultural Beliefs and Practices	16
4. Child Immunization Programmes and Policies in India	17
4.1 Childhood Immunization after Independence	17
4.2 Extended Programme on Immunization	17
4.3 Universal Immunization Programmes	18
4.4 Intensification of Routine Immunization	18
4.5 Immunization Week	19
4.6 Introduction of Pentavalent Vaccine	19

4.7 Introduction of Hepatitis B Vaccine	19
4.8 Pulse Polio Immunization	19
4.9 Mission <i>Indradhanus</i>	20
5. Gaps in Literature	20
6. Conceptual Framework	21
7. Objectives	23
8. Research Questions	24
9. Methodology and Survey Design	24
10. Selection of Study Areas	30
11. Survey Instruments	31
11.1 Quantitative Research Instruments	32
11.2 Qualitative Research Instruments	33
12. Data Sources	34
13. Chapterisation Scheme	35
<i>References</i>	37
Chapter II: Child Survival Issue: A Global Overview	41-69
2. Introduction	41
2.1 Millennium Development Goals and Child Survival	44
2.2 Child Immunization Coverage: A Global Overview	45
2.3 Child Immunization Coverage by Specific Vaccines in WHO ^s	47
Region	
2.4 Regional Variations of Specific Vaccines Coverage in the World	48
2.4.1 Regional Coverage of Measles	49
2.4.2 Regional Coverage of DPT-3	50
2.4.3 Regional Coverage of BCG	50
2.4.4 Regional Coverage of Poliomyelitis	51
2.4.5 Regional Coverage of Hepatitis-B	52
2.5 Target of Millennium Development Goals and Annual Reduction Rate of U5MR	53
2.6 Reduction in IMR and U5MR across WHO's Regions	54
2.7 Child Immunization Coverage in South Asian Region	57
2.8 Reduction in Under 5 Mortality Rate in South Asia	58

2.9 Child Immunization Coverage by Specific Vaccines in India	68
2.10 Regional Variations in Child Immunization Coverage in India	69
2.11 Reduction in Infant Mortality Rate and Under 5 Mortality Rate in India	62
2.12 Child Immunization Coverage by Specific Vaccines in Bihar	63
2.13 Regional Variation in Bihar	64
1.14 Trends of Child Immunization in Bihar	66
2.15 Reduction in Infant Mortality Rate in Bihar	66
2.16 Conclusion	67
<i>References</i>	69
Chapter III: Profile of the Study Area	70-110
3. Geographical Location	70
3.1. Regional Classification	70
3.2. Soil Cover	70
3.3. Water Resource	70
3.4 Administrative Divisions	71
3.5 Land Use Pattern	71
3.6 Irrigation	72
3.2. Economic Base	72
3.2.1 Agriculture	72
3.2.2 Industries	74
3.3 Population Characteristics	75
3.3.1 Rural and Urban Population	75
3.4 Demographic Characteristics	76
3.4.1. Sex Ratio	76
3.4.2. Fertility Rates	77
3.3.3. Population Growth	78
3.5 Social Characteristics	79
3.5.1 Social Composition	79
3.5.2 Distribution of Socially Marginalised Groups in Bihar	79
3.5.3 Prevalence of Underage Marriage	81
3.5.4 Literacy	82

3.6 Economic Characteristics	82
3.6.1 Work Participation Rate	82
3.6.2 Occupational Segregation of Workers	83
3.6.3 Category of Workers	84
3.6.4 Overall Socio-Economic Scenario and Status of Women in Bihar	84
3.7. Health Status	85
3.7.1. Infant and Child Mortality Rate	85
3.7.2 Neonatal and Post Neonatal Mortality Rate	87
3.7.3 Under 5 Mortality Rate	87
3.7.4 Maternal Mortality Ratio	88
3.8 Assessment of Maternal and Child Health Care Services in Bihar	88
3.8.1 Access to Antenatal Care Services	90
3.8.2 Institutional Delivery	91
3.8.3 Home Delivery	91
3.8.4 Access to Child Immunization	92
3.8.5 Health Related Issues in Bihar	92
3.9. District Profile of Jamui and Aurangabad	94
3.9.1. Geographical Characteristics of Jamui and Aurangabad	94
3.9.2 Population Characteristics	94
3.10 Social Characteristics	96
3.10.1 Caste Groups	96
3.10.2. Sub-castes	97
3.10.3 Religious Groups	98
3.10.4 Literacy	98
3.10.5 Underage Marriage	99
3.11 Demographic Characteristics and Health Outcomes	99
3.11.1 Infant Mortality Rate	99
3.11.2 Under 5 Mortality Rate	100
3.11.3 Crude Death Rate	101
3.11.4 Neonatal and Post Neonatal Mortality Rate	101
3.11.5 Total Fertility Rate	102
3.11.6 Crude Birth Rate	102
3.11.7 Natural Growth Rate	103

3.12. Economic Characteristics	103
3.12.1 Working Population	103
3.12.2 Category of Working Population	104
3.13 Village Profiles of Aurangabad District	105
3.13.1. Lohara Village	105
3.13.2. Jamhor	106
3.14 Village Profiles of Jamui District	107
3.14.1. AmmaSarari	107
3.14.2. Tajpur	107
3.15. Conclusion	108
References	108
Chapter IV: Child Immunization in India and Bihar: Socio-economic and Demographic Correlates	110-131
4.0 Introduction	110
4.1 Database and Methodology	110
4.3 Demographic Factors	111
4.3.1 Maternal Age	111
4.3.2 Birth Order	112
4.3.3 Sex of Child	113
4.4 Socio-economic Factors	114
4.4.1 Religion	114
4.4.2 Social Groups	116
4.4.3 Education Level of Mothers	117
4.4.4 Education Level of Father	118
4.4.5 Work Status	119
4.4.6 Wealth Index	120
4.4.7 Place of Residence	121
4.4.8 Exposure to Maternal and Child Care Services and Immunization	121
4.4.9 Post Natal Care	122
4.4.10 Place of Delivery	123
4.5 Multi Variant Analysis	124
4.6 Conclusion	127

<i>References</i>	128
Chapter V: Socio-economic Characteristics of Household and Child Immunization in Study Areas	132-174
5.0 Introduction	132
5.1 Demographic Characteristics	134
5.1.1 Sex of the Child	134
5.1.2 Birth Order	135
5.1.3 Age of Mothers	136
5.2 Social Characteristics of the Respondents	136
5.2.1 Family Type	136
5.2.2. Social Groups	137
5.2.3 Religious Groups	138
5.2.4 Father's Educational Level	139
5.2.5 Mother's Educational Level	140
5.3. Economic Characteristics of Surveyed Households	142
5.3.1. Living Standard	142
5.3.2. Agricultural Assets Index	144
5.3.3. Women's Work Participation	145
5.4. Other Characteristics of Respondents	146
5.4.1. Women's Autonomy Index	146
5.4.2. Place of Delivery	147
5.4.3. Family Cooperation	148
5.5. Influence of Background Characteristics on Child Immunization Jamui and Aurangabad District	149
5.6 Partial Coverage of Immunization	155
5.6.1 Dropouts in Multi Doses Vaccines	155
5.6.2 Reasons for Incomplete Immunization	168
5.7 Conclusion	169
<i>References</i>	172

Chapter VI: Role of Health Infrastructure and Health Functionary in Child Immunization 175-208

6.0 Introduction	175
6.1. The number of Healthcare Units	177
6.2 Deficit of Various Public Health Care Units in Bihar	178
6.2.1 Sub Centres	178
6.2.2 Primary Health Centre (PHC)	179
6.2.3 Additional Primary Health Centre (APHC)	179
6.2.4 Community Health Centre (CHC)	180
6.2.5. Sub- Divisional Hospital (SDH)	180
6.2.6 District Hospital (DM)	180
6.3 Infrastructure at Various Health Units in Bihar	181
6.3.1 Human Resource at Sub Centre	181
6.2.2 Physical Infrastructure at Sub Centre	182
6.3.3 Human Resources at Additional PHC and PHC	182
6.4. Availability and Deficit of Health Care Units in the Study Districts	183
6.4.1 Primary Health Centre in Jamui District	184
6.4.2 Primary Health Centre in Aurangabad District	185
6.4.3 Additional Primary Health Centre in Jamui District	186
6.4.4 Additional Primary Health Centre in Aurangabad District	187
6.4.5 Sub Centre in Jamui District	188
6.4.6 Sub Centre in Aurangabad District	189
6.5 Availability and Deficit of Human Resource in Study Districts	190
6.5.1 Doctors	190
6.5.2 ANM/Nurse Grade (A) / HLV	191
6.6 Physical Infrastructure and Amenities in Study Districts	192
6.6.1 Primary Health Centre	192
6.6.2 Additional Primary Health Centre	193
6.6.3 Sub Centre	194
6.7 Availability and Deficit of <i>Anganwadi</i> Centre in Study Districts	195
6.7.1. Jamui District	195
6.7.2. Aurangabad District	196
6.8 Availability and Deficit of ASHA Workers in Study District	197

6.8.1 Jamui District	197
6.8.2. Aurangabad District	298
6.9 Role of SC, PHC, <i>Anganwadi</i> and ASHA in Study Areas: A Qualitative Analysis	199
6.10. Conclusion	204
References	208

**Chapter VII: Knowledge, Attitude, and Practices towards Child
Immunization among Parents** 209-234

7.0 Introduction	209
7.1 Mother's Knowledge Regarding Child Immunization	211
7.1.1 Immunization	211
7.1.2 Childhood Diseases and Vaccine Preventable Diseases	211
7.1.3 Name of Vaccines	213
7.1.4 Numbers of Doses of Vaccines	213
7.1.5 Age of the Child at Vaccination	214
7.1.6 Interval between Two Doses of Vaccines	215
7.2 Father's Knowledge Regarding Child Immunization	216
7.2.1 Immunization Schedule	216
7.2.2 Childhood Diseases and Vaccination	216
7.2.3 Name of Vaccines	218
7.2.4 Numbers of Doses of Vaccines	218
7.2.5 Age of the Child at Vaccination	218
7.2.6 Interval between two Doses of Vaccines	219
7.3 Attitude, Belief and Perception	219
7.3.1 Importance of Immunization	220
7.3.2 Childhood Diseases and Vaccination	220
7.3.3 Vaccination	222
7.3.4 Severity of Diseases	222
7.3.5 Effectiveness of Vaccination	222
7.3.6 Side Effects of Vaccination	223
7.3.7 Fear of Injectable / Needles during and after Vaccination	223
7.3.8 Child Morbidity and Vaccination	224

7.3.9 Teething of Children and Vaccination	225
7.3.10 Trust in Allopathic Medicines	225
7.3.11 Trust in Government Agencies	226
7.3.12 Attitude and Behaviour of Health Service Providers	226
7.4 Conclusion	231
References	233
ChapterVIII: Summary and Conclusion	235-245
8.0 Introduction	236
8.2 Summary and Findings of the Study	236
8.3 Conclusion and Policy Implication	243
8.4 Limitations of the Study and Scope for Further Research	245
Bibilography	
Apendix	

List of Tables	Page No.
Chapter: II	
Table 2. 1 Target of MDGs and Annual Reduction Rate of Under 5 Mortality Rate among MDGs Regions (2015)	53
Table 2.2 Child Immunization Coverage by Specific Vaccines in South Asian Regions (2014)	57
Table 2.3 Trends in Child Immunization Coverage in India (2007-10)	61
Table 2.4 Trends in Full Child Immunization Bihar (2015-16)	66
Chapter: III	
Table 3.1 Land Utilization in Bihar, (2011)	71
Table 3.2 Source Wise Irrigated Areas (2010-11)	72
Table 3.3 Industrial Units in Bihar (2013-14)	74
Table 3.5 Demographic Characteristics of India and Bihar (2011)	76
Table 3.6 Fertility Rates, India and Bihar (2011)	77
Table 3.7 Change in Total Fertility Rate, Bihar (2015-16)	77
Table 3.8 Annual Exponential Growths (1991-2011)	78
Table 3.9 Composition of Social Groups in India and Bihar (2011)	79
Table 3.10 Literacy Rate in India and Bihar (2011)	82
Table 3.11 Change in Infant and Child Mortality Rates (2015-16)	86
Table 3.12 Access to Maternal and Child Healthcare Services Bihar (2015)	92
Table 3. 13 Accesses to Immunization, Bihar (2015-16)	92
Table- 3.14 Population Characteristics in Jamui and Aurangabad, Bihar (2011)	95
Table 3.15 Social and Religious Groups in Aurangabad and Jamui, Bihar (2011)	96
Table 3.16 Literacy Rates, Aurangabad and Jamui Districts, Bihar	98
Chapter IV	
4.1 Socio-economic and Demographic Determinants of Child Immunization	124
Chapter: Vth	
Table 5.1 Child Immunization by Sex of child, Bihar, Jamui and Aurangabad (2015)	134

Table 5.2 Child Immunization by Birth order, Bihar, Jamui and Aurangabad (2015)	135
Table 5.3 Child Immunization by Age of Mothers, Bihar, Jamui and Aurangabad (2015)	136
Table 5.4 Child Immunization by Type of Family, Bihar, Jamui and Aurangabad (2015)	137
Table 5.5 Child Immunization by Social Groups, Bihar, Jamui and Aurangabad (2015)	137
Table 5.6 Child Immunization by Religious Groups, Bihar, Jamui and Aurangabad (2015)	138
Table 5.7 Child Immunization by Father's Educational Level, Bihar, Jamui and Aurangabad (2015)	139
Table 5.8 Full Immunization by Mother's Educational Level, Bihar, Jamui and Aurangabad (2015)	140
Table 5.9 Child Immunization by Living Standard, Bihar, Jamui and Aurangabad (2015)	142
Table 5.10 Child Immunization by Agriculture Assets, Bihar, Jamui and Aurangabad (2015)	144
Table 5.11 Child Immunization by Work Status, Bihar, Jamui and Aurangabad (2015)	145
Table 5. 12 Child Immunizations and Women's Autonomy Index, Bihar, Jamui and Aurangabad (2015)	148
Table 5. 13 Place of Delivery and Immunization , Bihar, Jamui and Aurangabad (2015)	147
Table 5. 14 Family Cooperation and Child Immunization, Bihar, Jamui and Aurangabad (2015)	148
Table 5. 15 Influences of Background Characteristics on Child Immunization in Jamui and Aurangabad District (2015)	149
Table5. 16 Factors Affecting Child Immunization Coverage in Jamui District(2015)	151
Table 5.17 Factors Affecting Child Immunization Coverage in Aurangabad District (2015)	153
Table 5.18 Dropouts in Multi doses Vaccines in Jamui and Aurangabad	155

District (2015)	
Table 5.19 Dropouts in DPT by Background Characteristics in Jamui District (2015)	156
Table 5.20 Dropouts in DPT by Background Characteristics in Aurangabad District (2015)	158
Table 5.21 Dropouts in OPV by Socio-economic Characteristics in Jamui District (2015)	160
Table 5.22 Dropouts in OPV by Background Characteristics in Aurangabad (2015)	162
Table 5.23 Dropouts in Hepatitis-B by Socio-economic Characteristics Jamui (2015)	164
Table 5.24 Dropouts in Hepatitis-B by Background Characteristics in Aurangabad (2015)	166
Table 5.25 Reason for Dropouts in Multi Doses Vaccines (2015)	168

Chapter VI

Table 6: 1 Availability of Various Health Units in India and Bihar (2015)	177
Table 6: 2 Required and Deficit of Public Health Care Units in Bihar (2015)	178
Table 6: 3 Man Power at Sub Centre in Bihar (2015)	181
Table 6: 4 Physical Facilities at Sub Centre in Bihar (2015)	182
Table 6: 5 Human Resources at Additional PHC and PHC in Bihar (2015)	182
Table 6: 6 Health Care Units in Aurangabad and Jamui District, Bihar (2012)	183
Table 6: 7 Availability and Deficit of Primary Health Centre in Jamui District, Bihar (2012-13)	184
Table 6: 8 Availability of Primary Health Centre in Aurangabad District, Bihar (2011-12)	185
Table 6: 9 Availability and Deficit of Additional Primary Health Centre in Jamui Bihar (2012-13)	186
Table 6: 10 Availability of Additional Primary Health Centre in Aurangabad District, Bihar (2011-12)	187
Table 6: 11 Availability and Deficit of Sub Centre in Jamui District, Bihar (2011-12)	188
Table 6: 12 Availability and Deficit of Sub Centre in Aurangabad District,	189

Bihar (2012-13)	
Table 6: 13 Availability of Doctors in Jamui District, Bihar (2009-10)	190
Table 6: 14 Availability of Doctors in Aurangabad District, Bihar (2011-12)	190
Table 6: 15 Availability of Nurses ANM and HLV in Jamui District, Bihar (2009-10)	191
Table 6: 16 Availability of Nurses ANM and HLV in Aurangabad District, Bihar (2011-12)	191
Table 6: 17 Physical Infrastructures available at PHC in Aurangabad Districts, Bihar (2012-13)	192
Table 6: 18 Physical Infrastructures at PHC in Jamui Districts, Bihar (2009-10)	192
Table 6: 19 Physical Infrastructures at APHC in Aurangabad Districts, Bihar (2012-13)	193
Table 6: 20 Physical Infrastructures at APHC in Jamui Districts, Bihar (2009-10)	193
Table 6: 21 Physical Infrastructures at SC in Aurangabad Districts, Bihar (2012-13)	194
Table 6: 22 Physical Infrastructures at SC in Jamui Districts, Bihar (2009-10)	195
Table 6: 23 Availability and Deficit of <i>Anganwadi</i> Centres (AWC) in Jamui, Bihar (2013)	196
Table 6: 24 Availability and Deficit of <i>Anganwadi</i> Centres in Aurangabad District, Bihar (2013)	196
Table 6: 25 Block Wise Availability of ASHA Workers in Jamui District, Bihar (2012-13)	197
Table 6: 26 Block Wise Availability of ASHA Workers in Aurangabad District, Bihar (2012-13)	298

List of Figures

Page
No.

Chapter-II

Figure 2. 1 Percentage of GDP Spent as Health Expenditure in Developed Nations (2013)	43
Figure 2. 2 Percentage of GDP Spent as Health Expenditure in Developing Nations (2013)	43
Figure 2. 3: Global Coverage of Specific Vaccines(2014)	45
Figure 2. 4: Regional Coverage of Immunization in Developed Regions (2014)	47
Figure 2. 5 : Regional Coverage of Immunization in Developing Regions (2014)	47
Figure 2. 6 Reductions in Under 5 Mortality in Developed and Developing World (1990-2015)	55
Figure 2.7 Reductions in Under 5 Mortality in Developing Regions (1990-2015)	55
Figure 2.8 Reductions in Under 5 Mortality in Developing Regions (1990-2015)	56
Figure 2. 9 Trends of Under 5 Mortality Rate in South Asian Region (1990-2015)	58
Figure 2. 10: Child Immunization by Specific Vaccines in India (2007-08)	59
Figure 2. 11: Decline in Infant and Child Mortality in India (1990-2013)	62
Figure 2. 12: Child Immunization by Specific Vaccines in Bihar (2007-08)	63
Figure 2. 13: Reduction in Infant Mortality Rate in Bihar (1990-2013)	66

Chapter: III

Figure 1:1 Crop Pattern & Crop Production in Bihar (2013-14)	73
Figure 3.2 Productions of Major Crops in Bihar (2013-14)	73
Figure 3.3 Percentage of Urban Population in Bihar (1951-11)	75
Figure 3.4 Changes in Sex Ratio, Bihar (1901-11)	77
Figure3.5 Prevalence of Underage Marriage in Bihar (2012-13)	81
Figure 3.6 Work Participation in India and Bihar (2011)	82
Figure 3.7 Working Population in Bihar (2011)	83
Figure 3.8 Categories of Workers in Bihar (2011)	84
Figure 3.9 Infant Mortality Rate in India and Bihar (2012-13)	86
Figure 3.10 Neonatal and Post Neonatal Mortality Rate in India and Bihar (2012-13)	87
Figure 3.11 Under 5 Mortality in India and Bihar (2012-13)	87

Figure 3.12 Maternal Mortality Ratio in India and Bihar (2012-13)	88
Figure 2.13 Access of Antenatal Care Services in Bihar (2012-13)	90
Figure 3.14 Institutional and Home Deliveries in Bihar (2012-13)	91
Figure 3.15 Scheduled Caste Sub-Groups in Aurangabad District, Bihar (2011)	97
Figure 3.16 Scheduled Caste Sub-Groups in Jamui District, Bihar (2011)	97
Figure 3.17 Marriage below Legal Minimum Age in Aurangabad and Jamui, Bihar (2012-13)	99
Figure 3.18 Infant Mortality Rate in Aurangabad and Jamui, Bihar (2012-13)	100
Figure 3.19 Under 5 Mortality Rate in Aurangabad and Jamui, Bihar (2012-13)	100
Figure 3.20 Crude Death Rates in Aurangabad and Jamui, Bihar (2012-13)	101
Figure 3.21 Neonatal and Post Neonatal Mortality Rate in Aurangabad and Jamui, Bihar (2012-13)	101
Figure 3.22 Total Fertility Rate Aurangabad and Jamui, Bihar (2012-13)	102
Figure 3.23 Crude Birth Rate Aurangabad and Jamui, Bihar (2012-13)	102
Figure 3.24 Natural Growth Rate Aurangabad and Jamui, Bihar (2012-13)	103
Figure 3.25 Working Population Aurangabad and Jamui, Bihar (2012-13)	104
Figure 3.26 Categories of Working Population Aurangabad and Jamui, Bihar (2012-13)	104

Chapter IV

Figure: 4. 1 Child Immunization and Age of Mother, India and Bihar (2007-08)	111
Figure: 4. 2 Child Immunization and Birth Order, India and Bihar (2007-08)	113
Figure: 4. 3 Child Immunization and Sex of Child, India and Bihar(2007-08)	114
Figure: 4. 4. Child Immunization and Religion, India and Bihar (2007-08)	114
Figure: 4. 5 Child Immunization and Social Groups, India and Bihar (2007-08)	116
Figure: 4. 6 Child Immunization and Mother's Education, India and Bihar (2007-08)	118
Figure: 4. 7 Child Immunization and Father's Education, India and Bihar (2007-08)	118
Figure: 4. 8 Child Immunization and Work Status of Mother, India and Bihar (2007-08)	119
Figure: 4. 9 Child Immunization and Household Wealth Index, India and Bihar (2007-08)	120

Figure : 4. 10 Child Immunization and Place of Resedence, India and Bihar (2007-08)	121
Figure: 4. 11 Child Immunization and Access to Ante-Natal Care, India and Bihar (2007-08)	122
Figure: 4. 12 Child Immunization and Access to Post-Natal Care, India and Bihar (2007-08)	122
Figure: 4. 13 Child Immunizations and Place of Delivery, India and Bihar (2007- 08)	123

List of Map

**Page
No.**

Chapter II

Map 2. 1: State Level Variation in Full Immunization Coverage in India (2007-8)	61
Map 2.2 District Level Variation Full Immunization Coverage in Bihar (2007-8)	65

Chapter III

Map 3.1 Distribution of Scheduled Caste Population in Bihar (2011)	80
Map 3.2 Distributions of Scheduled Tribes Population in Bihar (2011)	80
Map 3.3 Study Area Map	94

ABBERVATION

AHS	ANNUAL HEALTH SURVEY
ANC	ANTENATAL CARE SERVICE
ANM	AUXILIARY NURSE MIDWIVES
APHC	ADDITIONAL PRIMARY HEALTH CENTRE
ASHA	ACCREDITED SOCIAL HEALTH ACTIVIST
AWC	ANGANWADI CENTRE
BCG	BACCILE CALMETTE GUERIN
BPL	BELOW POVERTY LINE
CBR	CRUDE BIRTH RATE
CDR	CRUDE DEATH RATE
CHC	COMMUNITY HEALTH CENTRE
CI	COMPOSITE INDEX
GDP	GROSS DOMESTIC PRODUCT
DH	DISTRICT HOSPITAL
DLHS	DISTRICT LEVEL HEALTH SURVEY
DPT	DIPHTHERIA-PERTUSSIS-TETANUS
EBC	EXTREMELY BACKWARD CASTE
EPI	EXTENDED PROGRAMME ON IMMUNIZATION
FGD	FOCUS GROUP DISCUSSION
GFR	GENERAL FERTILITY RATE
GIVS	GLOBAL IMMUNIZATION VISION AND STRATEGY
HDI	HUMAN DEVELOPMENT INDEX
Hep-B	HEPATITIS -B
ICDS	INTEGRATED CHILD DEVELOPMENT SERVICES
IFA	IRON AND FOLIC ACID
IHPS	INDIAN PUBLIC HEALTH STRUCTURE
ILIP	INFANT LACKING IMMUNIZATION PERCENTAGE
IMF	INTERNATIONAL MONETARY FUND
IMR	INFANT MORTALITY RATE
JSY	JANANAI SURAKASHA YOJANA
KAP	KNOWLEDGE ATTITUDE AND PRACTICES
LHV	LADY HEALTH VOLUNTEER

MCH	MATERNAL AND CHILD HEALTH
MCP	MOTHER AND CHILD PROGRAMME
MDG	MILLENNIUM DEVELOPMENT GOALS
MI	MISSION INDRADHNUS
MMR	MATERNAL MORTALITY RATIO
MMU	MOBILE MEDICAL UNITS
MO	MEDICAL OFFICER
MoHFW	MINISTRY OF HEALTH AND FAMILY WELFARE
MPW	MALE HEALTH WORKER
NFHS	NATIONAL FAMILY HEALTH SURVEY
NGO	NON GOVERNMENTAL ORGANISATION
NGR	NATURAL GROWTH RATE
NHM	NATIONAL HEALTH MISSION
NMR	NEONATAL MORTALITY RATE
NRHM	NATIONAL RURAL HEALTH MISSION
OBC	OTHER BACKWARD CASTE
OPV	ORAL POLIOMYELITIS VACCINE
PHC	PRIMARY HEALTH CENTRE
PNC	POST NATAL CARE SERVICE
RCH	REPRODUCTIVE AND CHILD HEALTH
RGI	REGISTRAR GENERAL OF INDIA
RI	ROUTINE IMMUNIZATION
SC	SCHEDULED CASTE/SUB CENTRE
SDG	SUSTAINABLE DEVELOPMENT GOALS
SDH	SUB DIVISIONAL HOSPITAL
SRS	SAMPLE REGISTRATION SYSTEM
TFR	TOTAL FERTILITY RATE
U5MR	UNDER FIVE MORTALITY RATE
UIP	UNIVERSAL IMMUNIZATION PROGRAMME
UNDP	UNITED NATION DEVELOPMENT PROGRAMME
UNICEF	UNITED NATIONS CHILDREN FUND
VPD	VACCINES PREVENTABLE DISEASES
WHO	WORLD HEALTH ORGANISATION

Introduction

1. Introduction

Immunization is the most powerful and effective health intervention to control and eliminate the morbidity and mortality among infants and children from life-threatening infectious diseases. Infectious diseases cause death and sometimes it makes small children physically impaired for their entire life. Sometimes, it also interrupts and prevents the cognitive development of children. Young children are more vulnerable to get an infection from communicable diseases, because their immunity power is yet to be developed. On the other hand, fully immunised children are less vulnerable to get affected by the ‘Vaccine Preventable Diseases’ (VPD) (Arif, 2004). Immunization is a process whereby a person is made immune or resistant to an infectious disease, normally by the administration of a vaccine (WHO, 2012). Vaccines stimulate the body and its own immune system to protect the person against subsequent infections or diseases. Therefore, the high prevalence of VPD leads to high infant and child mortality. It is also responsible for physical and mental disability among children.

Child Immunization Programme is a very cost-effective health intervention programme, which is very difficult for a developing country like India due to the low economic growth rate, large geographical areas and big population size. However, child Immunization has a positive physical and biological impact on the population of a country. Investments in child health programme have the great potentiality of valuable output in coming future. Larger investments in child health programme (CHP) create huge human resources that would be physically fit and mentally sound for an economy (Belli & Appaix, 2005).

A strong positive relationship exists between the better health of a population and economic growth process. Economic growth rate is enhanced by its healthy human resource. Healthy population leads to high economic growth, whereas sick and unhealthy population presents retarding influence on the economy because the sick and unhealthy population does not participate in the process of economic growth in the country (Chanchal, 2016). Furthermore, better child health conditions reduce the extra financial

cost of 'Health Care Service' (HCS) of the Government. It also diminishes the overburden of patients from public and private healthcare service centres. Better child health condition eradicates stress, worries, and the trouble faced by the parents and other family members in the household. On the other hand, unhealthy and disabled child increases economic cost, stress for their parents and other family members in the household. Sick child demands more time from the mother than a healthy child, which directly influences the economic activities of household (**Hope & Robert, 1992**). Furthermore, high cognitive growth rate have been observed in healthy children in comparison to the sick and unhealthy children. Thus, healthy children have higher school attainment and lower educational discontinuation rates whereas the sick children have lower school participation rate and high educational discontinuation rates (**Belli & Appaix, 2005**). High child Immunization coverage not only controls morbidity, mortality among infants and children, but it also increases the child survival rate and leads to higher life expectancy. High fertility rate also starts declining due to increments in 'child survival rate'. Therefore, greater success in child immunization programme has social, economic, and demographic application for a country.

Unfortunately, about 3 million children die every year globally from 'Vaccine Preventable Disease (VPD) and most of them belong to less developed countries of the world (**WHO, 2013**). Diseases such as Diphtheria, Measles, Pertussis, Pneumonia, Polio, Rotavirus Diarrhoea, Rubella, and Tetanus are considered as Vaccine Preventable Diseases (VPD) which are the most life-threatening infectious diseases for children. In 2012, the '**World Health Organization**' estimated the 'Global Child Mortality' from Vaccine Preventable Disease (VPD). It was estimated that about 476,000 children died from Pneumonia, 453,000 children died from Rotavirus, 199,000 children died from Hepatitis-B, 195,000 children died from Pertussis, 118,000 children died from Measles and 2,000 children died from Neonatal Tetanus in the world. In India, more than 5 lakh children had died due to 'Vaccine Preventable Diseases' (**Vashishtha & Kumar, 2013**). The '**Countdown Study 2015**' reveals that about 4 million 'new born babies die in the first month of the life, 5.9 million children die under age of five years, 4.5 million infants die before their first birthdays (**WHO, 2015**), in which 48 percent death occurs in Sub-Saharan African countries and 35 percent in South-Asian countries. This is a matter of concern for Government and societies.

‘Government of India’ provides five vaccines for seven VPDs under Universal Immunization Programme. Following are five vaccines (1) BCG (Bacillus Calmette-Guerin), (2) DPT (3) Measles (4) Polio (5) Hepatitis-B and seven diseases are (1) Childhood Tuberculosis, (2) Diphtheria, (3) Pertussis, (4) Tetanus, (5) Measles (6) Polio and (7) Hepatitis-B (**NRHM Annual Report, 2012**). Government of India’s Ministry of Health and Family Welfare, has recommended one dose of BCG, three doses against DPT, three doses of polio, one dose of measles, three doses of hepatitis- B as essential for ‘Full Immunization’. The vaccine of (1) BCG is given to the infant after birth or within one year of life and it protects from Tuberculosis. (2) DPT vaccine is given for Diphtheria, Pertussis, and Tetanus at the age of 6 weeks, 10 weeks and 14 weeks. (3) Oral Polio Vaccines (OPV) is given for poliomyelitis (4) One dose of measles vaccine is given for measles within 9 to 12 months and (5) Hepatitis – B should be given as early as possible within 24 hours after the birth of a child.

(National Immunization Schedule for Infants and Children).

National Immunization Scheduled for Infants and Children (2015)		
When	Name of Vaccines	Diseases Covers
At Birth (Zero Dose)	BCG (Bacillus Calmette-Guerin), OPV (Oral Polio Vaccines), Hepatitis B	Childhood Tuberculosis, Polio, Hepatitis B
6 Week	OPV, DPT, Hepatitis –B	Polio, Diphtheria, Pertussis, Tetanus Hepatitis-B
10 Week	OPV, DPT, Hepatitis –B	Polio, Diphtheria, Pertussis, Hepatitis-B
10 Week	OPV, DPT, Hepatitis –B	Polio, Diphtheria, Pertussis, Hepatitis-B
9-12 Months	Measles, Vitamin-A, JE	Measles, Vitamin-A, Japanese Encephalitis
16-24 Months	Measles, Vitamin-A, JE (Booster of DPT and OPV start)	Measles, Vitamin-A, Japanese Encephalitis
<i>Source – National Health Portal, Ministry of Health and Family welfare Published on 13 April 2015)</i>		

The ‘**World Health Organization**’ (WHO) and UNICEF have jointly estimated the global vaccination coverage of specific vaccine each year. The reports reveal that 83 percent of world’s children have been vaccinated against DPT in 2012, and 84 per cent children have been immunised with three doses of polio vaccine, 79 per cent children vaccinated against measles, 81 per cent children immunised from maternal and neonatal tetanus, and 79 per cent children against Hepatitis -B in the world.

2. Statement of the Problem

Last three decades have been considered as the ‘Immunization Revolution’ in the world and as well as in India. In 1978, India adopted an ‘Extended Programme on Immunization (EPI)’ with the objective of reduction of morbidity, mortality, and disability among children from six ‘Vaccine Preventable Diseases’ (VPD). Measles, Tuberculosis, Pertussis, (Whooping Cough), Diphtheria, Tetanus, and Poliomyelitis are recognised as ‘Vaccine Preventable Diseases’ (VPD). Furthermore, the Government of India launched ‘Universal Immunization Programme’ (UIP) in 1985-86. The Universal Immunization Programme (UIP) is one of the largest Immunization Programmes in the world in terms of the quantity of vaccines used, number of beneficiaries, number of Immunization sessions organised, and the geographical spread and diversity of areas covered. It targeted 85 percent full vaccination coverage of all six vaccination preventable diseases among infants in the country by 1990. These vaccines are provided free of cost all over the country. Furthermore, **Ministry of Health and Family Welfare, Government of India** has declared ‘**Year 2012**’ as the year of intensification of ‘**Routine Immunization**’. The key objective of this campaign is to improve full Immunization coverage and reach all children, particularly in remote areas, inaccessible and backward areas as well as in urban slums areas (**MHFW, 2014**)

In spite of the hard efforts, lots of money, time and energy spent on the UIP, the result is far from its goal because only 54 per cent children could be fully immunised in the country till 2008 (**DLHS, 2007-8**). India experiences the lowest child Immunization rate of any country in the world, while India has the highest birth cohort comprising 26 million new-borns per year (**UN Inter-Agency Group of Child Death, 2013**). The most recent data on vaccine preventable mortality in India (2008), reveals that about 826000 child death happens among 1-15 months old children in the country, in which three-quarter or 60,4000 deaths occur due to vaccine preventable diseases including diarrhoea, pertussis, tetanus, measles, meningitis, and pneumonia (**Black et al., 2008**). Infant Mortality Rate (IMR) and Under-Five Mortality Rate (U5MR) are already very high with 48 per 1000 and 58 per thousand in India (**National Family Health Survey, 2015**). The problem is more serious at the regional level. States like Assam (54) Madhya Pradesh (54) , Odisha (51), Uttar Pradesh (50), Rajasthan (47) , Chhattisgarh (46), Bihar (42), Meghalaya (47) and Haryana (41), experience higher infant mortality rate than the

national average (40 per 1000 live birth) (**Register General of India, 2013**). Similarly, Assam (73 per), Madhya Pradesh (69), Odisha (66), Uttar Pradesh (64), Rajasthan (57), Bihar (54) and Chhattisgarh (53) demonstrate higher under-five mortality rate than the national average (49 per 1000 live birth) (**Register General of India, 2013**).

India demonstrates poor coverage of BCG, DPT, Polio, Measles, and Hepatitis-B among children, while India is the leading producer and exporter of vaccines in the world at present (**Vashishtha & Kumar, 2013**). India indicates the lowest child Immunization coverage in the South Asian region (**WHO & UNICEF, 2013**). Sri Lanka has presented the best performance in the South Asia Region. It has also achieved the 'Millennium Development Goals'. Even, Bangladesh, Bhutan, and Nepal have a far better position than India. Furthermore, regional variations can also be seen regarding Immunization coverage across various states of the country. States like Himachal Pradesh, Punjab, Goa, Kerala, and Tamil Nadu show better performance with more than 80 per cent Immunization coverage whereas the states such as Uttar Pradesh, Arunachal Pradesh, Madhya Pradesh, and Bihar have achieved less than 50 percent child Immunization coverage.

Furthermore, within India, Bihar is the poorest performing state regarding child Immunization coverage i.e. only 41.4 percent (DLHS III, 2007-8) which is the third lowest state in terms of complete full vaccination coverage in the country. Variations can be also seen at the micro level within the state. Only two districts demonstrate the higher percentage of full child Immunization coverage than national level, namely 'Saran' with 67.0 per cent and 'Aurangabad' with 60.7 per cent; rest of 35 districts experience lower performance than the national average regarding Immunization coverage among children. Jamui district presents the poorest child Immunization coverage with only 19.1 percent (DLHS-III, 2007-08) in the state. This is a serious matter of concern for the Government of India.

In addition, multiple inequalities also exist in the country. Less educated mothers experience poor child Immunization coverage with only 37.8 percent, while higher educated mothers represent higher child Immunization coverage with 74.8 per cent. Similarly, only 35.6 per cent children of poorer section of the society are fully immunised, whereas it is 73.1 per cent among richest sections of the society. There is a wide gap between illiterate mothers and highly educated mothers as well. The percentage of childhood Immunization coverage also varies by various segments of the population

groups in the country. Hindu population records a better coverage of vaccination than Muslims and other minority communities. The Immunization coverage is the lowest among socially marginalised groups (SC/ST) than the non-marginalised counterparts. Only 52 per cent Scheduled Caste (SC) children and only 45 percent Scheduled Tribes (ST) children are fully immunised against VPDs in the country. Furthermore, female children have lesser access to Immunization than their male counterparts. Moreover, about 5 percent of the children have not received even a single vaccine in their life. Discontinuation is another important issue regarding the multiple doses of vaccines such as DPT, Polio, and Hepatitis B. This issue is acute in the rural areas.

Furthermore, poor public health care infrastructure is the next major issue in the study region. Public health centres play an important role in the successful implementation of healthcare schemes and programmes in the country, which are running through the State Governments, Central Government, and International Organisations. The number of public healthcare centres is too small to meet the actual demand. These healthcare centres are also experiencing lack of human as well as physical resources like non-availability of doctors, nurses, ANMs, paramedics and other medical personnel as well as irregular supply of subsidised medicines, proper storage facilities and so on. Apart from infrastructural problems; there are other social issues like ignorance, prejudices and superstitions against vaccinations.

Some districts of Bihar shows poor coverage of UIP and Jamui is one of them. That is why, Jamui district has been selected for the primary survey. Another district from South Bihar, namely Aurangabad has been selected for a comparative study; because this district shows a better coverage than Jamui district. District level comparison may give a better understanding of interplaying factors behind the poor coverage of the Immunization Programme. This study is probably the first of its kind conducted in these districts.

3. Literature Survey

Child Immunization is one of the important elements of maternal and child health care, therefore, many Governments of the developed and developing countries have adopted it as an integral part of their health policy. Special attention is being paid by various international and national organisations to improve the child health. The issue regarding child Immunization coverage have been studied very broadly by various scholars and

extensive literature is available in this regard. Therefore, various books, articles, reports, and other documents have been surveyed under various sub-themes.

3.1. Socio-economic and Demographic Determinants

Socio-economic and demographic characteristics of parents play a vital role in child Immunization coverage. In fact, a single factor is not responsible for child Immunization coverage, but a set of socio-economic and demographic factors are responsible for this **(Bardenheier et al., 2004)**.

3.1.1 Sex of Child

There is a strong evidence of sex discrimination against female children in Immunization coverage in North India. **(Dembkowaski et al., 2004; Mishra et al., 2004; Pande, 2003)** pointed out that sex bias is also responsible for the delay in vaccination of female infants. Actually, the son preference and sex biasness have been existing in India for centuries **(Visaria & Visaria, 1983)**. Female children get less attention than their male counterparts. **(Caldwell et al., 1982; Miller, 1981)** also found in their study that the male children are more likely to get treatment during illness than their female counterparts. The socio-economic, cultural, and religious factors are also responsible for gender discrimination regarding intra-household resource allocation for accessing healthcare facilities. In a traditional patriarchal set-up, male children provide labour in the field, help in earning money since childhood and moreover, it is believed that they will take care of the parents during their old age. In the traditional feudal society, couples having male children get more respect and are able to hold their dominance on others. In a patriarchal society, sons secure the lineage and perform funeral rites of the parents after their death. On the other hand, the daughters are considered as '*Paraya Dhan*'; who is destined to get married after puberty and have to leave their natal families for the in-laws. The prevalence of dowry system also adds further economic burden on the parents. In spite of legal assurance of daughters' equal right to the property, traditional Indian society does not recognise 'the right' and it compels parents to provide fat dowries during their daughters' wedding. Thus, parents try to save money for daughters' dowry instead of spending them on her health or education. On the other hand, the sons receive dowry during their marriage and it increases the family wealth **(Agarawal & Kumari, 2014)** Women are not only the victims of systematic social discrimination but also suffer from

more misery in the traditional set-up, which deny their right to education, health and others privileges enjoyed by males.

3.1.2 Birth Order

Birth order or parity is another important determinant of child Immunization (**Bronte-Tinkew & Dejong, 2005**). Children in the lower birth order show higher access to Immunization and vice versa (**Bardenheier et al., 2004**). However, child Immunization depends on ‘knowledge or learning’ factor and ‘negligence’ factor. Though, knowledge factor does not show much variation with birth order; but negligence factor shows remarkable variation. Children in the higher birth order face more negligence from their parents and thus have lesser access to Immunization (**Patra, 2006**). Children born in the first and second birth orders receive more attention from their parents than their younger siblings; because that time, pregnancy remains new to the mothers and they do not like to take any risk regarding their new-borns (**Bhatia & Cleland, 1995; Elo, 1992; Navaneetham & Dharmalingam, 2002; Raghupathy, 1996**).

Anti (2009) also found negative association of child Immunization and birth order in his Nigerian study. Similar negative association has also been observed by **Agarawal & Kumari (2014)** in Uttar Pradesh study. (**Anti, 2009**) also found negative association between child immunization and birth order in a study conducted in Nigeria. The maximum vaccination had been given to first birth order children in comparison to the higher birth order children in the Philippines (**Bardenheier et al., 2004**). In addition, the majority of the lower birth orders children’s mothers are younger who are more likely to utilize child health care services than older women (**Sharma, 2007**).

3.1.3 Age of Mother

Age of the mother is another important demographic determinant. It has been found that young mothers show more acceptance towards modern healthcare services and have more exposure to knowledge than their older counterparts. Young mothers often have more years of schooling, which increase their knowledge and awareness regarding modern facilities (**Elo, 1992; Raghupathy, 1996**). So, there is an inverse relationship between the child Immunization and the age of mother (**Anti, 2009**).

However, this finding is challenged by **Waldhoet et al. (1997)**; they observed in their study that older women have better knowledge and experience regarding childcare than their younger counterparts. However, in the traditional society, older women give less importance to modern healthcare facilities than the traditional methods (**Elo, 1992; Raghupathy, 1996**). **Bhuiya & Streatfield's (1991)** study on rural Bangladesh and **Antai's (2011)** study on Nigeria supports the fact that mothers' age plays an important role in child Immunization depending on their exposure to the traditional and contemporary knowledge.

3.1.4 Type of Family

Various type of family system are not equal in terms of child health outcome (**Bronte-Tinkew & Dejong, 2005**). Studies conducted by various scholars have revealed that children living in extended families get more care and support than nuclear families (**Mathew, 2012**). Similar finding has been observed by **Chen & Escarce (2006)** in case of treatment of childhood obesity. The time and economic help given by parent to their children for child wellbeing is quite different in both of the family types (**Thomson et al., 1994**).

The children living in separate families are more vulnerable to poor child health outcome in comparison to children living in joint families. Nuclear families face constraint of time (**Bronte-Tinkew & Dejong, 2005**).

3.1.5. Wealth Index

Changes in socio-economic status might lead to positive changes in the living standard and lifestyle and lead to maximum Immunization coverage (**Ruststein, 2000**). Economic status of the household has a strong positive impact on childhood Immunization coverage because high-income people have high affordability for vaccine uptake (**Arif, 2005**). Household income is one of the most important factors for child wellbeing and child Immunization. Low-income of household reduces childhood Immunization rate (**Bronte & Gorden, 2005**). Child Immunization discontinuation rate is also higher among poor population in comparison to the rich population (**Dompkowsk, 2004**). Poverty also controls health seeking behaviour in terms of ignorance. It also limits the accessibility of education (**Thelma et al., 1990**). Poor households have larger families and small house

sizes leads to overcrowding, poor sanitation, unhygienic condition; resulting in increase in the possibility of morbidity and mortality among new-born babies (**Sheldone, 1991**). The economic status of the family is one of the most important factors for child well-being. The low income of household reduces the childhood immunization rate (**Bronte-Tinkew & Dejong, 2005**) Poverty also controls health seeking behaviour in terms of ignorance and lack of education (**Thelma et al., 1990**). Furthermore, the poor households have larger number of children (**Sheldone, 1991**). Higher child Immunization coverage has been observed in rich households (**Agarawal & Kumari, 2014**).

3.1.6 Mother's Education

Mother's educational level is one of the most important and powerful factors explaining differentials in childhood Immunization coverage within societies (**Streutfield et al., 1990**). Maternal education plays a significant role in child health well-being (**Bardenheier et al., (2004)**). Children have higher chance of Immunization if their mothers have cleared at least middle school (**De & Bhutia, 2002**). Educated mothers have greater knowledge of childhood Immunization and better initializations of modern preventive services (**Mathews & Diamond, 1997; Streutfield et al., 1990**) Further, **Streutfield et al. (1990)** mentioned that maternal education is positively interrelated with childhood Immunization. Education allows women to access information about vaccination from mass media more efficiently and to identify better quality health care services. It has been observed that the children of primary school educated mothers are healthier than the children of illiterate mothers (**Arif et al., 2005**). **Lee & Mason (2005)** emphasized that only maternal education can improve the childhood Immunization. However, less educated mothers are less likely to immunise their daughters than the sons (**Arif et al., 2005**). If other variables are controlled, maternal education has a positive impact on child survival (**Bhuya & Stretfied, 2004**). In addition, no education or less education leads to delay in uptake of vaccination and higher discontinuation in Immunization (**Dombkowski, 2004**). Child mortality rates are much higher in families with uneducated parents since education is strongly correlated with the types of work they do. Education increases the earning capacity of the parents (**Ruststein, 2000; Stratified, 1990**). It is proved in some studies that the educated mothers are more likely to engage in health-promoting behaviours. Actually, education enhances the knowledge of childhood Immunization against VPD. There is an inter-linkage between the level of

education and knowledge of health care services. The educated mothers get more information and knowledge of child health and maternal health care related information, and they easily adopt modern medicine and health care practices (**Streatfield et al., 1990**). It is assumed that educated mothers' access to mass media and exposure helps in utilisation of childhood immunization Programme running in the country or state. Educated mothers have greater knowledge of childhood diseases and child Immunization. Thus, educated mothers understand the importance of child vaccination **Streatfield (1990)**. In addition, **Streatfield et al. (1990)** noted that knowledge of Immunization is universal among all educated and uneducated people, but the accurate knowledge of function of specific types of Immunization is not universal. The level of perfect knowledge of disease and its related vaccine increases with the educational level of parent. BCG and DPT are not well known in the society whereas ante-polio is popular among people. Probably, the name of the vaccine incorporates the name of diseases. Therefore, **Streatfield (1990)** noted that the level of education and correct knowledge of vaccine and its related disease are significant and it has a linear relationship. He also proved that educated women are much more likely to obtain their knowledge from medical personnel than those who had completed less than primarily school since educated mothers are more able to communicate in a better way with the health personnel than uneducated ones (**Cadwell, 1979**). Education enhances the parent's ability to process and evaluate information and to engage in critical thinking (**Sonalde & Alva, 1998**). Education also increases the earning capacity (**Ruststein, 2000**). Furthermore, education ensures better childcare and living environment. In addition, it strengthens the women's social and economic autonomy. Educated women are less fatalistic and more progressive than illiterate ones as they accept new knowledge and ideas from their surrounding community knowledge (**Babalola & Fatusi, 2009; Caldwell, 1979; Chen, 1984; Cleland & Ginneken, 1988; Tewodros et al., 2009; Tran et al., 2012; Qystein, 2004; Yang et al., 2010**).

3.1.7 Work Status of Mother

Mother's employment has a positive influence on child health, well-being, but in some cases, it has negative influence also (**Mittal et al., 2007**). **Memcher (1986)** and **Thomos (1990)** have explored that earning women have a positive influence and this directly improves child well-being. Earning women are more likely to spend income on food and

health care services for their children. Earning women have a comparatively different expenditure pattern than non-earning women (**Berman et al., 2015**). On the other hand, work status of mothers have inverse effect on the child health outcome as they find less time for child health care due to their higher workload. **Laubur Verena (2014)** explored in his study in Germany that total amount of time given by a mother to her child is the driving force for better child health outcome. He shows an inverse relationship between mother's education and time spent in childcare. Higher the mother's education, lower the time spent in childcare. Time spent on work decreases the time availability for child feeding, breastfeeding, and treatment seeking (**Jain, 1985**). In some cases, maternal employment does not become an element of empowerment because their income is either less or not sufficient for her poor household; they are often treated as secondary earners. In rural areas, most of the mothers are wage labourers, self employed and unpaid family workers or household workers (**Berman et al., 2015**). Apart from this, social and cultural environment also restrict women empowerment (**Berman et al., 2015**). Indian society is male dominated that restrict women's empowerment. The nature of work is quite different in agricultural sector than manufacturing or service sectors. Engagement of women in agricultural sector has adverse effect on the utilisation of public health care services and the risk of infant mortality has 50 per cent greater chance than non-working mothers. Parents who work in agricultural sector in rural areas are less likely to seek treatment in case of acute respiratory infection and diarrhoea and hardly get time to go for child Immunization. **Sivkami (1997)** found, in his study of rural Tamil Nadu, that working mothers spent less time than non-working mothers on child health care. Therefore, the children of the working mothers get less time than their non-working counterparts. **Susan (2002)** explored that working women, particularly labourers, cannot change their work schedule even after the childbirth and they have to go outside. In case of housewives, they have more work inside the house after childbirth. **Susan (2002)** mentioned that women are engaged in multiple economic activities in developing countries and their work intensity are different that influence their involvement in childcare.

3.1.8 Role of Father and Educational Level

Father plays a dominant role in the family because he has control over all resources of the household. Therefore, men decide when and where women should seek the health care

services (**Shaikh & Hatcher, 2004**). It is considered in the society that child care is only the task of mothers, while fathers also play a very important role and has large scale responsibility for their children's wellbeing. Father is the back bone of the household because he is the main economic resource provider. He provides the basic needs as well and is responsible for nutrition, medical care, and education in the household. In addition, fathers maintain peace and harmony among family members in the household (**Jahn & Asllam, 1995**).

3.1.9 Religion

The utilisation of health care services might vary across religious groups (**Benjamin & Brown, 2004**). Actually, the influence of religion on health outcomes is contradictory because it has been found to have both positive effects and negative effects (**Anti, 2009**). Religious groups that are in majority dominate in the utilisation of public health services (**Benjamin & Brown, 2004**).

Religious beliefs may motivate the individuals to lead healthier lives including the use of regular preventive care. In addition, religion may also enable the individuals to use health care services by providing information and even instrumental support (**Benjamin & Brown, 2004**). As seen in Nigeria, lower proportion of non-Immunization was observed among Muslims mothers as compared to Christian mothers. Muslims have also been generally discriminated in their access to health care services resulting in further poor levels of Immunization (**Anti, 2009**). Similarly, complete vaccination coverage was higher among Christians and Sikhs as compared to Muslims in India (**Mathew, 2012**). **Phukan et al. (2008)** has observed in their study in Assam that Hindu population groups seek more vaccination than the Muslims. On the other hand, **Levin et al. (1986)** and **Pearce & Axinn (1998)** did not find any significant relationship of utilisation of health care services and religion in their study conducted in the USA.

3.1.10 Social Groups

Indian society is highly stratified by castes and sub-castes. Scheduled Castes and Scheduled Tribes are at the bottom of the social hierarchy. Historically, they are most backward in terms of social, economic, cultural, and other aspects. They face more exclusion in economic development process whereas; general caste groups have better access to economic resources (**Mohindra et al., 1979**). It is also seen that infants from

general category families had higher vaccination coverage than the Scheduled Caste, Scheduled Tribe, and Other Backward Classes (**Mathew, 2012**). Since Scheduled Castes and Scheduled Tribes are considered as socially marginalised groups, thus, their health seeking behaviour is different from the other social groups (**Navaneethanmm & Dharmalingam, 2002**). Upper caste population have better access to wages, employment, education and have better awareness regarding healthcare facilities; thus, they record better access to Immunization than that of their lower caste counterparts. The practise of untouchability and social exclusion prevents the Scheduled Caste population to access the available healthcare facilities even within their own villages. They face apathetic behaviour from the service providers; health personnel refuse to touch their children during vaccination or seldom bother to inform them during the campaign. It not only lowers SC people's access to healthcare facilities but also creates a sense of inferiority which prevents them to approach for Immunization in the near future (**Bhatia & Cleland, 1995**). Caste based residential segregation is still prevalent in the Indian villages; the SC/ST people live in the separated hamlets far away from the main villages. However, healthcare centres always remain located to the main settlements and all campaigns or meetings regarding Immunization also happen in the main villages, not in the hamlets. Thus, they hardly get information about Immunization Programmes (**Appasamy et al., 1995**). Similarly, the tribal population is socially and geographically isolated. They live in remote and less accessible terrains; their localities usually remain devoid of basic health care facilities. Therefore, they are compelled to rely on traditional healers and local herbs instead of modern healthcare facilities (**Reena, 2011**). Hence maximum Immunization is reported among the upper caste population (**Phukan & Mahantra, 2008**).

3.2 Others Factors

3.2.1 Utilisation of Antenatal Care

Antenatal care and child Immunization have a close relationship. Mothers having ANC in the first trimester of pregnancy are more likely to immunise their children than the others (**Mathew, 2012**). During the ANC visits, mothers receive knowledge regarding childcare and Immunization; and they also develop a good rapport with the health personnel (**Sonalde & Soumya, 1998**). Hence, trust develops between the patient and health personnel. The patient acquires a greater general knowledge regarding health care system (**Sonalde & Soumya, 1998**).

3.2.2 Exposure to Mass Media

Exposure to mass media is another important social determinant of child Immunization. Mothers who regularly watch televisions, follow radio Programme and can read newspapers; receive more news and information regarding child health care and Immunization. Several studies have proved that mothers exposed to mass media are more likely to immunise their children against VPD than the others (**Patra, 2006; Anti, 2009**). It is assumed that mothers who can read newspapers are literate and more empowered than others (**Anti, (2009)**)

3.2.3 Place of Residence

The children living in urban areas are more immunised than rural areas. **Wilson (2000)** observed in the USA, that children living in rural America have lower Immunization rate as compared to their urban counterparts. The reason has been attributed to insufficient public health care centres and distance from medical centres. Urban areas are characterised by modernised technology, well maintained health facilities, health infrastructure, developed means and mode of transportation, communication, electrification, high mass media exposures etc. Urban residents also have the advantage of being educated, progressive and aware while rural people are characterized by poverty, technological and social backwardness, lack of health care services and less developed infrastructure (**Lalou & Grand, 1997**).

3.2.4 Distance of Health Centre

The distance of health care facility from the residence is an important factor in the utilisation of health care service (**Arif, 2005**). There is a strong association between vaccination of children and distance because short distance takes less time and low transport cost (**Al-Taiar et al., 2010**). **Brook (1973)** documented the fact that in America that longer distance decreases the proportion of attendance whereas short distance attracts more attendance whether it is a large bureaucratic or a small neighbourhood clinic. **Felkin et al. (2009)** pointed out to the distance decay effect on treatment of sick children in Kenya. The rate of clinic visitors decreased linearly at 0.5 km interval up to 4 km. Maximum visitors lived within 5 km radius of a health centre. **Peter et al. (2008)** also found an inverse relationship between distance and health utilisation. Metalled road connectivity and better means of transportation regulate proper supply and distribution of

vaccines. In addition, lack of adequate communication services limits the access to health care services. This obstacle becomes more prominent in remote areas where communication gets cut off during adverse weather conditions. An empirical study conducted by **McGuirk & Porell (1984)** suggests that distance and time factors strongly influence the hospital choice even in metropolitan areas where alternatives are widely available. Complete vaccination coverage is reported in only 19 percentage infants living in small villages located more than 5 km away from health centres. In contrast, villages located within 1 km of a health-care centre had 56.9 percent coverage. However, some villages that were relatively nearer to health centres also had lower vaccination coverage (**Mathew, 2012**).

3.2.5 Knowledge, Attitudes, Cultural Beliefs and Practices

Angellia et al. (1999) has found in their study conducted in Italy that misconception regarding vaccination delays Immunization of children. Mothers fear that Immunization is not helpful for their children's health and it prevents them to access the services. Another study conducted by **Awodel et al. (2005)** in Nigeria found that parents' awareness play a positive role in child's vaccination. Mother's age is another important factor which determines her belief and awareness regarding vaccination. Elder women are found to be reluctant towards vaccines in Nigeria (**Tarrant & Gregory, 2001**). In the rural areas, traditional healers, grandparents and neighbours often provide advice regarding childcare and they hardly advice anything scientific. Every society has its own norms and practices, which are imposed on the new mothers and babies through village communities and elders (**Coburn & Pope, 1997; Ahmed et al., 2000; Shaikh & Hatecher, 2004**).

4. Child Immunization Programme and Policies in India

Vaccination research and production in India had been initiated by the British rulers with the establishment of 15 vaccine institutes in 1890. The first vaccine for smallpox had been invented by Jenner in 1896, and after that, it spread over many parts of the world particularly in America and Europe due to its advantage. The smallpox vaccine reached India within 4 years of its invention in May 1802. The first dose of smallpox had been given to a three-year-old child named '*Anna Dusthall*' in Mumbai on 14 July 1802 (**Lehriya, 2014**). After that, smallpox vaccines have been sent to Chennai, Pune,

Hyderabad and Surat. **Haffkine** developed the world's first plague vaccine in 1897 at 'Plague Laboratory Mumbai'. Soon 'Indian Vaccine Institute' began to produce TT, Diphtheria Toxoids (DT), Diphtheria, and Pertussis Tetanus Toxoids (DPT). After independence, it took three decades to articulate India's first official policy of childhood vaccination, a policy that was in alignment with the policy of the 'World Health Organization (WHO).' 'The World Health Organization' had initiated '**Expanded Programme of Immunization**' (EPI) in 1974. In 1978, India adopted six childhood vaccines (1) Bacillus Calmette-Guerin (BCG), (2) TT. (3) DPT (4) DT (5) Polio and Typhoid. A measles vaccine was added much later in 1985 when the Government of India launched universal Immunization coverage of all pregnant women and children.

4.1 Childhood Immunization after Independence

After the Independence, child mortality and health issues were addressed through Maternal and Child Health (MCH) programme and these became an integral part of the family planning Programme. The Fifth Five-Year Plan covered the family planning Programme as an integral part of Maternal and Child Health (MHC) and Nutrition Services (**Bhinde & Kanitkar, 2011**). The first Primary Health Centre (PHC) was established in 1952 only for providing free or subsidised maternal and child healthcare services to the Indian population. There was only one ANM at Primary Health Centre (PHC) and three were posted at the sub-centres, which covered a population range of 20,000. MCH included Immunization of infant and preschool children against DPT, Immunization of mother against tetanus, prophylaxis against nutritional anaemia of mother and children and prophylaxis against blindness caused in children and mother (**Bhinde & Kanitkar, 2011**).

4.2 Extended Programme on Immunization (EPI) (1978)

The Extended Programme on Immunization (EPI) has been initiated by World Health Organization (WHO) and introduced globally in 1974. After four years of introduction, India also adopted EPI in January 1978 with the help of 'World Health Organization'. The main objective of the EPI was to reduce mortality and morbidity from Diphtheria, Pertussis, Tetanus, Poliomyelitis, Measles, Tuberculosis, and Typhoid. This was the first effort to deal with some of the problems of public health. The EPI has been implemented

through all existing health care centres such as Primary health centre (PHC) Community Health Centre (CHC) and Sub -centres (SC). It was the integration of Immunization services, expansion of vaccination coverage, the addition of new vaccine, development of cold chain system, and training of health personnel, expansion of health education, and evaluation of expanded Programme and other activities (**Debabar, 1985**). The EPI covered 25 per cent of DPT Immunization, 5.0 per cent of Polio, 65 per cent of BCG, 20 per cent of DT, and 2.0 percent of Typhoid in the country in 1980-82.

Name of Vaccine	Percentage
DPT	25.0
Polio	5.0
BCG	65.0
DT	20.0
Typhoid	2.0
<i>Sources-</i> Ministry of Health and Family Welfare (1981)	

4.3 Universal Immunization Programme (UIP) (1985)

Immunization Programme is one of the key interventions for the protection of children from VPD. Universal Immunization Programme was started in 1985 with the objectives of increase in percentage Immunization coverage, improving the quality of services, establishing a reliable cold chain system, improving health facility levels, introducing a district wise system for monitoring of performance, and achieving self-sufficiency in vaccine production.

4.4 Intensification of Routine Immunization (IRI), (2012)

India has declared the year 2012 as the year of ‘Intensification of Routine Immunization’. The key objective of this campaign is to improve full Immunization coverage, particularly in remote, inaccessible, and backwards areas as well as in urban slums. Various approaches have been adopted like the Micro Plan has been formed to cover all villages and hamlets in the country. Special attention has been given to pockets of low Immunization coverage. Intensification of Immunization activity has been started by observing Immunization weeks in low performing states. IEC (**Information, Education & Communication**) related activities have been launched to popularise Immunization Programme. Apart from awareness generation, recruitment of health personnel,

prioritising 200 poor-performance districts; migrant communities have been given consideration (MHFW, 2013).

4.5 Immunization Week (IW)

‘Immunization Week’ is one of the important strategies to improve Routine Immunization coverage in the priority areas. Immunization Weeks are proposed to be conducted in 16 low performing states including North Eastern (NE) states (Assam, Manipur, Meghalaya, Nagaland, Tripura, Arunachal Pradesh, Mizoram and Sikkim) Uttar Pradesh, Bihar, Jharkhand, Rajasthan, Madhya Pradesh, Chhattisgarh, Odisha and Gujarat, and 239 low performing districts have been prioritized for intensification. The objective of ‘Immunization Weeks’ is to increase the Immunization coverage with all vaccines under the National Immunization Schedule and to reach persons living in remote areas (NRHM, 2012).

4.6 Introduction of Pentavalent Vaccine (DPT+Hep-B +Hib) (2011)

India introduced ‘Pentavalent Vaccine’ firstly in two states viz. Kerala and Tamil Nadu under routine Immunization Programme from December 2011. Pentavalent Vaccine contains DPT, Hepatitis-B, and Haemophilia influenza (Hib). This was part of the Immunization schedule and required 6 injections to deliver the primary doses. Hib protects from Haemophilus influenza type B associated with Pneumonia and meningitis. About 25 lakh children have been vaccinated till August 2012 with the Pentavalent vaccine in the two states mentioned above. The Pentavalent vaccine has been expanded to 6 more states i.e. Haryana, J&K, Gujarat, Karnataka, Goa and Puducherry in 2012-13 (NRHM, 2012).

4.7 Introduction of Hepatitis B Vaccine (2002-03)

The Hepatitis-B vaccine has been introduced by Government of India in 2002-03 as a pilot in only 33 districts and 15 cities. In 2011, it has been universalized to all States/UTs in the country. Hepatitis B vaccine is given as intramuscular (IM) injection to the infants at 6th, 10th and 14th weeks along with the primary series of DPT and Polio vaccines. The additional one dose of hepatitis B is given at birth for institutional deliveries within 24 hours of birth (NRHM, 2012).

4.8 Pulse Polio Immunization (1988)

The first Programme for polio eradication has been initiated in 1988 in the world by ‘World Health Assembly’ resolution. In India, the ‘Pulse Polio Immunization Programme’

has been launched in 1995 in which 0-5 years old children are administered polio drops. About 172 million children are immunised during each National Immunization Day (NID). The last polio case in the country was reported from Howrah district of West Bengal on 13th January, 2011. Thereafter, no polio case has been reported in the country (25th May 2012). On 24th February 2012, World Health Organisation removed India from the list of countries with active endemic wild poliovirus transmission. There are 24 lakh vaccinators and 1.5 lakh supervisors involved in the successful implementation of the Pulse Polio Programme (NRHM, 2012). India was declared polio free by World Health Organization in 2014.

4.9 Mission *Indradhanus* (MI) (2014)

The Government of India has expressed its commitment to expand child Immunization coverage in the country by the year 2020. Ministry of Health and Family Welfare has launched '**Mission *Indradhanus***' on 25 December 2014 to expand child Immunization coverage across the country by the year 2020. The name of Mission *Indradhanus* means rainbow, which contains seven colours that represent the seven vaccine preventable childhood diseases namely Diphtheria, Pertussis (Whooping Cough), Tetanus, Childhood Tuberculosis, Polio, Hepatitis B and Measles. '**Mission *Indradhanus***' will be completed in two phases. In the first phase of the mission, 201 districts were to be covered which had poor vaccination coverage. This was proposed to be done by the year 2015. More than 50 per cent children are unvaccinated and partially vaccinated. Out of 201 districts, 82 districts belong to only four states of India namely, Uttar Pradesh, Bihar, Madhya Pradesh and Rajasthan. Another 297 districts will be covered in the second phase. Apart from this, vaccines for JE (Japanese Encephalitis) and Hib (Haemophilus influenza type B) are also being provided in selected states. All these vaccine preventable diseases are available free of cost for all the children (MoHFW, 2015).

5. Gaps in Literature

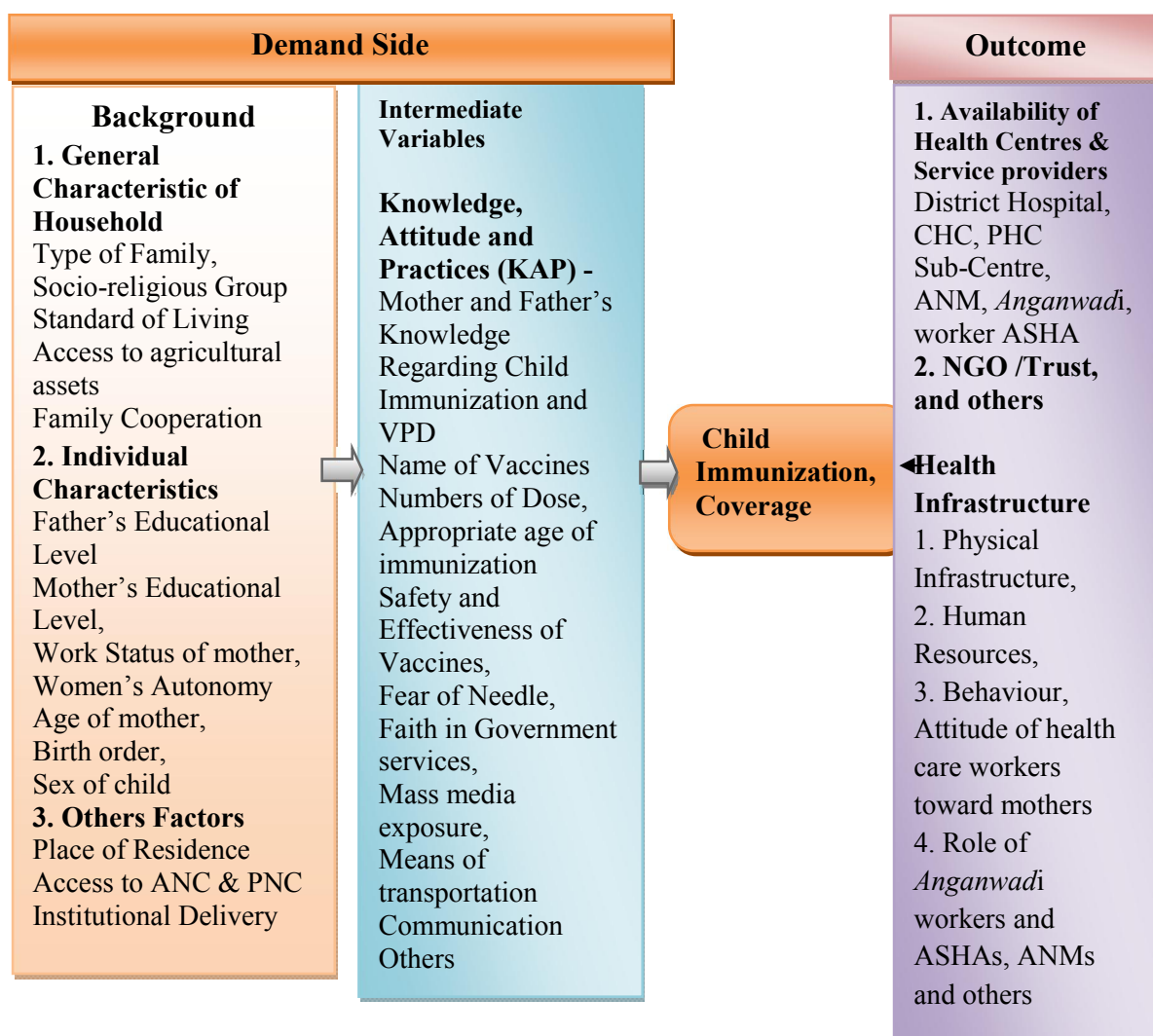
Although, so many studies have been done and extensive literature is available for child Immunization, many important factors are yet to be studied. This study intends to fulfil these gaps. The role of parents, particularly fathers, is vital in child Immunization process, but not many studies have focused on the father's characteristics and his contribution. This study will also cover mother's educational level, work status, type of work, awareness and women's autonomy. The contribution of family structure, family

cooperation and family conflicts have been almost ignored in many of the studies. The role played by the service provider and health functionaries have been ignored in various studies, but present study examines the availability of health care facility, the location of a health centre and its distance from the households, supply and distribution of vaccine and availability of the human and physical resources. The issue related to *Anganwadi workers*, *ASHAs* and ANMs have not been well documented while they are the engines of child Immunization Programme. This study also covers knowledge, attitude, and practice regarding child Immunization coverage extensively. A comparative analysis has been done between two different districts ‘*Jamui* and *Aurangabad*’, which have not been studied in the light of childhood Immunization. This study will be the first one to be conducted in Aurangabad and Jamui districts of Bihar.

6. Conceptual Framework

Child Immunization, an essential step towards reducing infant and child mortality is actually dependent on a number of socio-economic determinants which determine the demand and supply of Immunization in a region (**Mishra et al., 2003**). Physical infrastructure like availability of service centres, providers and supply of drugs are not the only factors that encourage better access to Immunization. Demographic factors like the age of mothers, number of children, sex of the child; family type and prevalence of child mortality in a region create demands for vaccination. On the other hand, parental awareness towards vaccination, faith in modern healthcare facilities and decision-making power of the mother as well as her educational level also bring changes in the access to vaccination. In this study, father’s role in child vaccination has been taken into account; therefore, father’s educational level, occupation and migration status are also analysed along with mother’s education, occupation, awareness as well as scope in decision making. Family type is an important determinant in this present study. In India, joint and extended families are still preferred in the rural areas and it affects Immunization in two ways. The biggest advantage of the joint family is availability of more persons for economic activities as well as for childcare. Many a times, grandparents or uncles take the initiatives to vaccinate the child, if the parents are too busy with their work. At the same time, elderly women especially the grandmothers may discourage Immunization due to her lack of faith in modern healthcare facilities.

Conceptual Model of Factors Determining Infant and Child Immunization



Moreover, in a traditional patriarchal set up; sex of the child always plays a crucial role. Male children are most preferred in the family and their survival is considered more important than their female counterparts. Thus, sex of the child is kept in the 'Demand side' box; which increases or decreases demand for Immunization. Apart from socio-demographic determinants; economic factors like family income, access to assets and landholdings also influence child Immunization, as these factors provide economic stability to a family.

Intermediate variables or the attitude and awareness are actually the real players in child Immunization process that either encourage or discourage the parents to bring their children for Immunization.

The last column or supply-side column shows that physical availability of healthcare centres alone is not enough to implement full Immunization. Other factors like behaviour of the service providers especially the doctors and the nurses as well as effective function ability of healthcare centres by providing regular services and effective medicines also determine success of Immunization Programme.

7. Objectives:

The salient objectives of the study are the following:

1. To ascertain the status and analyse the role played by background factors in child Immunization in India and Bihar.
2. To study the influence of socio-economic characteristics of the parents in child Immunization in the study areas.
3. To analyse the knowledge, attitude and practices toward child Immunization in the study areas.
4. To analyse the role of health infrastructure and service providers in child Immunization in the study areas.
5. To make a comparative assessment of child Immunization for a better and poor performing district.

8. Research Questions

1. What are the linkages between household characteristics and child Immunization?
2. In what manner does socio-economic characteristics of parents influence child Immunization?
3. Does knowledge, beliefs, and attitudes of the parents influence child Immunization?
4. What is the relationship between service provisioning and child Immunization status?
5. What are the problems and constraints of full Immunization coverage in the study areas?

9. Methodology and Survey Design

This study is based on mixed method approach in which both qualitative as well as quantitative techniques are used. Qualitative and quantitative methods have been used to fulfil the requirement of the research questions. The qualitative methodology comprises the interpretative mode of explanation while the quantitative methodology includes statistical analyse, cartographic and graphical presentation. Each chapter has been explained by different methodologies that are given below.

Chapter One: Introduction

The first chapter, **composite index** (Z –score method) have been performed for the selection of CD Blocks and Villages for the primary survey.

1. Indicators for Selection of C.D Block in the study areas

1. Child Sex Ratio (0-6 Years)
2. Percentage of Female Literacy of Total Female Population,
3. Percentage of Female Work Participation of Total Female Population
4. Percentage of Scheduled Caste Population of Total Population

2. Indicators for Selection of Villages

1. Child Sex Ratio (0-6 Years)
2. Percentage Female Literacy of Total Female Population
3. Percentage of Female Work Participation of Total Female Population
4. Percentage of Scheduled Caste Population of Total Population

Chapter Two: Child Survival Issue: A Global Overview:

The second chapter is based on secondary data collected from various sources. Quantitative techniques are applied to interpret these data through graphs, diagrams and maps. Qualitative information is processed through ‘content analysis’.

Chapter Three: Background of Study Areas: This chapter provides introduction to the study area and it is again based on secondary data collected from the Census of India (2011, 2001 and others), the Annual Health Survey (2012-13), NFHS-4 (2015-16) and SRS. Both state level and district level data are analysed to show a comparison between Bihar and India as a whole in terms of access to maternal and child healthcare services. Thematic maps are generated to show Bihar’s socio-economic condition. The district level analysis reveals intra-state variation of population growth, density and share of socially marginalised population across districts of Bihar. It helps in understanding the inter-regional disparity existing within the state in terms of human resource availability.

Chapter Four: Child Immunization in India and Bihar: Socio-economic and Demographic Correlates - The cross-tabulation technique has been used based on the dependent variable and independent variables to see the gross effect of the independent variable. Full Immunization coverage is the dependent variable and other socio-economic and demographic characteristics are independent variables. In addition, logistic regression has also been done with the help of SPSS computer software to see the net effect of independent variables. The basic logistic regression is

$$P = \frac{1}{1+e^{-z}} \dots \dots \dots (1)$$

Where P = estimated probability

Z = the predictor variables

E = base of natural logarithm with a value of 2.7183

As can be seen from the logistic curve the predictor variable has the largest effect on P, when P = 0.52. The value of p decreases in absolute magnitude as p approaches 0 and 1 after simplifying equation (1). We get,

$$\text{Logit } P = \frac{P}{1-P} \dots \dots \dots (2)$$

The quantity (P/1-P) is called odds, and the quantity log (P/1-P) is called the log odds or logit of P so the equation (2) becomes

$$\text{Logit } P = Z \dots \dots \dots (3)$$

If we presume Z as a function of predictor variable X₁, X₂.....X_n.

$$\text{We can write } P = b_0 + b_1 X_1 + \dots + b_n X_n \dots \dots \dots (5)$$

The coefficient b₁ represents the additive value effect of one unit change in predictor variable X₁ on the logs odds of the response variable.

Chapter Five: Socio-economic Characteristics of Household and Child Immunization in Study Areas: This chapter is based on the primary data obtained from the field survey and this data set is analysed through various statistical techniques like Cross Tabulation, Chi Square, Binary Logistics Regression Analysis, and Composite Index. Following composite indices are generated to assess agricultural assets and women’s autonomy.

- (1) **Agricultural Assets Index-** Agricultural assets Index has been constructed with following indicators- (1) Threshers in households,(2) Tractors in households, (3)Water pumps in households, (4) Agricultural labour, and (5) Number of cattle

in households. Each variable has been given weight and computed through 'Z score method'.

- (2) **Women's Autonomy Index-** Women's autonomy index is a composite index of (1) Mother participation in decision making in household activities, (2) Permission to go to health centre alone, (3) Permission to go to the market, (4) Get money for spending on household needs, (5) Have money for child health care.

Chapter Six: Role of Health Infrastructure and Health Functionaries in Child Immunization: This is also based on both secondary and primary data. Qualitative and quantitative methods have been used. In the quantitative method, various mathematical calculations have been conducted. These are the following

Required Sub-Centre (SC) = Total Population of Bihar /5000

Deficit SC = Required SC - Existing SC

Percentage Deficit of SC = Deficit SC/Required SC*100

Required Additional Primary Health Centre (APHC) = Total Population of Bihar/3,0000

Deficit APHC = Required APHC-Existing APHC

Percentage Deficit of APHC = Deficit APHC/Required APHC*100

Required Primary Health Centre (PHC) = Total Population of Bihar/3,0000

Deficit PHC = Required PHC-Existing PHC

Percentage Deficit of PHC = Deficit PHC/Required PHC*100

Required Community Health Centre (CHC) = Total Population of Bihar/1,20,000*

Deficit CHC = Required CHC -Existing CHC

Percentage Deficit of CHC = Deficit CHC/Required CHC*100

Required Sub-Divisional Hospital (SDH) = Total Population of Bihar/500000

Deficit SDH = Required SDH-Existing SDH

Percentage Deficit of SDH = Deficit SDH/Required SDH*100

<p>1 PHC/30,000 Population Norm Required PHC= Total Population of Jamui or Aurangabad /30,000. Deficit= Required PHC-Existing PHC, Percentage Deficit= Deficit/required*100</p> <p>1APHC/30,000 Population as IPHS Norm, Deficit=Required-existing PHC, Percentage Deficit= Deficit/Required*100 Required APHC= Total Population of Jamui or Aurangabad /30,000</p> <p>Required Sub Centres= Population of Block/ 5000 Deficit= Required-existing Per cent of Deficit=deficit/required*100</p> <p>Required <i>Anganwadi</i> Worker = Population / 1000 Deficit= In position-Required Percentage=Deficit/required*100</p> <p>Required ASHA = Population / 1000 Deficit= In position-Required Percentage=Deficit/required*100</p>

Qualitative Methods:

Qualitative methods have been also used in this chapter. Following qualitative methods have been adopted (1) In-depth interviews, (2) Focus Group Discussions and (3) Case Studies.

Number of <i>Anganwadi</i> Worker, ASHA and ANM for Interview			
	Anganwadi Workers	ASHA	ANM
Jamui District			
Tajpur	2	2	1
Amma Sarari	2	2	1
Aurangabad District			
Lohara	2	2	1
Jamhor	4	4	1
Total	10	10	4

Primary Survey (2015)

A total of 10 *Anganwadi* workers and 10 ASHAs have been interviewed; 4 *Anganwadi* workers and 4 *ASHAs* from Jamui district and 6 *Anganwadi* workers and 6 *ASHAs* from Aurangabad district have been selected for interview. An attempt has been also made to

interview 4 ANMs from the study areas. Case studies and in-depth interviews have been performed to assess the role of *Anganwadi workers* and *ASHAs* and their problems. Apart from this, ‘Focus Group Discussions’ (FGD) has been also conducted among 20-49 years old male and female members of sample villages. Furthermore, one additional primary health centres (*Tajpur*) and one sub-centre (*Amma Sarari*) in Jamui district, one primary health centre (in *Jamhor*) and one sub-centre (*Lohara*) have been also selected for the study of physical and human infrastructure in the study areas. These public health units are associated with sampled villages in both of the districts.

Chapter Seven: Knowledge, Attitude, and Practices towards Child Immunization among Parents – This chapter is mainly based on qualitative method. Focus Group Discussion and Case Studies have been adopted.

Sample Size for FGD				
	Jamui		Aurangabad	
Social Group	Tajpur	Amma Sarari	Lohara	Jamhor
GN	1	-	-	1
OBC	1	2	2	1
EBC	2	2	2	2
SC	2	2	2	2
Total	6	6	6	6

Primary Survey (2015)

Focus group discussions (FDG) have been conducted for the mothers and fathers of children and old women of the village to collect the information regarding community knowledge, attitude, beliefs, and behaviours. A total 24 focus group discussion (6 in each sample village) have been conducted among 20-49 years old from different social groups.

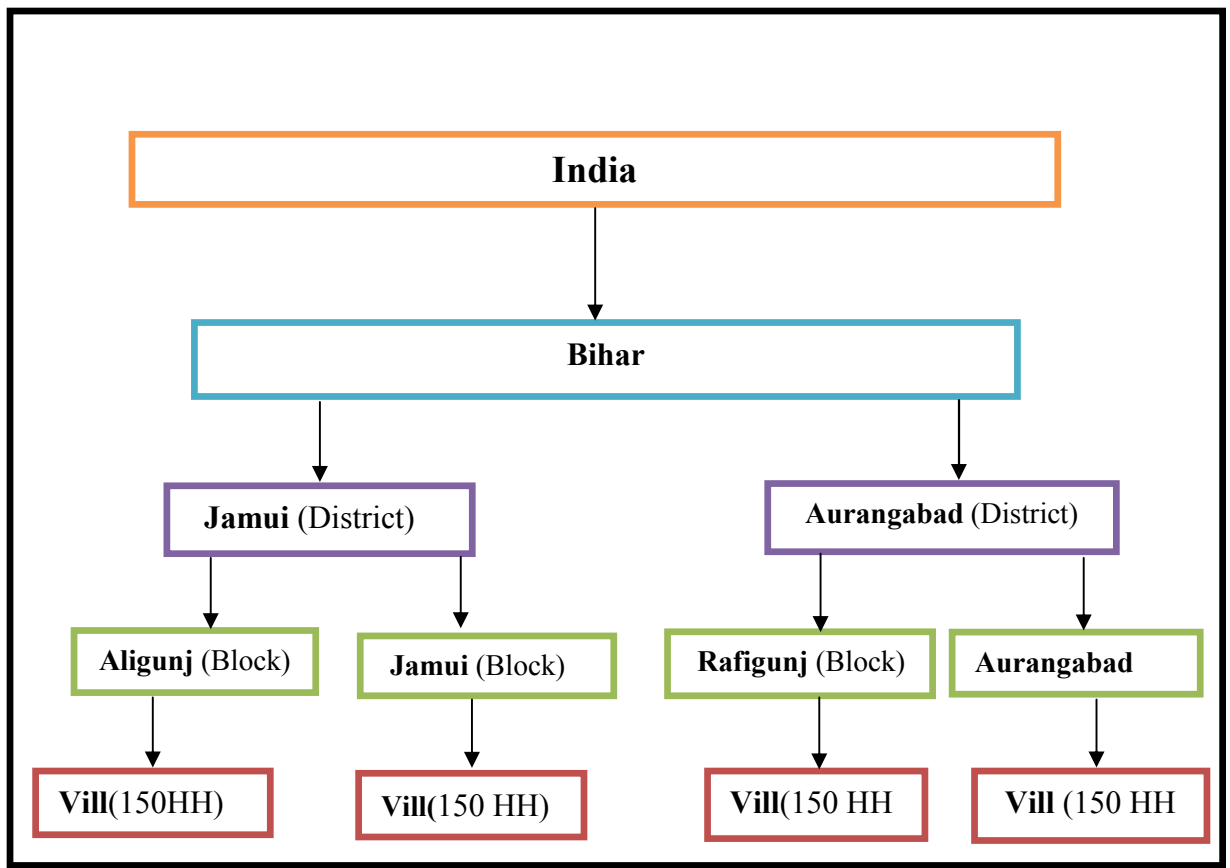
Chapter Eight: Summary and Conclusion

This is the concluding chapter which contains overall findings, limitations of the study and chapter summary. Based on the findings, policies have been recommended for better coverage.

10. Selection of Study Areas

The 'Multi-Stage Stratified Sampling Methodology' has been used for the selection of study areas. First, the state of Bihar has been selected on the basis of the percentage of full Immunization coverage. States have been ranked with the help of secondary data sources (District Level Health Survey 2007-08). Bihar is the third lowest among the large states in the country with 40 per cent child Immunization coverage. Next, districts have been also selected on the basis of percentage of full immunization coverage. First is poor performing district (Jamui) and the second one is better performing district (Aurangabad). At the third stage, '**Composite Index**' has been performed to select the CD Blocks. The Z- score method has been used to make a composite index. (1) **Child Sex Ratio** (2) **Percentage Female Literacy to total Female Population**, (3) **Percentage to Female Work Participation of the total Female Population**, and (4) **Percentage of Scheduled Caste Population** are the indicators of composite index. Finally, two CD Blocks have been selected from each district. One is the higher scored and the second one is a lower scored Block. The '**Rafigunj**' and '**Aurangabad**' CD Blocks have been selected from Aurangabad district and '**Jamui CD Block**' and '**Aligunj**' CD Blocks have been selected from Jamui district. At the fourth stage, Census village has been selected as 'Primary Sample Unit' (PSU) by the same method (composite index) with same variables. From each CD Blocks, one village having a better score in the composite index has been selected for the complete study. Total four villages have been selected, two from Jamui district and two from Aurangabad district for primary survey. Only those households have been covered having 12-23 months old children. A total 600 households have been fixed for the present study, three hundred from each districts and 150 households from each villages. All married women aged 15-45 years are the main respondents of the present study but fathers have been also interviewed. 'Target Groups Study' has been also performed, especially for poor, scheduled castes and Muslims.

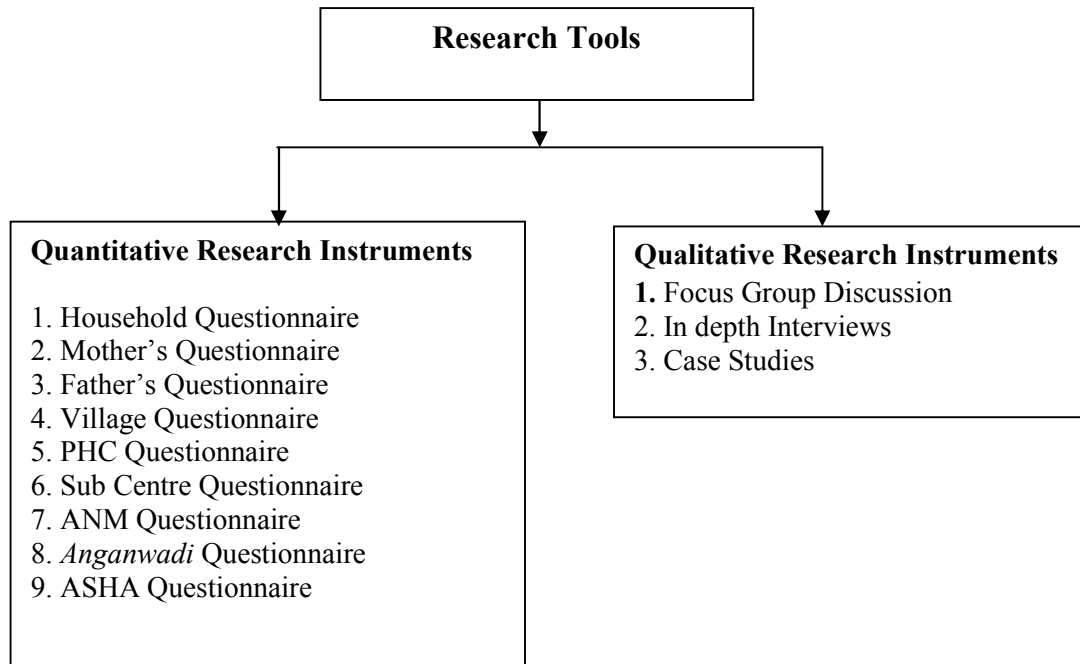
Selection of Study Area



11. Survey Instruments

A set of structured questionnaires have been used to collect primary data from the field; there are 9 sets of questionnaires, as mentioned below:

- i. Household Questionnaire,
- ii. Mother's Questionnaire,
- iii. Father's Questionnaire,
- iv. Village Questionnaire,
- v. PHC Questionnaire,
- vi. Sub Centre Questionnaire,
- vii. ANM Questionnaire,
- viii. Anganwadi Questionnaire
- ix. ASHA Questionnaire



11.1 Quantitative Research Instruments

I. Household's Questionnaire- Household questionnaire contains general household characteristics, socio-economic characteristics, number of family members, type of family, education level, caste, religion and others. Mother is the respondent of household questionnaire.

II. Mother's Questionnaire: Mother herself is the respondent of mother's questionnaire. It gives information about mother's age, relation with the head of household, educational attainment, work status, women's autonomy and other characteristics of the mother. In addition, it also covers the details about the child, sex of the child, the age of the child, child Immunization, knowledge, attitude towards Immunization, childhood diseases and other such information.

III. Father's Questionnaire: Father's Questionnaire covers the age of father, educational attainment, work status, mobility, and knowledge of Immunization, childhood diseases, attitude towards child Immunization, cooperation with wife in child Immunization, and others. Father is the respondent of father's questionnaire.

IV Village's Questionnaire: Villagers are the respondents of village questionnaire. It covers the size of the village, location, population, social structure, availability of education, availability of health care services, connectivity with market centre/primary

health centre, types of road, means of transportation, electricity, source of drinking water, agriculture and other economic activities and other information.

V. PHC and Additional PHC Questionnaire: Availability of physical infrastructure and human resource, the supply of drug and medicines, storage, cold chains, vehicle, electricity and other information have been collected by PHC's questionnaire and the respondent is the health personnel of that particular PHC.

VI Sub Centre Questionnaire: ANM is the respondent of the sub-centre questionnaire which gives information about the building of the sub-centre, the supply of drugs and medicines, beds available, rooms, buildings, water supply, light, instruments and equipments and other.

Apart from this, **VII ANM Questionnaire, VIII Anganwadi Questionnaire and IX.ASHA's Questionnaire** have also been used to get information about their own socio-economic condition of household, family, children, age, problems faced in child Immunization process and other personal and village problems in child Immunization.

11.2 Qualitative Research Instruments

(a) **Focus Group Discussions:** Focus group discussion (FDG) has been conducted among the mothers and fathers of children and old women of the village to collect the information regarding community knowledge, attitude, beliefs, and behaviour.

(b) **In-Depth Interviews-** In-depth interviews have been carried out with children's mother and health services providers. The first section of the questionnaire contains the socio-economic and background characteristics of the respondent. *ASHAs* and *Anganwadi* worker have been also interviewed.

(c) **Case Studies** – Case studies have also been carried out among those who have not received any vaccine and those who have received partial Immunization (Drop Outs). Case studies were also performed for *ASHAs* and *Anganwadi* workers in the study areas.

12. Data Sources

In order to complete this research work, various secondary data sources have been used. The following secondary data sources have been used in the study.

1. District Level Health Survey: Third Round of District Level Health Survey (2007-08) has been used in the present study in the fourth chapter. The District Level Health Survey is a sample survey, which covers health care utilisation for reproductive and child health, accessibility of health facilities, availability of health infrastructure, household facilities and other various aspects. This nationwide survey was conducted during December 2007 to December 2008 among 601 districts from 34 states and union territories in India. This data set is very useful for national and state level analysis in child Immunization coverage.

2. World Health Organization and UNICEF (2014): The second major data sources are the World Health Organization and UNICEF (2014) that are the largest data sources of the world. Both give major data on various aspects such as socio-economic, demographic, environmental, physical, health, cultural, political and others at the global level. Therefore, the status of child Immunization coverage by specific vaccines at the global level and variations in WHO regions and South Asian regions; level and trends of infant mortality rate and under-five mortality rates have been analysed by utilising these data sets.

3. Rural Health Statistics, Ministry of Health and Family Welfare (MoHFW), Statistics Division, Government of India (31 March 2015). This gives data on the availability of various public health facilities in the country (PHC, CHC, Sub Centre, District-Hospital, and others) such as the deployment of human resources, Universal Immunization Programme, availability of cold chain facility and progress in childhood Immunization coverage among others. Apart from this, other health infrastructure related data have also been derived from the following sources:

4. Directorate of General of Health Services, MoHFW, Government of India (2015)

5. Statistics Division, MoHFW, Government of India (2015)

6. District Health Action Plan NRHM, Aurangabad and Jamui (2012-13)

7. Integrated Child Development Service (ICDS) Bihar 2012-13

8. Annual Health Survey (2012-13): This Annual health Survey has been used to see the level and regional variations in infant and under five mortalities in Bihar. In addition, it also provides data on childhood Immunization at the district level.

9. Census of India (2011): Household data has been used to make a composite index to select C.D. Blocks for the selection of study areas. Data on Child Sex Ratio, Percentage of Female Literacy to total female population, Percentage of Female Work Participation to the total female population, and Percentage of scheduled caste population have been taken from the 'Census of India 2011'. Furthermore, the following data sources have been used to discuss the health and economic status of Bihar Jamui and Aurangabad districts.

Other Data Source include the following-

10 Sample Registration Systems, Registrar General of India 2013

11. Directorate of Economics and Statistics, Bihar (2010-11)

12. Department of Agriculture, Government of Bihar (2013-14)

13. Department of Industry, Government of Bihar (2013-14)

14. Primary Data Source: Primary data have also been collected through field survey in the study areas.

13. Chapterisation Scheme

1. The first Chapter is an introductory part, which provides a general introduction to the present study. It deals with the basic information on child Immunization, statement of the problem, literature review, conceptual framework, objectives, research questions, study areas database, methodology, sampling framework and chapter design.

2. The second Chapter is 'Child Survival Issue: A Global Overview. It deals with the global scenario of child Immunization coverage by specific vaccines (BCG, DPT, Polio, Measles, and Hepatitis-B) and its regional variations in 'WHO Regions'. This chapter also covers the regional difference in the South Asian regions. Child Immunization coverage has been also shown at the national level, state level, and at the district level. Millennium Development Goals and decline in infant and under-five mortality in WHO

Region have been included here. Infant mortality and under-five mortality have also been discussed at the national and state level.

3. **The third Chapter** pertains to the '**Background of the Study Areas**'; It provides detailed information of economic characteristics, social characteristics of Bihar, Jamui and Aurangabad districts. It also provides the background of socio-economic and demographic characteristics, general health condition and utilisation of health care services of Bihar, Jamui and Aurangabad districts.

4. **Chapter Fourth** is '**Child Immunization in India and Bihar: Socio-economic and Demographic Correlates**': This chapter is based on the secondary data set and analyses the status of childhood Immunization coverage among various socio-economic and demographic background of the households and an analysis of the various factors responsible for the uneven Immunization coverage among children. A comparative analysis has been done for Bihar and India.

5. '**Socio-economic Characteristics of Household and Child Immunization in Study Areas**'; the **fifth** chapter is based on primary observation in the study areas. It comprises a detailed analysis of general household characteristics, individual characteristics of the mother, the role of the father in child Immunization and family cooperation and conflicts.

6. **The Role of Health Infrastructure and Health Functionaries in Child Immunization** is the **sixth** chapter. Availability of health care service centres in Bihar and in study areas. Role of *Anganwadi* workers and ASHAs and other health provisioning aspects have been analysed in this chapter.

7. **The seventh Chapter** entitled as **Knowledge, Attitude, and Practice towards child Immunization**. Parent's knowledge of Immunization, attitude toward Immunization, beliefs in allopathic and Government health services, safety, and effectiveness of vaccines are examined in this chapter.

8. **Chapter Eight** presents a synthesis of the findings and conclusions of the research work.

References

- Al-Taiar, A., Clark, A., Longenecker, J. C., & Whitty, C. J. (2010). Physical accessibility and utilization of health services in Yemen. *International Journal of Health Geographics*, 9(1), 38.
- Antai, D. (2009). Faith and child survival: the role of religion in childhood immunization in Nigeria. *Journal of Biosocial Science*, 41(01), 57-76.
- Arif, G. M. (2004). Child health and poverty in Pakistan. *The Pakistan Development Review*, 211-238.
- Arnold, F., Choe, M. K., & Roy, T. K. (1998). Son preference, the family-building process and child mortality in India. *Population studies*, 52(3), 301-315.
- Awoyemi, T. T., Obayelu, O. A., & Opaluwa, H. I. (2011). Effect of distance on utilization of health care services in rural Kogi State, Nigeria. *Journal of human Ecology*, 35(1), 1-9.
- Babalola, S., & Fatusi, A. (2009). Determinants of use of maternal health services in Nigeria-looking beyond individual and household factors. *BMC pregnancy and childbirth*, 9(1), 43.
- Bardenheier, B. H., Yusuf, H. R., Rosenthal, J., Santoli, J. M., Shefer, A. M., Rickert, D. L., & Chu, S. Y. (2004). Factors associated with underimmunization at 3 months of age in four medically underserved areas. *Public health reports*, 119(5), 479-485.
- Bashshur, R. L., Shannon, G. W., & Metzner, C. A. (1971). Some ecological differentials in the use of medical services. *Health Services Research*, 6(1), 61.
- Belli, P. C., & Appaix, O. (2003). *The economic benefits of investing in child health*. World Bank, Washington, DC.
- Benjamins, M. R., & Brown, C. (2004). Religion and preventative health care utilization among the elderly. *Social Science & Medicine*, 58(1), 109-118.
- Bhalotra, S. (2010). Fatal fluctuations? Cyclicity in infant mortality in India. *Journal of Development Economics*, 93(1), 7-19.
- Bhatia, J. C., & Cleland, J. (1995). Determinants of maternal care in a region of South India. *Health Transition Review*, 127-142.
- Blau, D. M. (1999). The effect of income on child development. *Review of Economics and Statistics*, 81(2), 261-276.
- Bronte-Tinkew, J., & Dejong, G. F. (2005). Do household structure and household economic resources predict childhood immunization? Evidence from Jamaica and Trinidad and Tobago. *Population Research and Policy Review*, 24(1), 27-57.
- Brooks, C. H. (1973). Associations among distance, patient satisfaction, and utilization of two types of inner-city clinics. *Medical Care*, 373-383.
- Chanchal D. (February 2016), Yojana

Choe and T. K Roy (1998), "Son Preference, The Family- Bulding and Child Mortality in India" *Population Studies*, Vol. 52, No 3,pp 301-315.

Cohen, S. (1999). Social status and susceptibility to respiratory infections. *Annals of the New York Academy of Sciences*, 896(1), 246-253.

Countdown To 2015 Decade Report (2000-2010), "Maternal, New Born & Child Survival", WHO. 2012

Desai and Alva (1998), "Maternal Education and Child Health: Is there a strong causal relationship?" *Demography* Vol. 35, No 1, pp 71-81

Desai, S., & Alva, S. (1998). Maternal education and child health: Is there a strong causal relationship?. *Demography*, 35(1), 71-81.

Diddy Anti (2009), Faith and Child Survival; The Role of Religious in Childhood Immunization in Nigeria, *Journal of Biosocial Science*, pp.57-76

Dombkowski et al. (1974), "Risk Factors for Delay in Age – Appropriate Vaccination " , *Public Health Report* , Vol. 119, No 2, pp 144- 155

Dombkowski, K. J., Lantz, P. M., & Freed, G. L. (2004). Risk factors for delay in age-appropriate vaccination. *Public Health Reports*, 119(2), 144-155.

Fekin R. Daniel et.al (2009), "The Impact of Distance of Residence from a Peripheral Health Facility on Pediatric Health Utilistions in Rural Western Kenya" *Tropical MedicineAnd International Health*, Vol. 14, pp 54-61.

Hughart Nancy et al. (1999), "The Relation of Parent and Provider Characteristics to Vaccination Status of Children in Private Practices and Managed Care Organization in Maryland", *Medical Care*, Vol. 37, no 1, pp 44-55.

Jain Devaki (1985) The household trap : report on field survey of female activity pattern. In *Tyranny of the Household: Investigating Essays on women's Work*. New Delhi: Shakti Books.

Jain, D. (1985). household trap: Report on a field survey of female activity patterns. *Tyranny of the household: investigative essays on women's work/edited by Devaki Jain, Nirmala Banerjee*.

Kadri, A. M., Singh, A., Jain, S., Mahajan, R. G., & Trivedi, A. (2010). Study on immunization coverage in urban slums of Ahmedabad city. *Health and population: perspectives and issues*, 33(1), 50-54.

Kravdal, Ø. (2004). Child mortality in India: the community-level effect of education. *Population studies*, 58(2), 177-192.

Lalou, R., & LeGrand, T. K. (1997). Child mortality in the urban and rural Sahel. *Population an English Selection*, 147-168.

Lee, S. H., & Mason, A. (2005). Mother's education, learning-by-doing, and child health care in rural India. *Comparative education review*, 49(4), 534-551.

Levin, J. S., & Markides, K. S. (1986). Religious attendance and subjective health. *Journal for the Scientific Study of Religion*, 31-40.

Mancher J. (1986). Women's work and poverty: women contribution of household maintenance in south India", pp 99-119 in A Home Divided: women and income in the third world, D. Dwyer and J. Bruce. Stanford: Standford University Press.

Mathew, J. L. (2012). Inequity in childhood immunization in India: a systematic review. *Indian pediatrics*, 49(3), 203-223.

McGuirk, M. A., & Porell, F. W. (1984). Spatial patterns of hospital utilization: the impact of distance and time. *Inquiry*, 84-95.

Mencher, J. (1988). Women's work and poverty: Women's contribution to household maintenance in South India. *A home divided: Women and income in the Third World*, 99-119.

Mishra, V., Roy, T. K., & Retherford, R. D. (2004). Sex differentials in childhood feeding, health care, and nutritional status in India. *Population and development review*, 269-295.

Mittal, A., Singh, J., & Ahluwalia, S. K. (2007). Effect of maternal factors on nutritional status of 1-5-year-old children in urban slum population. *Indian Journal of Community Medicine*, 32(4), 264.

Müller, I., Smith, T., Mellor, S., Rare, L., & Genton, B. (1998). The effect of distance from home on attendance at a small rural health centre in Papua New Guinea. *International Journal of Epidemiology*, 27(5), 878-884.

Pande, R. P. (2003). Selective gender differences in childhood nutrition and immunization in rural India: the role of siblings. *Demography*, 40(3), 395-418.

Pearce, L. D., & Axinn, W. G. (1998). The impact of family religious life on the quality of mother-child relations. *American Sociological Review*, 810-828.

Peters, D. H., Garg, A., Bloom, G., Walker, D. G., Brieger, W. R., & Hafizur Rahman, M. (2008). Poverty and access to health care in developing countries. *Annals of the New York Academy of Sciences*, 1136(1), 161-171.

Phukan, R. K., Barman, M. P., & Mahanta, J. (2008). Factors associated with immunization coverage of children in Assam, India: over the first year of life. *Journal of Tropical Pediatrics*, 55(4), 249-252.

Pruitt, R. H., Kline, P. M., & Kovaz, R. B. (1995). Perceived barriers to childhood immunization among rural populations. *Journal of Community Health Nursing*, 12(2), 65-72.

Rani, M. U., & Rao, K. C. (1995). Socio-economic and demographic factors as predictors of nutrition and health knowledge of mothers in rural Andhra Pradesh. *Journal of Research APAU*, 23(2), 12-16.

Rutstein, S. O. (2000). Factors associated with trends in infant and child mortality in developing countries during the 1990s. *Bulletin of the World Health Organization*, 78(10), 1256-1270.

Sheldon (1999), "Social Status and Susceptibility to Infection" department of psychology Carenegie Mellon University paper-294, PP. 216-253.

Short, S. E., Chen, F., Entwisle, B., & Fengying, Z. (2002). Maternal work and child care in China: a multi-method analysis. *Population and Development Review*, 28(1), 31-57.

Shour E. susan et.al (2002). Maternal work and child care in china: A multi-Method Analysis, *Population and Development Review*, Vol.28, No 1, PP 31-57.

Streatfield et al. (1990), "Maternal Education and Child Immunization" *Demography*, Vol. 25, pp 447-455

Thomas, D. (1990). Intra-household resource allocation: An inferential approach. *Journal of Human Resources*, 635-664.

Thomson, E., Hanson, T. L., & McLanahan, S. S. (1994). Family structure and child well-being: *Economic Resources Vs. Parental Behaviors. Soc. F.*, 73, 221.

Tran, T. K., Gottvall, K., Nguyen, H. D., Ascher, H., & Petzold, M. (2012). Factors associated with antenatal care adequacy in rural and urban contexts-results from two health and demographic surveillance sites in Vietnam. *BMC Health Services Research*, 12(1), 40.

Tupasi, T. E., Velmonte, M. A., Sanvictores, M. E. G., Abraham, L., De Leon, L. E., Tan, S. A., ... & Saniel, M. C. (1988). Determinants of morbidity and mortality due to acute respiratory infections: implications for intervention. *Journal of Infectious Diseases*, 157(4), 615-623.

Vashishtha, V. M., & Kumar, P. (2013). 50 years of Immunization in India: Progress and Future.

Waldhoer, T., Haidinger, G., Vutuc, C., Haschke, F., & Plank, R. (1997). The impact of sociodemographic variables on immunization coverage of children. *European journal of epidemiology*, 13(2), 145-149.

Wilson, T. (2000). Factors influencing the immunization status of children in a rural setting. *Journal of Pediatric Health Care*, 14(3), 117-121.

Wilson, T. (2000). Factors influencing the immunization status of children in a rural setting. *Journal of Pediatric Health Care*, 14(3), 117-121.

World Health Organization. (2012). Countdown to 2015: taking stock of maternal, newborn & child survival: decade report (2000–2010).

Child Survival Issue: A Global Overview

2. Introduction

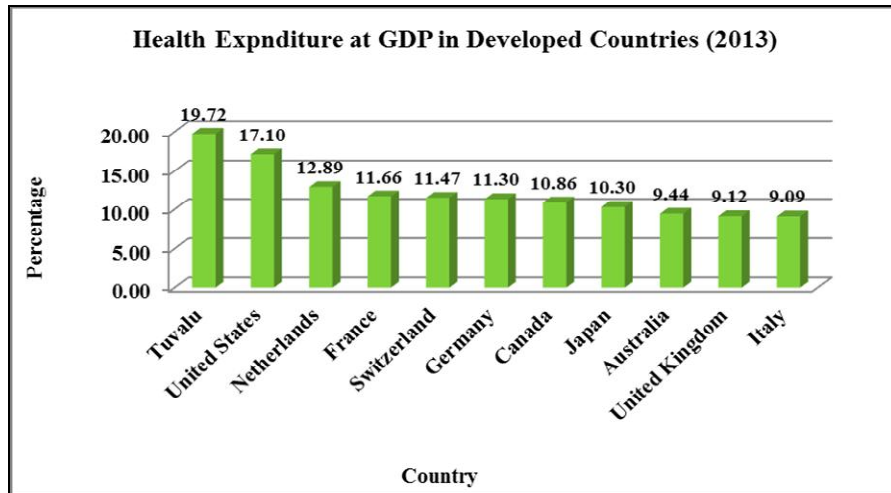
India's Maternal and Child Healthcare Policy have always placed a special emphasis on child Immunization and its universal coverage. In this backdrop India has adopted WHO's guidelines and launched '**Extended Immunization Programme**' in 1970 and '**Universal Immunization Programme**' in 1980. The **United Nation Millennium Declaration** 2000 has been set up to address extreme poverty in its many dimensions such as income, poverty, hunger, disease, gender discrimination, education and environmental sustainability (**UNICEF, 2015, Millennium Development Goals, Statistics and Monitoring**).

The 4th aim of MDGs is to reduce infant and under-five mortality rate till 2015. Next, the World Health Organisation and UNICEF jointly developed the '**Global Immunization Vision and Strategy**' (**GIVS**) in 2005 to reduce Vaccine Preventable Diseases (VPD) with the help of improving the Immunization coverage. The UNICEF celebrates '**Immunization Week**' every year from April 21 to 28 to raise awareness regarding Immunization that how it saves millions of lives and protects children from infectious diseases, especially those who reside in remote areas and urban slums. India declared 2012 as the year of intensification of routine Immunization. In spite of improvements in the Immunization coverage in the last two decades, but a large number of children, (nearly 18.7 million) are still out of the coverage and they are more vulnerable to VPD (**WHO, 2015**). More than 60 per cent of these children are living in the less developed and developing countries of Asia and Africa. Among these countries, **(1) Democratic Republic of Congo, (2) Ethiopia (3) India (4) Indonesia (5) Iraq (6) Nigeria (7) Pakistan (8) Philippines (9) Uganda and (10) South-Africa** record massive number of children without Immunization coverage (**UNICEF, 2015**). According to the WHO's estimate, 3.3 million babies are stillborn each year, more than 4 million babies die in the first month of their life, and 6.6 million children die before the age of five years in the world (**Dyer, 2005**). In case of India, occurrence of stillbirth, infant and child mortality rates are so high that is a serious concern. The problem is acute in the poor performing states like Bihar, Uttar Pradesh, Jharkhand, Rajasthan Odisha, and Chhattisgarh. As per UNDP report '**Human Development Index**' (**HDI**), 2015, India is facing high '**Infants Lacking**

Immunization Percentage’ against DPT with 12 per cent and 26 per cent against measles. **Infants Lacking Immunization Percentage** is the percentage of surviving infants who have not yet received their first dose of DPT and Measles vaccines. On the other hand, developed countries demonstrate very low **‘Infants Lacking Immunization Percentage’** (ILIP), Norway experiences 1 percentage infant lacking Immunization percentage against DPT, 7 per cent against measles, Netherlands experiences 1 per cent against DPT and 4 per cent in measles, Germany 2 per cent against DPT and 3 per cent in measles. Furthermore, Life Expectancy is also lower in India (68 years), than that of the developed nations like Norway (81.6 years), Australia (82.4 years), Switzerland (83.0 years), Denmark (80.0) and others (**UNDP Report, 2015**). United Nation Development Programme (UNDP) also formed **‘Sustainable Development Goals’ (SDGs)** addressing, poverty, hunger, education, gender equality and women’s empowerment, water sanitation, energy, accommodation, inclusive and sustainable growth among others. The third goal of the ‘Sustainable Development Goals’ aims to ensure a healthy life and promote well-being to all age groups. It cannot be achieved until vaccines preventable infectious diseases among children are eradicated and eliminated. This can be possible only through universalisation of child Immunization in the country.

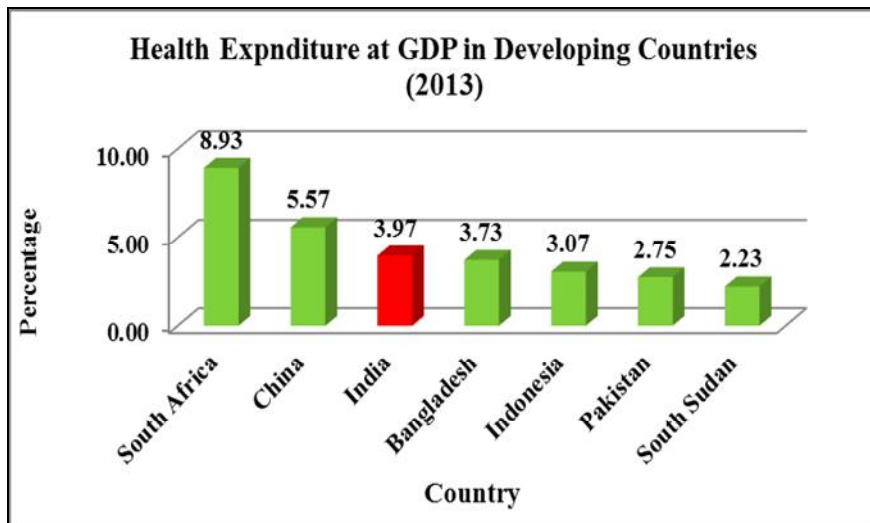
Child Immunization is a very cost effective health intervention Programme. There is a wide gap between developed and developing countries regarding public health expenditure. Tuvalu has the highest health expenditure with 19.72 per cent of its Gross Domestic Product (GDP), USA 17.10 per cent, Netherlands 12.89, France 11.66, Switzerland 11.47, Germany 11.30, Canada 10.86, Japan 10.30, Australia 9.44, United Kingdom 9.12, and Italy 9.09 per cent of its GDP. On the other hand, in developing countries, South Sudan spends 2.23 per cent, Pakistan 2.75, Indonesia 3.07 per cent, Bangladesh, 3.73 per cent, India 3.97, China 5.57 per cent, and South Africa 8.93 per cent of their GDP (**IMF, 2013**)

Figure 2. 1 Percentage of GDP Spent as Health Expenditure in Developed Nations (2013)



Source: International Monetary Fund (IMF), 2013

Figure 2. 2 Percentage of GDP Spent as Health Expenditure in Developing Nations (2013)



Source: International Monetary Fund (IMF), 2013

Through this chapter, the issue of child survival is discussed in the context of universal coverage of Immunization, goals and targets of MDGs as well as SDGs and the strategies to achieve them. A global overview is produced here. India's achievement in the universal coverage of Immunization has been analysed with special reference to Bihar. This chapter is

based on secondary data obtained from the various reports of WHO, UNICEF, and District Health Survey (Third and Fourth Round).

2.1 Millennium Development Goals and Child Survival

The issue of child survival not only indicates a nation's socio-economic and technological progress of country but it also shows its commitment towards social justice and citizen's welfare. It has already been stated that universal Immunization Programme and subsidised healthcare facilities have reduced the rates of infant and child mortality across the world, but still it is alarmingly high in certain regions. Mainly war-torn African and Asian nations record high infant and child mortality rates because of continuous political disturbance as well as inadequate health infrastructure. However, in India, the overall picture is relatively better than those nations; but still some geographically remote areas or economically backward regions depict different pictures.

The '**Countdown Study 2015**' reveals that nearly 4 million 'neonatal deaths' occur within the first month of the child's birth; 5.9 million children die before completing their fifth birth anniversary, 4.5 million infants die within one year after their birth (**WHO, 2015**). Infant and child mortality rate are alarmingly high in Sub-Saharan Africa, which records 48 per cent of the world's total infant and child deaths, followed by South Asia (35 per cent). In the wake of the new millennium, delegates from 189 states assembled in the USA to address the issue of regional disparity in socio-economic development and they signed the '**United Nations Millennium Declaration**' later converted into the '**Millennium Development Goals** (MDGs). The introduction of MDGs is no doubt a landmark event in world history. MDGs addresses not only the issues like abject poverty, food security and health-vulnerability, but also aim to test State Government' commitment towards achieving its targets through the lens of social justice and gender equality. Incorporating 8 goals, 21 Targets and 60 indicators, MDGs actually covers all basic human right issues ranging from food, shelter, security, income, health, education to environmental issues as well as sustainable development; and they become the new tools to measure a nation's progress beyond its economic and technological progress. At the same time, MDGs place special emphasis on international cooperation in building a world-wide just and equitable society. All the signatory nations are expected to achieve its goals and targets within fifteen years, but

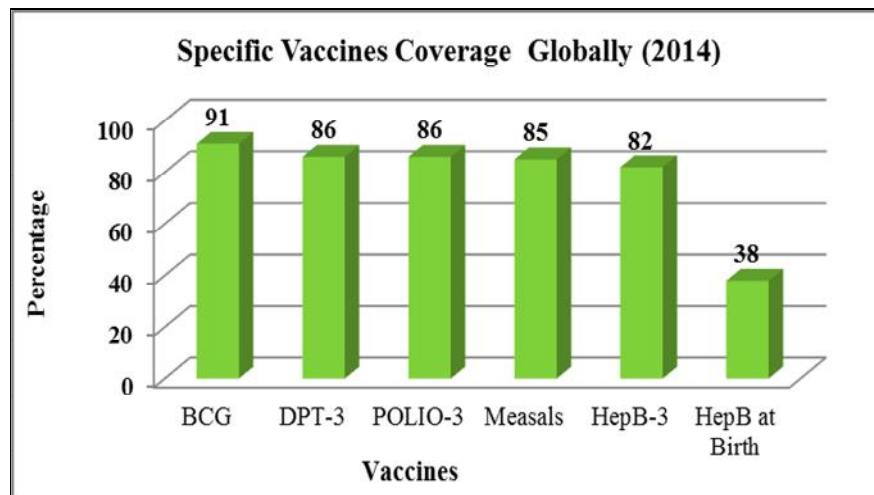
the strategies to achieve those goals remain in the hands of the respective state Government (UNICEF, 2015).

The Eight Goals set by the MDGs are listed below:

Millennium Development Goals	
Goal 1	Eradicate Extreme Hunger and Poverty
Goal 2	Achieve Universal Primary Education
Goal 3	Promote Gender Equality and Empower Women
Goal 4	Reduce Child Mortality
Goal 5	Improve Maternal Health
Goal 6	Combat HIV/AIDS, Malaria, and other diseases
Goal 7	Ensure Environmental Sustainability
Goal 8	Develop a Global Partnership for Development

2.2 Child Immunization Coverage: A Global Overview

Figure 2. 3: Global Coverage of Specific Vaccines (2014)



Source: World Health Organization- 2014

The “World Health Organization” (WHO) started the ‘Expanded Immunization Programme’ in 1974 to ensure routine Immunization service to all children with an aim of

eradicating 'Vaccine Preventable Diseases' (VPD) from the world (**Subaiya et al., 2014**). Initially, the Expanded Immunization Programme included four vaccines (DPT, BCG, Polio and Measles); and later on Hepatitis-B was included in the list (**Subaiya et al., 2014**). The most important vaccine is DPT (Diphtheria-Pertussis-Tetanus) which is given to 12 months old infants against three life-threatening diseases Diphtheria, Pertussis, and Tetanus. Three doses are essential to complete the course of DPT Immunization. The completion of its essential doses is an indicator of Immunization Programme performance (**Subaiya et al., 2014**). About 86 per cent (total-115.2 million) infants have been vaccinated with three doses of DPT worldwide in 2014. But unfortunately, about 18.7 million children could not complete the three series of DPT due to various reasons. Out of 18.7 million children, 50 per cent (9.3 million) children live in only five developing countries of the world. India is the first among them with 22 per cent, Nigeria 12 per cent, Pakistan 6 per cent, Indonesia 5.1 per cent, and Ethiopia 4 per cent.

Poliomyelitis or Polio vaccination is the second most important vaccine, which prevents an infectious disease caused by Polio Virus. Though Polio does not take lives and last for only few hours to few days but it cramps the muscles and makes the victim disabled for his/her entire life. Even years after the recovery, Post-Polio Syndrome may occur and make the person unable to move his or her limbs. Therefore, Polio vaccination should be given to the children at early age. Though India has acquired the status of a Polio-free nation but without regular Immunization Programme, it may come back in near future. Nigeria too had acquired that status in 2011; but the disease reoccurred in 2016 due to irregular Immunization Programme. Three doses are required for complete Immunization from Polio. The global coverage of Polio vaccination is 86 per cent (2014).

The **BCG (Baccile Calmette-Guerin)** vaccine protects children from childhood Tuberculosis. The global coverage of BCG vaccination is 91 per cent in 2014. Measles is another viral infection that causes high fever and severe skin inflammation, which may result in permanent scars on the victims' face. Measles is also a VPD and early vaccination can prevent it. The global coverage of Measles vaccination is 85 per cent in 2014.

Hepatitis-B is a viral infection that infects the liver of infants and children. Hepatitis-B also requires three doses, and one dose should be administered within 24 hours of birth to prevent

parental Hepatitis-B. The global coverage of three doses of hepatitis-B is 82 per cent, and zero doses or birth dose coverage is only 38 per cent.

2.3 Child Immunization Coverage by Specific Vaccines in WHO's Regions

The World Health Organization has classified the world into various regions that are called 'WHO' regions.

Figure 2. 4: Regional Coverage of Immunization in Developed Regions, (2014)

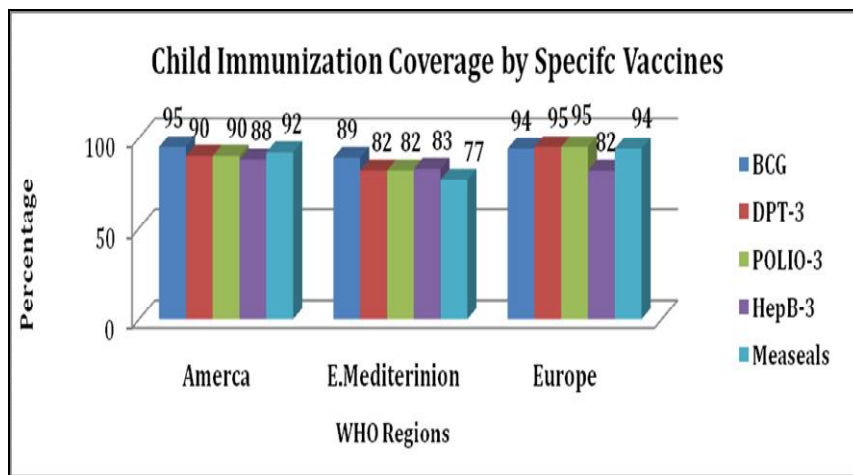
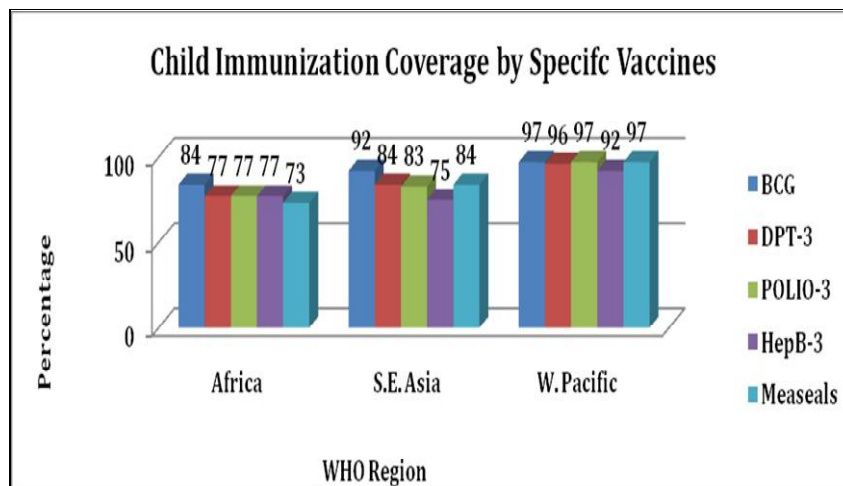


Figure 2. 5 : Regional Coverage of Immunization in Developing Regions, (2014)



Source: World Health Organization (2014)

Figure 2.4 and 2.5 represents considerable variations in childhood Immunization coverage across six geographical regions of the world, which are categorised by 'World Health

Organization.' The West Pacific Region shows better performance regarding all recommended vaccines. A total of 97 per cent measles, 97 per cent polio and 97 per cent BCG, 92 per cent hepatitis-B and 96 per cent DPT vaccines have been administered to 12 months old infants in the Pacific region. South-East Asia also shows significant percentage regarding child Immunization coverage of various vaccines. The 'BCG' vaccine has the highest percentage coverage with 92 per cent, followed by DPT with 84 per cent, measles 84 per cent, Polio 83 per cent, and Hepatitis-B 75 per cent in South-East Asian countries in 2014. Europe has achieved about 95 per cent polio and 95 per cent DPT, 94 per cent BCG, 94 per cent measles, and 82 per cent Hepatitis-B Immunization coverage. Europe is committed to sustain polio-free state, eliminate measles and rubella, control hepatitis B infection, meet regional vaccination coverage targets at all administrative levels, make evidence-based decision about the introduction of new vaccines and achieve financial sustainability of National Immunization Programme (WHO, Global Immunization News September 2014). The European Region has adopted the 'European Vaccine Action Plan (EVAP) in September 2014. East Mediterranean Regions have attained 89 per cent BCG, 83 per cent hepatitis-B, 82 per cent polio, 82 per cent DPT and 77 per cent measles vaccines. In America, the highest coverage of vaccines is BCG with 95 per cent, measles 92 per cent, DPT 90 per cent, polio (90 per cent), and 88 per cent Hepatitis-B. The African Region shows comparatively lesser performance regarding childhood Immunization coverage. The estimated coverage of BCG is 84 per cent, DPT-77, Polio-77, hepatitis-B -77 and measles-73 per cent.

The major regional average of child Immunization coverage hides the national and sub-national variations since the socio-economic development is quite uneven among all WHO Regions. West Pacific, Europe, and America present very high-level performance whereas South -East Asia and East Mediterranean show good performance and Africa presents a relatively less performance regarding childhood Immunization among 12-month infants.

2.4 Regional Variations in Specific Vaccines Coverage in the world

World health organization (WHO) has classified countries according to the coverage of various vaccinations. The High Coverage Regions record 99 per cent or more coverage; while the Medium Coverage Regions record 90 to 70 per cent and the Low Coverage

Regions record less than 70 per cent coverage of Immunization. Based on this classification, macro regional variations in Immunization coverage are given below:

2.4.1 Regional Coverage of Measles

High Coverage Regions

Countries with 99 per cent coverage of Measles vaccination are identified as 'High Coverage' states. The following states are found in this category:

Bahrain, Belarus, China, Cuba, Czech Republic, Democratic People's Republic of Korea, Guyana, Hungary, Iran, Kazakhstan, Luxembourg, Maldives, Monaco, Morocco, Nicaragua, Niue, Oman, Qatar, Republic of Korea, Saint Lucia-Saint Vincent and the Grenadines Seychelles, Sri Lanka, Thailand, Turkmenistan, United Republic of Tanzania, and Uzbekistan

Medium Coverage Regions

Medium Coverage states record 90 to 70 per cent coverage. Following countries are found in this category: India (83 per cent), Namibia (83 per cent), Palau (83 per cent), Togo (82 per cent), Uganda (82 per cent), Cameroon (80 per cent), Comoros (80 per cent), Congo (80 per cent), Mali, (80 per cent) Senegal (80 per cent) Kenya (79 per cent) Lebanon, (79 per cent) Marshall Islands (79 per cent), Ukraine (79 per cent) Sierra Leone (78 per cent), Democratic Republic of the Congo (77 per cent), Indonesia (77 per cent), Austria (76 per cent), Yemen (75 per cent), Timor-Leste (74 per cent), Niger (72 per cent), Djibouti (71 per cent), Ethiopia (70 per cent), and South Africa (70 per cent).

Low Coverage Regions

Low coverage regions are marked by less than 70 per cent coverage of Measles vaccination. The following countries are included in this category:

Guinea-Bissau (69 per cent), Guatemala (67 per cent), Tonga(67 per cent), Afghanistan (66 per cent), Papua New Guinea (65 per cent), Madagascar(64 per cent), Benin(63 per cent),Côte d'Ivoire(63 per cent), Pakistan (63 per cent), Gabon(61 per cent), Liberia(58 per cent), Iraq (57 per cent), San Marino (57 per cent), Chad (54 per cent), Syrian Arab (54 per cent), Haiti (53 per cent), Vanuatu (53 per cent), Guinea (52 per cent), Nigeria (51 per cent), Central African Republic(49 per cent), Somalia (46 per cent), Guinea (44 per cent), and South Sudan (22 per cent).

2.4.2 Regional Coverage of DPT-3

DPT vaccine records highest coverage across the world.

High Coverage Regions

Bahrain, Antigua and Barbuda, Belgium, Bhutan, Brunei Darussalam, China, Cook Islands, Cyprus, Czech Republic, Fiji, France, Greece, Hungary, Iran, Luxembourg, Maldives, Malta, Monaco, Mongolia, Morocco, Niue, Oman, Poland, Qatar, Republic of Korea, Rwanda, Saint Lucia, Seychelles, Sri Lanka, Thailand, and Uzbekistan pre cent high coverage of DPT 3 vaccine in the world.

Medium Coverage Regions

Medium coverage region records 80-70 per cent coverage. Following countries are found in this category: Angola (80 per cent), Comoros (80 per cent), Democratic Republic of the Congo (80 per cent), Guinea-Bissau(80 per cent), Panama(80 per cent), San Marino (80 per cent), Philippines(79 per cent), Djibouti (78 per cent), Indonesia (78 per cent), Marshall Islands (78 per cent), Mozambique(78 per cent), Uganda (78 per cent), Venezuela (78 per cent), Ethiopia (77 per cent), Mali (77 per cent), Timor-Leste (77 per cent), Ukraine (76 per cent), Afghanistan (75 per cent), Kiribati (75 per cent), Myanmar (75 per cent), Guatemala (73 per cent), Madagascar (73 per cent), Pakistan (73 per cent), Benin(70 per cent), Gabon(70 per cent), and South Africa (70 per cent)

Low Coverage Regions

The following countries are found in this category: Niger 68, Côte d'Ivoire 67, Nigeria, 66, Iraq (64 per cent), Vanuatu (64 per cent), Papua New Guinea(62 per cent), Guinea (51 per cent), Liberia (50 per cent), Haiti (48 per cent), Central African Republic (47 per cent) Chad (46 per cent), Syrian Arab Republic(43 per cent), Somalia (42 per cent), South Sudan (39 per cent), and Equatorial Guinea (24 per cent).

2.4.3 Regional Coverage of BCG

High Coverage Regions

The following countries are included in this category: Albania, Algeria, Argentina, Armenia, Bangladesh, Bhutan, Bolivia, Brazil, Brunei Darussalam, Cabo Verde, China, Cook Islands, Cuba, Dominican Republic, Fiji, Ghana, Guyana, Hungary, Iran, Kuwait, Libya, Malaysia, Maldives, Mongolia, Morocco, Nauru, Nepal, Niue, Oman, Panama, Portugal, Republic of

Korea, Rwanda, Singapore, Sri Lanka, Swaziland, and Thailand demonstrate a high BCG coverage.

Medium Coverage Regions

Medium coverage region records 80-70 per cent coverage. The following countries are included in this category:

Mali (79 per cent), South Africa(77 per cent), Comoros(76 per cent), Haiti(76 per cent), Niger(76 per cent), Ethiopia(75 per cent), Madagascar(75 per cent), Central African Republic (74 per cent), Ireland (74 per cent), Nigeria (74 per cent), Liberia(73 per cent) Vanuatu (73 per cent) Yemen (73 per cent), Guinea (72 per cent) Kiribati (72 per cent), and Equatorial Guinea (71 per cent).

Low Coverage Regions

The following countries record less than 60 per cent coverage of BCG vaccine: Chad (59 per cent), South Sudan (46 per cent), Somalia (37 per cent) are low part of the coverage region.

2.4.4 Regional Coverage of Poliomyelitis

High Coverage Regions

The Following countries have 99 per cent 'POLIO' vaccine coverage: Bahrain, Belgium, Brunei Darussalam, China, Cook Islands, Cuba, Cyprus, Czech Republic, Democratic People's Republic of Korea, Fiji, France, Greece, Hungary, Iran , Japan, Luxembourg, Maldives, Malta, Monaco, Mongolia, Morocco, Nicaragua, Niue, Oman, Qatar, Republic of Korea, Rwanda, Saint Lucia, Seychelles, Sri Lanka, Thailand, and Uzbekistan demonstrate high coverage of Polio vaccine.

Medium Coverage Regions

Medium coverage region comprises 80-70 per cent coverage. The following countries shows medium coverage of polio vaccine. India (82 per cent), Uganda (82 per cent), Angola (81 per cent), Grenada (81 per cent), Kenya(81 per cent), Micronesia (81 per cent), Panama (80 per cent),Marino(80 per cent), Comoros (79 per cent), Congo (79 per cent), Indonesia(79 per cent), Kiribati(79 per cent), Peru(79 per cent),Venezuela (79 per cent), Djibouti (78 per cent), Guinea-Bissau (78 per cent), Mozambique (78 per cent), Zambia (78 per cent), Marshall Islands(77 per cent),Myanmar (76 per cent), Timor-Leste(76 per cent), Afghanistan (75 per cent),Ethiopia (75 per cent),Lebanon (75 per cent), Ukraine (74, per

cent) Madagascar (73 per cent), Benin (72 per cent), Pakistan (72 per cent), and South Africa (71 per cent).

Low coverage Regions

The low coverage regions demonstrate less than 70 per cent coverage of Polio vaccine: such as Gabon (68 per cent), Iraq (67 per cent), Niger (67 per cent), Côte d'Ivoire (66 per cent), Nigeria (66 per cent), Guatemala (65 per cent), Vanuatu (65 per cent), Haiti (55 per cent), Chad (54 per cent), Papua New Guinea (53 per cent), Syrian Arab Republic (52 per cent), Liberia (49 per cent), Central African Republic (47 per cent), Somalia (47 per cent), South Sudan (44 per cent), Guinea (42 per cent), and Equatorial Guinea (30 per cent).

2.4.5 Regional Coverage of Hepatitis-B

High Coverage Regions

The following countries record 99 per cent Hepatitis B vaccine coverage: Antigua and Barbuda, Bahrain, Bhutan, Brunei Darussalam, China, Cook Islands, Czech Republic, Fiji, Iran, Maldives, Monaco, Mongolia, Morocco, Niue, Palau, Qatar, Republic of Korea, Rwanda, Saint Lucia, Seychelles, Sri Lanka, Thailand, Uzbekistan

Medium Coverage Regions

Medium coverage region records 80-70 per cent coverage. The following countries reported medium coverage of Hepatitis-B Angola (80 per cent), Comoros (80 per cent), Congo (80 per cent), Guinea-Bissau (80 per cent), Panama (80 per cent), San Marino (80 per cent), Marshall Islands (79 per cent), Philippines (79 per cent), Djibouti (78 per cent), Indonesia (78 per cent), Mozambique (78 per cent), Uganda (78 per cent), Venezuela (78 per cent), Ethiopia (77 per cent), Mali (77 per cent), Timor-Leste (77 per cent), Afghanistan (75 per cent), Canada (75 per cent), Kiribati (75 per cent), Myanmar (75 per cent), South Africa (74 per cent), Guatemala (73 per cent), Madagascar (73 per cent), Pakistan (73 per cent), Syrian Arab Republic (71 per cent), Benin (70 per cent), Gabon (70 per cent), and India (70 per cent) experience hepatitis-B vaccine coverage.

Low Coverage Regions

The following countries recorded less than 70 per cent coverage of Polio vaccination: Niger (68 per cent), Côte d'Ivoire (67 per cent), Nigeria (66 per cent), Vanuatu (64 per cent), Iraq (62 per cent), Papua New Guinea (62 per cent), Guinea (51 per cent) Liberia (50 per cent),

Haiti (48 per cent), Central African Republic (47 per cent), Chad (46 per cent), Ukraine (46 per cent), Somalia (42 per cent), Sweden (42 per cent), and Equatorial Guinea (24 per cent).

2.5 Target of Millennium Development Goals and Annual Reduction Rate of U5MR

Table 2. 1 Target of MDG and Annual Reduction Rate of Under 5 Mortality Rate among MDGs Region (2015)

Target of MDG and Annual Reduction Rate of Under 5 Mortality Rate among MDGs Region (2015)		
WHO Region	MDG Target (2015)	Annual Reduction Rate (2000-2015)
Developed	5	3.5
Developing	33	3.9
North Africa	24	4.1
Sub-Saharan Africa	60	4.1
S. America Caribbean	18	3.9
Caucasus & Central Asia	24	4.6
East Asia	11	8.1
South Asia	42	5.3
South East Asia	24	3.9
W. Asia	22	3.9
Oceania	25	4.3
World	30	3.9
Source: UNICEF, WHO, World Bank 2015		

The Millennium Development Goals set a target to bring down the under-five-mortality rate by the year of 2015 for various ‘World Health Organization’s regions of the world. World Health Organization has targeted to reduce U5MR by 5 per 1000 live births for developed regions, 33 per 1000 live births for developing countries, 24 per 1000 live births for North Africa, 60 per 1000 live births for sub-Sahara Africa, 18 per 1000 live births for South America Caribbean, 24 per 1000 live births for Caucasus and Central Asia, 11 per 1000 live births for East Asia, 42 per 1000 live births for South Asia, 22 per 1000 live births for West Asia, 25 per 1000 live births for Oceania and 30 per 1000 live births for the world to achieved the millennium development goals.

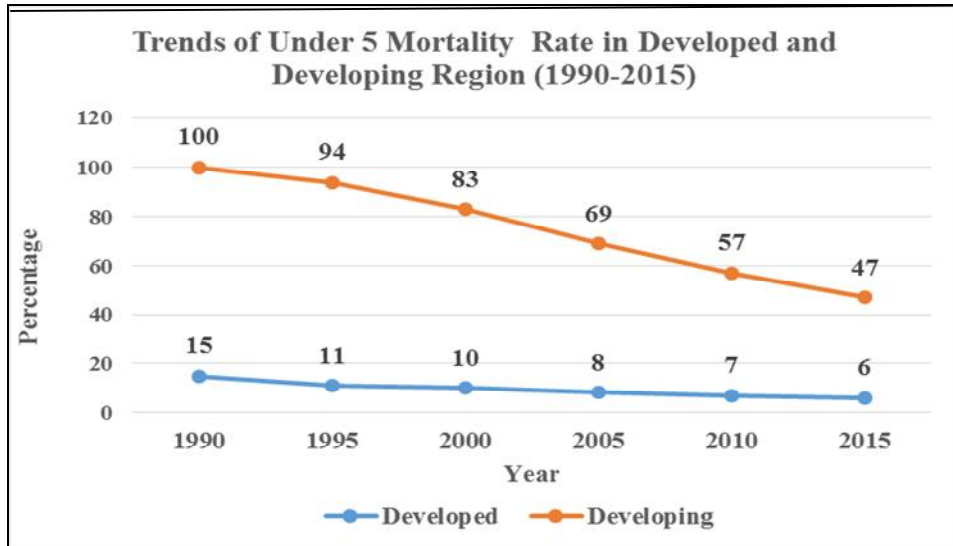
The average ‘Annual Reduction Rate’ of Under-Five Mortality rate has also been measured in various World Health Organisation Regions of the world. Table 2.1 indicates that the developed regions experienced 3 per 1000 per cent, while developing countries experience

3.9 per cent annual reduction rate in under five mortality. North America experienced 4.1 per cent, Sub-Saharan Africa 4.1 per cent, South America and Caribbean 3.9 per cent, East Asia 8.1, 3.9 per cent, South East Asia, 3.9 per cent, West Asia, 4.3 per cent Oceania 3.9 per cent annual reduction rate in under-five mortality rate during the year of 2000 to 2015.

2.6 Reduction in IMR and U5MR across WHO's Regions

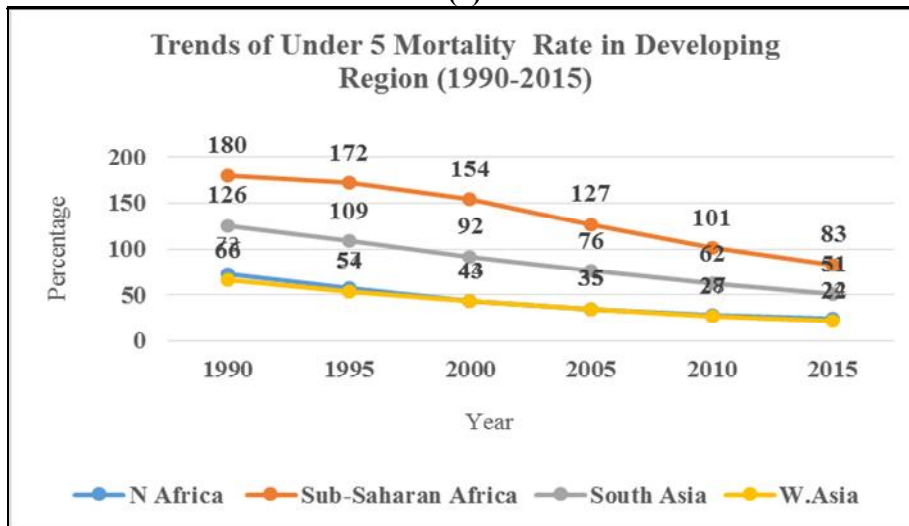
Routine Immunization is the most important Public Health Programme for achieving the United Nation Millennium Development Goals (WHO, Immunization and Vaccine Development, South-East Asia Region, 2014). Therefore, the 4th aim of 'Millennium Development Goals' (MDG) targets to reduce Infant Mortality Rate (IMR) and Under 5 Morality Rate (U5MR). The Millennium Development Goals (MDGs) are targeted to reduce the 'Infant Mortality Rate and Under 5 Morality Rate' by two thirds over the period of 1990-2015. After the universalisation of Child Immunization Programme against vaccine preventable diseases and adoption of Millennium Development Goals, the substantial reduction has been observed in infant mortality rate and under-five mortality rates throughout the world. The under-five children mortality rate has declined from 66 children per 1000 live births in 1991 to 43 children per 1000 live births in 2015, but still MDGs target could not because under five mortality rate was 30/1000 till 2015. The under-five child mortality is declining annually with the rate of 3.9 per cent per year globally. Furthermore, the declining rate of child mortality is not equally attained among WHO regions of the world.

Figure 2.6 Reductions in Under 5 Mortality in Developed and Developing World (1990-2015)



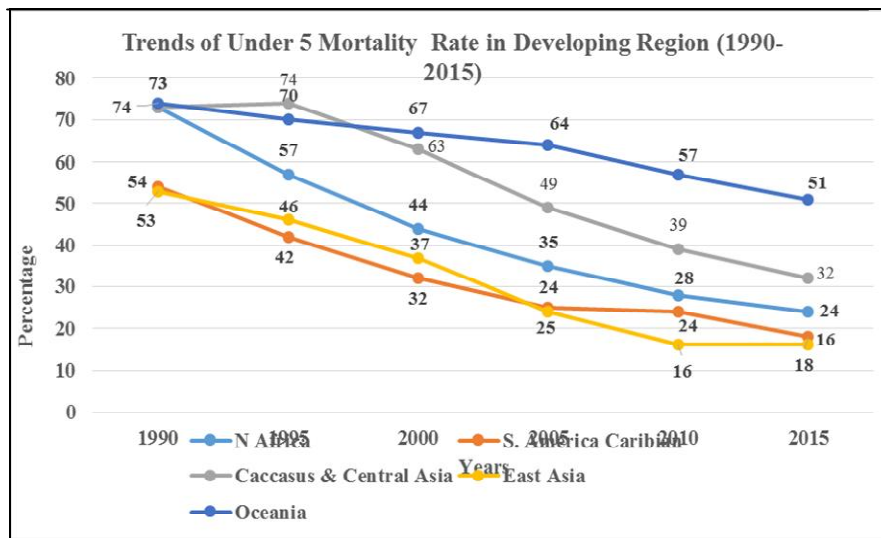
Source: World Health Organization (2015)

Figure 2.7 Reduction in Under 5 Mortality in Developing Regions (1990-2015)
(1)



Source: World Health Organization (2015)

(2)



Source: World Health Organization (2015)

The figure 2.6 reveals that the developed regions has done the best effort to control the under-five mortality rate which declined it from 15 to 6 between 1991 to 2015, whereas the target was only 5/1000. On the other hand, in the developing regions, the under-five mortality has declined from 100 to 47 between years of 1991 to 2015. In the North Africa Region, it has declined from 73 to 24, Sub-Saharan-African from 180 to 83, Southern America Caribbean from 54 to 18, Caucasus & Central Asia from 73 to 32, East- Asia from 53 to 16, South Asia from 126 to 51, South- East-Asia from 72 to 24, West- Asia from 66 to 22, Oceania from 74 to 51 per cent between of 1991 to 2015. The reduction of under-five mortality rate has been greater in developing regions such as Southern America Caribbean, Caucasus, Central Asia, East- Asia, South- East-Asia, West- Asia whereas, the North Africa Region, Sub-Saharan-African, South Asia, and Oceania demonstrate comparatively lower rate regarding reduction in child mortality. Furthermore, within the region, the under-five mortality reduction rate is quite uneven particularly in the developing regions and some countries have very high under-five mortality rate whereas some countries have very less under-five child mortality. African and South Asian countries have still very high under-five mortality rate due to low child Immunization coverage, poverty, poor health infrastructure and less economic development.

2.7 Child Immunization Coverage in South Asian Region

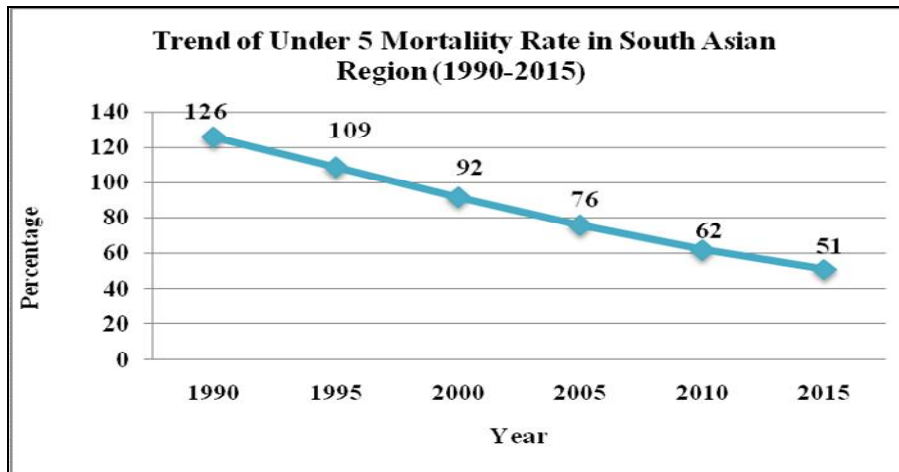
Table 2.2 Child Immunization Coverage by Specific Vaccines in South Asian Region (2014)

Child Immunization Coverage by Specific Vaccines in South Asian Region (2014)						
Vaccine	Pakistan	Bangladesh	Bhutan	Nepal	Sri Lanka	India
BCG	85	99	99	99	99	91
DPTIII	73	95	99	92	99	83
Polio III	88	95	92	86	99	82
Measles	63	89	97	88	99	83
Hepatitis-B	73	95	99	92	99	70
<i>Source: WHO, UNICEF, (2014)</i>						

According to the World Health Organization and UNICEF report of 2014, India shows poor coverage of BCG, DPT, Polio, Measles, and Hepatitis-B among children. Sri Lanka records the best performance in the South Asian Region. Even, Bangladesh, Bhutan, and Nepal have performed far better than India. Only 91 per cent children have been vaccinated with BCG, 83 per cent of the third dose of DPT, 82 per cent of the third dose of DPT, 82 per cent of the third dose of Polio, 83 per cent from Measles, and 70 per cent from Hepatitis-B in India. In Sri Lanka, 99 per cent children achieved full Immunization coverage of BCG, DPT, Polio, Measles, and Hepatitis-B till 2014. Bangladesh is also performing well in child Immunization in the South-Asian region. About 99 per cent children have been vaccinated against BCG, 98 per cent from DPT, 95 per cent of the third doses of DPT, 95 per cent of polio, 94 per cent of measles, and 95 per cent from Hepatitis-B in Bangladesh. The third country is 'Bhutan' that covers 99 per cent of BCG, 99 per cent of DPT-I, 92 per cent of DPT III, 97 per cent of Polio, 99 per cent of Measles and 99 per cent of Hepatitis-B. About 85 per cent children have been vaccinated with BCG, 73 per cent of the first dose of DPT, 88 per cent from polio and 63 per cent from Measles and 73 per cent with Hepatitis-B. Nepal attained 99 per cent of BCG, 92 per cent DPT, 86 per cent of Polio, Measles- 88 per cent, and 92 per cent Hepatitis-B Immunization among children in the country.

2.8 Reduction in Under 5 Mortality Rate in South Asia

Figure 2. 9 Trends of Under 5 Mortality Rate in South Asian Region (1990-2015)



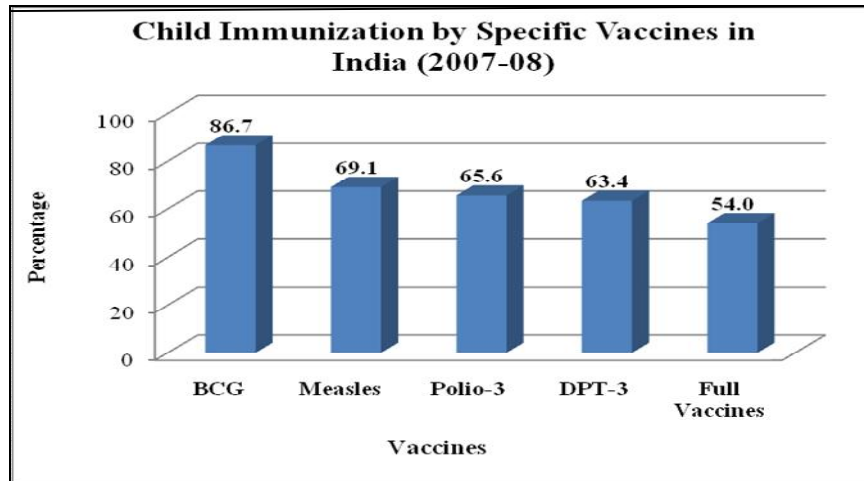
Source: World Health Organization (2015)

Substantial reduction has been registered in the South Asian region after the adoption of Millennium Development Goals. The under- five mortality rate has declined from 126 to 51 between 1990 to 2015. Although, the South Asian Regions could not achieve Millennium Development Goals where the aim was to reduce under-five mortality rate by 42 per 1000 live births between 1991-2015 but present U5MR is the big achievement because it was very high in 1990 and now has come down to near about its target in 2015.

2.9 Child Immunization Coverage by Specific Vaccines in India

Although, India is the leading producer and exporter of vaccines in the world, but large number children are not immunised in the country (**Vashishtha and Kumar, 2013**). The 'District Level Health Survey (2007-08) data reveals that the BCG has the highest coverage with 86.7 per cent against 'Tuberculosis', Measles has the second highest coverage with 69.1 per cent, followed by third dose of Polio 65.6 per cent, third doses of DPT 63.4 per cent and full Immunization coverage 54.0 per cent.

Figure 2. 10: Child Immunization by Specific Vaccines in India (2007-08)



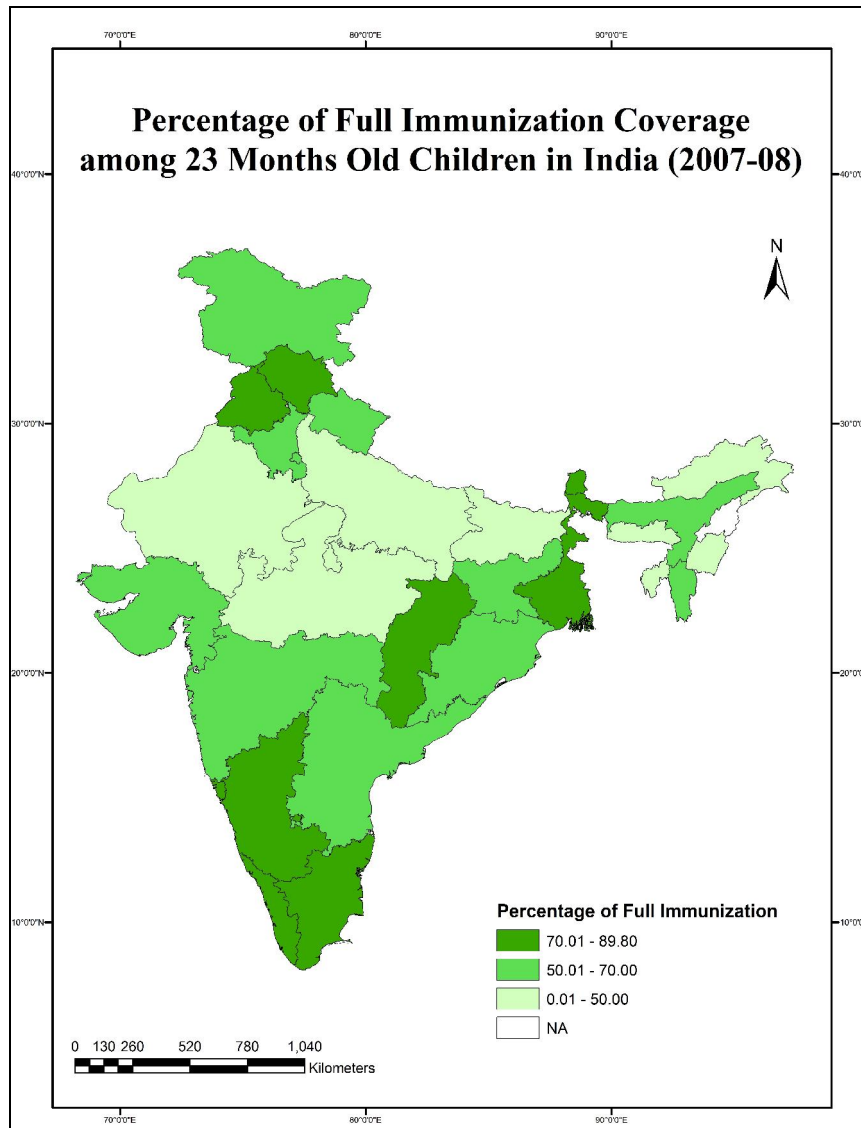
Sources: DLHS-III (2007-08)

2.10 Regional Variations in Child Immunization Coverage in India

Data have been collected for 27 states and 6 union territories of the country while Nagaland and Telangana have been not covered by the District Level Health Survey 2007-08. It is seen that full Immunization coverage has not been equally attained by all states due to unequal socio-economic development and availability of health infrastructure.

Therefore, the highest child Immunization coverage has been reported in Goa with 89.8 per cent, and the lowest child Immunization coverage has been reported in Arunachal Pradesh with 13.3 per cent. There is a wide gap between the highest coverage state and the lowest coverage state with 76.5 per cent, and it is 7 times more than the highest one.

Map 2.1: State Level Variations in Full Immunization Coverage in India



Source: DLHS-III (2007-08)

Union Territories in India demonstrate higher child Immunization coverage in comparison to rest of the larger states in the country v.i.z. Lakshadweep 86.2 per cent, Daman Diu 84.0 per cent, Andaman Nicobar Islands 83.6 per cent, and Pondicherry with 80.2 per cent, Delhi 67.3 per cent and Dadra Nagar Haveli 64.8 per cent. ‘Lakshadweep shows the highest Immunization coverage whereas, ‘Dadar Nagar Haveli has the lowest Immunization coverage among the union territories.

The South Indian states show better child Immunization coverage than the North Indian states (except Himachal 82.2 per cent and Punjab 79.9 per cent), such as Tamil Nadu 81.6 per cent, Kerala 79.6, Karnataka 76.7 per cent. In addition, West Bengal 75.7, Chhattisgarh 73.0 per cent have also reported higher child Immunization coverage in the country.

States like Maharashtra (69.0 per cent), Andhra Pradesh (66.7), Uttaranchal (62.9), Odisha (62.2), Jammu and Kashmir (62.2), Haryana (59.6) Gujarat (54.8), Mizoram (54.20), and Jharkhand (54.0) experience medium Immunization coverage in the country.

The North Indian and North-East states show poor performance regarding child Immunization in the country. Arunachal Pradesh has 13.3 per cent, the lowest coverage of child Immunization in the country. Uttar Pradesh 30.2 per cent, Meghalaya 33.1 per cent, Madhya Pradesh 36.0 per cent, Tripura 38.2 per cent, Bihar 41.4 per cent, Manipur 47.4 per cent, *Rajasthan* 48.7 per cent, *Assam* 50.7 per cent are the poor performing states which have lower coverage of child Immunization than the national level.

Table 2.3 Trends in Child Immunization Coverage in India (2007-2010)

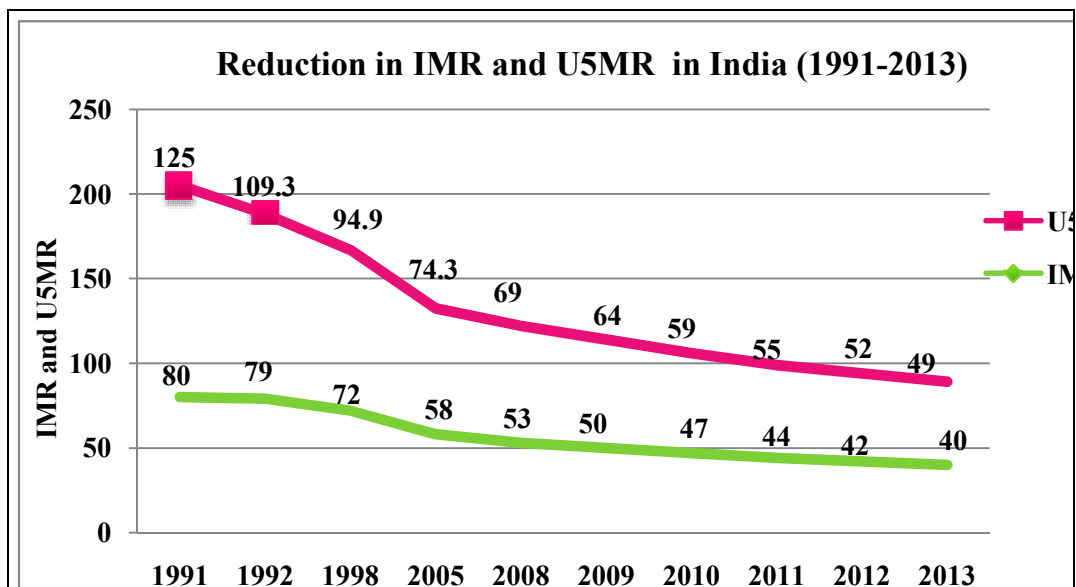
Trend of full Immunization in India (2007-2010)	
1998-99	54.2
2002-04	45.8
2007-08	53.5
2009-10	61.0

Source : NFHS –III (2007-08) and NRHM Report (2009-10)

Fluctuations are recorded in the coverage of child Immunization. 54.2 per cent children were fully immunised in 1998-99 but it declined to 45.8 per cent in 2002-04., again it increased to 53.5 per cent during 2007-08. As per Coverage Evaluation Survey (CEV) of NRHM, in 2009-10, it increased up to 61 per cent. Therefore, the rate of coverage of full vaccination is very slow at the national level, and has a fluctuating trend.

2.11 Reduction in Infant Mortality Rate and Under 5 Mortality Rate in India

**Figure 2. 11: Decline in Infant and Child Mortality in India
(1991-2013)**

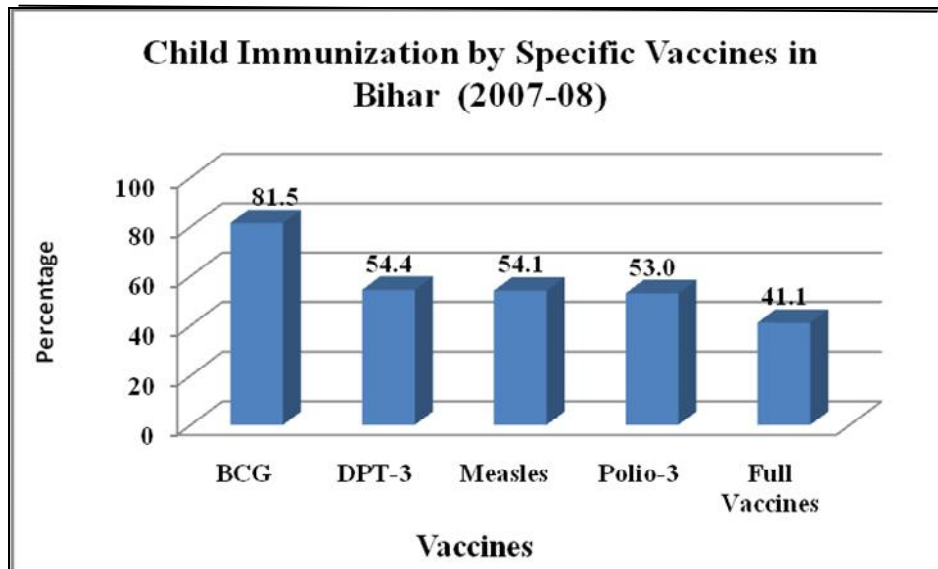


Source: SRS Statistical Reports for different years, Office of RGI, New Delhi

Substantial reductions have been observed in infant mortality rate and under-five mortality rates in the country. The under-five mortality rate has declined from 125 to 49 between years 1991 to 2013. Similarly, infant mortality rate has also declined from 80 to 40 between years 1991 to 2013.

2.12 Child Immunization Coverage by Specific Vaccines in Bihar

Figure 2. 12: Child Immunization by Specific Vaccines in Bihar (2007-08)

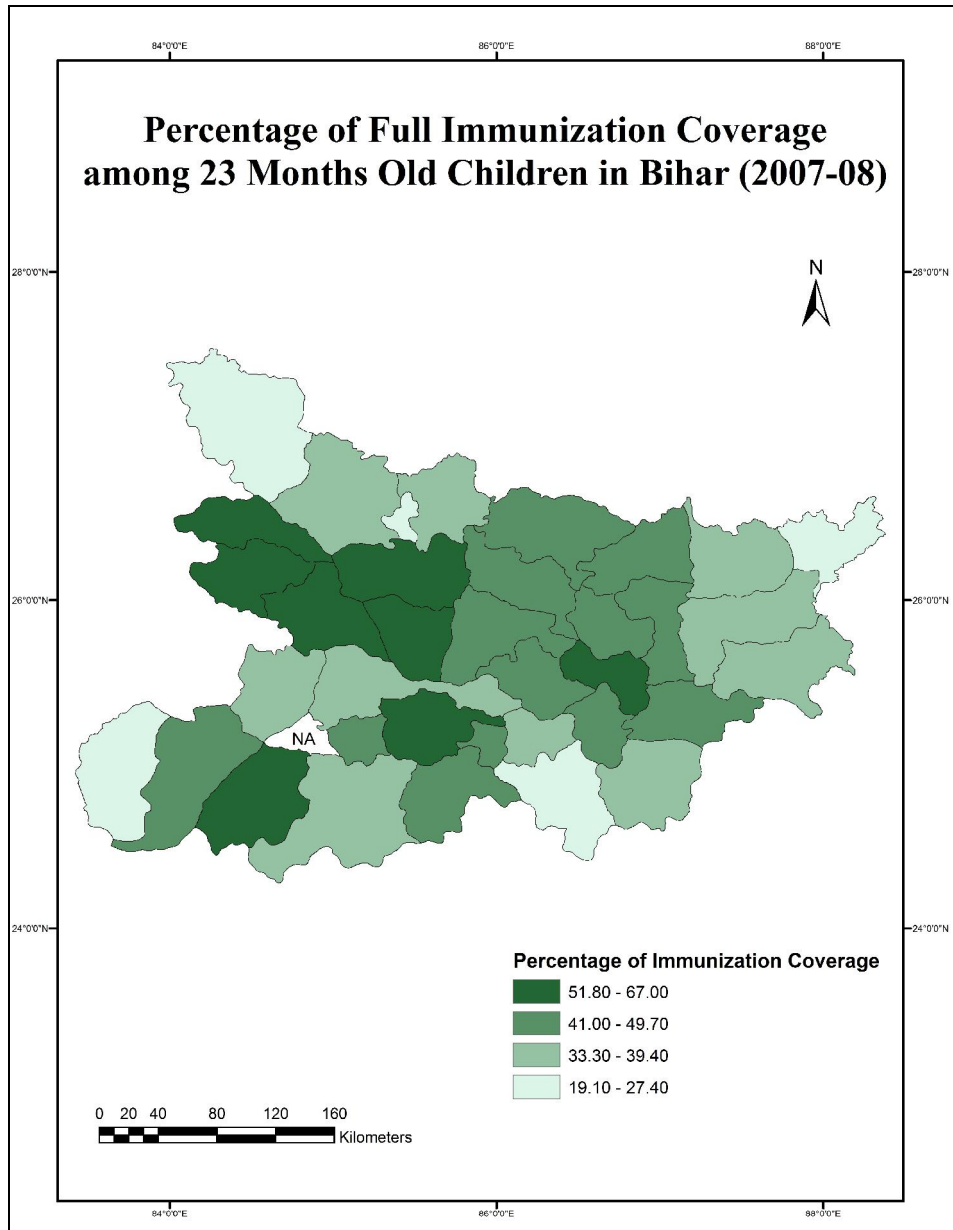


Source: DLHS-III (2007-08)

The figure 2.12 presents that 'BCG' vaccine has the highest coverage among all recommended vaccines in childhood. Next, three doses of DPT with 54.4 per cent, Measles with 5.1 per cent, and three doses of 'Polio' with 53.0 per cent. There is very low coverage of full Immunization with 41.1 per cent in the state.

2.13 Regional Variations in Bihar

Map 2.2 District Level Variations Full Immunization Coverage in Bihar



Bihar ranks third from the bottom in term of full Immunization coverage with 41.4 per cent coverage. Even within the state, district level variations are noticeable. Out of the 37 districts, Saran records highest coverage (67 per cent), whereas Jamui records the least coverage (19.1 per cent). Therefore, Jamui district has received special focus in this study. Another study district selected is Aurangabad that records 60.7 per cent coverage. Only six districts have more than 50 per cent full Immunization attainment, and these are Vaishali 59.3 per cent, Gopalganj 55.4 per cent, Nalanda 55.2 per cent, Muzaffarpur 54.9 per cent, Khagaria 52.3 per cent, and Siwan 51.8 per cent.

Kishanganj district with per cent 23.6 per cent, West Champaran 27.1 per cent, Sheohar 27.4 per cent, Buxar 33.3 per cent, Araria 33.3 per cent, Katihar 34.8 per cent, Gaya 35.7 per cent and others are the poor performing districts in the states.

High Immunization Coverage (More than 49.70 per cent): Only nine districts fall in this category: Saran (67.0 per cent) Aurangabad (60.7 per cent), Vaishali (59.3 per cent), Gopalganj (55.4 per cent), Nalanda (55.2 per cent), Muzaffarpur (54.9 per cent), Khagaria (52.3 per cent), Siwan (51.8 per cent), and Bhagalpur (49.70 per cent).

Medium Immunization Coverage (39.41-49.70 Per cent): There are 13 districts in this category: Samstipur (47.8 per cent), Nawada (46.5 per cent), Darbhanga (45.8 per cent), Madhepura (45.2 per cent), Jehanabad (44.7 per cent), Shekhpura (44.4 per cent), Munger 43.2 per cent, Madhubani (43.1 per cent), Saharsa (43.0 per cent), Rohtas (41.5 per cent), Supaul (41.5 per cent), Begusarai (41.0 per cent), Purnia (41.0 per cent) and Patna (39.1 per cent).

Low Immunization Coverage (27.1 to 39.40 Per cent): Low coverage districts are the following: Banka (37.6 per cent) East Champaran (37.3 per cent), Sitamarhi (36.8 per cent), Lakhisarai (36.6 per cent), Gaya (35.7 per cent), Katihar (34.8 per cent), Araria (33.3 per cent) Bhojpur (33.3 per cent), and Buxar (33.3 per cent).

Very Low Immunization Coverage (Less than 27.40 per cent): Sheohar (27.4 per cent), West Champaran (27.1 per cent), Kaimur (24.9 per cent), Kishanganj (23.6 per cent), Jamui (19.1 per cent) are the districts with very low Immunization coverage in the state.

1.14 Trends in Child Immunization in Bihar

Table 2.4 Trends in Full Child Immunization Bihar (2015-16)

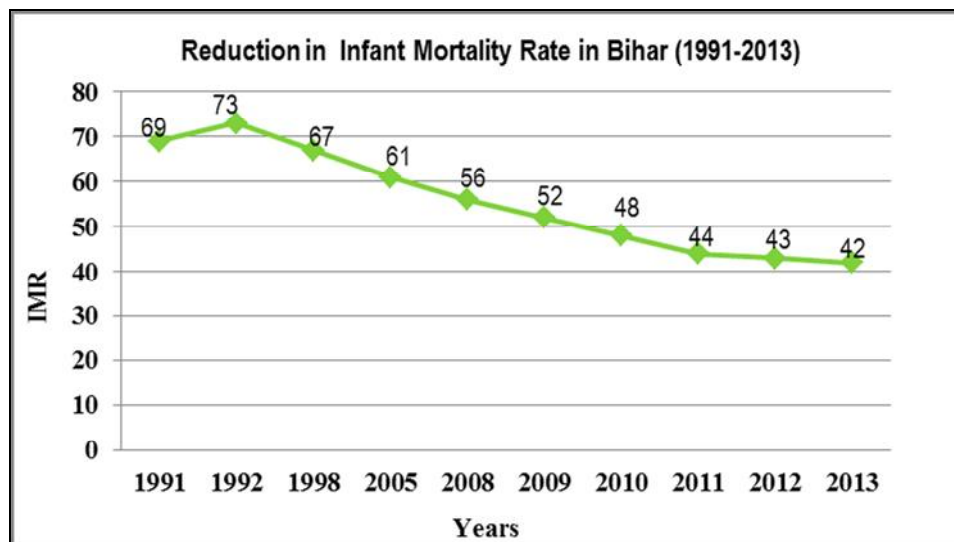
Trend of Full Child Immunization Bihar (2015-16)	
1998-99	22.0
2002-04	23.0
2007-08	41.0
2009-10	49.0
2015-16	61.7*

Source: NFHS-III (2007-08) and *NFHS IV (2015-16)

Trend of child immunization coverage Bihar, has a regular and positive change, but a very low coverage rate has been reported. Only 22 per cent children were fully immunised in 1998-99 which has increased to 61.7 per cent in 2015-16. Extensive improvement has been reported between years of 1998 to 2016 in full Immunization coverage in Bihar.

2.15 Reduction in Infant Mortality Rate in Bihar:

Figure 2. 13: Reduction in Infant Mortality Rate in Bihar (1991-2013)



Source: SRS Statistical Reports for different years, Office of RGI, New Delhi

Figure 2.13 presents that infant mortality rate has declined from 69 to 42, between 1998-99 and 2015-16. Millennium Development Goals have played a very important role in controlling child mortality (Singh, 2013).

2.16 Conclusion

The 'Childhood Immunization Programme' is the most cost effective health intervention programme to diminish child morbidity and mortality from vaccine preventable diseases. 'BCG' appeared as the most common vaccine among all recommended vaccines within overall vaccines preventable diseases that have been administered to 12-months old infants globally whereas, three doses of Hepatitis-B and Zero dose of Hepatitis-B are utilised vaccines in the world. Polio is very common and has the highest exposure to mass media among all recommended vaccines, it is on the third rank after BCG and DPT worldwide. At the regional level, West Pacific, Europe, South -East Asia, East Mediterranean and America demonstrate the highest childhood Immunization coverage in the world, whereas, developing countries and Africa present very poor picture and children are still under immunised. It is a notable fact that these regions comprise more than half of the world population. Poor health infrastructure is one of the most crucial determinants of poor coverage of child Immunization in the developing countries. The 'Child Immunization Programme' has played a very significant role to achieve the 4th aim of 'Millennium Development Goals', which deal with the reduction in infant mortality rate and under-five mortality rate. Substantial reduction has been observed in developed regions such as Southern America, Caribbean, Caucasus and Central Asia, East-Asia, South- East-Asia, and West- Asia region regarding under-five mortality rate since 1991 to 2015 whereas, the North Africa Region, Sub-Saharan-Africa, South Asia, and Oceania demonstrate comparatively slower rate regarding reduction in under-five mortality. Furthermore, in the nations within the regions, the under-five mortality reduction rate is quite uneven particularly in developing regions. Some countries have very high under-five mortality whereas some countries experience very low under-five child mortality. There is a lack of adequate stock of vaccines, poor storage and its management that directly affects the supply chain and interrupts the Immunization process. Less social mobilisation and careful communication are also seen within these regions (**Subaiah, 2014**). **World Health Organisation (2014)** observed that limited resources, poor management of health system, inadequate monitoring and supervision, and competing health priorities lead to less child Immunization coverage within these regions of the world. Sri Lanka has a wonderful performance in child Immunization coverage in South Asian countries. Sri Lanka is the first South Asian country that has attained the highest percentage of child Immunization coverage and has achieved the aim

of 'Millennium Development Goals' like any other developed country of Europe or America. Furthermore, Bangladesh, Bhutan, and Nepal have also established higher childhood Immunization coverage in South Asian region whereas, India and Pakistan lag behind in this South-East Asian region. 'BCG' has the highest coverage not only globally, but also at the national level in India and Bihar. The second highest vaccination coverage is of Measles, followed by Polio-3 and DPT in India. Furthermore, in Bihar, the second vaccine is DPT-3 followed by Measles and Polio whereas 'Full Immunization Coverage' (FIC) is very low at the national level as well as in Bihar.

Therefore, the highest child Immunization coverage has been reported in Goa while the lowest child Immunization coverage has been reported in Arunachal Pradesh. There is a wide gap between the highest Immunization coverage state and the lowest Immunization coverage state. All union territories demonstrate higher child Immunization coverage in comparison to larger as well as small states in the country. The South Indian states demonstrate better child Immunization coverage than the North Indian states (except Himachal and Punjab), Tamil Nadu, Kerala and Karnataka. The North Indian and North-East states show poor performance regarding child Immunization in the country. Uttar Pradesh, Meghalaya, Madhya Pradesh, Tripura, Bihar, Manipur, Rajasthan and Assam are poor performing states which have lower coverage of child Immunization than the national level. Bihar has very low Immunization coverage in the country. Within the state, regional distribution is very uneven. *Saran*' district has the highest full vaccination that is higher than the national level and the state level whereas Jamui has the lowest percentage of child Immunization coverage that is much less than the national and state level. Only two districts in Bihar have a higher percentage of full child Immunization coverage than the national level. Only six districts have more than 50 per cent full Immunization, and these are *Vaishali*, *Gopalganj*, *Nalanda*, *Muzaffarpur*, *Khagaria*, and *Siwan*, the rest of the 30 districts have less than the national level coverage of child Immunization in the state. Since 'Universal Immunization Programme' (UIP) has been introduced with the expansion of Immunization services and strengthening of 'Routine Immunization', significant progress has been observed in the reduction of infant mortality rate and under-five mortality rate due to vaccine-preventable diseases among every region of the world. Furthermore, this has also reduced the burden of childhood diseases. Dropouts in the case of multiple dose vaccines like DPT, Polio, and Hepatitis-B is another important problem again achieving the full Immunization coverage in India and Bihar. Irregular trends have been observed in full Immunization coverage in India, whereas regular and positive

trends have been reported in Bihar. It is no doubt that Tuberculosis, Malaria, and incidence of Poliomyelitis have been controlled in the country. Infant mortality rate and under-five mortality rate have also declined between two decades due to Universal Immunization and Millennium Development Goals, but more vigorous and continuous efforts are required particularly to achieve the new global target of zero preventable child deaths and maternal deaths by the year 2030 (**India and Millennium Development Goals, 2015**).

References

Dempsey, et.al (2008). The role of economic information in decision-making by the advisory committee on immunization practices. *Vaccine*, 26(42), 5389-5392.

Dyer. (2005). Some countries will not achieve millennium development goals for health by 2015, WHO says. *BMJ: British Medical Journal*, 330(7496), 863.

Estimates developed by the un inter-agency group for child mortality estimation, New York, USA

Lawn, J. E., Costello, A., Mwansambo, C., & Osrin, D. (2007). Countdown to 2015: Will the millennium development goal for child survival be met?. *Archives of Disease in Childhood*, 92(6), 551-556.

Moïsi, J. C. et al. (2010). Spatial and socio-demographic predictors of time-to-immunization in a rural area in Kenya: Is equity attainable?. *Vaccine*, 28(35), 5725-5730.

Paterno Anna, Child Mortality and the Millennium Development Goals: Characteristics, Trend and Determinist

Singh, P. K. (2013). Trends in child immunization across geographical regions in India: focus on urban-rural and gender differentials. *PloS one*, 8(9), e73102.

Subaiya, S. et al. (2015). Global routine vaccination coverage, 2014. *MMWR. Morbidity and Mortality Weekly Report*, 64(44), 1252-1255.

UNICEF (2015), Millennium Development Goals (MDG) Statistics and Monitoring

United Nation children's Fund (2015) level and trend in child mortality, Report 2015

United Nation Development Programme, 'Human Development Index' Report 2015

Immunization and Vaccine Development South-East Asia Region (2014) WHO

Global Immunization News September (2014) WHO

Child Immunization Coverage. (2016) WHO

Global Immunization data. (July 2014) WHO

Immunization, Vaccines and Biological, World Immunization Week.(2012) WHO

Profile of the Study Area

3. Geographical Location

3.1. Regional Classification

Bihar is situated in the eastern part of India (83° 19' 50" East to 88° 17' 40" East longitude and 24° 20' 10" North to 27° 31' 15" North latitude) with an area of 94163.00 sq. km. The state shares the international boundary with Nepal and national boundary with other Indian states like Uttar Pradesh, West Bengal and Jharkhand. From north to south the length of the state is 362 kilometres and from west to east it is 483 kilometres. Bihar can be divided into three natural regions (1) Foothills of the Himalayan Region covers only 0.06 per cent (2) Gangetic Plain comprises 96.26 per cent of the total areas (3) Southern Plateau comprises 3.86 per cent of the total geographical area of the state. Before the creation of Jharkhand in 2000, Bihar owned the mineral rich Chotanagpur plateau as well as a huge forest cover. However, the present state has very little forest cover as well as mineral resources.

3.2. Soil Cover

Bihar is situated in 'Middle *Gangetic* Plain' and has a regular gentle slope with 6 cm per kilometer tilting from west to the east. It is made up of 'Alluvial Soil' deposited by the Himalayan Rivers and southern peninsular rivers originating from the *Chhota-Nagpur* Plateau.

'Piedmont Swamp' and '*Terai*' soils are found in northern Bihar adjacent to the Nepal border or the Himalayan foothill areas, but riverine alluvial soil covers more than 90 per cent of the state. This young and fertile soil cover contains silt, clay and alluvium, ideal for food grain cultivation. This fertile alluvial soil is the backbone of the state economy.

3.3. Water Resource

Rainfall of the state depends on the arrival of the monsoons, its annual average rainfall is 1124.9 mm. Bihar is not only rich in surface water, but also endowed with a huge reservoir of ground water. Ganga is the main river flow from the west to the east and divides the state into two halves, i.e. south and north Bihar. Numerous tributaries have joined Ganga from both the right and the left sides of the river. Among them, Ghaghara, *Gandak*, *Budhi Gandak*, *Bagmati*, *Kamala*, *Balan*, *Kosi* and *Mahananda* are the right bank tributaries and *Karmnash*, *Son*, *Punpun*, *Falgu*, *Quel* etc. are the left bank

tributaries. Right bank tributaries are all perennial rivers and provide adequate water throughout the year but at the same time it creates devastating floods due to frequent shifting of the courses. Left bank tributaries like Falgu etc. are not perennial rivers but are ephemeral rivers; their beds go dry during the winter and summer seasons.

3.4 Administrative Divisions

The state of Bihar has been politically divided into 9 divisions, 38 districts, 101 subdivisions, 534 Community Development Blocks (CD Blocks), and 45103 revenue villages. There are also 130 towns, 60 and 14 urban agglomerations in the state.

3.5 Land Use Pattern

Table 3.1, Land Utilizations in Bihar (2011, in Lakh Hec.)

Land Utilization of Bihar (2011, in Lakh Hec.)		
Total Areas (in Lakh Hec.)	93.6	(Per cent to total area)
Net Areas Sown	52.58	56.18
Land Put to Non Agriculture	16.99	18.15
Current fallow land	9.2	9.83
Forest	6.22	6.65
Barren and Non Cultivable land	4.32	4.62
Miscellaneous Tree Crop and grovs	2.44	2.61
Other Fallow Land	1.22	2.32
Cultivable West Land	0.45	2.65
Permanent Pasture and Grazing	0.16	1.74

Source- Agriculture Census of India (2011)

Agriculture is the main occupation of the people of Bihar, and two third of its total population directly depends upon agriculture for their livelihood. Table 3.1 presents the land utilization pattern of the state. Total geographical area of Bihar is about 93.60 lakh hectares, within this total area, 52.58 lakh hectares are net cultivated, followed by non- agricultural land of 16.99 lakh hectares, Current fallow land 9.2 lakh hectares, Forest 6.22 lakh hectares, Barren and Non Cultivable land 4.32 lakh hectares, Miscellaneous Tree Crop and grovs 2.44 lakh hectares, Other Fallow Land 1.22 lakh hectare, Cultivable Waste Land 0.45 lakh hectare, Permanent Pasture and Grazing land 0.16 lakh hectare. Therefore, Bihar has a very large agriculture land.

3.6 Irrigation

Table 3.2 Source Wise Irrigated Areas (2010-11)

Source Wise Irrigated Areas (2010-11)	
Sources	Gross Irrigated Areas (Lakh. Hect.)
Tube-wells	29.25
Canals	12.79
Others	1.47
Tank	0.66
Wells	0.26
<i>Source-Directorate of Economics and Statistics, Bihar(2010-11)</i>	

Although, the state receives 1124.9 mm rainfall annually due to the uncertainty of Monsoons, unequal distribution of rainfall, irregular rainfall, and seasonal rainfall, multiplicity of crops and artificial mode of irrigation have been developed. Tube wells, Canals, Tanks and wells are the main sources of irrigation water in the state. According to the Census 2011, a total of 48.48 per cent area is irrigated in the state. Table 3.2 presents that 29.25 lakh hectare areas are irrigated by tube well, followed by 12.79 lakh hectare by canals, 0.66 and 0.26 lakh hectare by tanks and wells and 1.47 lakh hectare area are irrigated by other sources of irrigation in the state.

3.2. Economic Base

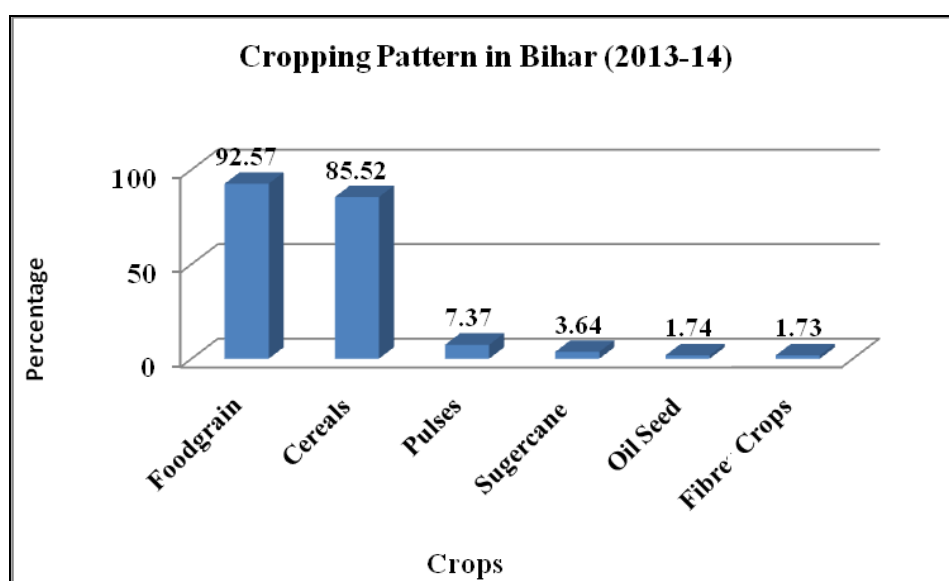
3.2.1 Agriculture

The state's economic base is largely dependent on agriculture and other primary activities. Agricultural economy itself is dependent on rice and wheat cultivation; but the production of cash crop is very limited. However, traditional methods of farming and cultivation are still prevalent in Bihar; introduction of machinery in the agricultural field is still restricted the few formers.

Agriculture in Bihar is largely dominated by food crops which are produced in 92.57 lakh hectare areas, share of cereals crops is 85.52 lakh hectares, Pulse 7.37, Sugar Cane 3.64, Oil Seed 1.74 and Fibre Corps 1.73 lakh hectare.

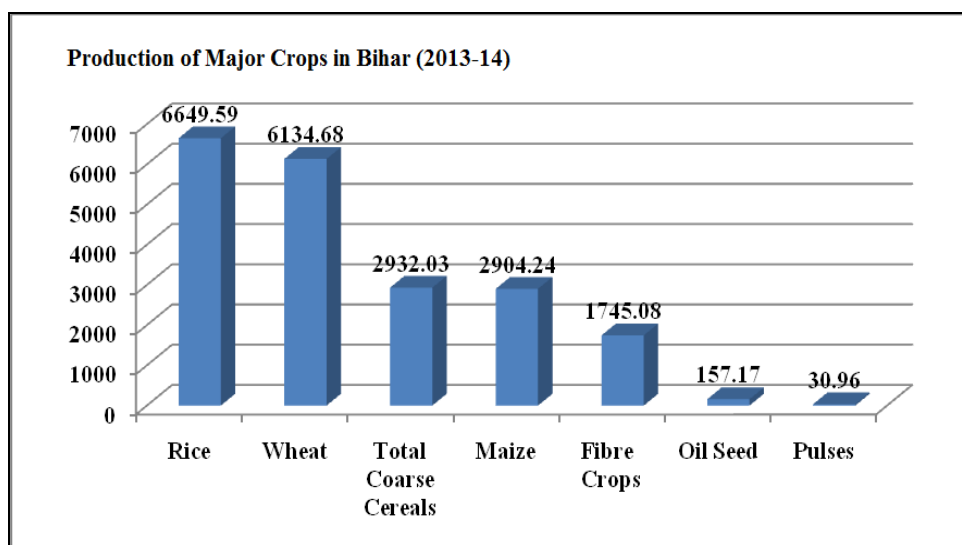
Rice, Wheat, Maize are the major crops which are produced in Bihar. Besides of these, Pulses, Oil seeds, Sugarcane, Jute and Tobacco are also produced. Annual production of rice is 6649.59 thousand tonnes, wheat 6134.68 thousand tonnes, total coarse cereals 2932.03 thousand tonnes, maize 2904.24 thousand tonnes, fibres crops 1745.25 thousand tonnes, oil seed 157.17 thousand tonnes, pulse 30.96 thousand tonnes produced in during 2013-14.

Figure 3.1 Crop Pattern and Crop Production in Bihar (2013-14)



Source-Directorate of Economics and Statistics, Bihar, Patna (2010-11)

**Figure 3.2 Productions of Major Crops in Bihar (2013-14),
(in 000 Tonnes)**



Source - Department of Agriculture Government of Bihar (2013-14)

Apart from agriculture, animal husbandry, poultry farming, sericulture, apiculture, pisciculture, floriculture are also practiced in the state. Animal husbandry is one of the important sectors of agriculture that provide large scale of employment particularly to the poor, land less, small farmers and marginalized sections of the society. It is considered as supplementary to the agriculture. In spite of this, agriculture is main occupation of the

state, but it is still being practiced by traditional methods with old tools and instruments. Therefore, a subsistence type of agriculture is still being practiced that has not been commercialized or market oriented.

3.2.2 Industries

Table 3.3 Industrial Units in Bihar (2013-14)

Industrial Units in Bihar (2013-14)	
Types of Enterprises	Number of Units
Large Scale Industries	19
Micro Scale	2991
Small Scale	131
Medium Scale	11
Total	3152
<i>Source:</i> Department of Industry Government of Bihar (2013-14)	

Though Bihar is endowed with fertile riverine alluvial plains, good for crop cultivation, but state is poor in mineral resources and forest cover with only 6.87 per cent. Due to lack of raw materials, the state has no big manufacturing industries but heavily depends on small scale agro-based or cottage industries. As of 2012, industry accounts for only 5 per cent of the state's economy; whereas agriculture accounts for 22 per cent and service sector contributes 73 per cent of the state's GDP. The growth of manufacturing sector is very slow (0.39 per cent). The state records the lowest per capita GDP, compared to the other Indian states.

Industrial data reveals that the state has very few big industries (IOC Barauni etc.) but nearly 3000 micro scale and 131 small scale industries. Food, brewery, sugar, leather, textile and dairy (*Sudha Dairy*) are the main industries. Bihar records the lowest number of industrial units in India (1.22 per cent to total India's industrial units.) The Annual Survey of Industries, 2011-12 reveals that India as a whole has 2.18 lakh factories but Bihar has only 3232 units.

Lack of heavy industries is one of the main reasons of poverty and unemployment; that leads to outmigration. Planning Commission's data (2011-12) shows that Bihar has 33.74 per cent households Below Poverty Line (BPL). Some studies reveal that Poverty in India has some unique features, UP, Bihar and Jharkhand accounts for 27 per cent of the

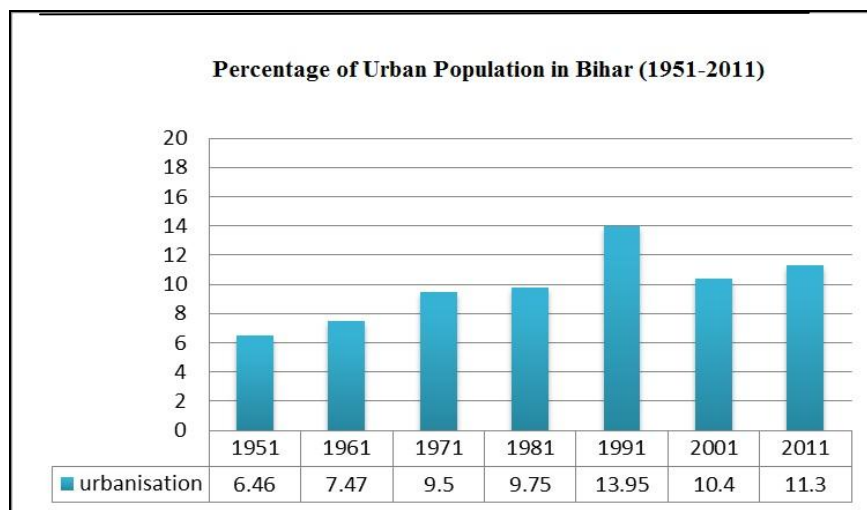
total population (**Himanshu, 2007**). More than three-quarters of poor live in rural areas and most of them depend on agricultural activities.

3.3 Population Characteristics

3.3.1 Rural and Urban Population

Being the third largest populous state and one of the densely populated regions (1,106 Person/ sq.km), Bihar accounts for 8.6 per cent of India’s total population and also records low per capita land availability. Nearly 89 per cent of its total population lives in the rural areas and only 11.29 per cent live in the urban areas. Bihar is one of the least urbanized states in India (after Himachal Pradesh) and thus, a large part of its population live without urban amenities and infrastructure. Since 1951, the state has recorded a steady increase in urban population from 6.46 per cent in 1951 to 13.95 per cent in 1991; then a mild decline in 2001 due to separation of Jharkhand from Bihar. In 2011, this has increased to 11.3 per cent. However, the rate of urbanization is very low compared to the national average.

Figure 3.3 Percentage of Urban Population in Bihar (1951-2011)



Source: Census of India, 1951 to 2011

3. 4 Demographic Characteristics

Table 3.5 Demographic Characteristics of India and Bihar (2011)

Demographic Characteristics of India and Bihar (2011)		
	Bihar	India
Total Population	10.41 Crores	121.01 Crores
Male	54,278,157	
Female	49,821,295	
Urban Population	11.29 per cent	31.15 per cent
Rural Population	88.71 per cent	68.85 per cent
Percentage of total Population to India	8.6per cent	100
Decadal Growth Rate	25.42	17.64
Sex Ratio/1000 male	918	940
Child Sex Ratio	935	914
Density/km ²	1,106 Person	382
Child Population (0-6 Age)(Percentage)	18	13.6
Total Fertility Rate	3.7	
Out-Migration Rate		

Source: Census 2011, NFHS-3 & 4; Annual Health Survey 201-13; NSSO

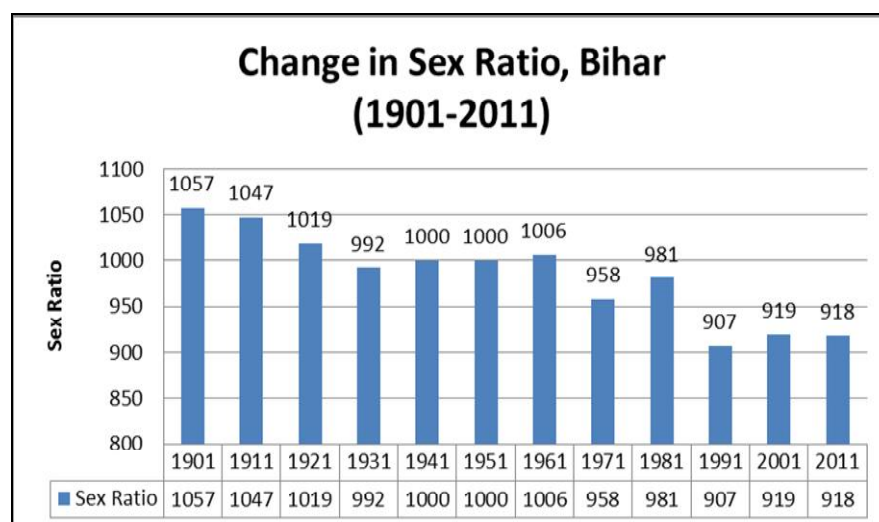
Bihar is the second largest state in the country in term of population that comprise of 8.60 per cent of the nation's total population. As per Census 2011, the total population of state is 1,04,099,452. The decadal growth rate was above national during 2001 to 2011 with 25.42 per cent, whereas it was 17.64 per cent at the national level. Bihar is the second highest densely populated state in the country with 1106 person per square km. Sex ratio is 918 females per 1000 males that is below the national level sex ratio of 940 females per 1000 males. The child sex ratio is high with 935 female children per 1000 male children against the India level of (916 female children). The total child population in Bihar is 18 per cent in respect to 13.6 per cent at the national level.

3.4.1. Sex Ratio: The first and foremost demographic indicator, that shows women's overall status in the society, is sex ratio (number of females per thousand males). India as a whole records adverse sex ratio for female population and this problem is acute in some states. Bihar records lower sex ratio (918) than India (940) as a whole in 2011.

Temporal data reveals that since the first Census (1901) the state has witnessed a sharp decline in female population. From 1901 to 1961; Bihar's sex ratio was above 1000; 1971 onwards it started declining and in 1991; it decreased to 907 (lowest in the century). The

last two decades records slight increase in sex ratio. However, there is not much variation between 2001 and 2011 data.

Figure 3.4 Changes in Sex Ratio, Bihar (1901-2011)



Source: Census of India (1901-11)

3.4.2. Fertility Rates

Table 3.6 Fertility Rates, India and Bihar (2011)

Fertility Rates, India and Bihar (2011)		
	Bihar (2011)	India (2011)
Crude Birth Rate (CBR) (Per 1000 live Birth)	27.7	21.8
General Fertility Rate (GFR)	114.4	81.2
Total Fertility Rate (TFR)	3.6	2.4
Gross Reproduction Rate (GRR)	1.7	1.2
Natural Growth Rate (NGR)	21.6	14.5

Source - Sample Registration System (2011)

Table 3.7 Change in Total Fertility Rate, Bihar (2005-06 to 2015-16)

	NFHS-4 (2015-16)			NFHS-3 (2005-06)
	Rural	Urban	Total	
TFR	3.6	2.4	3.4	4.0

Source: NFHS-4 Report, 2015-16

Bihar records the highest fertility rate in India; its fertility rate is comparable to Namibia (NFHS-4). The Crude Birth Rate is 27.7; General Fertility Rate is 114.4 and Total Fertility Rate is 3.6. All these figures are much higher than the national average. The

National Family Health Survey (NFHS) 4th Round's report reveal that the state has recorded decline in TFR from 4.0 in 2005-06 to 3.4 in 2015-16. Urban area records 2.4 TFR; whereas rural TFR is as high as 3.6.

At the same time, the state records very low death rate (6.8 in 2010); whereas India's average death rate is above 7.0. Concentration of young population is one of the reasons for low death rate. Therefore, natural growth is very high (21.6) in comparison to India as a whole (14.5).

TFR is also an indicator of women's status in a society. Table 3.6 denotes that every woman on an average give birth to more than 3 or 4 children; which is much higher than India's 'Two-Child Policy'. High fertility indicates low age at marriage. Annual Health Survey data also supports the fact that a considerable number of men and women get married before the legal minimum age at marriage. It is probably, one of the most important reasons of high fertility.

3.4.3. Population Growth

Table 3.8 Annual Exponential Growths (1991-2011)

Table 3.8 Annual Exponential Growth (1991-2011)			
	1991-2001	2001-2011	Change
Bihar	2.5	2.26	-0.24
India	1.93	1.64	-0.29

Source: Calculated from 2001 and 2011 Census

Annual exponential growth shows that though Bihar's population growth has slightly reduced in the last decade; but it is still higher than the national average. Total Fertility Rate was 3.7 in 2010; and the state has a huge youth and adolescent population. According to 2011 data, Bihar accounts for the country's 22.47 per cent adolescent (10-19 years) and 16.85 per cent youth (15-24 years) population. However, the state reveals adverse sex ratio for women in these two age groups (854 and 846 respectively).

3.5 Social Characteristics

3.5.1. Social Composition: The state has more than 83 per cent Hindu population and 16.5 per cent Muslim population; other religious groups are negligible in number. Among the Hindu population, 15.9 per cent or nearly 16 per cent are Scheduled Caste or *Dalit* population; but Scheduled Tribe is only 1.3 per cent. Therefore, the state has considerable number of *Dalit* and minority population (Map 1)

Table 3.9 Composition of Social Groups in India and Bihar, 2011

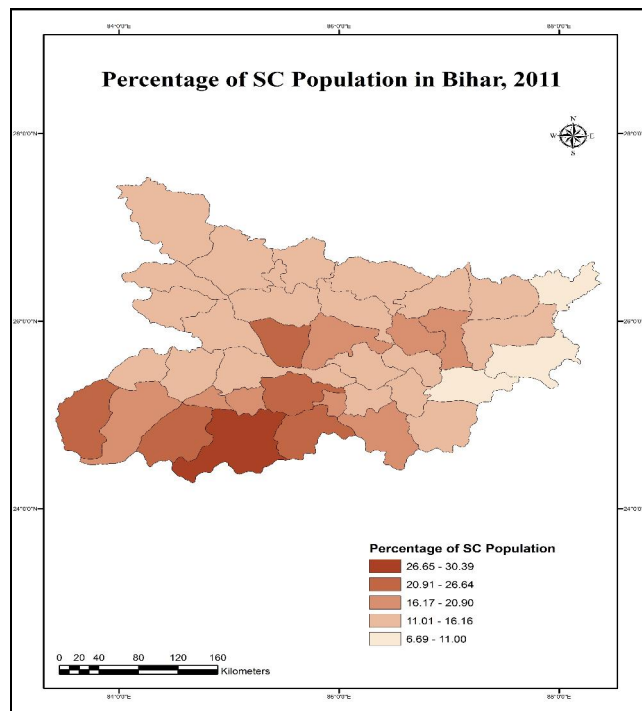
Composition of Social Groups in India and Bihar, 2011		
Social Groups	Bihar (in Per cent)	India (in Per cent)
Hindu	83.5	79.80
Muslim	16.5	14.23
Other Religious Groups	0.5	5.75
Scheduled Caste	15.9	16.63
Scheduled Tribes	1.3	8.61

Source: Computed from Census 2011 Data

3.5.2 Distribution of Socially Marginalised Groups in Bihar (2011)

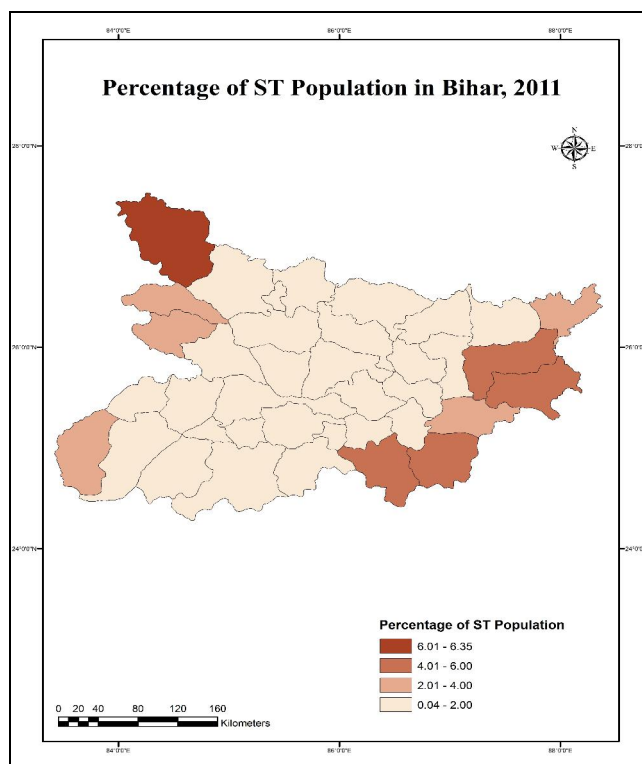
Though Bihar records less than one per cent of ST population, but some of its districts adjacent to Nepal's Tarai region and Chotanagpur Plateau show high concentration of tribal population. Paschim Champaran (near Nepal border), Katihar, Purnia, Banka and Jamui (adjacent to Jharkhand and West Bengal) districts have tribal pockets. Jamui, the other study district for this work, records 4.48 per cent ST population. Apart from the tribal population, Jamui also have more than 17 per cent SC population.

Map 3.1 Distributions of Scheduled Caste Population, Bihar (2011)



Source – Census of India (2011)

Map 3.2 Distributions of Scheduled Tribe Population, Bihar (2011)

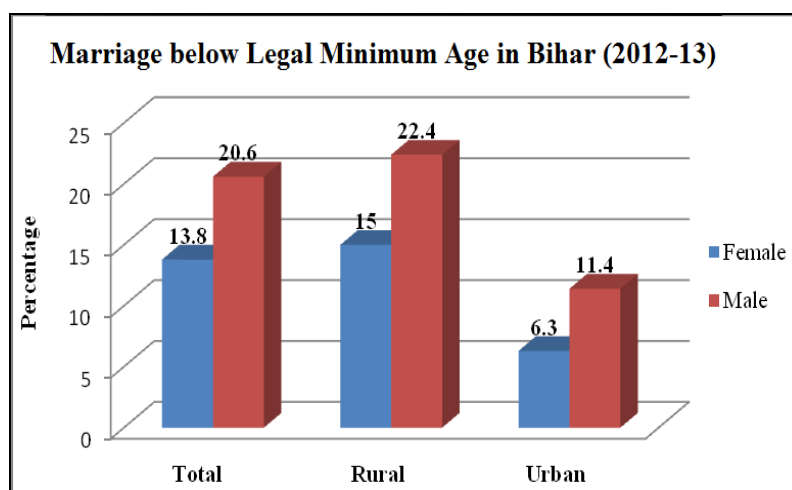


Source: Census of India (2011)

3.5.3 Prevalence of Underage Marriage:

The Prohibition of Child Marriage Act (2006) sets 18 years for women and 21 years for men as the minimum legal age for marriage. Marriage under the age of 18 years is considered as Human Rights Violation by the UNICEF. However, in Bihar, the Mean age at Marriage recorded is 17.2 years in 2001. Rajasthan has the lowest Mean Age at Marriage of 16.6 years, followed by Uttar Pradesh, Bihar, Madhya Pradesh and Andhra Pradesh. Annual Health Survey (2012-13) data reveals that 13.8 per cent women and 20.6 per cent men married before the legal age. In rural areas, underage marriage is higher than that of the urban areas. Early age at marriage influences to longer child bearing age, fertility, child care, still birth, neonatal mortality, post neonatal mortality, infant mortality, maternal mortality and life time birth. The ‘Annual Health Survey’ (2012-13) has collected data on marriage below the legal age. A total 20.6 per cent male got marriage before the attainment of legal age with respect to females 13.8 per cent.

Figure 3.5 Prevalence of Underage Marriage in Bihar (2012-13)



Source- Annual Health Survey (2012-13)

Furthermore, the percentage of early age at marriage is higher in rural areas than urban areas. In rural areas, 15 per cent female get married before 18 years whereas 22.4 per cent male get married before the legal age of marriage. On the other hand, in urban areas, it is only 6.3 per cent females and 11.4 per cent males get married before attaining the legal age. Low age at marriage is actually accentuated by women’s inadequate access to education and job market. The literacy data, work participation rate and occupation segregation support this observation.

3.5.4. Literacy

Table 3.10 Literacy Rate in Bihar and India (2011)

Literacy Rate in India and Bihar (2011)		
(Effective Literacy Rate)	Bihar (in Per cent)	India (in Per cent)
Literacy	61.8	72.98
Male Literacy	73.39	80.88
Female Literacy	53.33	63.63 (64.6)
Source: Census of India (2011)		

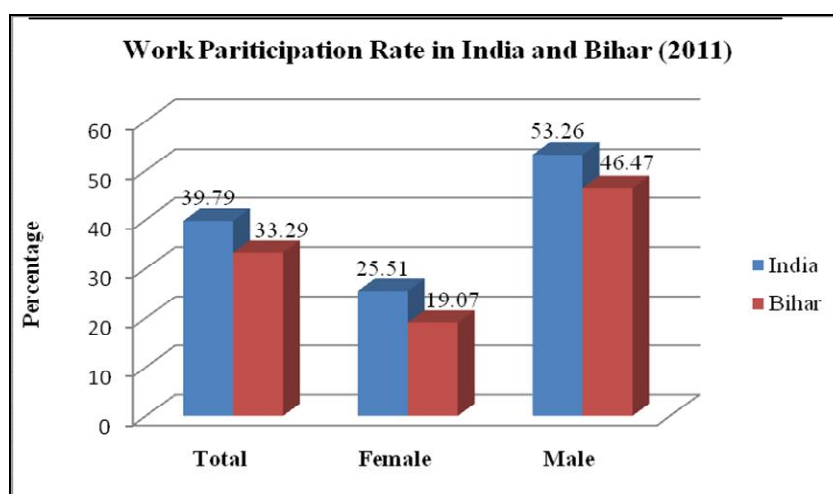
Bihar's overall literacy rate is 61.8 per cent; which is much lower than the national level figure (72.98 per cent). Male literacy rate is 73.39 per cent and female literacy rate is 53.3 per cent. The male-female gap in literacy rate is 20.29 per cent. SC population records 48.6 per cent female literacy rate, which is lower than the state average. Low literacy rate and high gender gap in literacy denote that women have lesser access to education. Bihar is one of the north Indian states which shows more than 20 per cent gap between male and female literacy rates.

3.6 Economic Characteristics

3.6.1 Work Participation Rate

Access to the job market is considered as one of the indicators of women's autonomy. Work Participation Rate (WPR) shows that the overall Work participation Rate is 39.79 for India.

Figure 3.6 Work Participation in India and Bihar (2011)



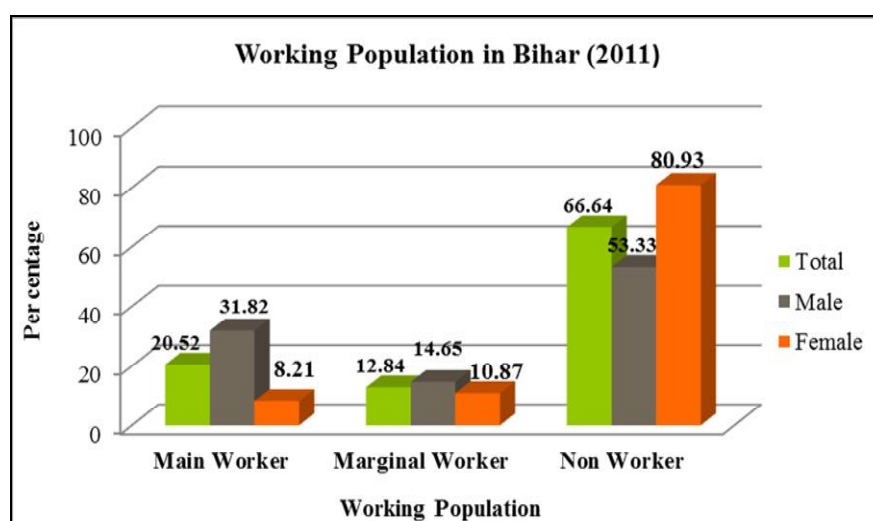
Source: Census of India (2011)

However, Bihar records lower WPR (33.29) compared to the national average. Male WPR is also low in Bihar (46.47) compared to India (53.26). In case of female WPR, India as a whole records a dismal picture, female WPR of India is only 25.51; whereas Bihar records much worse situation with 19.07 female WPR. The gap between male and female WPR indicates that women in Bihar have less access to the job market.

3.6.2 Occupational Segregation of Workers

Occupational segregation shows the distribution of people across and within various occupations and jobs based on demographic characteristics like gender and so on. According to 2011 Census, 20.52 per cent workers are main workers in Bihar; followed by 12.84 per cent marginal workers and 66.64 per cent non-workers.

Figure 3.7 Working Population in Bihar (2011)

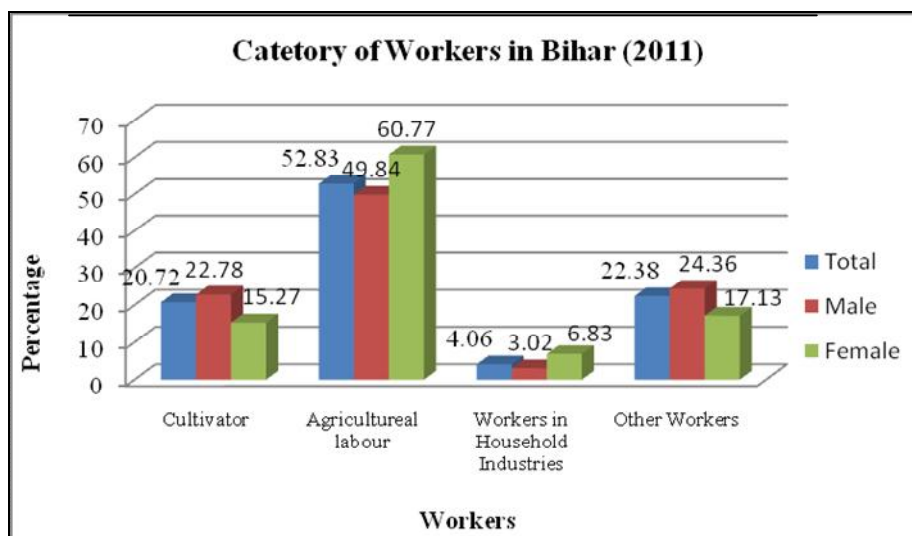


Source: Census of India, 2011

Gender based segregation reveals that 31.82 per cent men and 8.21 per cent women are main workers; more than 80 per cent women are non-workers. Even among the marginal workers, male workers are higher than the female workers. Total main workers are 20.52 per cent and male main workers (31.82 per cent) are in greater proportion than the female main workers (8.21 per cent) in Bihar. Total marginal workers are 12.84 per cent and this varies from male with 14.65 per cent to female with 10.87 per cent. Total non-working is 66.64 per cent; female non workers are 80.93 per cent against male non-workers of 53.33 per cent. The Fig 3.7 shows that the non –workers are much higher proportion in the state of Bihar.

3.6.3 Category of Workers

Figure 3.8 Categories of Workers in Bihar (2011)



Source: Census of 2011

In Bihar, most of the workers (both men and women) work as agricultural labourers. More than 60 per cent of the women main workers earn their livelihood as agricultural labourers. The percentage share of workers in the Household Industries and Other activities is relatively lower than the agricultural activities. Moreover, the percentage of cultivators is also very low compared to agricultural labourers.

Total cultivators are 20.72 per cent in Bihar, and males are in greater proportion with 22.78 per cent than females (15.27 per cent). Agricultural labour is higher than all categories of workers in the state. Total agriculture labour is 52.83 per cent with 60.77 per cent female against 49.84 per cent males. The percentage of household industries worker is the lowest among all types of working population. The total household industries workers are only 4.06 per cent, and this varies from 6.83 per cent female 3.02 per cent male. The other work force in the state is 22.38 per cent, where 24.36 per cent are male and 17.13 per cent are female.

3.6.4 Overall Socio-economic Scenario and Status of Women in Bihar

Therefore, socio-economic and demographic data reveals that Bihar is one of the least urbanised states where people mainly depend on agricultural activities in spite of having low per capita land availability and inadequate facilities for commercial farming. Traditional rural economy of the state reveals subjugation of women in the social, economic and demographic fields. Strong son preference is reflected through sudden fall of sex ratio in 1991; low WPR for women and their over representation in the agricultural

sector as agricultural labourers instead of landholders; denote that women have less access to the high paid jobs and in the urban labour market. High gender gap in literacy supports the fact that women have inadequate access to education which no doubt leads to lack of awareness regarding modern health care facilities and heavy reliance on traditional practises. Furthermore, the state is an out-migrating state; male out-migration is highest in Bihar. It leads to the long absence of fathers or husbands from the families and decision making certainly comes onto the women's shoulders. Unless and until women become aware of the modern healthcare facilities, there is little chance in the improvement of child health and Immunization.

3.7. Health Status

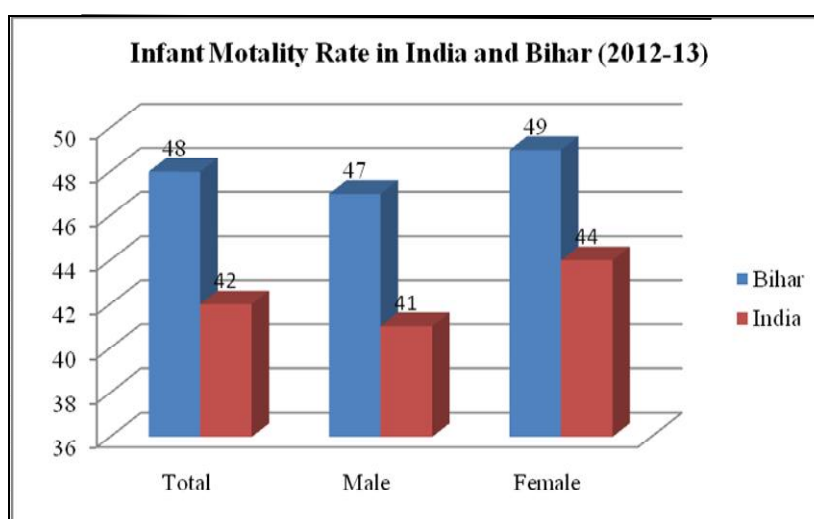
Health outcome data provided by Annual Health Survey (2012-13) and National Family Health Survey-4 (2015-16) reveal that infant and child mortality rates are still very high in Bihar. Infant Mortality Rate is the number of deaths per thousand live births of children under one year of age (**Masuy and Gourbin, 1994**). There are two types of Infant Mortality; perinatal Mortality or late fetal death or death of new born within one week of postpartum. Neonatal Mortality is the death of the infant within 28 days postpartum. Post-Neonatal mortality is the death of an infant during 28 days to one year of its birth.

Perinatal Mortality is mainly the result of premature birth or pregnancy related complications; but Neo-Natal death is mainly attributed by lack of healthcare facilities and unhygienic living environment. Infant Mortality Rate is one of the crucial indicators used to monitor the progress of a country towards the achievement of the Fourth Goal of the Millennium Development Goals (MDGs) put forward by the United Nation in the beginning of this millennium. Now this goal is incorporated within the Sustainable Development Goals (SDGs) as the third goal.

3.7.1. Infant and Child Mortality in Bihar

Infant Mortality Rate or IMR is higher in Bihar (48 per thousand live births) than the national average (42). Male IMR (47) is lower than the female IMR (49), indicating son preference and neglect of girl child. In case of national level, IMR is 40 per cent, male IMR is 41 and female IMR is 44 per cent.

Figure 3.9 Infant Mortality Rate in India and Bihar (2012-13)



Source- Annual Health Survey for Bihar (2012-13) & SRS for India (2012)

Table 3.11 Change in Infant and Child Mortality Rates in Bihar (2015-16)

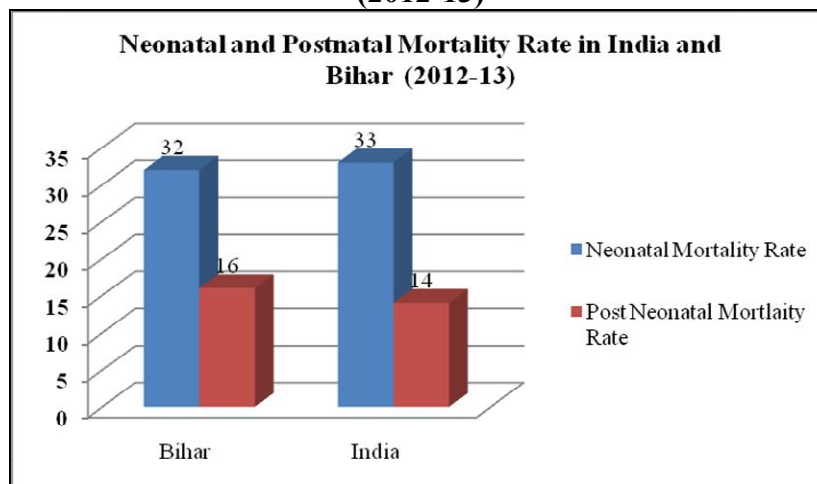
Change in Infant and Child Mortality Rates in Bihar (2015-16)				
	NFHS-4 (2015-16)			NFHS-3 (2005-06)
	Rural	Urban	Total	Total
Infant Mortality Rate (IMR)	49	34	48	61
Under-Five Mortality Rate (U5MR)	60	40	58	84

Source: NFHS (2015-16)

Though Bihar records decline in Infant and Child Mortality from 2005-06 to 2015-16; but the current figures are still high. Rural-urban gap is also noticeable; urban areas record much lower infant and child mortality and the figures are close to the national average. Annual Health Survey and NFHS data reveal that infant and child mortality is higher in the one year to five years of age groups. These deaths are not due to pregnancy related complications or generic factors; but due to external factors like lack of access to modern healthcare facilities and Immunization.

3.7.2 Neonatal and Post Neonatal Mortality Rate

Figure 3.10 Neonatal and Post Neonatal Mortality Rate in India and Bihar (2012-13)



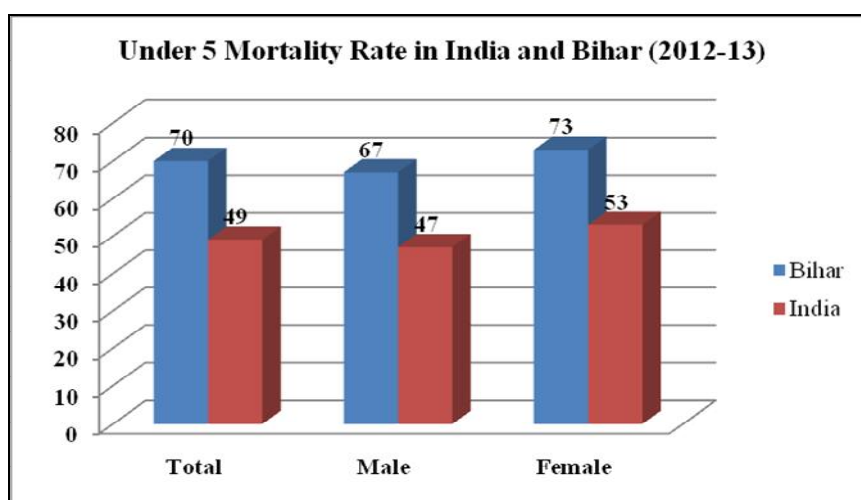
Source- Annual Health Survey (2012-13, SRS Registrar General of India (2012)

Neonatal and Post Neonatal Mortality Rates for Bihar are 32 and 16 respectively; these are close to the national average. Bihar records slightly lower Neonatal Mortality Rate than India as a whole. It indicates that infant deaths are mainly the result of exterior factors rather than internal complications.

Death of a child before its fifth birthday or Under Five Child Mortality is another indicator of health outcome which often depicts a country's medical infrastructure as well as its citizens' socio-economic and living conditions

3.7.3 Under 5 Mortality Rate

Figure 3.11 Under 5 Mortality in India and Bihar (2012-13)



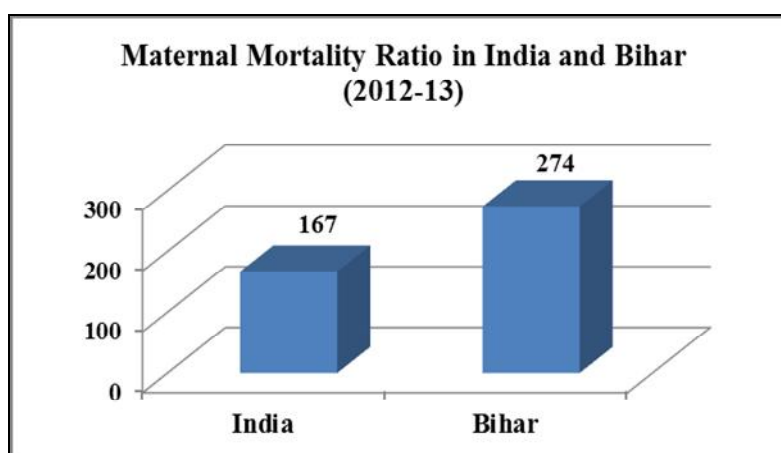
Source- Annual Health Survey for Bihar (2012-13) & SRS for India (2012)

Under Five Mortality Rate is 70 in Bihar, it is higher than the national average (49). Male Under Five Mortality is 67; and female Under Five Mortality is 73. Gender gap in Child Mortality is alarming.

3.7.4 Maternal Mortality Ratio

In reproductive health, mother's health is directly interlinked with child's health. Therefore, before analysing the issues related with child health and Immunization, one should look at the Maternal Mortality Ratio (MMR), which defines the number of women who die from pregnancy-related causes while pregnant or within 42 days of pregnancy termination per 100,000 live births (World Bank 2013). The 'Maternal Mortality Ratio' of Bihar is higher (274 per 100000) than the national average (167 per 100000 live births). From the above discussion, it has been found that the data on maternal and child mortality is highlighting a gender gap as well as rural-urban gap. Girl children are more vulnerable to untimely death than that of their male counterparts. Similarly, rural areas perform poorly in terms of maternal and child mortality. These mortality rates are only health outcome data; they alone cannot explain anything, unless and until health infrastructure data is analysed properly.

Figure 3.12 Maternal Mortality Ratio in India and Bihar (2012-13)



Source: Ministry of Statistics and Programme Implementation, Govt. of India (2011-13) Annual Health Survey (2012-13)

3.8 Assessment of Maternal and Child Health Care Services in Bihar

Health infrastructure data can be analysed in two ways, the first one is availability and the second one is accessibility. Availability of healthcare facilities denotes physical existence of certain services in the locality. However its accessibility depends on effectiveness and

quality of the service delivery system as well as the presence and quality of the service providers.

India's commitment to universal access to healthcare facility started since its Independence; but after the introduction of Survival and Safe Motherhood (CSSM) Programme jointly sponsored by the World Bank and UNICEF in 1992-93; it provided special emphasis on maternal and child health. Under this programme, Universal Immunization Programme (UIP) was started and it identified good and bad performing states or regions. These programmes were given a new vigour when, the Government of India launched the RCH Programme during 1997-98 for implementation 9th plan by integrating Child Survival and Safe Motherhood (CSSM) Programme with other Reproductive and Child Health (RCH) services (Nayar, 2011, Paul et al. 2011). In this RCH services, antenatal care (ANC) services are one of the most crucial component that helps to reduce maternal and child mortality. It aims to provide free antenatal care to all pregnant women that includes proper health-check-ups; providing free medicines and Iron and Folic Acid Tablets (IFA), three Tetanus injections and encouraging institutional deliveries (Elo, 1992). For encouraging institutional delivery, the Government has initiated various cash-incentive schemes like *Jananai Suraksha Yojana (JSY)* for the poor and weaker sections. However, the access to healthcare facilities is not uniform across India.

Table 3.12 Access to Maternal and Child Healthcare Services (2015-16)

Utilization of Maternal and Child Healthcare Services Bihar (2015-16)			
Maternal and Child Health Care Services	Urban	Rural	Total
Mothers who had antenatal check-up in the first trimester (per cent)	50.4	32.7	34.6
Mothers who had at least 4 ANC visits (per cent)	26.3	13.0	14.4
Mothers whose last birth was protected against Neonatal tetanus (per cent)	93.1	89.2	89.6
Mothers who consumed IFA tablets for 100 days or more during pregnancies	12.3	9.4	9.7
Registered pregnancies under Mother and Child Protection (MCP) Card	76.2	80.3	79.9
Mothers who received postnatal care from a health personnel within 2 days of delivery	52.6	41.1	42.3
Mothers who received benefit from JSY	40.0	55.8	53.9
Institutional births	74.3	62.7	63.8

Source: NFHS-4, 2015-16

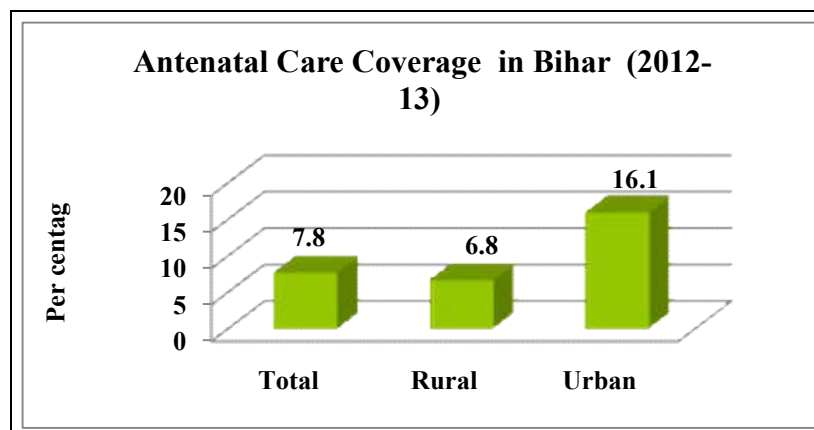
According to the NFHS-4 data, there is a huge rural-urban gap in terms of access to maternal and childcare services. Bihar records very low access to antenatal and postnatal care. Only 34.6 per cent women receive antenatal care during the first trimester of pregnancies; the figure goes down to 14.4 per cent in case of expected mothers who have completed at least four antenatal care visits. In the urban areas, the percentage is quite high. More than 50 per cent expected mothers receive antenatal care during the first trimester of their pregnancies and 26.3 per cent make at least four ANC visits. However, rural women hardly receive antenatal care during their pregnancies.

Component wise segregation reveals that Tetanus Injection has nearly 90 per cent coverage in the state as a whole. Even in the rural areas, nearly 90 per cent women receive TT injections during pregnancy; it protects children from neonatal tetanus.

Percentage of women who have consumed IFA tablets for hundred days is as low as 9.7 per cent for Bihar; 12.3 per cent for the urban areas and 9.4 per cent for the rural areas.

3.8.2 Access to Antenatal Care Services

Figure 3.13 Accesses to Antenatal Care Services in Bihar (2012-13)



Source: Annual Health Survey (2012-13)

World health Organization prescribes four antenatal care visits for any pregnant women; at least three visits should be mandatory. The Annual Health Survey data shows that only 7.8 per cent women in Bihar get full antenatal care; in the rural areas, the percentage is even lower than the state average. Only 6.8 per cent rural and 16 per cent urban women receive full antenatal care during pregnancies.

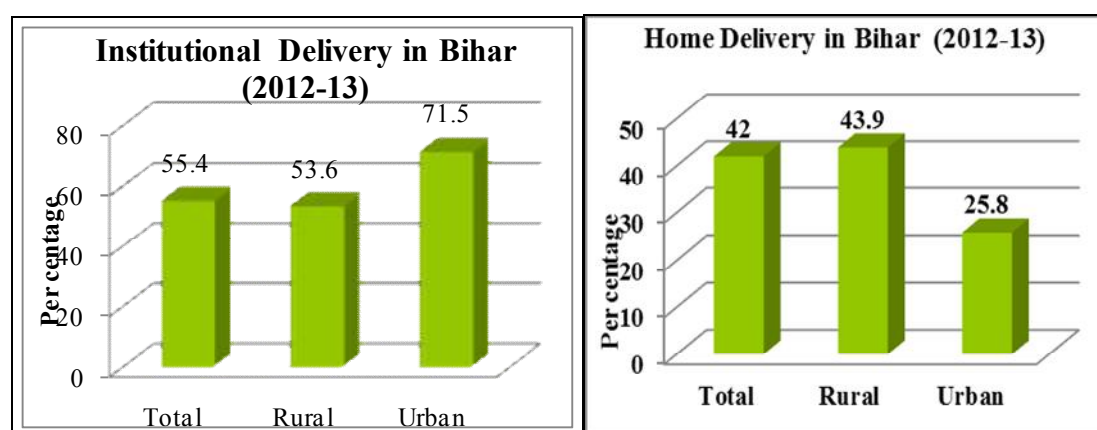
3.8.3 Institutional Delivery

Government schemes like pregnancy registration under Mother and Child Card shows nearly 80 per cent coverage; and these are a huge success in the rural areas. Similarly, JSY beneficiaries are higher in number (55.8 per cent) in the rural areas than the urban areas (40.0 per cent). In spite of huge rural beneficiaries of JSY and MCP cards; the percentage of institutional births in the rural areas is only 62.7 per cent which is lower than urban Bihar (74.3 per cent). However, in case of institutional births, Bihar has achieved a milestones in the NFHS-4 phase. The earlier round (NFHS-3) records only 19.9 per cent institutional birth (2005-06); but now the state records 63.8 per cent institutional births in 2015-16.

3.8.4 Home Delivery

The Annual Health Survey (2012-13) also supports the fact of increment in institutional delivery. Bihar records 55.4 per cent institutional births; where urban and rural areas account for 71.5 per cent and 53.6 per cent institutional births respectively. However, more than 40 per cent of the child delivery takes place in the homes. Though this percentage is only 26 per cent in the urban areas, but in the rural areas, this is nearly 44 per cent.

Figure 3.14 Institutional and Home Deliveries in Bihar (2012-13)



Source: Annual Health Survey (2012-13)

3.8.5 Access to Child Immunization

Table 3. 13 Access to Immunization, Bihar (2015-16)

Access to Immunization, Bihar (2015-16)			
Child Health and Immunization	Urban	Rural	Total
Percentage of Children (12-23 months) fully immunized	59.7	61.9	61.7
Percentage of Children (12-23 months) received most of the vaccines in public health facility	87.0	96.4	95.5
Percentage of Children (12-23 months) received most of the vaccines in private health facility	11.4	3.2	3.9
Percentage of Anemic Children (6-59 months) (<11.0 g/dl)	58.8	64.0	63.5

Source: NFHS-4, 2015-16

Apart from antenatal and post-natal care, a newly born child requires many special treatments. For fulfilling these special needs, the Integrated Child Development Services (ICDS) has been launched in 1975; which provides immunization; supplementary nutrition, free health-check-ups, referral services, pre-school non-formal education and information on health and nutrition.

Percentage of fully immunized children (those who have completed 3 doses of polio, BCG, measles and DPT) is 61.7 per cent in Bihar; this figure is almost the same in the rural areas but slightly lower in the urban areas (59.7 per cent). NFHS-4 data reveals that 96 per cent children receive most of the vaccines from public health care facilities and very few depend on the private ones. In the villages, immunization coverage is better than that of their urban counterparts. However, the percentage of anaemic children is slightly higher in the villages (64 per cent) than the urban areas (59 per cent). Though, child immunization has got nearly 60 per cent coverage; but anaemia requires special attention.

3.8.6 Health Related Issues in Bihar

Therefore, secondary data highlights that Bihar reveals certain issues that have direct or indirect impact on maternal and child health. The state is one of the least urbanized states in India, mainly depending on traditional rural economy, based on agriculture and primary activities. At the same time, the state records high population growth due to high fertility and generates highest inter-state outmigration for work and employment. Traditional societal set-up, underage marriage of men and women and high fertility trend denotes that women have lesser access to education, job market and experience high

fertility due to strong son preference. Sharp decline in the sex ratio since 1991 onwards supports this fact. Demographic and health data reveals that though the state accounts for a huge number of young and adolescent population; but at the same time, it is experiencing high infant and child mortality; especially for the girls. Most of these infant and child deaths are due to external factors like infection or unhygienic living environment; not due to birth-related complications; because Under-Five and Post-Natal mortality rates are higher than the Peri-Natal mortality rates. Therefore, access to maternal and child care facility plays a crucial role in this factor. NFHS-4 and Annual Health Survey (2012-13) data reveals that though the State Government has achieved success in popularising institutional births under JSY and MCP schemes; but still a large number of births take place in homes. Antenatal and postnatal cares are still not very popular in Bihar; only TT immunization during pregnancy has a better coverage; but IFA tablet distribution and postnatal care within twenty four hours are not still extensively utilized by the expected and new mothers. Child immunization on the other hand, shows a much better coverage and public healthcare facilities act as the main service providers; but anaemia among children requires special attention.

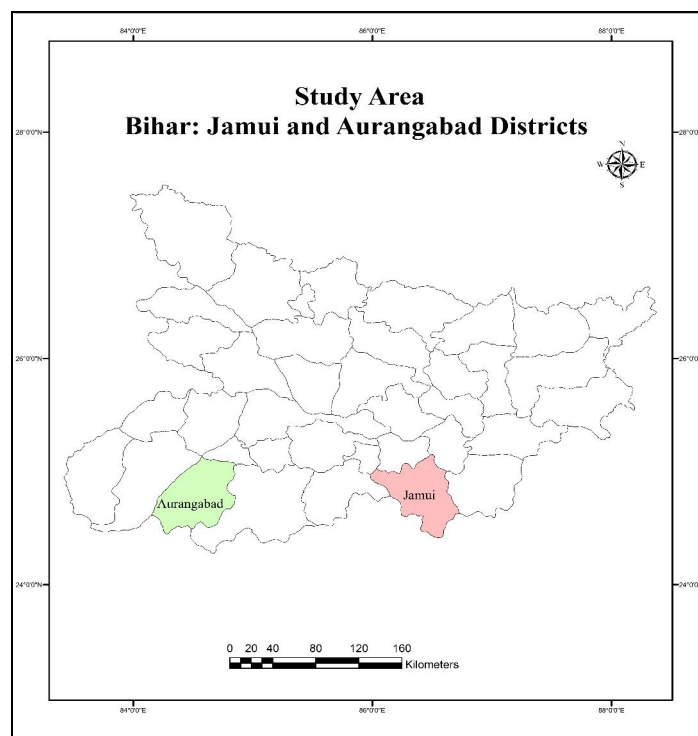
However, from the secondary data we can only get an overall picture of the state in terms of its socio-economic, demographic and health condition; but we cannot say what exact reasons are playing behind this poor performance. Scholars often give reasons like poverty and lack of infrastructural facilities; but these are may not be the only reasons. Unless and until, one can make a district-level analysis; it is not possible to say whether this dismal picture is true everywhere or there is regional variation even within the state.

3.9 District Profile of Jamui and Aurangabad

3.9.1. Geographical Characteristics of Jamui and Aurangabad

Geographically, both Jamui and Aurangabad districts are located in South Bihar; but at two opposite directions. Jamui is situated in the eastern part of South Bihar, while Aurangabad is located in the West and the latter has a bigger geographical area. Aurangabad is seventh largest district of Bihar (3,305 sq.km) and Jamui ranks eleventh (3,098 sq.km) in terms of size. Each of these districts is further sub-divided into Community Development Blocks (CD Blocks), revenue villages and towns for administrative convenience. Jamui has ten CD blocks, more than fifteen hundred (1503) revenue villages and five towns. On the other hand, Aurangabad has eighteen CD Blocks, more than eighteen hundred revenue villages (1847) and six towns. Though Aurangabad is a bigger district and has more revenue villages than Jamui, but has only one more urban centre than Jamui. It indicates that urbanization level in both the districts is more or less the same.

Map 3.3 Study Area Map



3.9.2 Population Characteristics

Table- 3.14 Population Characteristics in Jamui and Aurangabad Districts, Bihar (2011)

Population Characteristics Jamui and Aurangabad Districts, Bihar (2011)		
	Jamui	Aurangabad
Total Areas (in sq. km)	3,098	3,305
Total Population	1,760,405	2,540,073
Male (Per cent)	52	52
Female (Per cent)	48	48
Urban Population(Per cent)	8.26	9.0
Rural Population (Per cent)	91.74	91.0
Decadal Growth Rate	25.85	26.18
Proportion to Bihar Population (Per cent)	1.69	2.44
Sex Ratio/1000 Male	922	926
Child Sex Ratio	956	944
Density/km ²	568	769
Total Child Population (0-6 Age)	324,513	455,394
Male Population (0-6 Age) (Per cent)	51.13	51
Female Population (0-6 Age)	48.86	48
TFR	3.1	3.1

Source: Census 2011, India

Jamui and Aurangabad districts have almost same population characteristics; both the districts reveal almost same male-female ratio; 52 per cent male and 48 per cent female population. Sex ratio is 922 and 926 respectively and TFR is 3.1. Even the child population (0-6 years) shows 51 per cent male and 48 per cent female population. Moreover, both the districts record more than 91 per cent rural population and very low urban population (less than 10 per cent). Though Aurangabad records slightly higher percentage of urban population than Jamui, but it is not very high. It has already been stated that both the districts fall under low density zones and account for 1.69 and 2.44 per cent of the state's total population respectively; but the decadal growth rate is above 25.00 per cent. Aurangabad records 26.18 per cent and Jamui records 25.85 per cent decadal growth rate.

3.10 Social Characteristics

3.10.1 Caste Groups

Table 3.15 Social and Religious Groups in Aurangabad and Jamui District, Bihar (2011)

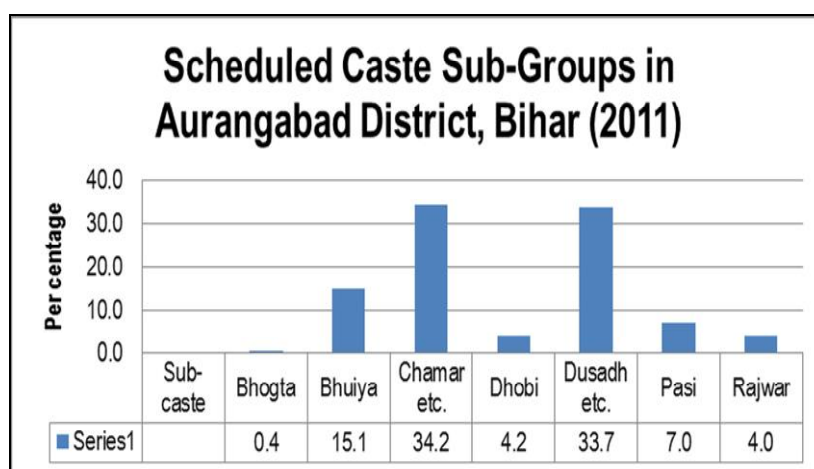
Social and Religious Groups in Aurangabad and Jamui District, Bihar (2011)		
	Jamui	Aurangabad
Hindu	86.67	90.20
Muslim	12.36	9.34
Others (Religious Group)	0.97	0.46
Scheduled Caste	17.19	24.00
Scheduled Tribes	4.48	0.04
<i>Source - Census of India , (2011)</i>		

Aurangabad district experiences higher literacy rate with 70.32 per cent literates than Jamui district (59.79 per cent). The female literacy rate is also higher in Aurangabad district with 59.71 per cent than Jamui district with 37.28 per cent. In case of male literacy, Aurangabad district demonstrates 80.11 per cent while Jamui exhibit 71.23 per cent. Hindu religious group is in majority in both the districts. Aurangabad encompasses 90.2 per cent Hindu population, 9.33 per cent Muslim population and 0.36 per cent other religious groups. In Jamui, Hindu population is 86.67 per cent, 12.36 per cent Muslims and 0.97 per cent other religious groups. The scheduled caste population is in greater proportion in Aurangabad district with 23.0 per cent than Jamui district (17.9 per cent), but there is very less scheduled tribes population in both the districts. There is only 0.03 per cent scheduled tribe population in Aurangabad district and 3.38 per cent in Jamui district.

Scheduled Caste or *Dalit* population is predominantly high in the South Bihar. Gaya district adjacent to Aurangabad (the study district) records highest concentration of SC population (30.39 per cent) in the state. Aurangabad too records 24.10 per cent SC population. On the other hand, Jamui district situated in the south-eastern part of Bihar records significantly high concentration of Scheduled Tribe (ST) population.

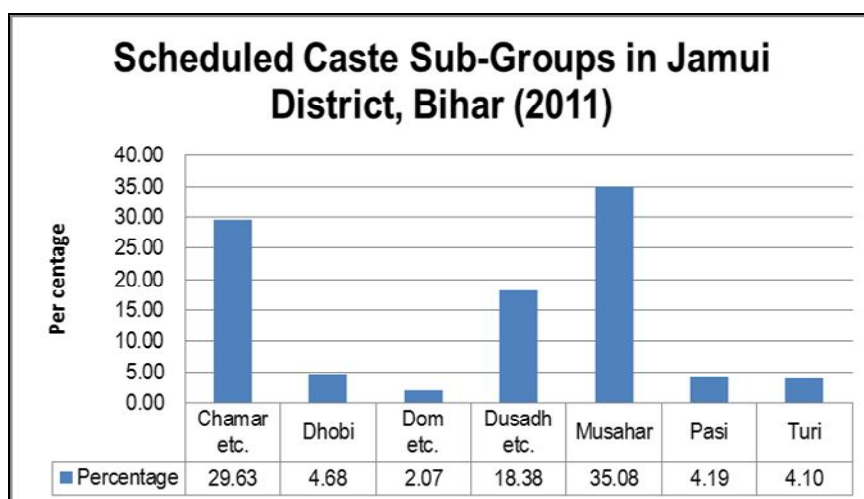
3.10.2 Sub-castes

Figure 3.15 Scheduled Caste Sub-Groups in Aurangabad District, Bihar (2011)



Source: Computed from Census 2011,

Figure 3.16 Scheduled Caste Sub-Groups in Jamui District, Bihar (2011)



Source: Computed from Census 2011,

Caste-based Indian society not only exhibits caste hierarchy but also reveals segregation based on numerous sub-castes and creeds. Scheduled Castes and Tribes also exhibit various sub-castes and groups. In Bihar, caste-based segregation is crucial in every village. Aurangabad district accounts for more than 24 per cent of its total population in SC group, and within that Chamar (34.2 per cent), Dusadh or Paswan (33.7 per cent), Bhuiya (15.1 per cent) and Pasi (7 per cent) groups are predominant.

In Jamui district, Musahar (35.8 per cent) is the numerically dominant group. Chamar (30 per cent) and Dusadh (18.38 per cent) are the other dominant groups.

All these sub-castes are still based on traditional caste based occupations. Chamars are mostly engaged in leather work and tanning; while Musahars are mainly landless agricultural labourers and highly migratory in nature. All these sub-castes show different levels of socio-economic development, which ultimately affects their health status.

3.10.3 Religious Groups

Both Aurangabad and Jamui districts are Hindu dominated. Aurangabad has 90.2 per cent Hindu population and Jamui has 86.67 per cent Hindu population. Muslims are the second largest community in these two districts. Jamui has 9.34 per cent Muslim population, which is lesser than Aurangabad (12.36 per cent). Therefore, both the districts have considerable number of Muslim population, who form the largest share among religious minority groups. Other religious groups account for less than one per cent of population in both the districts.

3.10.4 Literacy

Table 3.16 Literacy Rates, Aurangabad and Jamui Districts, Bihar (2011)

Literacy Rates, Aurangabad and Jamui Districts, Bihar (2011)		
	Jamui	Aurangabad
Literacy	59.79	70.32
Male Literacy	71.24	80.11
Female Literacy	47.28	59.71

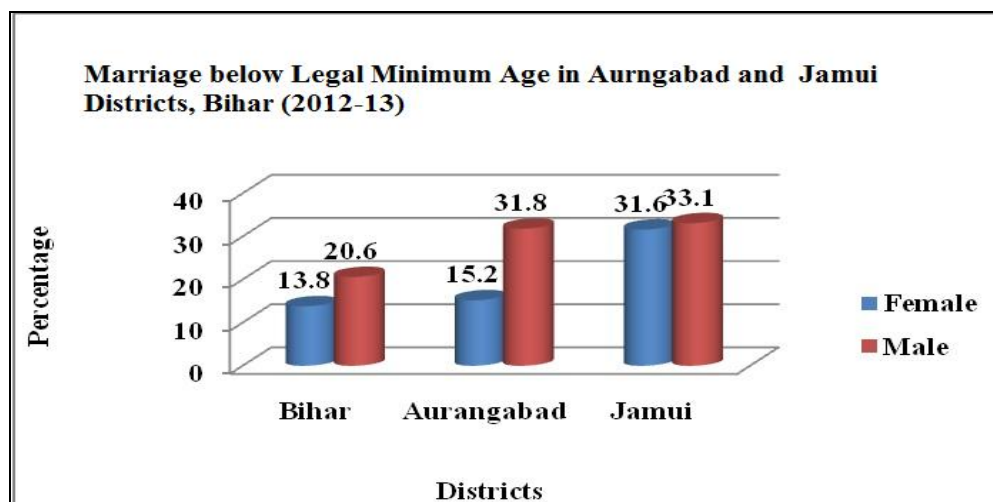
Source - Census of India, (2011)

Overall literacy rate of Aurangabad and Jamui are 70.32 per cent and 59.79 per cent respectively. Aurangabad records a higher literacy rate. Though male literacy rate is above 80 per cent and 71 per cent in these two districts, but female literacy rates are not impressive. Aurangabad is one of the districts in South Bihar, that records 60 per cent female literacy, but Jamui records only 47.28 per cent female literacy.

3. 10.5 Underage Marriage

Figure 3.17 Marriage below Legal Minimum Age in Aurangabad and Jamui Districts,

Bihar (2012-13)



Source- Annual Health Survey (2012-13)

In both Aurangabad and Jamui districts more than 30 per cent men (31.8 and 33.1 per cent respectively) are married before the legal minimum age of marriage. However, in Jamui, 31.6 per cent women are also married before 18 years, but this percentage is low in Aurangabad (15.2 per cent). Bihar as a whole shows 13.8 per cent women and 20.6 per cent men get married before the minimum legal age at marriage; this percentage is acute in Jamui district.

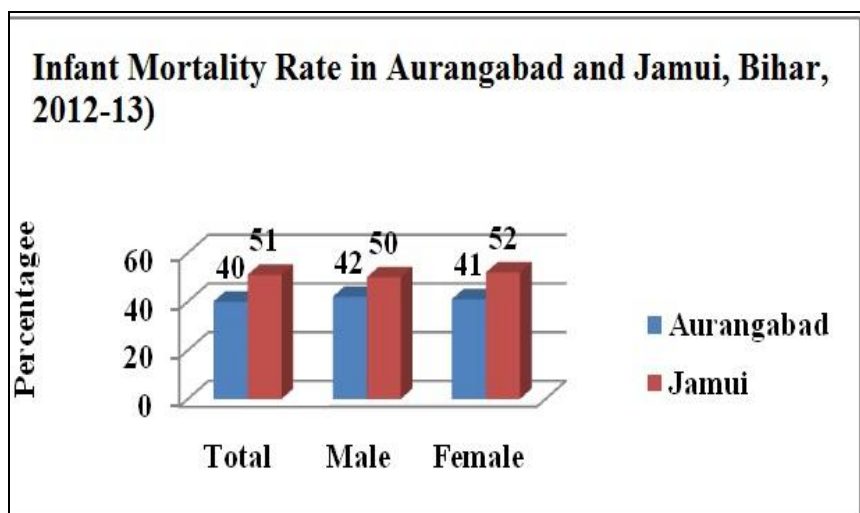
3.11 Demographic Characteristics and Health Outcomes

3.11.1 Infant Mortality Rate

Aurangabad district experiences comparatively lower Infant Mortality Rate (MMR) with 30 per 1000 live births than Jamui district with 51 per 1000 live births. Female infant mortality rate is 31 against male infant mortality rate with 32 per 1000 live births.

On the other hand, in Jamui district, female infant mortality rate is 52 and whereas male mortality rate is 50 per 1000 live births.

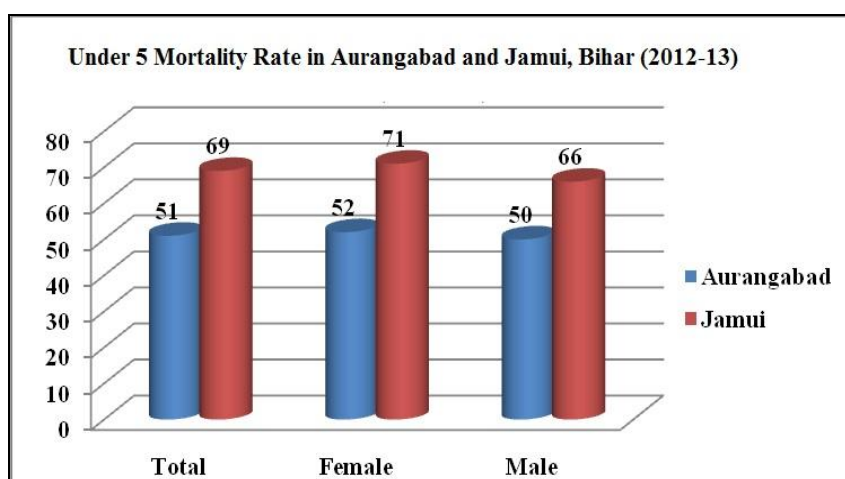
Figure 3.18 Infant Mortality Rate in Aurangabad and Jamui, Bihar (2012-13)



Source- Annual Health Survey (2012-13)

3.11.2 Under 5 Mortality Rate

Figure 3.19 Under Five Morality Rate in Aurangabad and Jamui, Bihar, (2011)

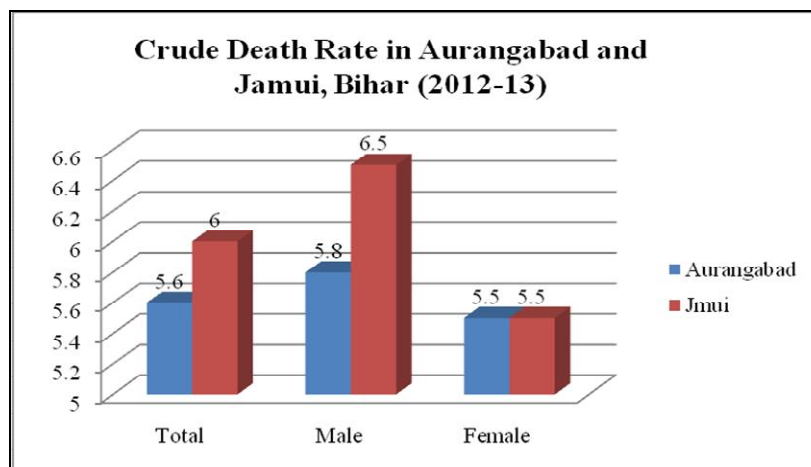


Source- Annual Health Survey (2012-13)

The Fig 3.19 shows that under five mortality rate is higher in Jamui district with 69 per 1000 live births than Aurangabad (51 live births). Female under five mortality rate is 71 per 1000 live births against male under five mortality rate with 66 per 1000 live births in Jamui district. Sex difference regarding under- five mortality rate is lesser in Aurangabad. In Aurangabad, female under five mortality rate is 52 per 1000 live births whereas male under five mortality rate is 50/1000 live births.

3.11.3 Crude Death Rate

Figure 3.20 Crude Death Rates in Aurangabad and Jamui, Bihar (2012-13)

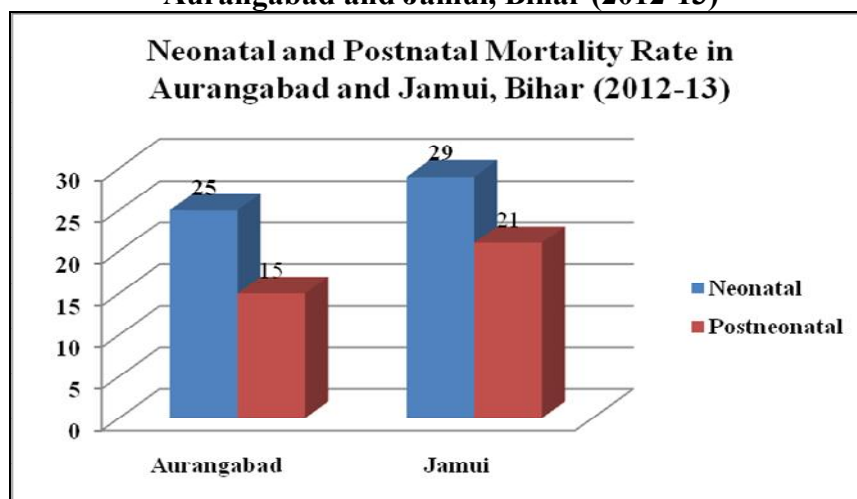


Source- Annual Health Survey (2012-13)

Crude Death Rate (CDR) is almost closer in both the districts. Aurangabad experiences 5.6/1000 live births and Jamui 6.0/1000 live births. In case of females, under-five mortality rate (5.8/1000live birth) is almost equal to male under -five mortality rate (5.5/ 1000 live births) in Aurangabad district whereas in Jamui, female under-five mortality rate 6.5 is little higher than male under five mortality rate 5.5/1000 live births. One important point is that female under-five mortality rate is almost equal in both districts.

3.11.4 Neonatal and Post Neonatal Mortality Rate

Figure 3.21 Neonatal and Post Neonatal Mortality Rate in Aurangabad and Jamui, Bihar (2012-13)



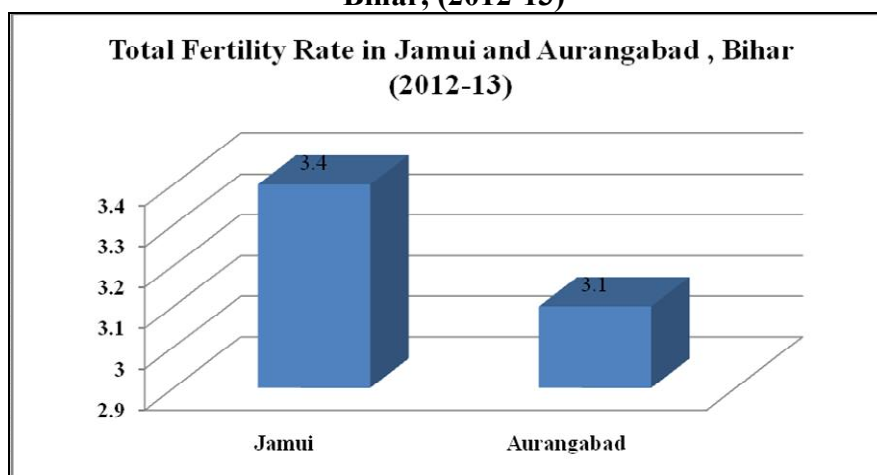
Source- Annual Health Survey (2012-13) Fig-3.23

Jamui district experiences higher neonatal mortality rate with 29/1000 than Aurangabad district 25/1000 live births. In case of Post Neonatal Mortality, Aurangabad district experiences 15/1000 live births and Jamui 21 per 1000 live births. Thus, Jamui district

experiences both higher 'neonatal mortality rate and post neonatal mortality rate' than Aurangabad district.

3.11.5 Total Fertility Rate

Figure 3.22 Total Fertility Rate, Aurangabad and Jamui Districts, Bihar, (2012-13)

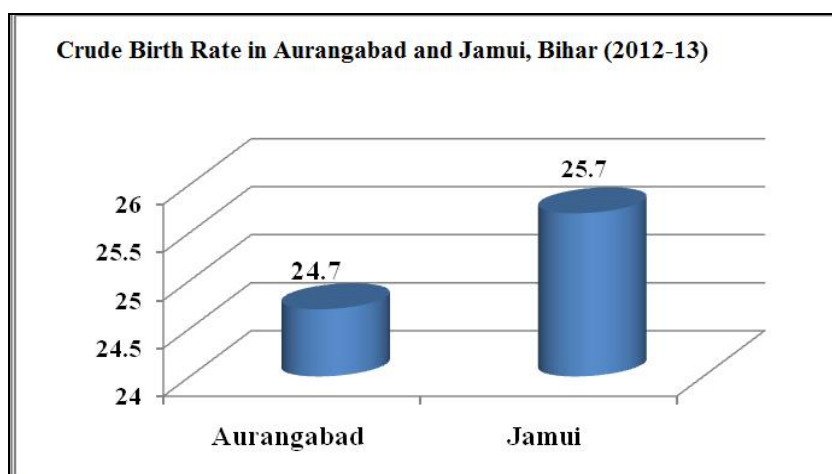


Source- Annual Health Survey (2012-13)

There is no difference between Aurangabad and Jamui districts regarding total fertility rate, and both districts have 3.1 total fertility rates. This is close to the Bihar level (3.6.) fertility rate.

3.11.6 Crude Birth Rate

Figure 3.23 Crude Birth Rate, Aurangabad and Jamui Districts, Bihar (2012-13)



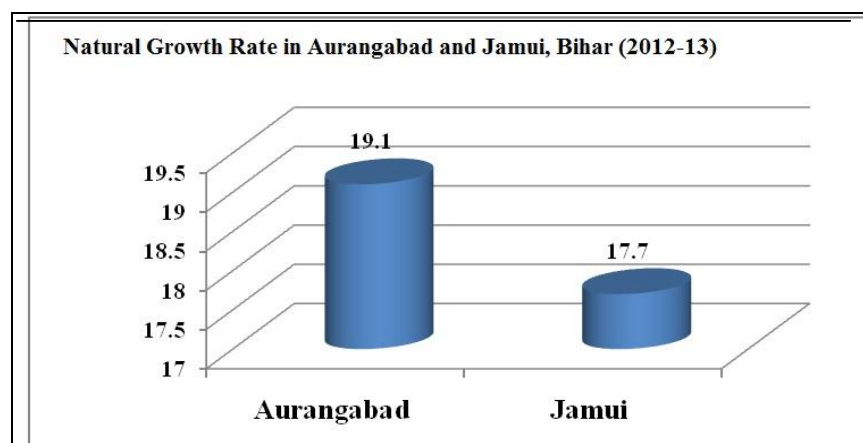
Source- Annual Health Survey (2012-13)

Crude Birth Rate is greater in Jamui districts with 25.7 per 1000 live births than Aurangabad district with 23.7 per 1000 live births.

3.11.7 Natural Growth Rate

Aurangabad district experiences higher Natural Growth Rate with 19.1 in comparison to Jamui district with 17.7 per 1000 live births. Therefore, the demographic and health outcome data reveals that in spite of the same fertility rate and high birth rate; Jamui's natural growth is lower than Aurangabad due to high death rate.

Figure 3.24 Natural Growth Rate, Aurangabad and Jamui Districts, Bihar (2012-13)



Source- Annual Health Survey (2012-13)

The district not only records high CDR for adult men; but also records high IMR and Under Five Mortality Rates for infants and children. Now the question arises that what are the reasons behind such differences in health outcome data? There are two probable answers; the first one is of course poverty, which leads to unaffordability of healthcare facility and the second one is availability and accessibility of those facilities in the said district. Apart from these two answers, there is another aspect that deals with awareness and mothers' autonomy that allow children to access modern healthcare facilities. All these factors are no doubt intertwined with each other; and are dependent on various other factors.

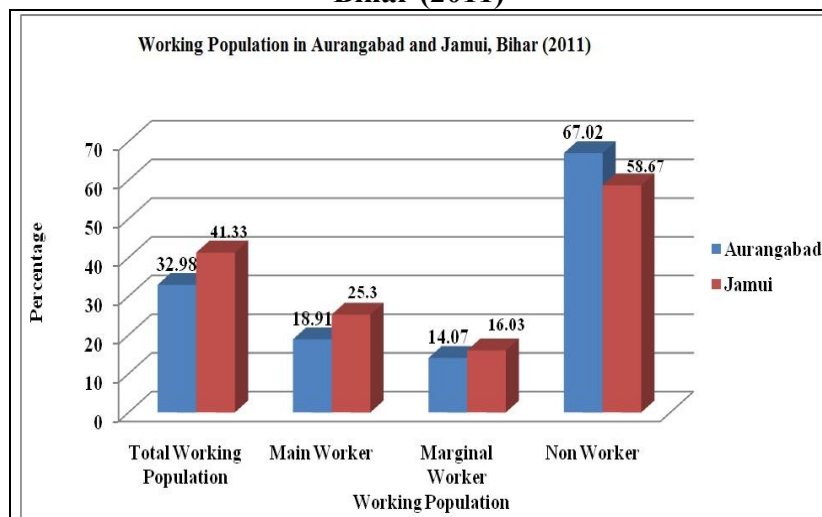
3.12 Economic Characteristics

3.12.1 Working Population

The total working population is 32.98 per cent in Aurangabad district against 31.33 per cent in Jamui district. Total main workers are 18.91 per cent in Aurangabad whereas it is 25.3 per cent in Jamui district, 13.07 per cent are marginal workers in Aurangabad and 16.03 per cent in Jamui

district. Non-working population is greater in Aurangabad district with 67.02 per cent than Jamui district with 58.67 per cent.

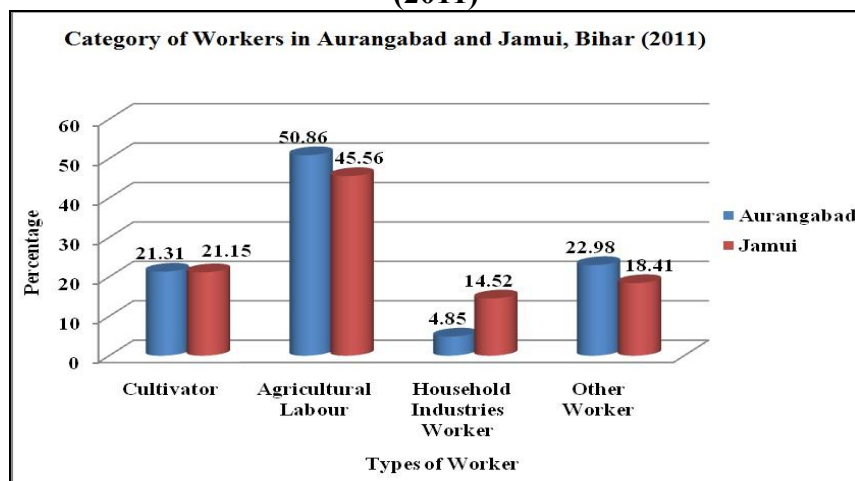
Figure 3.25 Working Population, Aurangabad and Jamui Districts, Bihar (2011)



Source - Census of India (2011)

3.12.2 Category of Working Population

Figure 3.26 Categories of Working Population Aurangabad and Jamui (2011)



Source- Census of India (2011)

There are four types of workers namely cultivator, agricultural labourers, household industry workers and other workers, considered in the Census of India. Figure 3.26 indicates that the percentage of cultivators is almost equal in both the districts with 21.31 per cent in Aurangabad and 21.15 in Jamui district. Agricultural labour is 50.86 per cent in Aurangabad against Jamui with 35.56 per cent. There is a wide gap between Jamui and Aurangabad district regarding household workers. There are 13.52 per cent household

industry workers in Jamui district and only 3.85 per cent in Aurangabad. Furthermore, in Aurangabad, 22.98 per cent are other workers while Jamui district has 18.31 per cent other work.

3.13. Village Profile of Aurangabad District

3.13.1. Lohara Village: Village *Lohara* is a remote village situated in the north of (Aurangabad) District headquarters and falls within *Rafiganj* CD Block. There are 27 revenue villages under this CD Block and *Lohara* is one of them. The distance between *Rafiganj* and *Lohara* is 17 kilometres. Aurangabad town is around 80 kilometres away from *Lohara* village. Road network between *Rafiganj* and *Lohara* is not well developed; people have to depend on railways for commuting. However, the village has no railway halt; so, villagers have to walk five kilometres to reach to the *Ismailpur* halt to , which is a small railway Holt on the Delhi - Howrah mainline. There is no metalled or unmetalled road between the village and the nearest railway station; villagers walk across the mud pavements between the crop fields and seasonal ponds or *Nahar* to take train. Although five years ago, a road was constructed between *Lohara* and *Rafiganj*; but it is not accessible by public transport, only private vehicles can go. *Lohara* is the main village, while *Babubigha* and *Raghunathpur* are two small hamlets of *Lohara*. *Babubigha* is eight hundred metres away from the main village.. The hamlet houses five Rajput families. Sub health center of *Lohara* village situated in this hamlet. On the other hand, *Raghunathpur* hamlet largely inhabited by Dalit and OBC population; but there is no sub-centre to deliver healthcare facilities.

Lohara village has 1877 population, out of which 968 are males and 909 are females. Overall effective literacy rate is 51.5 per cent, however female literacy is less than 40 per cent (39.7 per cent), while male literacy is above 60 per cent (61.3 per cent). Social composition of the village shows that it is completely inhabited by Hindu population; there is no Muslim or Scheduled Tribe Population; but among the Hindu population, caste-wise segregation of hamlets is noticeable. Brahmins and Rajputs are the main upper caste population sub-groups, while SC or Dalit population is divided into Ravidas, Manjhi, Dusadh (Paswan) and many others. OBC group records Yadav , Koiri, Teli, Churasiya, Thakur (barber) and so on.

Situated on the alluvial plain, this village is surrounded by crop fields and agriculture provides sustenance to the villagers. However, irrigation facility is limited and is mainly

dependent on either diesel pumps or hand pumps; because electricity is not available here. Hand pumps are the main source for drinking water; though two public hand pumps in the village; but many people have their own arrangements. Public hand pumps were not found to be in working condition.

Village *Lohara* has one primary school, but no secondary or higher secondary schools. A higher secondary school is under construction, but it is yet to be opened. A new Panchayat Office was under construction, but no one knew when it would be finished. The village has five groceries and four rice and flour mills and three Anganwadi centre. It has already been stated that the village has a sub-centre; but it is not functional. The village is completely devoid of basic services and infrastructure like banks, post-office, telephone booth, public transport, dairy and granaries or store-houses. Parasitic diseases like small pox, pneumonia, malaria and diarrhea have snatched many lives and young and aged are the worst victims of these epidemics.

3.13.2. Jamhor: *Jamhor* is another village of Aurangabad district situated on the Delhi-Howrah railway route near *Anugrah Naryan Road Rail station*. This village is 12 kilometres away from *Aurangabad* town and has better road connectivity and public transport facilities. Overall effective literacy rate is above 60 per cent; but female literacy rate is only 43.1 per cent. There is a huge gap in male-female literacy rate (male literacy rate is 56.9 per cent). This village records a high concentration of SC population (26.14 per cent to the total population), but no Scheduled Tribes (except Lohar, the newly declared ones) found. Upper Caste population mainly consists of *Brahmins*, *Rajputs* and *Kaysth (Sinha)*; among them *Rajputs* are the main landholders. Though out of the 1484 households. This village has huge backward caste population, who are divided into OBC and EBC (Extremely backward Caste). *Yadav*, *Koiri* and *Agarwal* are the main OBC sub-castes; while *Kahar*, *Nai/Thakur*, *Teli*, *Halwai*, *Mali*, *Barhi (Carpenter)*, *Baniya*, *Chaurasiya*, *Surdhi* and *Kumharare* are the EBC sub-castes. In SC or Dalit population, *Ravidas*, *Dusadh*, *Manjhi*, *Passi (Chaudhri)* and *Dom* are the main sub-groups. Religious minority or Muslim population is also there; they too are divided into various sub-groups like *Dobi*, *Julaha*, and *Saiyad*.

Jamhor village is also a small market centre where farmers bring their agricultural products for selling and buying all types of tools and goods for their agricultural practices and personal uses. Fertilizer shops, cloths shops, seeds stores, Medical stores, sweets shops, general stores, agricultural instrument shops, tea shops, *Dhabas*, mobile recharge centers, *Paan/Gutka shops*, flour and rice mills, car/motorbike mechanics, fruit and

vegetable stalls, cyber cafes, printer/photo copy shops , electronic repairing centers, and other shops are found here. In addition, one dairy cooperative, two grain storages are also available. Other infrastructure like Banks, Post Offices, Public Telephone booths, dairy, granaries are also available. Primary, secondary and higher secondary schools are fully functional here and the village has eight *Anganwadi* centres and one PHC as well as private clinics. Electricity is available here and thus, irrigation facilities are fully harnessed. One NGO named '*Chandrika Samajik Santha*' is working here for the village welfare. Though agriculture is the main economic activity, but occupational diversity is found here; many people are engaged in government services and business entrepreneurs.

3.14 Village Profile of Jamui District:

3.14.1. Amma sarari: Amma is the main village and Sarari is its smaller hamlet. This village is seven kilometer away from the Jamui town and is well connected by metal roads and public transportation system. The village contains 1188 people, among them 631 are males and 557 are females. The overall literacy rate is 52.1 per cent, but female literacy is much lower (40.6 per cent) than their male counterparts (59.38 per cent). Though this village is also a Hindu dominated village, but largely inhabited by the Dalit and OBC; the percentage share of Upper Caste population is very less. Traditional subsistence agriculture is the main economic activity of the village and it largely depends on the vagaries of monsoon rather than technological know-how. The village has no electricity, so, irrigation facility is limited. The villagers have arranged a generator with their own savings; it provides electricity to houses for two-three hours at night. Hand pumps are generally used to harness the ground water for both drinking and other purposes. Safe cooking fuels are not available; villagers still use biomass fuel (wood and cow dung cakes) for cooking purpose. The village has primary and middle schools, one sub health centre and Anganwadi centres. ASHA workers provide maternal and child health care services.

3.14.2. Tajpur : This village falls under Aligunj CD Block of Jamui district. It is a small village with 601 population; with 318 males and 283 females. Agriculture is the main economic activity of this village. This village has no Muslims and ST households; only Hindu households reside here and they are divided into various castes and sub-castes. This village is 40 kilometre away from Jamui town. Though it has electricity, but its supply is neither regular nor predictable. So, villagers rely on hand pumps to get drinking

water. Schools and Anganwadi centres are functioning in this village and a new additional primary health centre has been opened here for delivering healthcare facilities.

3.15. Conclusion

Being one of the most populous and densely populated states of India, Bihar shows its heavy economic reliance on traditional farming activities and inadequate development of basic amenities and infrastructure. Society too reflects traditional set up; where women's overall development is far behind than their men folk. Socially marginalized groups (SC/ST population) are still concentrated in few districts (either in the north or in the south). The central part of Bihar (Gangetic alluvial floodplain) records better socio-economic development compared to the northern and southern parts of the state, adjacent to Nepal and Jharkhand's hilly areas. Access to healthcare also shows a poor coverage and as a result, high infant and child mortality, maternal mortality and high prevalence of anaemia are recorded in the state. On the basis of secondary data, two districts have been selected for primary survey; among them Aurangabad shows better socio-economic conditions than Jamui. All these villages have considerable number of socially marginalized groups and exhibits caste-based segregation of residential areas. Therefore, both villages and their hamlets are selected. In the successive chapters, child immunization status of these villages will be analysed on the basis of primary data collected from the field and it will help in understanding, whether only connectivity and infrastructure play a silent role in the access to immunization services or other factors like social or physical exclusion also have roles to play.

References

- Bihar through Figures. (2013): Government of Bihar.
- Bihar: Road Map for Development of Health Sector a Report of the Task Force on Bihar Government. (2007, August), New Delhi: Government of India.
- Economic Survey.(2014-15), Government of Bihar.
- Elo, I. (1992). Utilization of maternal health-care services in peru: the role of women's education. *Health Transition Review 2 (1)*, 49-69.
- Drèze and Sen (2002) India: Development and Participation, p336, Oxford University Press
- Himanshu. (2007). Recent trends in poverty and inequality: some preliminary results. *Economic and political weekly*, 497-508.

Nayar, K. R. (2011). Gaps In Goals: The history of goal-setting in health care in india. *Oman Medical Journal*, 26(1), 1.

Paul, V. K. et.al. (2011). Reproductive health, and child health and nutrition in india: meeting the challenge. *The Lancet*, 377(9762), 332-349.

Child Immunization in India and Bihar: Socio-economic and Demographic Correlates

4.0 Introduction

A substantial reduction has been observed in case of infant mortality and under-five mortality in India after the adaptation of Universal Immunization, but the burden of Vaccine Preventable Diseases (VPD) is still very high in contrast to the developed countries of the world (Mathew, 2012). All the recommended vaccines are provided free of cost by the Government of India but unfortunately, these do not reach to the every people of the country (Mathew, 2012). The report of third round of 'District Level Health Survey' report data reveals that only 54 per cent children are fully immunised against Vaccine Preventable Diseases (VPD) in 2007-08. Percentage of child immunization coverage varies across the states. Some states, like Himachal Pradesh, Punjab, Tamil Nadu, Karnataka and Kerala record better coverage than Bihar, Uttar Pradesh, Jharkhand and Arunachal Pradesh. In addition, the socio-economic difference can also be observed in child immunization coverage.

Actually, child immunization uptake is a multi-dimensional process and it is influenced by various factors, but socio-economic and demographic factors appear as the most important predictors (Cobrun and Pope, 1974; Kumar and Mohanty, 2011). The changes in socio-economic status might lead to better child health care and higher immunization coverage (Rutstein, 2000). Socio-economic and cultural heterogeneity is the characteristics of Indian society. A considerable difference can be seen in terms of educational attainment, female education, and economic status, social status that directly or indirectly determines the immunization coverage. Hence, child immunization coverage varies widely across the different sections of the society. Therefore, this chapter has attempt to explored socio-economic and demographic correlates of child immunization in India and Bihar.

4.1 Database and Methodology

The data has been derived from the District Level Health Survey (2007-08) conducted by 'International Institute of Population Sciences' (IIPS) Mumbai, under 'Ministry of Health and Family Welfare, Government of India'. The immunization converge of children in the

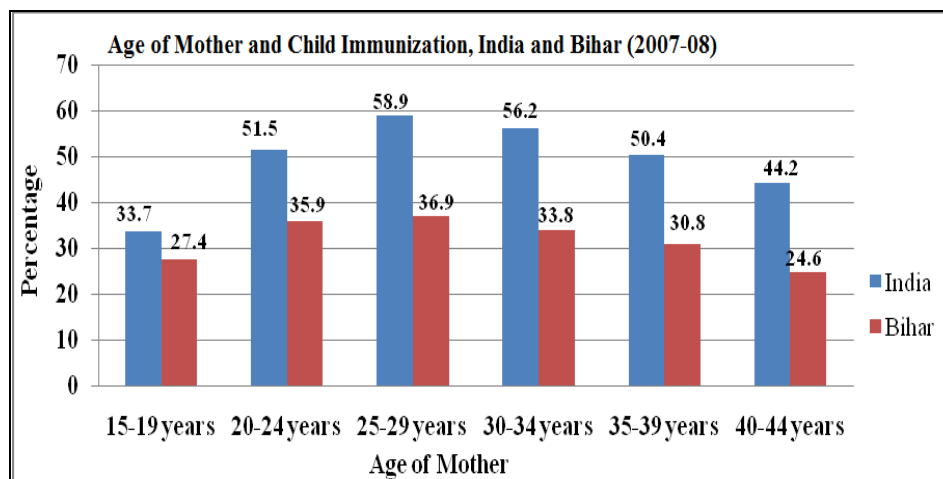
age group of 12-23 months has been recorded either by the vaccination card or by asking the mothers in the 15-49 years old age group, in case the vaccination card was not available. The ‘Ministry of Health and Family Welfare, Government of India’ has recommended one dose of BCG, three doses against DPT, three doses of polio, and one dose of measles considered as Full Immunization. This is the dependent variable, whereas the independent variables include Maternal Age, Birth Order, Sex of Child, Mother Educational Attainment, Work Status of Mother, Religion of Household, Caste of Household, Wealth Index, Place of Residence, and Utilisation of Full Antenatal Care, Post Natal Care and Place of Delivery.

Cross tabulation technique has been applied to see the gross effect of socio-economic determinants. Logistic regression analysis has also been performed to measure the net effect of independent variables on dependent variable.

4.3 Demographic Factors

4.3.1 Maternal Age

Figure: 4. 1 Child Immunization and Age of Mother, India and Bihar (2007-8)



Source- DLHS –III (2007-08)

Fig 4.1 reveals that child immunization is not equally attained by all age groups of mothers at the national level as well as state (Bihar) level. The highest child immunization coverage has been reported among middle age group mothers (25-29 years old) with 58.9 per cent, whereas the lowest per cent age of complete immunization is reported by 15-19 years age groups mothers with only 33.7 per cent . There is a wide gap between the highest and the lowest percentage of child immunization coverage in the

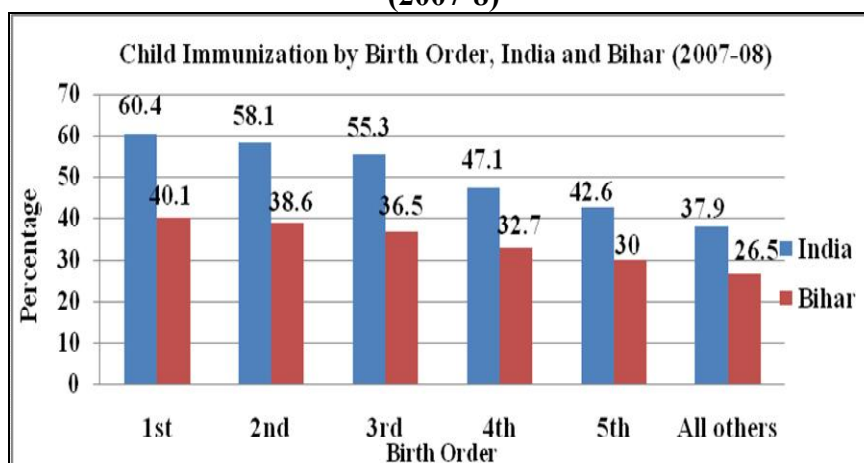
country, and it is almost double than the lowest ones. The second highest age group mothers is 30 -34 years with 56.2 per cent , IIIrd -35-39 years (51.5 per cent), IVth-40-44 years (44.2 per cent), Vth-20-24 years old mother (51.5 per cent) and VIth-15-19 years old mothers (33.7 per cent). An important finding is that the older age group mothers (30-44 years old) comparatively get their children immunised than very younger age group mothers (15-24 years age group).

Similar facts have also been observed in the case of Bihar regarding child immunization coverage against six vaccine preventable diseases among children. The per cent age of child immunization coverage increases with mother's age only up to the age of 25-29 and then it decreases. The highest percentage of complete immunization coverage has been reported among 25-29 years old age group mothers with 36.9 per cent, whereas lowest child immunization has been reported among 40-44 age group mothers with 24.6 per cent age. It is a large gap between the highest and the lowest one. The second highest is 20-24 years age group (35.9 per cent), IIIrd 30-34 years old age group (33.8 per cent), IVth is 35-39 years old age group (30.8 per cent), Vth15-19 years old age group (27.4 per cent), and the last one is 40 to 44 years old mothers. Overall, the percentage of complete child immunization coverage among all age group mothers reflect that they get their children immunised much less in Bihar in comparison to the national level. A similar finding has also been noted by **Bhuiya and Streatfield (1990)** in Rural Bangladesh, **Antai (2011)** in Nigeria. The reason could be that the middle age group mothers experience maximum childbirth; they also have greater years of schooling than older and very younger women. Therefore, they easily accept modern health care services. Younger women have greater exposure to modern medicines (**Elo, 1992; Raghupathy 1996**). On the other hand, the older women have a better experience and good knowledge of childcare. Thus, they give less importance to modern medicines (**Elo, 1992; Raghupathy 1996**).

4.3.2 Birth Order

Childhood immunization coverage is inversely associated with birth order of children. Higher the birth order, lower the immunization coverage, and lower the birth order, higher the immunization coverage. The highest childhood full immunization coverage against vaccine preventable diseases at the national level has been reported in the first birth order children with 60.4 per cent , followed by 1st, 2nd (58.1 per cent), 3rd (55.3 per cent), 4th (47.1 per cent), 5th (42.6 per cent) and others (37.9 per cent). There is a wide gap (22.5 per cent) between the highest and the lowest birth order.

Figure: 4. 2 Child Immunization by Birth Order, India and Bihar (2007-8)



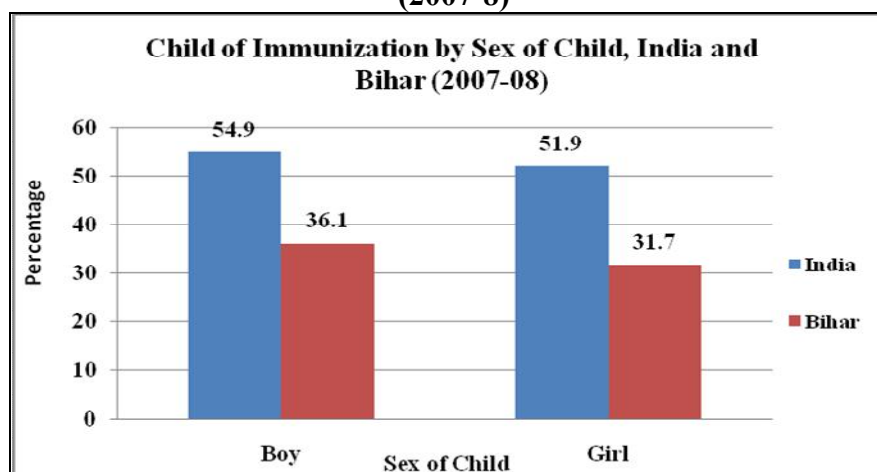
Source- DLHS –III (2007-08)

A similar finding has also been reported in Bihar. The highest percentage of complete immunization coverage has been noted among first birth order children with 40.1 per cent , with progressive decline in the IInd, IIIrd, IVth, Vth, all other orders i.e. 38.6 per cent 36.5 per cent , 32.7 per cent , 30.0 per cent , and rest of all other 26.5 per cent accordingly. Agarawal and Kumari (2014) have also found a negative association in child immunization coverage with birth order of children in Utter Pradesh, and (Bronte-Tinkewa and Dejong (2005) in Philippines. Patra (2006) has mentioned two effects prevail in childhood immunization. First one is ‘**Learning effect**’ about immunization. It is seen in the first birth orders children and does not vary with the higher birth order. The second one is ‘**Negligence effect**’ which is higher in higher birth order children (Parta 2013).

4.3.3 Sex of Child

The percentage of full immunization is higher in Male children than female children. This fact is observable both in India as well as in Bihar. In India, 54.9 per cent male children received full immunization, whereas only 36.1 per cent female children received it. The picture is the same for Bihar. The state records 51. 9 per cent full immunization for boys and 31.7 per cent for girls. Statistics reveals acute gender biasness and neglect of the female children. Studies conducted by UNICEF (2009) also supported the fact that son preference and neglect of girl child in India raises this gap. This pattern also can be in the African and Latin American countries. Studies conducted by Babalola and Fatusi, 2009; Antai, 2009) also support the fact that sex of the child is an important determinant of immunization

Figure: 4.3 Child Immunization and Sex of Child, India and Bihar (2007-8)



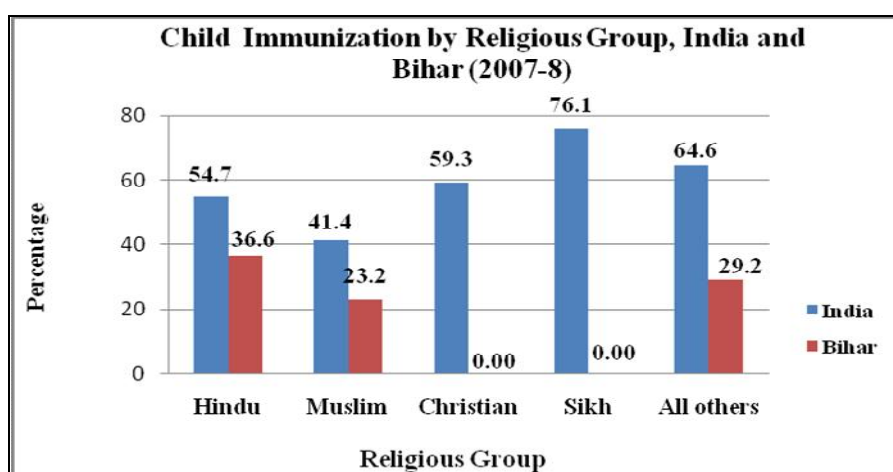
Source- DLHS –III (2007-08)

4.4 Socio-economic Factors

The word ‘Socio-economic’ includes a wide range of factors. However, in this section, the coverage of child immunization will be analysed by religion, social groups, maternal education, work status, household wealth index and place of residence. All these factors directly or indirectly play their role in child immunization.

4.4.1 Religion

Figure: 4.4 Child Immunization and Religion, India and Bihar (2007-8)



Source- DLHS –III (2007-08)

Though India is a Hindus dominated country, but highest immunization coverage is reported among the Sikhs (76.1 per cent) and Christians (59.3 per cent). Hindu population records 54.7 per cent immunization coverage and Muslims population records the lowest coverage (41.4 per cent) in India. However, in Bihar, Christians and Sikhs communities

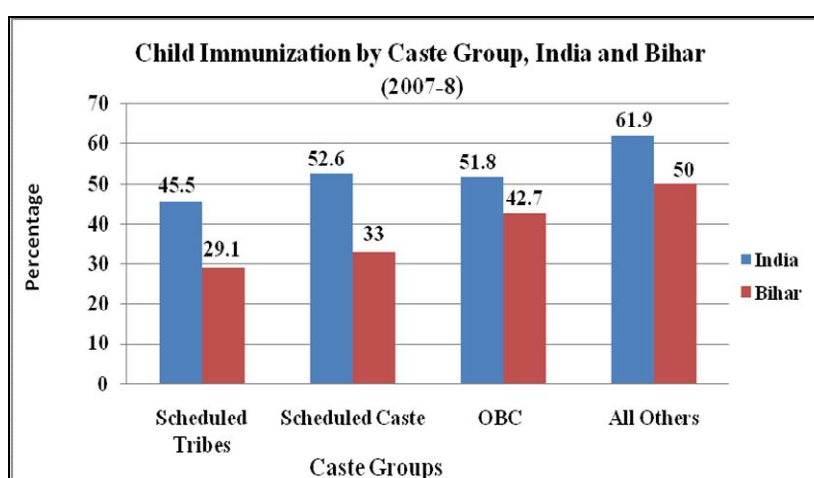
are negligible in number; the state is mainly inhabited by Hindus and Muslims population, as well as by few other religious groups. Hindu population records better coverage (36.6 per cent) than that of their Muslim counterparts (23.2 per cent) in Bihar. Actually, Indian population presents the combination of many religious groups in different proportion. Hindus is the largest religious group that comprises 80.79 per cent of the total population followed by Muslims with 14.23 per cent, Christians 2.30 per cent, Sikhs 1.27 per cent, Buddhists 0.70 per cent, Jains 0.37 per cent, Zoroastrianism / Parsis 0.01 per cent, and Judaism 0.0005 per cent (**Census of India, 2011**). There are considerable differences regarding the level of education, particularly female education, economic status of household, work participation, female work participation, household income, employment, women empowerment, accessibility and utilisation health care facility and others among various religious groups in the country. Furthermore, their religious beliefs and Knowledge, Attitude, Practices, (KAP) towards child immunization are quite different. Therefore, child immunization coverage is not equally attained by different religious groups in the country. The influence of religion on health outcomes is contradictory because sometimes, it is positively correlated and sometimes it is negatively associated (**Antai, 2009**).

Sikh, Christian, Buddhist, Jain and all other religious groups have higher literacy rate and particularly higher female literacy rate than Muslims and Hindu population groups. (*See appendix –III*). In addition, work participation is also greater in Christians, Buddhist, Jain and all other groups. Furthermore, the utilisation of Antenatal care services and institutional delivery are also higher among Sikhs, Christians, and other religious groups than Hindu and Muslim population groups in the country. (*See appendix –III*) The Sikh religious groups have one more advantage because they are mainly concentrated in Punjab, Haryana and Delhi which are the highly developed states of India. Punjab and Haryana have been the regions of green revolution and subsistence agriculture upgraded into commercial agriculture. "Green Revolution" not only increases the agricultural production, but it also plays a vital role in the industrialisation of the region. In addition, there is one of the most important Industrial Regions of India located there named '**Delhi-Ghaziabad-Amritsar Industrial Regions (Singh, 1971)**'. This industrial region spreads up to Faridabad, Mathura, and Saharanpur that surrounds the Delhi Capital Region. The region specialises in agriculture based industries (rice mills, wheat mills, sugar mills, etc.), engineering, electronic, chemical, glass, textile, woollen, synthetic fibre, chemical, electronic, pharmaceuticals, agricultural implements, cycle, tyre-tube and so many other

industries (Tiwari, 2011). As a result of the increments in State Gross Domestic Product (SGDP), per capita income has drastically increased, unemployment narrowed and work participation increased in this region. Delhi is the largest metropolitan region of India with well-developed health infrastructure, highly developed communication and transportation system, high income, higher female literacy and high work participation, high income and all others factors that lead to high child immunization coverage. On the other hand, the 'Christian Religious Group' is mainly concentrated in the five north-east regions of India (Nagaland, Mizoram, Meghalaya, Manipur, and Arunachal Pradesh) that is a comparatively more backward region of the country. Christian missionaries and Non-Governmental Organization (NGO) are working among the Christian population group for the betterment of maternal and child health care. They believe and follow modern health care preventive methods and medicines. The Muslims population group demonstrates comparatively very lowest percentage of child immunization coverage in India and Bihar since the Muslim population is socially and economically more backward than the rest of religious population groups in the country. The lack of awareness, less mass media exposures, less women's physical and economic autonomy, low educational attainment, poor female literacy, belief in God and luck limit the child immunization coverage among Muslims. Furthermore, religious salience and domination is a significant factor in the utilisation of healthcare services in the country. The Muslim women are discriminated against in their access to health care services resulting in further poor levels of immunization (Anti, 2009).

4.4.2 Social Groups

Figure: 4.5 Child Immunization and Social Groups, India and Bihar (2007-8)



Source- DLHS -III (2007-08)

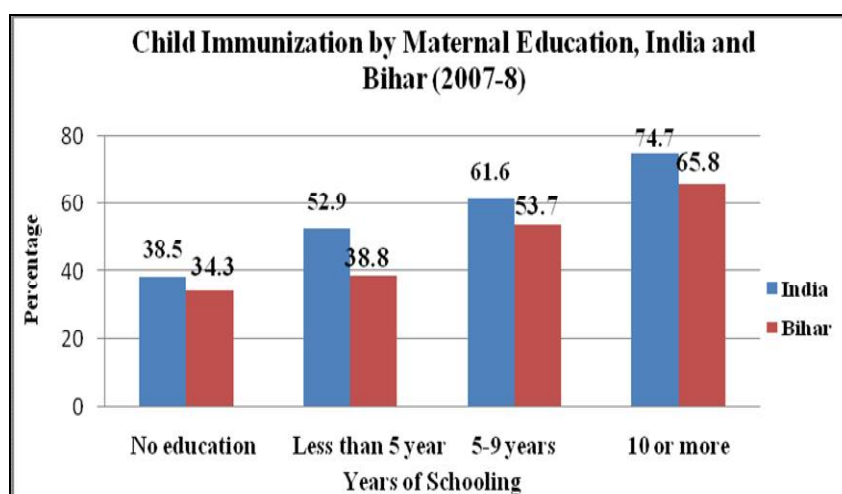
Apart from religion, Indian society is divided into various caste and sub-castes, which create various social groups specific to a particular state or region. Socially marginalized communities like SC and OBC record 50 per cent (or slightly more) coverage of immunization; ST records 45.5 per cent coverage. ST or Scheduled Tribe population records the lowest coverage. Others (Non-SC/ST & OBC) record 61.9 per cent coverage. State level data also represents the same facts, where ST records 29.1 per cent (lowest) coverage followed by SC (33per cent) and OBC (42.7 per cent); others (Non-SC/ST & OBC) records 50 per cent coverage.

Irrespective of their religion and social group, more than 50 per cent of children in Bihar do not receive full immunization. Higher illiteracy rate particularly female illiteracy is one of the most important responsible factors for low immunization rate among the scheduled castes and scheduled tribes in the country (*See appendix III*). In addition, factors such as higher poverty rate, high unemployment, less of mass media exposure among scheduled castes and scheduled tribes are also responsible for under immunization in India and Bihar. Furthermore, higher work participation in unorganized sector and less household income restricts the use and utilisation of health care facility and other medical facilities. Most of the mothers work as agricultural labour or other labourers in unorganised sectors, and their income is very low and is not sufficient for household requirements and child care. The factors that have been mentioned above are more pronounced among the scheduled caste group in the country and Bihar. On the other hand, general caste groups have better access to resources and government services (**Mohindra et al., 2008**).

4.4.3 Education Level of Mothers

Maternal education directly influences child healthcare as well as immunization. Mothers having ten years or more schooling record highest immunization coverage for their children and it is more than 74 per cent. However, mothers with five to nine years of schooling record 61.6 per cent and less than five years of schooling record 52.9 per cent coverage. Mothers without formal schooling record the lowest coverage (38.5per cent). Similar fact is found in the state level data of Bihar. Mothers having ten or more than ten years of schooling record highest immunization coverage (65.8 per cent). It decreases with average years of schooling. Mothers without formal education records low immunization coverage (34.3 per cent).

Figure: 4. 6 Child Immunization and Mother’s Education, India and Bihar (2007-8)

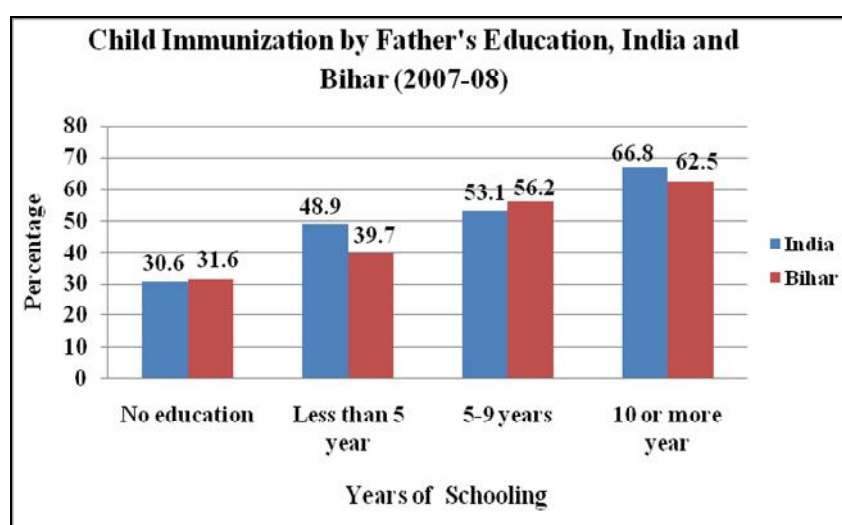


Source- DLHS –III (2007-08)

This fact is also supported by **Desai and Alva (1998)** who have conducted a similar study in twenty two developing countries. Education enhances the knowledge of childhood immunization against ‘Vaccine Preventable Diseases’. There is an inter-linkage between the level of education and knowledge of health care services. Educated mothers get more information and knowledge of child health and maternal health care related information, and they easily adopt modern medicines and health care practices. In addition, educated mothers have greater access to health care services than uneducated mothers (**Streatfield et al., 1990**).

4.4.4 Education Level of Father

Figure: 4. 7 Child Immunization and Father’s Education, India and Bihar (2007-8)



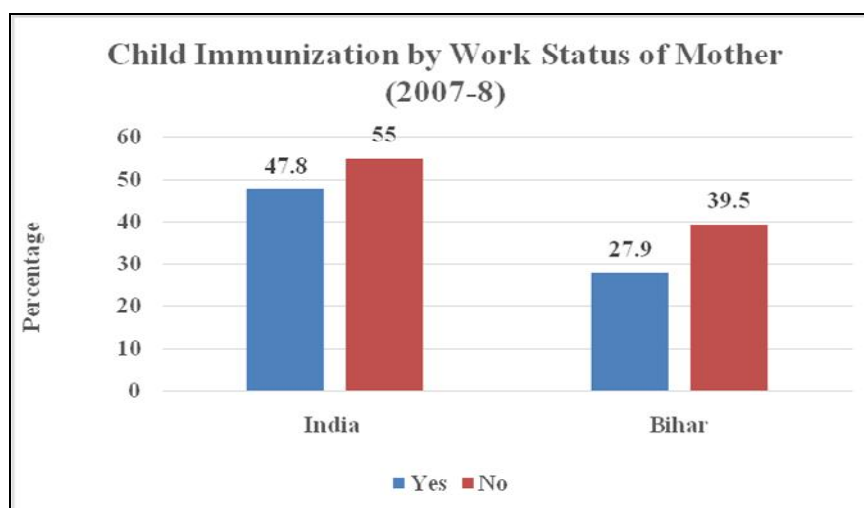
Source- DLHS –III (2007-08)

Fathers having no formal education experience the lowest child immunization coverage with only 30.6 per cent, while less than five years of schooling reported 48.9 per cent, father having 5 to 9 years schooling recorded 53.1 per cent. Fathers having 10 and more years schooling recorded the highest child immunization coverage with 66.8 per cent at the national level.

Similar pattern is found at the state level (Bihar). The lowest child immunization coverage has been reported by uneducated fathers with 31.6 per cent, less than five years schooling fathers reported 39.7 per cent. Fathers having 5-9 years schooling reported 56.2 per cent, and the 10 and more years schooling fathers recorded the highest child immunization coverage with 62.5 per cent.

4.4.5 Work Status

Figure: 4. 8 Mother’s Work Status and Child Immunization, India and Bihar (2007-8)



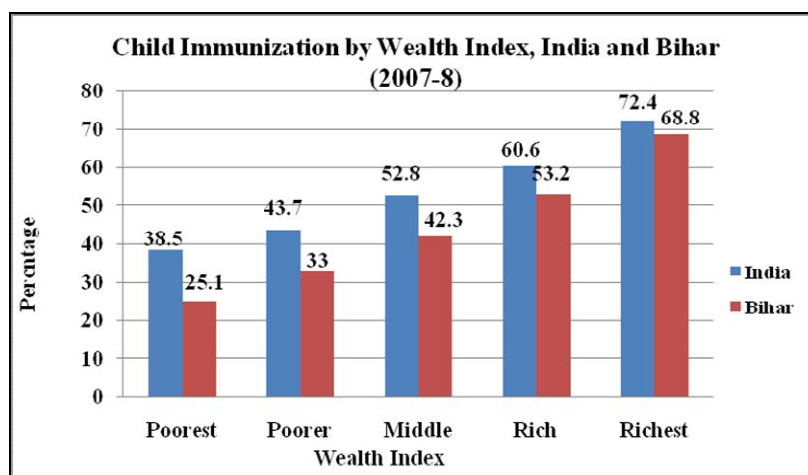
Source- DLHS –III (2007-08)

Mother’s work status and child immunization has a positive correlation. Children whose mothers were working since the last 12 months record lower immunization coverage (47.8 per cent) than their non-working counterparts (55.0 per cent) in India. In Bihar also, working mothers record lower immunization coverage (27.9) than their non-working counterparts (39.5 per cent).

4.4.6 Wealth Index

Figure:4. 9 Child Immunization and Household Wealth Index, India and Bihar (2007-8)

The wealth index is a composite score of living standard based on assets (such as TV, Bicycle etc.) and household characteristics such as types of house, access to water, sanitation, system etc.



Source- DLHS –III (2007-08)

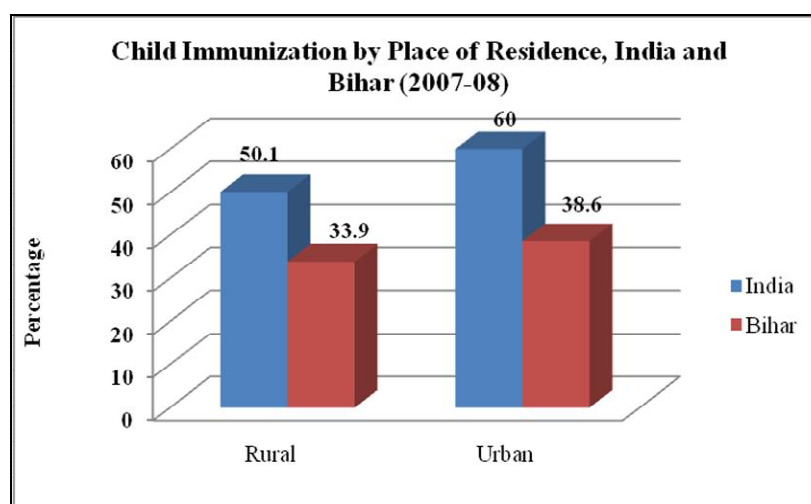
Significant differences can be seen in child immunization coverage among various economic groups of the household. Children who belong to the richest households get maximum immunization coverage with 72.4 per cent followed by the rich 60.6 per cent , middle income 52.8 per cent , poorer sections 43.7 per cent and the poorest sections 38.5 per cent at the national level. The poorest section of society has very low immunization coverage in India.

In Bihar, children who belong to the richest households are more immunised with 68.8 per cent followed by richer sections 53.2 per cent, middle class section 42.3 per cent, poorer sections 33.0 per cent and the poorest sections 25.0 per cent in Bihar. There is a wide gap between the richest and poorest with 43.8 per cent in Bihar. Same facts have been seen by **Agarawal and Kumari (2014)**. The economic status of the family is one of the most important factors for child well-being. The low income of household reduces the childhood immunization rate (**Bronte & Dejong, 2005**). The economic status of the household has a strong positive impact on childhood immunization as affordability of vaccination and travel costs are important aspects of accessibility (**Arif, 2005**). Poverty also controls health seeking behaviour in terms of ignorance and lack of education (**Thelma et al., 1990**).

4.4.7 Place of Residence

In India, 63 per cent children living in urban areas receive full immunization compared to 50.1 per cent living in the rural areas. This is similar in Bihar, but the gap is lower. The state records 38.6 per cent children from urban areas and 33.9 per cent from the rural areas receiving full vaccination. The rural urban gap is lower in Bihar, because the state as a whole records very low level of urbanization

Figure 4.10 Child Immunization and Place of Residence, India and Bihar (2007-8)



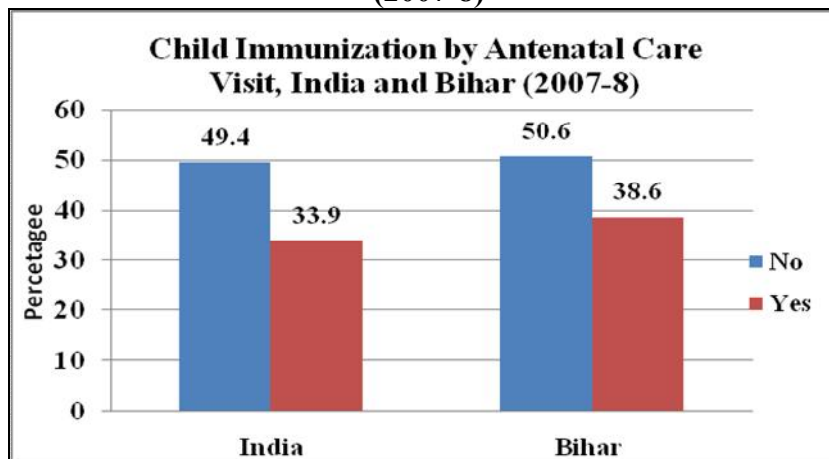
Source- DLHS –III (2007-08)

Urban areas are characterised by well-developed and maintained health infrastructure, developed means and mode of transportation, communication, electrification, high mass media exposure and others. Urban residents also have the advantage of being educated, progressive and aware, while the rural areas are characterized by poverty, technological and social backwardness, lack of health care services and less developed infrastructure (Wilson, 2000; Lalou and LeGrand, 1997).

4.4.8 Exposure to Maternal and Child Care Services and Immunization

India is one of the few countries, that offers subsidized maternal and child health care facilities to all and also provides cash incentives to the poor for accessing institutional delivery during child birth. However, due to various reasons, public healthcare facility is yet to reach to the greater segment of the Indian citizens, but it is a good indicator to explain, why certain region records poor immunization coverage and other pockets perform better.

Figure: 4. 11 Child Immunizations and Access to Antenatal Care, India and Bihar (2007-8)

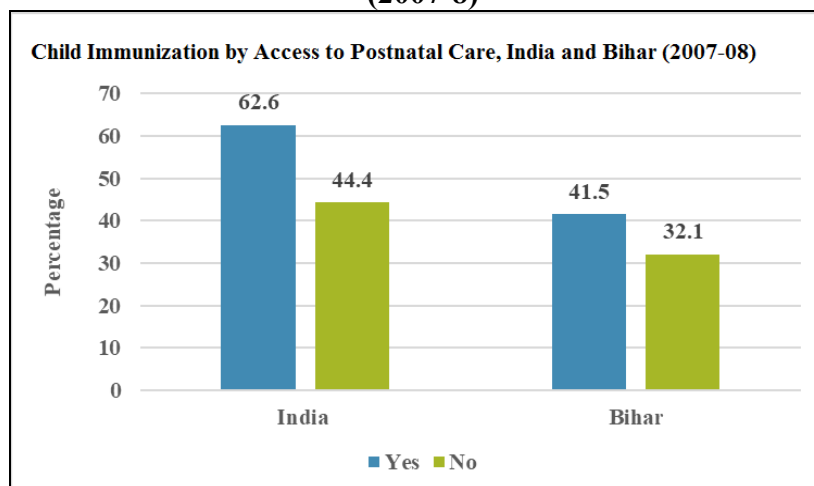


Source- DLHS –III (2007-08)

Women having exposure to ANC services are more likely to bring their children for immunization, because they receive full information regarding vaccinations and also develop a good rapport with the service providers. Thus, 33.9 per cent have women in India and 38.6 per cent in Bihar reported that they have received ANC as well as have brought their children for immunization. **Desai and Alva (1998)** state that women who seek antenatal care are much more likely to get their children immunized after birth and in the later years. Women who are more exposed to antenatal care may learn about the importance of immunization.

4.4.9 Post Natal Care

Figure: 4. 12 Child Immunization and Access to Post Natal Care, India and Bihar (2007-8)



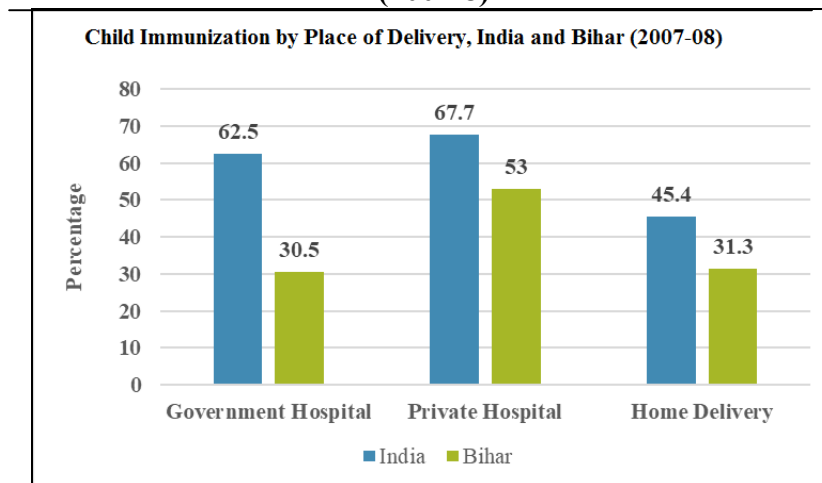
Source- DLHS –III (2007-08)

Data reveals that the women who have received post natal care within two weeks after delivery reported greater child immunization coverage with 62.6 per cent in contrast to

those who have not received post natal care service with 44.4 per cent in the country. Similar pattern can be seen in Bihar where the women who have received post natal care experience higher child immunization coverage with 41.5 per cent, whereas who have not received post natal care present lower coverage with 32.1 per cent.

4.4.10 Place of Delivery

Figure 4.13 Child Immunizations and Place of Delivery, India and Bihar (2007-8)



Source- DLHS –III (2007-08)

Children who have born in private hospitals and Government hospitals record higher coverage with 67.7 per cent and 62.5 per cent respectively whereas, who those have been born at home are less immunised with 45.4 per cent in the country. In case of Bihar, children who have born at Government hospitals and homes record lower immunization coverage with 30.5 per cent and 31.3 per cent. However those who have born at private hospitals experience higher coverage with 53 per cent.

4.5 Multi Variant Analysis

Table 4.1 Socio-economic and Demographic Determinants of Child Immunization

Influence of Background Characteristics on full vaccination coverage India and Bihar (2007-08)		
	India	Bihar
Age of Mother	Exp(B)	Exp(B)
15-19 years®		
20-24 year	2.161***	1.711***
25-29 years	3.582***	2.446***
30-34 years	4.694***	2.912***
35-39 years	4.969***	2.886***
40-44 years	5.211***	2.509***
Birth Order		
1 st ® Birth Order		
2 nd Birth Order	0.924***	0.778*
3 rd Birth Order	0.733***	0.585***
4 th Birth Order	0.537***	0.531***
5 th Birth Order	0.472***	0.435***
All others	0.34***	0.37***
Sex of Child		
Male Children ®		
Female Children	0.903***	0.911
Mother's Education		
Uneducated Mothers ®		
Less than 5 year Educated	1.425	0.983
5-9 years Educated	1.628	1.226
10 or more year Educated	1.255	0.856
Father's Education		
Uneducated Fathers®		
Less than 5 year Educated	1.165	0.425
5-9 years Educated	1.142	0.402
10 or more year Educated	1.159	0.453
Work Status		
Yes ®		
No	1.102	1.014
Religious Group		
Hindu ®		
Muslim	0.607***	0.478***
Christian	0.857***	
Sikh	1.614***	
All others	1.21***	
Caste Group		
General Caste ®		
Other Backward Castes	0.845***	.686***

Scheduled caste	0.916***	0.519**
Scheduled tribes	1.052***	0.806***
Wealth Index		
Poorest ®		
Poorer	1.214***	1.407***
Middle	1.563***	1.793***
Rich	2.032***	2.373***
Richest	2.812***	4.015***
Place of Residence		
Rural ®		
Urban	1.094***	1.47
Received full ANC		
No ®		
Yes	1.903***	1.629***
Received PNC		
No ®		
Yes	1.561***	.930
Place of Delivery		
Government Hospital ®		
Private Hospital	1.030**	1.806***
Home Delivery	1.992**	1.529***

(Data Source - DLHS-2007-08), * $p < 0.05$, ** $p < 0.01$, 0.001*** ® Reference Category
Dependent Variable – Full Immunization (1= Yes, 0=No)

Table 4.1 shows that age of the mother is a significant predictor and is positively associated with childhood immunization coverage at the national level and state level as well. The younger mothers of 20-24 years age group are 2.161 times more likely to get their children immunized than 15-19 years age group mothers, 25-29 years age group mothers 3.58 times, 30-34 years age group mothers 4.694 times, 35-39 years age group mothers 4.969 times and 40-44 years age group mothers 5.211 times more likely to get their children immunized with respect to 15-19 years age group mothers in India. In Bihar, 20-24 years age group mothers are 1.171 times, 25-29 years age group mothers 2.446 times, 30-34 years age group mothers 2.921 times, 35-39 years age group mothers 2.889 times, and 40-44 years age group mothers are 2.509 times more likely to get their children immunised in comparison to 15-19 years age group mothers.

Birth order is a statistically significant factor and inversely associated with childhood immunization coverage against vaccine-preventable diseases India and state. Children who belong to the second birth order are 0.924 times less likely to get complete immunization than the first birth order children in India. This is followed by third birth order children i.e. 0.733 times, fourth birth order children 0.537 times, fifth birth order

children 0.472 times, and all other birth order children are 0.340 times less likely to get complete immunization in the country than first birth order children. A similar pattern has been observed in Bihar, with second birth order children 0.778 times, third birth order children 0.585 times, fourth birth children 0.531 times, fifth birth order children 0.435 times and all other birth children are 0.37 times less likely to get immunization than first birth order children.

Although sex of the child is statistically not a significant factor in Bihar, but this is significant in India. The female children are 0.903 times less likely to complete Immunization than their counterparts in India.

The table 4.1 reveals that education level of mother and father have not appeared as significant factors in the study.

The religion of the household is a statistically significant factor in both India and Bihar, but mixed relationships appeared regarding child immunization. Children belonging to Muslim and all other (Buddhism, Jainism, Zoroastrianism /Parsi, Judaism etc.) religious groups are 0.607 times less likely to get immunized in comparison to the Hindu population group, whereas Christian and Sikh population groups are 0.857 times and 1.614 times more likely to get immunized than Hindu population group in the country. In the case of Bihar, Muslims and all other religious (Buddhism, Jainism, Zoroastrianism /Parsi, Judaism etc.) groups are 0.478 times and 0.246 times less likely to get their children immunised than the Hindu population group. There is no Christian and Sikh religious group in Bihar.

Caste is an important factor influencing child immunization coverage that is inversely associated with it. The 'Other Backward Castes' (OBCs) is 0.845 times, Scheduled Castes (SCs) 0.916 and Scheduled Tribes (STs) 1.052 times less likely to get their children immunised with respect to the general caste (Upper Caste) group against vaccine preventable diseases in the country. In Bihar, Other Backward Castes (OBCs) 0.686 times, Scheduled Castes (SCs) 0.519 times and Scheduled Tribes (STs) are 0.806 times less likely to get immunised in comparison to the General Caste group.

Wealth index is an important factor and has passive effect on child immunization coverage. The children from the poorer sections of the society are 1.214 times more likely, Middle class 1.563 times more likely, rich 2.032 times more likely and the richest 2.812 times more likely to get their children immunised with respect to the poorest sections of society in India. In Bihar, the poorer are 1.407 times more likely, middle 1.793

times more likely, rich 2.373 times more likely and the richest 4.015 times more likely to get immunised than the poorest sections of the society.

Children living in urban areas are more likely to get immunised than rural areas. Children living in the urban area are 1.094 times in India and 1.470 times in Bihar more likely to get immunised than rural children. Mothers who have received at least three antenatal care services during their pregnancy period are 1.903 times in India and 1.629 times in Bihar more likely to get their children immunised than those who have not received any antenatal care services during their pregnancy.

Children whose mothers have received post natal care services within two week of delivery are more likely to get immunised than those who have not taken post natal care services. Children who have born at home have less chance of immunization in India and Bihar.

4.6 Conclusion

The age of the mother is a significant factor in childhood immunization coverage at the national level as well as the state level. Data reveals that the middle age groups mothers (20-34 years old) get their children Immunised maximum against Vaccine Preventable Diseases (VPD) in the country as well as in Bihar, whereas very younger women and older age group women are less likely to get their children immunized. Furthermore, the overall percentages of child immunization coverage that have been received by all age groups of mothers are comparatively very less in Bihar in comparison to India.

There is inverse relationship appeared between birth order and childhood immunization coverage. The highest percentage of complete immunization coverage has been observed among the first birth order children and further, it reduces in the IInd, IIIrd, IVth, Vth, and all other birth orders subsequently.

The percentage of child immunization coverage against vaccine-preventable diseases is significantly higher among male children than female children. The important fact that appeared from this study is that gender bias regarding child immunization prevails among all states of India whether it is north Indian state or south Indian state, developed state or less developed state. Furthermore, gender gap can also be seen among all religious and social groups, and even it can also be seen in well-educated and higher economic status households. The urban places of India are not an exception in this regard.

There is linear relationship exists between the years of maternal education and percentage of childhood immunization coverage in the country and the state. The percentage of immunization coverage positively increases with the years of schooling of the mother.

Therefore, the highest child immunization coverage has been reported among 10 and more years of schooling by mothers, whereas the lowest immunization coverage has been reported among the uneducated mothers. But the education of mothers is statistically not significant in both the regions India and Bihar.

Similarly there is positive association between years of fathers' education and child immunization coverage.

Religion is very important predictor in child immunization process in the country. Religion has a mixed relationship with the per cent age of childhood immunization coverage at the national level, but it is negatively associated in Bihar. Highest child immunization has been reported among the Sikhs religious group, whereas the lowest child immunization has been reported by Muslims religious group in India. Christian and all other religious groups also show better performance in child immunization than the Hindu and Muslim religious groups.

The percentage of child immunization coverage is very low among scheduled castes and scheduled tribes population, whereas general castes portray the highest child immunization in the country as well as the state.

Wealth index has a positive impact on child immunization coverage in the country as well as in Bihar. The highest per cent of full immunization coverage is reported by the richest sections of the society, while lowest child immunization coverage has been reported by the poorest sections of the society. The children living in urban areas are more immunised than rural areas.

Those women who received at least three antenatal care services during their pregnancy period got their children immunised in comparison to those who have not received any antenatal care services. Mothers who have received post natal care services are more likely to immunise their children than who have not received post natal care services. Children who have been born at home have low possibility to seek all recommended vaccines against infectious diseases in either of the study areas.

References

- Agrawal, S. C., & Kumari, A. (2014). Immunization Status of Children and the Influence of Social Factors: A Hospital Based Study in Western Uttar Pradesh. *Pediatric Infectious Disease*, 6(1), 25-30.
- Antai, D. (2009). Faith and Child Survival: The Role of Religion in Childhood Immunization in Nigeria. *Journal of Biosocial Science*, 41(1), 57-76.
- Arif, G. M. (2004). Child Health and Poverty in Pakistan. *The Pakistan Development Review*, 211-238.

- Arnold, F., Choe, M. K., & Roy, T. K. (1998). Son Preference, the Family-Building Process and Child Mortality in India. *Population Studies*, 52(3), 301-315.
- Babalola, S., & Fatusi, A. (2009). Determinants of Use of Maternal Health Services in Nigeria-Looking Beyond Individual and Household Factors. *BMC Pregnancy and Childbirth*, 9(1), 43.
- Bardenheier, B. H., Yusuf, H. R., Rosenthal, J., Santoli, J. M., Shefer, A. M., Rickert, D. L., & Chu, S. Y. (2004). Factors Associated with Underimmunization at 3 Months of Age in four Medically Underserved Areas. *Public Health Reports*, 119(5), 479-485.
- Benjamins, M. R., & Brown, C. (2004). Religion and Preventative Health Care Utilization among the Elderly. *Social Science & Medicine*, 58(1), 109-118.
- Bhatia, J. C., & Cleland, J. (1995). Determinants of Maternal Care in A Region of South India. *Health Transition Review*, 127-142.
- Bronte-Tinkew, J., & Dejong, G. F. (2005). Do Household Structure and Household Economic Resources Predict Childhood Immunization? Evidence from Jamaica and Trinidad and Tobago. *Population Research and Policy Review*, 24(1), 27-57.
- Cohen, S. (1999). Social Status and Susceptibility to Respiratory Infections. *Annals Of The New York Academy of Sciences*, 896(1), 246-253.
- Desai, S., & Alva, S. (1998). Maternal Education and Child Health: is There a Strong Causal Relationship?. *Demography*, 35(1), 71-81.
- Dombkowski, K. J., Lantz, P. M., & Freed, G. L. (2004). Risk Factors for Delay in Age-Appropriate Vaccination. *Public Health Reports*, 119(2), 144-155.
- Feikin, D. R., Nguyen, L. M., Adazu, K., Ombok, M., Audi, A., Slutsker, L., & Lindblade, K. A. (2009). The Impact of Distance of Residence From a Peripheral Health Facility on Pediatric Health Utilisation in Rural Western Kenya. *Tropical Medicine & International Health*, 14(1), 54-61.
- Hughart, N., Strobino, D., Holt, E., Guyer, B., Hou, W., Huq, A., & Ross, A. (1999). The Relation of Parent and Provider Characteristics to Vaccination Status of Children in Private Practices and Managed Care Organizations in Maryland. *Medical care*, 44-55.
- Kadri, A. M., Singh, A., Jain, S., Mahajan, R. G., & Trivedi, A. (2010). Study on Immunization Coverage in Urban Slums of Ahmedabad City. *Health And Population: Perspectives and Issues*, 33(1), 50-54.
- Kam, E. L. P. (2011). Evaluating Immunization Rates and Barriers to Immunization For Children 1 to 5 Years Old in Rural India. Mount Sinai School of Medicine.
- Kravdal, Ø. (2004). Child Mortality in India: The Community-Level Effect of Education. *Population Studies*, 58(2), 177-192.
- Kumar, A., & Mohanty, S. K. (2011). Socio-Economic Differentials in Childhood Immunization in India, *Journal of Population Research*, 28(4), 301.

- Lalou, R., & LeGrand, T. K. (1997). Child Mortality in The Urban and Rural Sahel. *Population an English Selection*, 147-168.
- Lee, S. H., & Mason, A. (2005). Mother's Education, Learning-By-Doing, and Child Health Care in Rural India. *Comparative Education Review*, 49(4), 534-551.
- Levin, J. S., & Markides, K. S. (1986). Religious Attendance and Subjective Health. *Journal for the Scientific Study of Religion*, 31-40.
- Mathew, J. L. (2012). Inequity in Childhood Immunization in India: A Systematic Review. *Indian Pediatrics*, 49(3), 203-223.
- McGuirk, M. A., & Porell, F. W. (1984). Spatial Patterns of Hospital Utilization: The Impact of Distance and Time. *Inquiry*, 84-95.
- Mishra, V., Roy, T. K., & Retherford, R. D. (2004). Sex Differentials in Childhood Feeding, Health Care, and Nutritional Status in India. *Population and Development Review*, 30(2), 269-295.
- Mohindra, K. S., Haddad, S., & Narayana, D. (2008). Can Microcredit Help Improve the Health of Poor Women? Some Findings from A Cross-Sectional Study in Kerala, India. *International Journal for Equity in Health*, 7(1), 2.
- Müller, I., Smith, T., Mellor, S., Rare, L., & Genton, B. (1998). The Effect of Distance from Home on Attendance At a Small Rural Health Centre in Papua New Guinea. *International Journal of Epidemiology*, 27(5), 878-884.
- Narayana, D. L. (1979). Economics of Sriculture in Rayalaseema.
- Pande, R. P. (2003). Selective Gender Differences in Childhood Nutrition and Immunization in Rural India: The Role of Siblings. *Demography*, 40(3), 395-418.
- Pearce, L. D., & Axinn, W. G. (1998). The Impact of Family Religious Life on The Quality of Mother-Child Relations. *American Sociological Review*, 810-828.
- Peters, D. H., Garg, A., Bloom, G., Walker, D. G., Brieger, W. R., & Hafizur Rahman, M. (2008). Poverty and Access to Health Care in Developing Countries. *Annals of the New York Academy of Sciences*, 1136(1), 161-171.
- Pruitt, R. H., Kline, P. M., & Kovaz, R. B. (1995). Perceived Barriers to Childhood Immunization among Rural Populations. *Journal of Community Health Nursing*, 12(2), 65-72.
- Rutstein, S. O. (2000). Factors Associated With Trends in Infant and Child Mortality in Developing Countries During the 1990s. *Bulletin of The World Health Organization*, 78(10), 1256-1270.
- Streatfield, K., Singarimbun, M., & Diamond, I. (1990). Maternal Education and Child Immunization. *Demography*, 27(3), 447-455.

Tran, T. K., Gottvall, K., Nguyen, H. D., Ascher, H., & Petzold, M. (2012). Factors Associated with Antenatal Care Adequacy in Rural and Urban Contexts-Results from two Health and Demographic Surveillance Sites in Vietnam. *BMC Health Services Research*, *12*(1), 40.

Tupasi, T. E., et al . (1988). Determinants of Morbidity and Mortality Due to Acute Respiratory Infections: Implications for Intervention, *Journal of Infectious Diseases*, *157*(4), 615-623.

Waldhoer, T., Haidinger, G., Vutuc, C., Haschke, F., & Plank, R. (1997). The Impact of Sociodemographic Variables on Immunization Coverage of Children. *European Journal of Epidemiology*, *13*(2), 145-149.

Wilson, T. (2000). Factors Influencing the Immunization Status of Children in a Rural Setting. *Journal of Pediatric Health Care*, *14*(3), 117-121.

Socio-economic Characteristics of Household and Child Immunization in Study Areas

5.0 Introduction

Rapid urbanization, migration, industrialization and development of slums have created a pandemic situation in which there is a possibility of an outbreak of Vaccine Preventable Diseases (VPD). High population density coupled with continuous increase of infective agents into open air and water make children more vulnerable to Vaccine Preventable Diseases (**Kumar et al., 2010**). The situation is more critical in less developed countries of the world. Immunization is the only effective health intervention to combat the risk of outbreak of life threatening Vaccine Preventable Diseases. The Government of India has launched various child immunization programmes and schemes to achieve universal child immunization coverage, such as ‘Expanded Programme on Immunization (EPI) in (1978), Universal Immunization Programme (1985), Intensification of Routine Immunization (2012) Immunization Week (IW), and Mission *Indradhanus*’ on 25 December 2014. All vaccines are provided free of cost throughout the country. But only 62 percent children are fully immunized against vaccines preventable diseases till 2015-16 (DLHS-IV). Therefore it becomes important to study the underlying factors responsible for low coverage of child immunization, especially in Jamui and Aurangabad districts in Bihar.

Utilization of Public Health Care Services is multi-factorial in nature, in which a set of factors act simultaneously. Social status, economic status, demographic characteristics, cultural beliefs, women’s autonomy, and political system influence the utilization of public health care services (**Shaikh & Hatcher, 2004**). The people belonging to upper socioeconomic strata are four times more likely to seek treatment than low socio-economic status when they get sick. The social determinants such as religion, caste are also highly predictable in child immunization (**Shrivastwa et al., 2015**).

According to **Penchansky & Thomas (1981)** coverage of any healthcare service largely depends on five dimensions, i.e. a) availability, b) accessibility, c) accommodation, d) affordability and e) acceptability of a service. The last one or acceptability mainly depends

on socio-cultural set-up, which may vary from region to region as well as across the social groups. At the same time, 'affordability factor' depends on households income as well as wealth or assets. All these five dimensions together create three types of situations a) Vaccine Resistance b) Vaccine Opposition and c) Vaccine Hesitancy which may lead to complete exclusion or partial exclusion from immunization programme or delay in the procedure (**Merten et al., 2015**). Gender may be one of the factors that determine a child's potentiality to receive vaccine, but it depends on other socio-economic characteristics of the individual households (*ibid*). All these factors are equally important for accessing other healthcare services like ANC and institutional deliveries (**Shaikh & Hatcher, 2004**). Income or household assets show positive correlation with access to healthcare services as well as immunization. This not only increases affordability but also increases the awareness level. Therefore, children from the upper quintile of MPCE are more likely to receive treatment when sick. Rich households as well as individuals can afford to lose one working day during medical emergency but the poor ones cannot (**Coburn & Pope, 1997**).

Therefore, this chapter deals with socio-economic and demographic characteristics of the surveyed households and analyses its influence on child immunization. Two districts of Bihar, namely Jamui and Aurangabad are chosen for the primary survey and three hundred households from each of the districts are selected on the basis of 'house listing' operations done with the help of Anganwadi workers and other health volunteers. A total of six hundred households are selected on the basis of households having children (12-23 months of age) eligible for immunization.

Mothers of the children are the main respondents, but fathers' responses are also recorded for analysing fathers' role in immunization. The 'Immunization Survey Register of Two Years Old Children' maintained by the Anganwadi and ASHA workers have helped to identify the potential respondents as well as provides data on their basic socio-economic background. According to the Government norm, every beneficiary is expected to maintain a 'card' to keep track with their children's immunization schedule. This card also highlights the beneficiaries' immunization status as well as provides data on 'partial' and 'complete' coverage.

Based on primary data collected from the field, socio-economic and demographic correlates of child immunization is analysed through various statistical techniques. Regression analysis helps in understanding the important determinants of an individual household that influences the ‘immunization’ status of a child. Descriptive statistics like Cross Tabulation and Chi-square represents have been used. Quantitative analysis alone cannot depict the true scenario, thus it requires additional supplements from the qualitative data collected through Field Notes, In-depth Interviews, Cases Studies and Focus-Group Discussion (FGD) analysis. The primary survey reveals that a total of 54.8 per cent children in Jamui district and 65.3 per cent children in Aurangabad district are fully immunized against VPD. In Jamui district, Polio vaccine records the highest coverage with 78.7 per cent followed by 75.9 per cent Measles, 72.8 per cent DPT, 71.4 per cent BCG, and 62.1 per cent for Hepatitis B. In cases, of Aurangabad district, the highest immunization coverage records for BCG with 89.3 per cent, followed by OPV 82.0 per cent, 81.7 per cent measles, and 74.0 per cent for DPT. Full Immunization incorporates one dose of BCG, one dose of Measles, three doses of DPT, Polio and Hepatitis-B vaccines. However, there is a huge drop-out in these doses, especially for DPT, Hepatitis-B and Polio vaccinations, because they have multiple doses. With the help of descriptive statistics, a cross-sectional study of socio-economic and demographic determinants of childhood immunization coverage in rural settlements of Bihar is presented in the subsequent sections. The present study has been carried out in selected households with varying socio-economic and demographic characteristics of household.

5.1 Demographic Characteristics

5.1.1 Sex of the Child

Table 5.1 Child Immunization Coverage by Sex of Child, Bihar, Jamui and Aurangabad (2015)

Child Immunization Coverage by Sex of Child, Bihar, Jamui and Aurangabad (2015)				
	Jamui		Aurangabad	
Sex of Child	No. of Cases	Percentage	No of Cases	Percentage
Male	99	55.6	113	67.3
Female	66	53.7	83	62.9
Chi-Square Test	.737		.428	

Source- Computed from Primary Survey (2015)

Table 5.1 reveals that out of the total respondents, 55.6 percent male and 53.7 percent female children received full immunization in Jamui district. However, male children record 67.3 percent coverage and female children record 62.9 percent. Similar finding have been also observed by **Singh (2013)** in Punjab, Haryana, Bihar and Uttar Pradesh. Other studies conducted by **Pande & Yazbeck (2003); Kumar et al., (2010)** reveal that male children are more likely to receive full immunization than that of their female counterparts.

5.1.2 Birth Order

Table 5.2 Child Immunization by Birth Order, Bihar, Jamui and Aurangabad (2015)

Child Immunization by Birth Order, Bihar, Jamui and Aurangabad (2015)				
Birth Order	Jamui		Aurangabad	
	No. of Cases	Percentage	No. of Cases	Percentage
1 st	69	61.1	104	71.2
2 nd	52	58.4	44	71.0
3 rd	33	45.2	33	60.0
4 th and Above	11	42.3	15	40.5
Chi-Square Test	.085		.003	

Source- Computed from Primary Survey (2015)

Table 5.2 reveals that percentage of children with full immunization coverage decreases with the increase in birth order. Therefore, birth order and immunization coverage has an inverse relationship. Aurangabad district records highest immunization coverage in first birth order children with 71.2 per cent, followed by second birth order 71.0 percent, third birth order 60.0 per cent , and fourth and above birth order 40.5 per cent .

Jamui records lower Immunization coverage, highest for the first birth order children (61per cent), that declines for the younger siblings. Second birth order children recorded 58.4 per cent, third birth order children recorded 45.2 per cent, and fourth birth and above birth order children recorded 42.3 per cent coverage. Similar observation has been also noted by **Schaffer and Szilagyi,1995; Raghupathy, 1996; Bhatia & Cleland 1995); Elo, 1992); Navaneetham, & Dharmalingam, 2002).**

5.2.3 Age of the Mother

Table 5.3 Child Immunization by the Age of Mother, Bihar, Jamui and Aurangabad (2015)

Child Immunization by the Age of Mother, Bihar, Jamui and Aurangabad (2015)				
Age Group	Jamui		Aurangabad	
20-24 Year	113	57.9	128	66.7
25-29 Year	37	48.1	48	62.3
30-34 Year	12	50.0	16	66.7
35-39 Year	2	50.0	4	57.1
Chi-Square Test	.463		.877	

Source- computed from Primary Survey (2015)

In this study, respondents are divided into four age groups. The sample does not contain respondents below twenty and above forty years of age. In Aurangabad district, the highest child immunization coverage has been reported among 20-24 years age group (66.7 per cent) and in the 30-34 years age group (66.7 per cent), whereas low immunization coverage was reported among 25-29 years age group (62.3 percent) and 35-39 age group (57.1 percent).

In Jamui district, the highest child immunization coverage has been reported among 20-24 years age group (57.9 per cent), followed by 30-34 Year age group (50.0 per cent), 35-39 Year age group (50.0 per cent) and 25-29 years age group mother (48.1 per cent). Similar finding have been observed by **Elo,1992), Mohamud, et al., 2014) Raghupathy, 1996)** state that younger mothers easily accept modern health care services in comparison to older age group mothers.

5.2. Social Characteristics of the Respondents

5.2.1 Types of Family

Family type is another important factor which plays a role in child immunization. In this sample survey, it has been found that children from joint families record better immunization coverage than those who are from nuclear families. Both the districts of Jamui and Aurangabad record higher immunization coverage for respondents from joint families. Children from joint families record 61.8 per cent coverage in Jamui and 68.5 percent coverage in Aurangabad districts. On the other hand, respondents from nuclear families record 50 per cent coverage in Jamui and 64.3 per cent coverage in Aurangabad.

Table 5.4 Child Immunization by Type of Family, Bihar, Jamui and Aurangabad (2015)

Child Immunization by Type of Family, Bihar, Jamui and Aurangabad (2015)				
	Jamui		Aurangabad	
Type of Family	No. of Cases	Percentage	No of Cases	Percentage
Joint Family	76	61.8	50	68.5
Nuclear Family	89	50.0	146	64.3
Chi-Square Test	0.043		0.514	

Source- Computed from Primary Survey (2015)

Secondary literature states that joint families offer better cooperation by other family members. Secondly joint family households have higher household income and greater control over resources. On the other hand, nuclear families face specific issues like time constraint and lack of manpower. This problem is acute in agrarian families, where both parents work as agricultural labourers and mothers' get little time to bring their children for immunization (Thomson, Hanson & McLanahan, 1994).

5.2.2. Social Groups

Table 5.5 Child Immunization by Social Group, Bihar, Jamui and Aurangabad (2015)

Child Immunization by Social Group, Bihar, Jamui and Aurangabad (2015)				
	Jamui		Aurangabad	
Caste Groups	No. of Cases	(Percent) Immunized	No of Cases	(Percent) Immunized
General Caste	23	63.9	51	82.3
Other Backward Caste	53	57.0	35	70.0
Extremely Backward Caste	31	55.4	55	65.5
Scheduled Caste	57	50.9	46	53.5
Chi-Square Test	.470		.003	

Source- Computed from Primary Survey (2015)

Both Jamui and Aurangabad districts record highest immunization coverage for General Caste population. In Jamui district, General caste group record 63.9 per cent child immunization coverage. Other backward caste record 57.0 per cent coverage, Extremely Backward caste 55.4 per cent, Scheduled caste record 50.9 percent child immunization coverage.

Similarly in Aurangabad district, General caste group record highest immunization coverage with 82.3 per cent, followed by OBC (70.0 per cent), EBC (65.5 per cent), SC (53.5 per cent). Caste factor is significant in Aurangabad but not in Jamui. Scheduled Caste population faces discrimination in the access to public healthcare facilities (Acharya, 2010). High illiteracy, poverty, lack of knowledge regarding child immunization and unawareness might be causes of low immunization among deprived sections of the society. Secondly their occupation (agricultural labour, manual worker, cultivator) and nature of work could be the underlying factors for low immunization coverage among the deprived population.

5.2.3 Religious Groups

Table 5. 6 Full Immunization by Religious Group, Bihar, Jamui and Aurangabad (2015)

Full Immunization by Religious Group, Bihar, Jamui and Aurangabad (2015)				
	Jamui		Aurangabad	
Religious Group	No. of Cases	Percentage Immunized	No of Cases	Percentage Immunized
Hindu	163	55.07	188	65.72
Muslims	00	00	8	52.06

Source- Computed from Primary Survey (2015)

In this sample size, Jamui has no Muslim household, only Aurangabad has eight Muslim households. Aurangabad, Muslim households record lesser immunization coverage (52.06 per cent) than that of their Hindu counterparts. Child health care activities are unequally distributed between mother and father in Indian society. Fathers are hardly involved in child care activates.

A 26 years old Muslim woman Aurangabad district told that she never got support from her husband and in-laws for child immunization. Moreover, she was not allowed to go outside without the permission of her in-laws. The society, as well as the community, does not like women who frequently go out without the permission of her husband and in-laws. Therefore, she could not bring her children for immunization. She also added that her husband never shared the duty of childcare as it is women's job and he thinks that his job is to earn money and bring food, clothes and other necessary things from the market. (Cases study 5.1)

Strong patriarchal society is not conducive to women's physical, educational, social, economic and others empowerment. Muslims women have very less interaction with rest of the non -Muslim women. So information regarding child immunization and other maternal and child health care programmes and schemes cannot reach to the Muslims household. The rate of social change is very slow in a Muslim community.

5.2.4 Father's Educational Level

Table 5.7 Child Immunization and Father's Education, Bihar, Jamui and Aurangabad (2015)

Child Immunization and Father's Education, Bihar, Jamui and Aurangabad (2015)				
	Jamui		Aurangabad	
Educational Level	No. of Cases	Percentage	No of Cases	Percentage
Uneducated	73	47.4	84	59.2
Primary School Level	16	55.2	27	61.4
Middle School Level	33	57.9	22	66.7
High School and Above Level	13	70.5	25	78.8
Chi-Square test	.021		.028	
<i>Source-</i> Computed from Primary Survey (2015)				

Father is the main decision maker in a household (Jahn & Aslam, 1995). The percentage of child immunization coverage increases with the increase in father's education level. Table 5.7 shows that fathers who have studied up to high school and above level records 70.5 per cent immunization coverage in Jamui district. Fathers who have completed middle school and primary school have recorded 57.9 and 55.2 per cent immunization coverage respectively, whereas uneducated father records lowest immunization coverage with 47.4 per cent.

Similarly in Aurangabad, fathers who have completed high school and above level records highest immunization coverage with 78.8 percent followed by middle school (66.7 per cent), primary school have records (61 per cent). Fathers with no formal schooling record lowest immunization coverage with 59.2 per cent. The Pearson's Chi-square test is found to be significant in both of the districts. Tuttle (1994) has noted similar observation in his study. Father's education level plays a significant role in child immunization, educated fathers' are more aware of immunization programmes and its relevance.

Cases Study: A 34 years old young man in Jamhor village in Aurangabad district has a one and half-year-old daughter. He is a graduate and is working as an agent in Life Insurance Corporation of India (LIC). He belongs to Other Backward Caste (OBC) community and agriculture is the main occupation of his household. He takes his wife and child on the bike and visits the Primary Health Centre (PHC) for vaccination on the correct time and date of immunization. He has given all vaccines to his daughter. This is despite the facts that the PHC is situated in the same village but is in the absolutely opposite direction from his house. When a question was asked, why do you go to the health centre with your wife? He answered, "I am a father, and I have the responsibility to care for my child and wife both. On the day of vaccination, PHC remains crowded; it would be difficult for my wife to stand in the queue for a long time holding the baby in her arms. So, I go to help her in carrying the child and I stand in the queue instead of her. Sometimes, the service providers speak roughly to women. Moreover, my two wheeler provides an additional advantage of transportation and also saves time." (Cases Study No-5.2). (John, & Aslam, 1995) has mentioned that child being carried by father in the presence of the mother is a very important measure of father involvement in childcare. It shows the closeness to his children because he is actively participating and spending time and energy for his family.

5.2.5 Mother's Educational Level

Table 5. 8 Child Immunization by Mother's Educational Level, Bihar, Jamui and Aurangabad (2015)

Child Immunization by Mother's Educational Level, Bihar, Jamui and Aurangabad (2015)				
	Jamui		Aurangabad	
Educational Level	No. of Cases	Percentage Immunized	No. of Cases	Percentage Immunized
Uneducated	90	46.6	135	62.2
Primary Level	8	61.5	19	65.5
Middle Level	23	63.9	11	68.8
High School and Above	44	74.6	31	81.6
Chi-Square Test	.001		.142	

Source- Computed from Primary Survey (2015)

There is a positive correlation between maternal education and child immunization coverage. In Jamui district, the highest child immunization coverage (74.6 per cent) has been reported among the mothers who have completed high school and above level. Mothers, who have studied up to middle school and primary school records 63.9 per cent and 61.5 percent of immunization coverage, while uneducated mothers records 46.6 per cent immunization coverage. Chi-square test shows that mother's education is significant and it increases with child immunization coverage.

In Aurangabad district, mothers who have studied up to high school and above level recorded 81.6 per cent, middle school level recorded 68.8 per cent, primary level 65.5 per cent whereas uneducated mother recorded lowest immunization with 62.2 per cent.

The importance of maternal education in child immunization is also admitted by many other scholars such as **Streatfield et. al (1990), Matthews, Z., & Diamond, I. (1997)**. The following cases study shows how maternal education impacts child immunization in the study areas.

While conducting fieldwork in the village of Lohara in Aurangabad district, the research scholar came to a hamlet named Raghunathpur. The people were friendly as well as cooperative, some of them agreed to provide in-depth information about the village's infrastructure and healthcare facilities. In that group, 7-8 are women, 4-5 men and a few children. Five minutes later, a woman came to scholar and asked respectfully, 'Who are you, sir? Where are you coming from? What do you do? Why are you collecting data regarding child immunization? Why are you collecting information regarding the socio-economic condition of households? What will you do with these data and information?' She asked so many questions in one breath. The enumerator answered all the questions. She was speaking fluent Hindi, not with the Magadhi accent. She was full of self-confidence. Finally, she introduced herself and said that she is 22 years old. She has a two years old female child. She belongs to 'Musahar' community (Mahadalit or scheduled caste group) who still faced untouchability in the society. She has studied up to primary school. She has no agricultural land. She works as an agricultural labourer on others' agricultural land for her livelihood. Her husband is an also agricultural labour. Sometime she also worked in house construction, road construction for earning cash. Financial constraints did not allow her to study further

and right now she had to work either as an agricultural labourer or as a construction worker for earning her livelihood. Residing in a small kutchra house or better to say in a hut with her in-laws, husbands and children, the woman hardly could save anything from her wages. Poor she may be in wealth but not in awareness. She has received full Antenatal Care Services from the Anganwadi centre and maintained a good rapport with ASHA (during her last pregnancy). She opted for institutional delivery instead of relying on the local dais. The nearest PHC was in Rafgunj, about fifteen kilometres away from her hamlet, but still, she encouraged her husband to hire a private vehicle to go there for delivery. She also admitted that Anganwadi Workers do not bother to visit the hamlet of Mushara as it is located in the periphery of the main village. However, she herself visited the Anganwadi centre and collected the schedule of health check-ups as well as immunization routine. She is educated enough to read the English names of months written on the card and can follow the calendar for immunization schedule. (Cases Study No-5.3)

Therefore, education drastically changes the behaviours, knowledge, and attitude. Education also leads to a better awareness and progressiveness in all aspect of life. This is particularly true in cases of women and mothers.

5.3. Economic Characteristics of Surveyed Households

5.3.1. Living Standard

Table 5. 9 Child Immunization by Living Standard, Bihar, Jamui and Aurangabad (2015)

Child Immunization by Living Standard				
Living Standard	No. of Cases	Jamui	No. of Cases	Aurangabad
Low-Living Standard	89	51.4	108	61.7
Medium-Living Standard	56	57.7	60	69.8
High-Living Standard	16	66.7	28	73.7
Chi-Square Test	.288		.231	

Source- Computed from Primary Survey (2015)

Living standard is the composite index of housing characteristics and household assets which includes type of houses, number of rooms, separate room for cattle, separate kitchen, location of drinking water, toilet facility, vehicles (bicycle, motorcycle, scooter, three wheeler, four wheeler, others), television, radio, mobile, phone, electric fan, electricity availability, chair, sofa sets. Each household characteristics and household assets variable is assigned with weight and generated through the 'Z-score method.' The sample households have been divided into three categories Low, Medium and High according to the score denoting the standard of living. The living standard of household is positively associated with child immunization coverage and it is a proxy variable that shows the economic status of the surveyed households.

Both Jamui and Aurangabad record highest immunization coverage among the households having a high standard of living. In Jamui district, the highest child immunization coverage has been reported in households with high living standard (66.7 per cent), medium standard of living households experience 57.7 per cent child immunization coverage. The lowest child immunization coverage has been reported in the low standard of living households with 51.4 per cent.

A similar pattern is seen in Aurangabad district. The highest child immunization coverage has been observed in the households having a high standard of living with 73.7 per cent, 69.8 per cent in middle standard of living households and the lowest child immunization has been observed in low standard of living households with 61.7 per cent.

Coburn & Pope (1974) state that households having high living standard can provide more time to child care than others. People belonging to a rich section of the society have more time to access health care services without loss of income but, it is the inverse condition for poor people. **Shaikh & Hatcher (2004)** mentioned that poor financial condition of the household, illiteracy, low social status, large family size and cultural beliefs and practices of population groups lead to poor utilization of primary health care services.

5.3.2. Agricultural Assets Index

Table 5.10 Availability of Agricultural Assets and Child Immunization, Bihar, Jamui and Aurangabad (2015)

Agricultural Assets and Child Immunization, Bihar, Jamui and Aurangabad (2015)				
Agricultural Asset Index	No of Households	Jamui	No of Households	Aurangabad
Low	88	51.5	130	62.8
Medium	66	58.9	54	67.5
High	11	61.1	12	92.3
Chi-Square Test	.401		.085	

Source- Computed from Primary Survey (2016)

Agriculture Asset Index is a composite index. It incorporates the following variables: (a) Tractors (b) Threshers (c) Water pumps (d) Hired agricultural labourers (e) Number of cattle or livestock. These variables have been given weight and then the composite score is calculated by using the z-score technique. In Jamui district, lowest child immunization coverage has been observed in the households having a low score in agricultural assets index (51.5 per cent), households in the middle strata record 58.9 percent and households with high score in the Agricultural Asset Index records highest immunization coverage (61.1 per cent).

In Aurangabad district, highest child immunization coverage has been reported in the households having high score in agriculture assets index with 92.3 per cent followed by 67.5 percent in medium agriculture assets index and 62.8 percent in the low agriculture assets index households. Agriculture is the main economic activity in the study area and here both men and women equally participate in agricultural activities. Various types of activities have to be performed in cultivation such as ploughing, harvesting, threshing, irrigation, seeding, plantation and others which require more time and physical energy. The traditional method of agricultural practices and usage of old tools and limited resources consume maximum time and extra physical labour and energy of the parents. They get less time for child health care and child immunization. On the other hand, modern method of cultivation and agriculture practised with the help of modern tools such as threshers, tractors, water pumps, more human resources and better resources make the job easy and fast. It saves time and energy. The households having higher agricultural asset index get more time for child health care

activities. Therefore, households having high agricultural assets index experience higher child immunization coverage than households with low agricultural assets index.

5.3.3. Work Participation

Table 5. 11 Mothers Work Participation and Child Immunization Coverage, Bihar, Jamui and Aurangabad (2015)

Child Immunization by Work Status of Mother, Bihar, Jamui and Aurangabad (2015)				
Work Status	No. of Cases	Jamui	No. of Cases	Aurangabad
House Wife	103	63.6	129	72.9
Agriculture Labourers	62	44.6	67	54.5
Chi-Square Test	.001		<u>.001</u>	
<i>Source-</i> Computed from Primary Survey (2015)				

In Jamui district, mothers who are agricultural labourers experience lower child immunization coverage (44.6 per cent) than housewives (63.6 per cent). In Aurangabad district, mother participating in agricultural activities show 54.5 per cent child immunization, while housewives record 72.9 per cent. The Pearson's Chi-square test is found to be significant in both the districts.

Mencher (1986) and **Thomson, et.al. (1994)** also mentioned that work status of the mother has an inverse relationship with child's health outcome because working mothers face the dual burden and heavy workload. This problem becomes acute in the cases of socially marginalised communities because most of the women work either in the agricultural sector or in other informal activities (**Kent & MacRae, 2010**). Women who are agricultural labourers also have to do a lot of domestic work such as cooking food, cleaning house, gathering fuel, and gathering fodder, fetching water and others activities in the household. Mothers are not available for their small children for a long period, while they work. The nature of work is quite different in agriculture sector than other sectors of the economy.

A 30 years old women in Jamhor village in Aurangabad district stated that “if we do not go to work what will we eat? During the peak time of cultivation such as harvesting, weeding, plantation, and threshing and others, we have to carry our small babies to the crop fields.

We have no own agricultural land, but work in other's fields.” (Cases Study No: 5.4). **Susan E.Short et.al (2002)** explored that working women especially the daily wage labourers cannot change their job or get paid maternity leave. Thus, they like to join in their work as soon as possible after the child is born.

5.4. Other Characteristics of Respondents

5.4.1. Womens Autonomy Index

Women’s autonomy index is a composite index which includes (1) Mother’s participation in the decisions making regarding household activities, (2) Permission to go health centre alone, (3) Permission to go to the market, (4) Access to money for household expenditure 5) Access to money for spending for child healthcare.

Table 5. 12 Child Immunization and Womens Autonomy Index, Bihar, Jamui and Aurangabad (2015)

Women Autonomy Index and Child Immunization, Bihar, Jamui and Aurangabad (2015)				
Autonomy Index	No of Cases	Jamui	No of Cases	Aurangabad
Low	26	36.6	88	52.1
Medium	20	42.6	36	70.6
High	119	65.0	72	90.0
Chi-Square Test	.000		.000	

Source- Computed from Primary Survey (2015)

There is positive association between mothers’ autonomy and child immunization coverage. In Jamui district, those mothers having high autonomy in their household experience maximum child immunization with 65.0 percent, medium autonomy records 42.6 per cent coverage, those mother having low autonomy in their household records low immunization with 36.6 per cent. Similarly in Aurangabad district, those mothers having high autonomy record 90.0 per cent, middle autonomy records 70.6 per cent, and low autonomy records 52.1 percent immunization coverage.

Women who have less autonomy in financial matters face great difficulties to protect themselves and their children. Women are usually not allowed to visit the Primary Health Centre or health provider alone. Women even cannot make the decision to spend money for health care with own choice. Thus, women cannot access health service facility even during

emergency without the permission of their husbands and in-laws (Shaikh, & Hatcher, 2004).

5.4.2. Place of Delivery

Access to the healthcare facility is a crucial component which determines maternal and child health. Institutional delivery is a good indicator to show respondents' access to maternal and child healthcare system.

Table 5. 13 Place of Delivery and Immunization Coverage Bihar, Jamui and Aurangabad (2015)

Child Immunization by Place of Delivery, Jamui and Aurangabad (2015)				
Place of Delivery	No of Cases	Jamui	No of Cases	Aurangabad
Home	59	50.0	105	60.3
Government Hospital	78	57.4	78	70.3
Private Hospital	28	59.6	13	86.7
Chi-Square Test	.389		.047	

Source- Computed from Primary Survey (2015)

Table 5.13 reveals that respondents who opted for home delivery during childbirth record lowest immunization coverage (59.6 per cent), mothers who opted for government hospital record 57.4 per cent, and those who opted for private hospital record 59.6 per cent child immunization coverage in Jamui district.

In Aurangabad district, those mothers who have opted home delivery record 60.3 per cent, government hospital record 70.3 per cent, and private hospital record 86.7 per cent child immunization coverage. Therefore, the place of delivery significantly influences immunization coverage. The Pearson's Chi-square test is found to be significant in Aurangabad district but is not significant in Jamui district. A similar finding was found in the study conducted by **Mohamud et.al. (2014)** in Ethiopia that children born in hospitals or healthcare are more likely to be immunized than those who are born in their home.

5.4.3. Family Cooperation

**Table 5. 14 Family Cooperation and Child Immunization
Jamui and Aurangabad (2015)**

Family Cooperation and Child Immunization				
Family Cooperation	No of Cases	Jamui	No of Cases	Aurangabad
Yes	153	68.3	164	77.7
No	12	15.6	32	36.0
Chi-Square Test	.000		.000	

Source- Computed from Primary Survey (2015)

Those children whose mothers are accompanied by other family members in immunization process are more immunized (68.3 per cent), whereas the mothers who did not get cooperation and were not accompanied by other family members experience low child immunization with only 15.6 per cent in Jamui district. Similarly, in Aurangabad district, the highest child immunization coverage has been reported among those children whose mothers received cooperation from other family members in the household with 77.7 per cent, while those mothers who were not helped by other family member show less child immunization with 36.0 per cent. The Pearson's Chi-square test is found to be significant in both the districts.

Childcare is a very broad concept in which various types of regular medical care and non-medical care are provided to the child. This is very big and difficult task for a single inexperienced mother in a household. It is a collective work of all family members. Child immunization is one of the most important elements of child health care in which various types of vaccines and multiple doses have to given to children. Harmony and the cooperative family environment in the household make it easy. Therefore, the child accompanied and helped by other family members in the household reveals more immunization than those households where no family cooperation exists in this regard. On the other hand, family conflicts in the household create the adverse environment that brings negative impact to the child well-being (Maccoby & Martin, 1983), (Vandewater, & Lansford, 1998).

5.5. Influence of Background Characteristics on Child Immunization Jamui and Aurangabad District, Bihar 2015

Table 5.15 A Binary Logistic Regression of Influence of Background Characteristics on Child Immunization in Jamui and Aurangabad District, Bihar 2015

Influence of Background Characteristics on Child Immunization in Jamui and Aurangabad District, Bihar (2015)					
	Sig.	Exp.(B)		Sig.	Exp.(B)
Sex of Child			Social Group		
Male®			General Caste ®		
Female	.618	.899	Other Backward Caste	.013**	0.175
Birth Order			Extremely Backward Caste	.013**	0.219
1 st ®			Scheduled Caste	.007***	0.187
2 nd	.825	1.061	Living Standard		
3 rd	.079	.601	Low®		
4 th and above	.897	.941	Medium	0.849	0.925
Age of Mother			High	.002***	0.048
20-24 Year®			Agricultural Assets Index		
25-29 Year	.797	.935	Low®		
30-34 Year	.977	.987	Medium	0.416	0.693
35-39 Year	.637	1.414	High	0.172	6.086
Types of Family			Mother's Work Status		
Joint Family®			House Wife ®		
Nuclear Family	0.929	0.962	Agriculture Labourers	.025**	0.401
Father's Education			Women's Autonomy Index		
Uneducated fathers ®			Low®		
Primary Level	0.571	1.316	Medium	.001***	5.097
Middle Level	0.855	0.902	High	.000***	9.957
High School and Above	0.262	1.825	Place of Delivery		
Mother's Education			Home ®		
Uneducated Mothers ®			Government Hospital	0.269	0.634
Primary Level	0.554	0.708	Private Hospital	0.235	3.337
Middle Level	0.45	1.961	Family Cooperation		
High School and Above	0.162	2.991	Yes®		
			No	.000***	6.513
<i>Data Source-</i> Computed from Primary Survey (2015) ® Reference Category *10per cent, **5per cent, ***1per cent Level of Significance Respectively , Dependent Variable, Full Immunization (1=Yes, 0=No)					

A binary logistic regression has been performed with immunization as the dependent variables and a set of independent variables. While 'others' variables are controlled, the table reveals that social group is a significant variable. The household belonging to Other Backward Caste group is less likely (odds ratio .175 and 5 per cent significance level) to immunize their children in comparison to the General Caste group. Extremely Backward Caste is also significant and less likely to immunize their children (odds ratio is .219 and 5 per cent significance level). Similarly, Scheduled Caste group is significant and less likely to immunize their children in comparison to the General Castes (odd ratio .187 at one per cent significance level).

High living standard is a significant factor and children belonging to households with higher living standards are more likely to immunize their children than low living standard households (odd ratio .048 and 1 per cent significance level).

Mother's Work Status appeared as a significant factor. Children whose mothers are agricultural labourers are less likely to immunise their children than those children whose mothers are housewives (odd ratio.401 and 5 per cent significance level).

Woman Autonomy Index is a significant factor in child immunization coverage. Women having medium woman's autonomy index are more likely (odds ratio 5.097 at 1 per cent significance level) to immunise their children than those who have lower autonomy. Similarly, women who have a higher autonomy index are more likely (odds ratio 9.957 at one per cent significance level) to immunise their children than women in the lower and medium autonomy index.

Family cooperation has a strong significant effect on child immunization. Those children whose mothers are helped or accompanied by family members in the immunization process are more likely (odds ratio 6.513 at one per cent significance level) to immunise their children than who have are not received any cooperation.

Table 5. 16 A Binary Logistic Regression of Factors Affecting Child Immunization Coverage in Jamui District, Bihar 2015

Influence of Background Characteristics on Child Immunization in Jamui District, Bihar (2015)					
	Sig.	Exp. (B)		Sig.	Exp. (B)
Sex of Child			Social Groups		
Male ®			General Caste ®		
Female	.556	1.222	Other Backward Caste	.010***	.140
Birth Order			Extremely Backward Caste	.183	.329
1 st ®			Scheduled Caste	.390	.474
2 nd	.583	1.267	Living Standard		
3 rd	.166	.569	Low Standard®		
4 th	.327	.531	Medium Standard	.442	.721
Age of Mother			High Standard	.384	.447
20-24 Years ®			Agricultural Assets Index		
25-29 Years	.621	.824	Low®		
30-34 Years	.503	.634	Medium	.299	1.455
35-39 Years	.182	.119	High	.746	.751
Types of Family			Mother's Work Status		
Joint Family®			House Wife ®		
Nuclear Family	.371	.725	Agriculture Labourers	.002***	.244
Father's Education			Women's Autonomy Index		
Uneducated®			Low®		
Primary Level	.422	1.614	Medium	.001***	7.540
Middle Level	.495	1.369	High	.000***	25.957
High School and Above	.011**	4.068	Place of Delivery		
Mother's Education			Home ®		
Uneducated®			Government Hospital	.442	1.348
Primary Level	.634	.704	Private Hospital	.316	1.825
Middle Level	.431	1.479	Family Cooperation		
High School and Above	.006***	3.959	Yes®		
			No	.000***	15.667
<i>Data Source-</i> Computed from Primary Survey (2015)					
*10per cent, **5per cent, ***1per cent Level of Significance Respectively , ® Reference Category					
Dependent Variable, Full Immunization (1=Yes, 0=No)					

Table 5.16 presents the Binary Logistic Regression of Child Immunization (dependent variable) and a set of socioeconomic variables. When other variables are controlled fathers who have studied up to high school and above level are more likely (odds ratio 4.068 and 5 per cent of significance level) to immunize their children against vaccines preventable diseases in comparison to uneducated and less educated fathers in the study areas of Jamui district.

Maternal education is a significant variable which has a positive effect on child immunization coverage. Those mothers who are educated up-to high school and above level are more likely (odds ratio 3.945 at one percent significance level) to immunize their children than those who are uneducated

The finding of the present research demonstrates that social group is a highly significant variable. Households belonging to Other Backward Caste groups are less likely (odds ratio 0.140 at one per cent significance level) to seek child immunization in comparison to General Caste group.

Work status of women , exhibit a significant determinant in child immunization process in Jamui district. Women who are agricultural labourers are less likely to (odds ratio 0.244 at one per cent significance level) immunizes their children in comparison to the housewives.

Women's autonomy index is a highly significant factor in child immunization coverage. Women who have medium autonomy index are more likely (odds ratio 7.540 at one per cent significance level) to immunize their children in contrast to those women who have lower autonomy index. Similarly, women who have higher women autonomy index are more likely (odds ratio 25.957 at one per cent significant level) to immunise their children than lower and medium autonomy index.

Family cooperation has strong significant effect on child immunization. Those children whose mother receive cooperation and are accompanied by other family members in immunization process are more likely (odds ratio 15.667 at one per cent significance level) to immunize their children than those who do not receive so.

Table 5. 17 A Binary Logistic Regression of Factors Affecting Child Immunization Coverage in Aurangabad District, Bihar (2015)

Factors Affecting Child Immunization Coverage in Aurangabad District					
	Sig.	Exp. (B)		Sig.	Exp. (B)
Sex of Child			Social Group		
Male®			General Caste ®		
Female	.294	.697	Other Backward Caste	.020**	.184
Birth Order			Extremely Backward Caste	.025**	.248
1 st ®			Scheduled Caste	.014**	.205
2 nd	.745	.864	Living Standard		
3 rd	.027**	.319	Low Standard of Living ®		
4 th	.003***	.138	Medium Standard of Living	.747	1.150
Age Group of Mother			High Standard of Living	.005***	.056
20-24 ® Year			Agricultural Assets Index		
25-29 Year	.116	2.179	Low®		
30-34 Year	.071*	4.153	Medium	.566	.754
35-39 Year	.729	1.464	High	.149	7.954
Types of Family			Mother's Work Status		
Joint Family®			House Wife ®		
Nuclear Family	.970	.983	Agriculture Labourers	.041**	.377
Father's Education			Women's Autonomy Index		
Uneducated ®			Low®		
Primary Level	.379	1.575	Medium	.001***	4.866
Middle Level	.924	.946	High	.000***	13.171
High School and Above	.279	1.857	Place of Delivery		
Mother's Education			Home Delivery®		
Uneducated ®			Government Hospital	.191	.571
Primary Level	.484	.645	Private Hospital	.172	5.017
Middle Level	.386	2.322	Family Cooperation		
High School and Above	.092*	4.201	Yes®		
			No	.000***	6.938

Data Source- Computed from Primary Survey (2016)

*10per cent, **5per cent, ***1per cent Level of Significance Respectively, ® Reference Category

Dependent Variable, Full Immunization (1=Yes, 0=No)

A logistic regression equation has been computed for Aurangabad district where immunization has been considered as the dependent variable. When other variables are controlled, the third and fourth birth order children are less likely to be immunized (odds ratio is 0.319 at 5 per cent significance level, fourth birth order (odds ratio is 0.138 at 1 per cent significance level) than first birth order children.

Again mothers who belong to 30-34 years age group are more likely to immunize (odds ratio is 4.153 and 10 per cent significance level) their children than 20-24 years age group mothers.

Mothers who have studied up to high school and above level are more likely (odds ratio 4.201 at 10 per cent significance level) to immunise their children in comparison to illiterate mothers.

Social group appeared as a significant factor in Aurangabad district. Women who belong to Other Backward Castes are less likely to immunize (odds ratio 0.184 and 5 per cent significance level) their children than General Social group women. Similarly, Extreme Backward caste group women (odds ratio 0.248 and 5 per cent significance level) and Scheduled Caste group are less likely (odds ratio 0.205 and 5 per cent significance level) to immunise their children in comparison to General Caste group.

Standard of living is a highly significant factor in Aurangabad district regarding child immunization. Women who have a high living standard are more likely (odds ratio 0.056 and 1 per cent significance level) to immunize their children in comparison to women having low standard of living.

Work status of women demonstrates to be a significant factor in Aurangabad district. Women who work as agricultural labourers are less likely (odds ratio 0.377 and 5 per cent significance level) to immunise their children than housewives.

Women autonomy index is highly significant and has strong positive effect on child immunization coverage in the study area. Women who are at medium autonomy index are more likely (odds ratio 4.866, 1 per cent significance level) to immunize their children than those women who have low autonomy index, while those women who have high women autonomy index are more likely to (odds ratio 13.171 and 1 per cent significance level) immunise their children in comparison to those who have medium and low autonomy index.

Family cooperation is highly significant and has a strong positive effect on child immunization process. Women who are accompanied by other family members of their household in immunization process are more likely (odds ratio 6.938 and 1 per cent significance level) to immunize their children than those who does not receive any cooperation.

5.6 Partial Coverage of Immunization

5.6.1 Dropouts from Multi Dose Vaccines

Table 5.18 Percentage of Dropouts from Multi-doses Vaccines in Jamui and Aurangabad District, Bihar (2015)

Percentage of Dropouts in Multi-doses Vaccines in Jamui and Aurangabad District, Bihar (2015)				
	Jamui		Aurangabad	
	Number of cases	Percentage	Number of cases	Percentage
DPT	67	22.3	61	20.3
OPV	51	16.9	48	16.0
Hepatitis-B	93	31.0	61	20.3

Data Source- Computed from Primary Survey (2015)

Ministry of Health and Family Welfare, Government of India recommends three doses of DPT, three doses of OPV and three doses of Hepatitis-B for full immunization, but unfortunately, children were found not to uptake all recommended three doses of these particular vaccines. Table 5.18 reveals that Jamui district experiences 22.3 per cent Dropouts in the cases of three doses of DPT uptake, while this is 20.3 per cent in Aurangabad district. In the cases of three doses OPV, Jamui district experiences 16.9 per cent and Aurangabad indicates 16.0 per cent Dropouts s. Jamui district experiences a higher Dropouts rate with 31.0 per cent than Aurangabad district with only 20.3 per cent in Hepatitis-B coverage.

Table 5. 19 Percentage of Dropouts in DPT Vaccine by Background Characteristics in Jamui District, Bihar (2015)

Dropouts in DPT by Background Characteristics in Jamui District, Bihar (2015)		
Types of Family	No of Cases	Percentage
Joint Family	13	18.3
Nuclear Family	55	25.2
Father's Educational Level		
Uneducated	35	26.3
Primary Educated	8	18.0
Middle	5	15.0
High school and Above Level	10	12.0
Mother's Educational Level		
Uneducated	52	24.6
Primary Educated	5	20.0
Middle	3	18.7
High School and Above Level	5	13.5
Social Groups		
General	9	14.3
OBC	8	16.7
EBC	16	19.5
SC	24	30.4
Living Standard		
Low	45	27.1
Medium	17	20.2
High	6	15.8
Agricultural Assets Index		
Low	45	22.7
Medium	15	19.2
High	2	15.4
Women's Work Status		
Housewife	32	18.1
Agricultural Labourer	35	28.5
Womens Autonomy Index		
Low	40	24.8
Medium	10	20.0
High	13	16.5
Family Cooperation		
No	29	34.1
Yes	39	19.1

Data Source- Computed from Primary Survey (2015)

25.2 per cent Dropouts s have been recorded for the third dose of DPT vaccination in Jamui district in nuclear families as against 18.3 per cent in joint families.

Children of illiterate fathers record higher Dropouts s (26.3 per cent) followed by primary educated fathers (18.0 per cent), middle school educated fathers (15.0 per cent). Minimum Dropouts has been reported in high school and above level educated fathers (12.0 per cent).

The children of the mothers without formal schooling record higher Dropouts s (24.6 per cent), primary educated mothers (20 per cent), and middle school educated mothers (18.7 per cent). Lower Dropouts rate has been reported among high school and above level educated mothers (13.5 per cent).

Scheduled Caste group population reveal higher Dropouts rate with 30.4 per cent, Extremely Backward Caste 19.5 per cent, Other Backward Caste 16.3 per cent, and General Caste 14.3 per cent Dropouts s in vaccination of DPT.

Highest Dropouts s have been reported from the households with low living standard (27.1 percent); 20.2 per cent for medium living standard households, and 15.8 percent from the households with the highest standards of living.

Similarly, household's access to agricultural assets also defines the economic status of the respondents. Lower the score in Agricultural Asset Index, higher the rate of drop-out from the immunization schedule. Households with lowest scores in the Agricultural Asset Index recorded highest Dropouts s (22.7 per cent), followed by the middle score (19.2 per cent). Lowest Dropouts is recorded for those who have better access to agricultural assets (15.4 per cent).

Work status of the mother is another important variable. Mothers working as agricultural labourers record higher immunization Dropouts s (25.4 per cent) for their children than their non-working counterparts. Housewives record least Dropouts s (17 per cent) in DPT vaccination.

Mothers having more autonomy record low immunization Dropouts. Those children whose mothers receive cooperation from other family members in immunization process demonstrate low Dropouts s with 19.1 percent, whereas the children whose mothers do not received cooperation experience 34.1 percent Dropouts s in DPT uptake.

Table 5. 20 Percentage of Dropouts in DPT by Background Characteristics in Aurangabad District, Bihar (2015)

Dropouts in DPT by Background Characteristics in Aurangabad District, Bihar (2015)		
Types of Family	No. Cases	Percentage
Joint Family	20	16.5
Nuclear Family	40	23.4
Father's Education		
Uneducated	32	21.2
Primary Educated	5	17.8
Middle	8	14.5
High school and Above	7	12.0
Mother's Education		
Uneducated	39	20.9
Primary Educated	2	15.4
Middle	4	11.8
High School and Above	6	10.3
Social Groups		
General	5	14.3
OBC	15	16.3
EBC	12	21.4
SC	26	24.5
Religious Group		
Hindu	57	21.0
Muslim	6	35.29
Living Standard		
Low	37	21.9
Medium	18	19.1
High	2	8.7
Agricultural Assets Index		
Low	40	24.2
Medium	18	16.4
High	2	11.8
Women's Work Status		
Housewife	27	17.
Agricultural Labourer	34	25.4
Womens Autonomy Index		
Low	19	28.4
Medium	9	19.1
High	32	18.0
Family Cooperation		
No	17	22.7
Yes	43	19.8

Data Source- Computed from Primary Survey (2015)

Table 5.20 reveals that nuclear families experience higher Dropouts (23.4 per cent) in contrast to joint families (16.5 per cent) in the uptake of three doses of DPT vaccines in Aurangabad district.

The percentage of Dropouts for DPT vaccines was found to be inversely associated with father's educational level. Maximum Dropouts has been reported among those children whose father's are illiterate (21.2 per cent), 17.8 per cent Dropouts was reported among primary educated fathers, 14.5 per cent in middle school educated fathers and minimum Dropouts has been reported in high school and above level educated fathers (12.0 per cent). Illiterate mothers experience higher Dropouts (20.9 per cent), followed by primary educated mothers (15.4 per cent), middle school educated mothers (11.8 per cent), and the lower Dropouts rate has been reported in high school and above level educated mothers (10.3 per cent).

Scheduled Caste group population reveal higher Dropouts rates in the third dose of DPT vaccines uptake (24.5 per cent) followed by Extremely Backward Caste (21.4 per cent), Other Backward Caste (16.3 per cent), and General Caste (14.3 per cent).

Muslim population group experience more Dropouts rate with 25.0 per cent and Hindu population group with 20.1 per cent.

Highest Dropouts has been reported in the households with low standard of living (21.9 per cent), medium standard of living households (19.1 per cent), and the lowest Dropouts has been reported in households with high living standard (8.7 per cent).

Low agricultural assets index households indicate higher Dropouts rate with 24.2 per cent, medium agricultural assets index household with 16.9 per cent, high agricultural assets index households with 11.8 per cent. Mothers who are Agricultural labourers experience higher Dropouts rate (25.4 per cent) than housewives (17.0 per cent).

High women's autonomy index demonstrate lower Dropouts rate with 18.0 per cent, medium autonomy index with 19.1 per cent and higher Dropouts rate have been observed in low autonomy index with 28.4 per cent. Higher Dropouts rate has been reported in that household where there is no family cooperation (22.7 per cent), while households with cooperation from other family members reported only 19.8 per cent Dropouts in Aurangabad district.

Table 5. 21 Percentage of Dropouts in OPV by Socioeconomic Characteristics Jamui District, Bihar (2015)

Percentage of Dropouts in OPV by Socioeconomic Characteristics Jamui District, Bihar (2015)		
Types of Family	No of Cases	Percentage
Joint Family	21	17.1
Nuclear Family	41	23.0
Father's Educational Level		
Uneducated	32	20.8
Primary Educated	8	17.2
Middle	11	14.0
High school and Above Level	6	9.8
Mother's Educational Level		
Uneducated	40	20.7
Primary Educated	2	15.0
Middle	5	13.0
High school and Above Level	6	10.0
Social Groups		
General	5	13.5
OBC	16	17.2
EBC	12	21.4
SC	26	23.4
Living Standard		
Low	38	22.0
Medium	19	19.6
High	2	8.3
Agricultural Assets Index		
Low	42	24.6
Medium	18	16.1
High	2	11.1
Women's Work Status		
Housewife	24	14.8
Agricultural Labourer	27	19.4
Womens Autonomy Index		
Low	21	29.6
Medium	9	19.1
High	32	17.5
Family Cooperation		
No	17	22.1
Yes	45	20.1

Data Source- Computed from Primary Survey (2015)

Joint family demonstrates lower Dropouts in immunization with 17.1 per cent, whereas nuclear family experiences higher Dropouts with 23.0 per cent in vaccination of the third dose of OPV vaccines in Jamui district.

Maximum Dropouts has been reported among illiterate fathers (20.8 per cent) followed by primary educated fathers (17.2 per cent), 14.0 per cent among middle school educated fathers and minimum Dropouts have been reported among high school and above level educated fathers with 9.8 per cent.

Higher percentage of Dropouts have been reported among illiterate mothers (20.7 per cent) followed by the primary educated mothers (15.0 per cent), middle school educated mothers (13.0 per cent), and lowest Dropouts rate has been reported among high school and above level educated mothers with 10.0 per cent.

The percentage of Dropouts also varies across social groups. Scheduled castes have a high Dropouts rate (23.4 per cent) followed by Extremely Backward Caste (21.4 per cent), Other Backward Caste (17.2 per cent) and General Caste (13.5 per cent).

Highest Dropouts has been reported in households with low standard of living (22.0 per cent), medium living standard (19.6 per cent), and the lowest Dropouts has been reported in households with high living standard (8.3 per cent).

Households having low agricultural assets index indicate higher Dropouts rate with 24.6 per cent, medium agricultural assets index have a Dropouts rate of 16.1 per cent, and household with high agricultural assets index indicate the lowest Dropouts rate with 11.1 per cent in OPV vaccination among children.

Mothers who are agricultural labourer experience higher Dropouts rate with 19.4 per cent, while housewives experience 14.8 per cent.

High women's autonomy index demonstrate lower Dropouts rate with 17.5 per cent, medium women's autonomy index shows 19.1 per cent and low autonomy index presents 29.6 per cent Dropouts.

Higher Dropouts rate has been reported in that household where there is no family cooperation with 22.1 per cent, where mothers do not receive any family cooperation report 20.1 per cent Dropouts in immunization of children in Jamui district.

Table 5. 22 Percentage of Dropouts in OPV by Background Characteristics in Aurangabad District, Bihar (2015)

Dropouts in OPV by Background Characteristics in Aurangabad, Bihar (2015)		
Types of Family	No of Cases	Percentage
Joint Family	15	20.5
Nuclear Family	40	17.6
Father's Educational Level		
Uneducated	30	21.1
Primary Educated	7	15.9
Middle	4	12.1
High school and Above Level	8	10.0
Mother's Educational Level		
Uneducated	40	18.4
Primary Educated	5	17.0
Middle	2	12.5
High school and Above Level	4	10.5
Social Groups		
General	7	11.3
OBC	7	14.0
EBC	14	16.7
SC	22	25.6
Religion		
Hindu	50	17.7
Muslim	4	23.5
Living Standard		
Low	38	21.7
Medium	13	15.1
High	4	10.5
Agriculture Assets Index		
Low	37	17.9
Medium	12	15.5
High	2	15.0
Women's Work Status		
Housewife	21	11.9
Agricultural Labourer	27	22.0
Womens Autonomy Index		
Low	37	21.9
Medium	10	19.6
High	6	8.0
Family Cooperation		
No	18	20.2
Yes	29	13.7

Data Source- Computed from Primary Survey (2015)

Table 5.22 indicates that nuclear family experiences higher Dropouts (17.6 per cent) in comparison to joint family (20.5 per cent).

The percentage of high Dropouts rate in OPV vaccination is higher among illiterate fathers (21.1 per cent) followed by primary educated father experiencing 15.9 per cent, 12.1 per cent among middle school educated fathers and minimum Dropouts have been reported among high school and above level educated fathers with 10.0 per cent.

Similarly, illiterate mothers experience higher Dropouts (18.4 per cent) followed by primary educated mothers (17.0 per cent), middle school educated mothers (12.5 per cent) while high school and above level educated mother reported 10.5 per cent Dropouts.

General caste (11.3 per cent) experiences lower Dropouts with respect to OPV vaccination as compared to Other Backward Caste (14.0 per cent), Extremely Backward Caste (16.7 per cent), and Scheduled caste (25.6 per cent).

Hindu population demonstrates lower Dropouts rate with 17.7 per cent and Muslim with 23.5 per cent.

The highest Dropouts has been reported among households with low living standard (21.7 per cent), medium living standard (15.1 per cent), and high living standard reports 10.5 per cent Dropouts.

Household with Low agricultural assets index show higher Dropouts rate (17.9 per cent) followed by medium agricultural assets index (15.5 per cent), and high agricultural assets index (15.0) per cent.

Mothers who are agricultural labourers experience higher Dropouts rate with 22.0 per cent against housewives with 11.9 per cent Dropouts rate.

High women's autonomy index demonstrate lower Dropouts rate with 8.0 per cent, medium autonomy index (19.6 per cent) and higher Dropouts rate have been observed among low autonomy index with 21.9 per cent.

Higher Dropouts rate has been reported in that household in which mothers did not receive any cooperation with 20.2 percent. This figure is 13.7 percent in households where the mothers received cooperation from the family members.

Table 5. 23 Dropouts in Hepatitis-B by Socioeconomic Characteristics Jamui District, 2015

Dropouts in Hepatitis-B by Socioeconomic Characteristics Jamui, District, 2015		
Types of Family	No of Cases	Percentage
Joint Family	24	34.3
Nuclear Family	65	31.0
Father's Educational Level		
Uneducated	41	31.5
Primary Educated	12	27.7
Middle	8	24.2
High school and Above Level	15	20.0
Mother's Educational Level		
Uneducated	66	32.7
Primary Educated	8	29.0
Middle	4	25.0
High school and Above Level	8	22.0
Social Groups		
General	16	26.2
OBC	15	31.3
EBC	26	32.1
SC	24	32.0
Living Standard		
Low	56	33.9
Medium	21	26.3
High	8.0	22.3
Agricultural Assets Index		
Low Assets Index	56	29.2
Medium Assets Index	21	27.6
High Assets Index	3	25.0
Women's Work Status		
Housewife	46	26.4
Agricultural Labourer	47	38.2
Women's Autonomy Index		
Low	59	37.8
Medium	17	35.4
High	13	17.1
Family Cooperation		
No	28	34.6
Yes	50	25.0
Total		

Data Source- Computed from Primary Survey (2015)

In Jamui district nuclear family shows a lower Dropouts with 31.0 per cent, while in the joint family this is 34.3 per cent in the cases of Hepatitis-B vaccination.

Uneducated fathers experiences higher Dropouts rate with 31.5 per cent, while fathers who have studied up to primary school indicate 27.7 per cent Dropouts , 24.2 per cent by middle school educated fathers and the lowest Dropouts has been reported by those fathers who have studied up to high school and above level with 20.0 per cent.

A similar pattern has been observed in the cases of mother's educational level. The highest Dropouts rate has been reported among uneducated mothers with 32.7 per cent whereas, primary educated mothers experience 29.0 per cent, middle school educated mothers reported 25.0 per cent, and high school and above level educated mothers present exhibit 22.0 per cent Dropouts for child immunization of hepatitis-B.

Scheduled caste group (32.0 per cent) and Extremely Backward Caste (32.1 per cent) group portray higher Dropouts rate as compared to Other Backward Caste (31.3 per cent) and General Caste (26.2 per cent).

Highest Dropouts has been reported among households with low standard of living with 33.9 per cent followed by households with medium living standard (27.6 per cent). The lowest Dropouts has been reported in high living standard households (22.3 per cent).

Household with lower agricultural assets index indicate higher Dropouts rate with 29.2 per cent followed by medium agricultural assets index (19.2 per cent) and high agricultural assets index present 25.0 per cent Dropouts in hepatitis-B vaccination.

Mothers who are agricultural labourers experience higher Dropouts rate with 38.2 per cent than housewives with 26.4 per cent.

High women's autonomy index demonstrate lower Dropouts rate with 17.1 per cent, medium autonomy index with 35.4 per cent, while highest Dropouts rate has been observed among low autonomy index with 37.8 per cent.

Households where other family members do not cooperate with the mother in child immunization process experience higher Dropouts with 34.7 per cent, whereas lower Dropouts rate with 25.0 per cent has been observed where mothers receive cooperation for child immunization in Jamui district.

Table 5. 24 Percentage of Dropouts in Hepatitis-B by Background Characteristics in Aurangabad District, Bihar (2015)

Dropouts in Hepatitis-B by Background Characteristics in Aurangabad, Bihar (2015)		
Types of Family	No of Cases	Percentage
Joint Family	37	31.4
Nuclear Family	63	37.1
Father's Educational Level		
Uneducated	43	29.0
Primary Educated	7	25.0
Middle	12	21.8
High school and Above Level	10	17.5
Mother's Educational Level		
Uneducated	70	37.6
Primary Educated	4	30.8
Middle	8	24.2
High school and Above Level	12	21.4
Social Groups		
General	4	11.1
OBC	34	37.4
EBC	21	40.4
SC	39	37.1
Religion		
Hindu	81	30.6
Muslim	5	33.0
Living Standard		
Low	57	34.5
Medium	23	24.7
High	5	4.3
Agricultural Assets Index		
Low	58	35.4
Medium	33	31.1
High	5	27.0
Work Status		
Housewife	39	25.0
Agricultural Labourer	61	46.2
Women's Autonomy Index		
Low	23	32.4
Medium	12	27.0
High	41	23.5
Family Cooperation		
No	31	44.3
Yes	69	31.7

Data Source- Computed from Primary Survey (2015)

In the cases of Aurangabad district, joint family system presents lower Dropouts with 31.4 per cent as compared to the nuclear family system with 37.1 per cent.

Illiterate father (29.0 per cent) shows high Dropouts followed by the primarily educated fathers (25.0 per cent), middle school educated fathers (21.8 per cent) and minimum Dropouts have been reported among high school and above level educated father with 17.5 per cent.

Mothers who are uneducated (37.6 per cent) also show higher Dropouts followed by primary educated mothers (30.8 per cent), middle school educated mothers (24.2 per cent), and lowest Dropouts rate has been reported among high school and above level educated mothers with 21.4 per cent regarding hepatitis-B vaccination.

Higher Dropouts rate has been observed among Scheduled Caste Group (37.1 per cent) followed by Extremely Backward Caste (40.4 per cent), Other Backward Caste (37.4 per cent), and General Caste (11.1 per cent).

Muslim population group experience more Dropouts rate with 40.0 per cent against Hindu population group with 34.6 per cent.

Households with Low living standard present high Dropouts rate with 34.5 per cent, medium living standard with 24.7 per cent, and the lowest Dropouts has been reported in high living standard with only 4.3 per cent.

Those households having low agricultural assets index show higher Dropouts rate with 35.4 per cent, whereas the households having medium agricultural assets index exhibit 31.1 per cent, and high agricultural assets index report 27.0 per cent.

Mothers who are agricultural labourers (46.2 per cent) experience higher Dropouts rate compared to housewives (25.0 per cent).

Mothers belonging to high women's autonomy index demonstrate lower Dropouts rate with 23.5 per cent, while medium autonomy index exhibit 27.0 per cent and higher Dropouts rate have been observed in low autonomy index with 32.4 per cent.

Higher Dropouts rates (44.3 per cent) have been reported in those households where no family member cooperates with the mother in child immunization process, whereas, lower Dropouts rate with 25.0 per cent has been observed, where mothers receive cooperation from family members in immunization their children.

5.6.2 Reasons for Incomplete Immunization

Table 5. 25 Reasons for Dropouts in Immunization, Bihar (2015)

Reasons for Drop-out in Immunization, Bihar (2015)		
Reasons	No of Cases	Percentage
Mother had no time	22	14.29
Child was sick	14	9.09
Child was teething	12	7.79
Forgot date of vaccination	11	7.14
Child had gone to relative's house	6	3.90
Fear of side effects	9	5.84
Mother was sick	11	7.14
No knowledge regarding multi dose vaccines	13	8.44
OPV is only vaccine	9	5.84
Anganwadi worker did not informed	14	9.09
Anganwadi/ASHA / ANM did not visit in our hamlet	8	5.19
ANM/ANGANWADI not available on the day of vaccination	9	5.84
Large number of vaccines and dose	7	4.55
All vaccines not significant	6	3.90
Other factors	3	1.95
Total number of dropouts	154	100.00

Data Source- Computed from Primary Survey (2015)

Various reasons have been reported for Dropouts in multi dose vaccines in the study areas. Table 5.25 reveals that 14.29 per cent mothers reported that they did not have time for immunising their children. During the field survey, a thirty years old respondent from Amma village, Jamui said, *“I do not have time to bring my child for immunization. I have to manage both household chores and the field. So, I skipped the next dosages of DPT; I think only one dose is enough for my child.”*

About 9.09 percent children could not be fully immunized because the child was sick at the date of vaccination, 7.7 per cent children were teething on the date of vaccination. About 7.14 per cent mothers mentioned that they had forgotten the date of vaccination because there is a long interval between two vaccination dates. *A 35 years old lady in Amma Sarari village in Jamui district said that “I am not educated enough to read the names of the English months. How do I recall the next day of vaccination?”*

About 3.9 per cent children had gone to the relative's house (maternal home) on the day of vaccination, 5.84 per cent mother had expressed side effects after vaccination. 7.41 per cent mother were sick on the date of vaccination. Nearly 8.44 per cent respondents mentioned that they had no knowledge of multi doses of vaccines. 5.81 per cent respondents thought that OPV is enough for their child's immunization. Nearly 9.09 per cent complained that neither Anganwadi worker nor ASHA informed them, while vaccination was being administered. Similarly, 5.19 per cent mothers stated that Anganwadi / ASHA workers never visit their hamlets, even though their hamlet is under the same Anganwadi centre. 5.84 per cent respondents visited the vaccination booth but neither the ANM nor ASHA were available. 4.55 per cent mothers forgot the total number of vaccines and the total number of doses to be administered.

A thirty years old male respondent from Lohara village of Aurangabad district said, "The long list of immunization confused us. We are not educated enough to read all the difficult English names of diseases, their vaccine names as well as the booster doses. Therefore, we face trouble in recalling the next date of vaccination. Moreover, we are more concerned about the frequently occurring diseases like pneumonia, diarrhoea and so on; but their vaccination is not available."

From this interview, it is clear that the service providers do not make any effort to create awareness among the people regarding the life-threatening nature of Polio, Diphtheria and other vaccines preventable diseases.

About 3.9 per cent women mentioned that all vaccines are not important because these diseases do not occur in their village. Some are very rare. 1.90 per cent gave other reasons for discontinuation of vaccination.

5.7 Conclusion

Sex differentials can be seen in the cases of child immunization coverage in both the districts. Female children are comparatively less immunized than male children. There is an inverse relationship between birth order and child immunization coverage in both of the districts. Children who belong to first birth order are more immunized than rest of the high birth order children in both districts. In Jamui district, very young mothers experience better child immunization than older age group mothers. There is no difference between 30-34 years age

group and 35-39 years age group mothers. In Aurangabad district, highest child immunization coverage has been observed in 20-24 and 30-34 years old age group mothers.

Children living in joint families are more immunized as compared to those living in the nuclear families in both districts. Aurangabad district demonstrates higher child immunization coverage than Jamui district. The figures for nuclear family are closer to joint family in Aurangabad district. On the other hand, there is a wide gap observed between the joint family and nuclear family regarding child immunization coverage in Jamui district.

Father's educational level positively influences child immunization coverage. The percentage of child immunization increases with father's educational level. Children whose fathers have studied up to high school and above are more immunized in comparison to uneducated fathers in both districts. There is a wide gap between uneducated and high school educated fathers.

Mother's educational level also appeared to be a significant predictor, and positive correlation has been observed in both the districts regarding vaccine uptake. Women, who have studied up to high school and above have performed well in immunization of children as compared to illiterate mothers.

Social group has appeared as a significant factor in both the districts but it is more significant in Aurangabad district in comparison to Jamui district. Child immunization coverage varies with social stratification which shows a declining pattern from General caste to Scheduled Caste. Therefore, children belonging to the deprived section of the society are more prone to incomplete immunization. The children belonging to lower caste group presents low immunization coverage than General Caste group.

Children belonging to the minority section of the society are less immunized in contrast to the majority sections of the society.

Living standard emerged as another highly significant determinant for child immunization coverage in Aurangabad district, whereas it is not significant in Jamui district. Highest child immunization coverage has been observed in households with high living standard..

Work status of mothers negatively influence child immunization coverage in both the district. Those women who are agricultural labourers could not immunize their children. Thus, the lowest child immunization coverage has been recorded among those children whose mothers work as agricultural labourers for their livelihood in the study areas.

Women's autonomy index appeared as the most significant determinant factor in child immunization coverage in both Jamui and Aurangabad district. Higher women's autonomy index has a strong positive effect on vaccines uptake. Highest child immunization coverage has been recorded among those children whose mothers have acquired higher autonomy in the household. On the other hand, a lower women's autonomy discourages child immunization and indicates poor child immunization coverage in the study areas.

The finding reveals that the non institutional delivery leads to low child immunization. Those children who have been born at home are less immunized against those children who have been born in the Government hospital or in private hospital.

Family cooperation is a highly significant factor in both the districts and has a positive effect on child immunization coverage. Highest child immunization coverage has been recorded among those children whose mothers have received co-operation from other family member in immunization process.

The logistic regression analysis results reveal that the father and mother of the child who have studied up to high school and above, high women's autonomy index, work status, and family cooperation are found to be significant predictors for child immunization coverage in Jamui district. In Aurangabad district, mother's educational level, social group, high living standard, mother's work status, women's autonomy index and family cooperation have been found to be important predictors in child immunization coverage.

Jamui district experiences higher Dropouts rate with respect to three doses of DPT. There is no large gap between Jamui and Aurangabad district in cases of Dropouts in three doses of OPV. Jamui and Aurangabad are almost equal in terms of Dropouts rate in OPV. In the cases of hepatitis-B, Jamui has higher Dropouts rate in comparison to Aurangabad district.

The Dropouts rate in cases of multi dose vaccines is not equally distributed among various households with different socioeconomic characteristics in the study areas. Children who

belong to nuclear family system experience more Dropouts rate in both the districts. The parents who have studied up to high school and above experience less Dropouts rate. Children who belong to the deprived sections of the society suffer more from Dropouts. Higher Dropouts rate has also been observed among minority sections of the society. Children who belong to households with high living standard experience low Dropouts rates. The households having high agricultural assets index indicate less Dropouts in child immunization coverage. Mother having less autonomy in the households, experience high Dropouts rates than those having high autonomy. The cooperation of other family members in household discourages the Dropouts rate in the utilisation of all recommended vaccines. Therefore, it can be said that the socio-economic characteristics of households are important predictors in child immunization coverage in both the districts. The socio-economic characteristics of households are more positively influential in Aurangabad district in comparison to Jamui district. In Aurangabad district, better socio-economic status of households leads to higher child immunization coverage.

Additionally, the socio-economic characteristic of households is also responsible for drop out in multi dose vaccines uptake in Jamui and Aurangabad districts. In Jamui district the low socio-economic status of households result in high Dropouts rate in DPT, OPV, and Hepatitis-B vaccines. In most of the socio-economic variables of the households, higher Dropouts rate in Jamui district has been observed, whereas in Aurangabad most of the socio-economic variables demonstrate comparatively low Dropouts rate in utilisation of DPT, OPV and Hepatitis-B. Therefore Aurangabad district experiences less Dropouts rate in multi dose vaccines uptake.

References

- Acharya, S. (2010). Caste and patterns of discrimination in rural public health care services. *Blocked by Caste: Economic Discrimination in Modern India (New Delhi: Oxford University Press, 2010)*, 208-229.
- Acharya, S., & Kanitkar, T. (1995). Maternal and child mortality: a study of village Nirpura district Meerut (UP). Research Series 95. Mumbai: IIPS.
- Arif, G. M. (2004). Child health and poverty in Pakistan. *The Pakistan Development Review*, 211-238.

- Arnold, F., Choe, M. K., & Roy, T. K. (1998). Son preference, the family-building process and child mortality in India. *Population Studies*, 52(3), 301-315.
- Baru, R. V. (1998). *Private health care in India: social characteristics and trends*. New Delhi: Sage Publications.
- Baru, R., Acharya, A., Acharya, S., Kumar, A. S., & Nagaraj, K. (2010). Inequities in access to health services in India: caste, class and region. *Economic and Political Weekly*, 49-58.
- Bhatia .J.C. and Cleland J. (1995) “Determinants of maternal care in region of south india”, *Health Transition Review*, 5(2) 127-142
- Coburn, D., & Pope, C. R. (1974). Socio-economic status and preventive health behaviour. *Journal of Health and Social Behavior*, 67-78.
- Elo, I. T. (1992). Utilization of maternal health-care services in Peru: the role of women's education. *Health Transition Review*, 49-69.
- Jahn, A., & Aslam, A. (1995). Fathers' perception of child health: a cases study in a squatter settlement of karachi, Pakistan. *Health Transition Review*, 191-206.
- Kent, R., & MacRae, M. (2010). Agricultural livelihoods and nutrition—exploring the links with women in Zambia. *Gender & Development*, 18(3), 387-409.
- Kumar, D., Aggarwal, A., & Gomber, S. (2010). Immunization status of children admitted to a tertiary-care hospital of north India: reasons for partial immunization or non-immunization. *Journal of Health, Population And Nutrition*, 300-304.
- Maccoby, E. E., & Martin, J. A. (1983). Socialization in the context of the family: Parent-child interaction. *Handbook of child psychology: formerly Carmichael's Manual of child psychology/Paul H. Mussen, editor*.
- Matthews, Z., & Diamond, I. (1997). Child immunized in Ghana: the effects of family, location and social disparity. *Journal of Biosocial Science*, 29(03), 327-343.
- Mencher, J. P. (1980). The lessons and non-lessons of Kerala: Agricultural labourers and poverty. *Economic and Political Weekly*, 1781-1802.
- Merten, S. et.al.(2015). Gender determinants of vaccination status in children: evidence from a meta-ethnographic systematic review. *PloS one*, 10(8), e0135222.
- Mohamud, et.al. (2014). Immunization coverage of 12–23 months old children and associated factors in Jijiga District, Somali National Regional State, Ethiopia. *BMC Public Health*, 14(1), 865.
- Navaneetham, K., & Dharmalingam, A. (2002). Utilization of maternal health care services in Southern India. *Social Science & Medicine*, 55(10), 1849-1869.

- Nilanjan, P. (2006). Universal Immunization programme in India: the determinants of childhood immunization. this paper was presented at the 42nd Annual Conference (5-7 Jan, 2006) of The Indian Econometric Society (TIES), held at GND Univ., Amritsar, India.
- Nwakoby, B. N. (1994). Use of obstetric services in rural Nigeria. *Journal of the Royal Society of Health*, 114(3), 132-136.
- Padmanabha, P. (1992). Integrating family welfare and development programmes: some organisational considerations. *Economic and Political Weekly*, 89-91.
- Pande, R. P. (2003). Selective gender differences in childhood nutrition and immunization in rural India: the role of siblings. *Demography*, 40(3), 395-418.
- Penchansky, R., & Thomas, J. W. (1981). The concept of access: definition and relationship to consumer satisfaction. *Medical Care*, 19(2), 127-140.
- Raghupathy, S. (1996). Education and the use of maternal health care in Thailand. *Social Science & Medicine*, 43(4), 459-471.
- Schaffer, S. J., & Szilagyi, P. G. (1995). Immunization status and birth order. *Archives of pediatrics & Adolescent Medicine*, 149(7), 792-797.
- Shaikh, B. T., & Hatcher, J. (2004). Health seeking behaviour and health service utilization in Pakistan: challenging the policy makers. *Journal of Public Health*, 27(1), 49-54.
- Short, S. E., Chen, F., Entwisle, B., & Fengying, Z. (2002). Maternal work and child care in China: a multi-method analysis. *Population and Development Review*, 28(1), 31-57.
- Shrivastwa, N., Gillespie, B. W., Kolenic, G. E., Lepkowski, J. M., & Boulton, M. L. (2015). Predictors of vaccination in India for children aged 12–36 months. *American Journal of Preventive Medicine*, 49(6), S435-S444.
- Singh, P. K. (2013). Trends in child immunization across geographical regions in India: focus on urban-rural and gender differentials. *PLoS one*, 8(9), e73102.
- Streatfield, K., Singarimbun, M., & Diamond, I. (1990). Maternal education and child immunization. *Demography*, 27(3), 447-455.
- Thomson, E., Hanson, T. L., & McLanahan, S. S. (1994). Family structure and child well-being: Economic resources vs. parental behaviors. *Social Forces*, 73(1), 221-242.
- Tupasi, T. E., Velmonte, et al. (1988). Determinants of morbidity and mortality due to acute respiratory infections: implications for intervention. *Journal of Infectious Diseases*, 157(4), 615-623.
- Vandewater, E. A., & Lansford, J. E. (1998). Influences of family structure and parental conflict on children's well-being. *Family Relations*, 323-330.

Role of Health Infrastructure and Health Functionary in Child Immunization

6.0 Introduction

Subsidised and free public healthcare to all was no doubt the result of the Alma-Ata Conference, which promoted social justice and right to better health for all. The introduction of 'tiered healthcare system' in India was the obvious outcome of the conference. The introduction of the Primary Health Centres (PHC) placed all Indian citizens in the centre of the public healthcare system. The main function of the PHC is to provide basic medicines to the local people and to refer the critical cases to the urban hospitals. These centres not only provide curative medicines; but also distribute preventive medicines and vaccines against various fatal diseases (**Ransom et al., 2012**). PHCs are the cornerstone in the National Rural Health Mission (NRHM) and help in the implementation of various health schemes formulated by the Centre as well as the State Government. Substantial increase in the number of PHCs in the rural areas has reduced the infant and child mortality rates in the last five decades (**Shamkar & Katharia, 2004**). However, this impact is not uniform across the states; but a huge regional variation is noted in terms of health outcomes; which may be the result of unequal distribution and development of healthcare infrastructure across India. Successful implementation of public healthcare system depends on a number of factors ranging from economic input to infrastructural inputs like the regular supply of medicines, equipment, power, water and personnel (**Kumar, 2013**). Apart from inadequate infrastructure, PHCs face other issues like overcrowding and inadequate knowledge regarding new diseases emerging from industrialisation and environmental pollution (**Gopalan, 1994**). Therefore, India's public healthcare system is constantly facing the problems of inadequate reach to the majority of its population. Sincere governmental efforts towards universal immunisation has made the country polio-free and tackled other infectious parasitic diseases like Malaria, Tuberculosis, Leprosy, Smallpox and Plague (**Subitha, 2011**). However, the country still records high infant and child mortality as well as maternal mortality. Other health related problems like low weight and anaemia are still major issues in some states. Though ICDS scheme aims to promote universal access to Antenatal Care (ANC) and Post Natal Care (PNC) by providing cash incentives to the poor families for choosing institutional delivery during pregnancies instead of traditional practices; but still the coverage of these

services is low in some regions. Bihar is one of the states which records low coverage of ANC, PNC, institutional delivery and other MCH (Maternal and Child Healthcare) services. Child immunisation on the other hand records an almost universal coverage; but some parts of Bihar still records low coverage. Therefore, in this chapter, the status of healthcare infrastructure in the study districts has been analysed on the basis of secondary data. Deficiency of healthcare services is identified by using the following formula:

Methodology

Required health Sub Centre (SC) = Total Population of Bihar /5000

Deficit SC = Required SC - Existing SC

*Percentage Deficit of SC = Deficit SC/Required SC*100*

*Required Additional Primary Health Centre (APHC) = Total Population of Bihar/30000**

Deficit APHC = Required APHC-Existing APHC

*Percentage Deficit of APHC = Deficit APHC/Required APHC*100*

Required Primary Health Centre (PHC) = Total Population of Bihar/3,0000

Deficit PHC = Required PHC-Existing PHC

*Percentage Deficit of PHC = Deficit PHC/Required PHC*100*

*Required Community Health Centre (CHC) = Total Population of Bihar/1,20,000**

Deficit CHC = Required CHC -Existing CHC

*Percentage Deficit of CHC = Deficit CHC/Required CHC*100*

Required Sub-Divisional Hospital (SDH) = Total Population of Bihar/500000

Deficit SDH = Required SDH-Existing SDH

*Percentage Deficit of SDH = Deficit SDH/Required SDH*100*

6.1. The Number of Healthcare Units

The 'Health Care System' (HCS) in the rural India has been developed as part of a three-tier system, at the lowest level, the Sub Centre (SC), at the second tier the Primary Health Centre (PHC) and the top, the Community Health Centre (CHC). All these healthcare units are established as per the population norms set by the Government.

**Table 6:1 Availability of Various Health Care Units in India and Bihar
(31 March 2015)**

Availability of Various Health Care Units in India and Bihar (31 March 2015)		
Health Centre	India	Bihar
Sub Centre (SC)	1,53,645	9729
Primary Health Centre (PHC)	25,268	533
Additional Primary Health Centre (APHC)	NA	1243
Community Health Centre (CHC)	5,396	70
Sub- Divisional Hospital (SDH)	1,022	45
District Hospital (DH)	763	36
Mobile Medical Units (MMU)	1,253	07
<i>Source-</i> Rural Health Statistics, MoHFW, Statistics Division, Government of India (31 March 2015)		

Data reveals that there are total 1, 53, 645 Sub Centres, 25268 Primary Health Centres (PHC), and 5396 Community Health Centres (CHC) functioning in the country. In addition, there are 1022 Sub-Divisional Hospitals (SDH), 763 District Hospitals (DM), 1253 Mobile Medical Units (MMU) also operating to provide health care services to the rural and urban population in the country. In Bihar, there are 9729 Sub Centres (SC), 533 Primary Health Centres (PHC), 1243 Additional Primary Health Centres (APHC), 70 Community Health Centres (CHC), 45 Sub-Divisional Hospitals (SDH), 36 District Hospitals 9 (DH), and only 7 Mobile Medical Units (MMU) that are functioning (Rural Health Statistics, 2015).

6.2 Deficit of Various Public Health Care Units in Bihar

Table 6: 2 Required and Deficit of Public Health Care Units in Bihar, 2015

Required and Deficit of Public Health Care Units in Bihar, 2015				
Health Centre	Existing	Required	Deficit	Percentage Deficit
Sub Centre	9729	20819	11090	53
Additional Primary Health Centre	1243	5205	3962	76
Primary Health Centre	533	3470	1587	46
Community Health Centre	70	867	797	92
Sub- Divisional Hospital	45	208	163	78
<p><i>Source-</i> Rural Health Statistics, MoHFW, Statistics Division, Government of India (March 2015)</p> <p><i>Required SC/APHC/PHC/CHC/SDH= Total Population of Bihar /5000,30,000/30,000/1,20000/5,00000</i></p> <p><i>Deficit= Required SC-Existing SC,</i></p> <p><i>Percentage Deficit= deficit/Required*100</i></p> <p>Total population of Bihar (Census 2011) - 104,099,452</p>				

6.2.1 Sub Centres

The Sub Centre is the lowermost or grassroots level unit in the Public Health Care System and the cornerstone of delivering free basic healthcare services to the local people. The Sub Centre (SC) provides maternal and child health care services, family planning advice and methods, nutritional supplements, immunization and treatment for diarrhoea and other communicable diseases. The main purpose of the Sub Centre is to provide preventive and curative medicines and to promote basic norms of hygiene; therefore, its role is mainly 'preventive, curative and promotive' (MoHFW, 2012).

According to the Government norm, there should be a Sub Centre for every 5000 population in the plain region and for three thousand population in the hilly region or remote areas. Population norm is thus slightly relaxed in the tribal areas where villages are sparsely located. Since the study areas are located in the plain land, so, one Sub Centre has been established for every 5000 population. There are 9729 Sub Centres in Bihar, but it actually requires 20819 Sub Centres, and it is facing 53 percent deficit in this regard. The state requires 11090 units more Sub Centres.

Each Sub Centre is supposed to have one ANM (Auxiliary Nurse Midwifery), one female health worker (Lady Health Volunteer) one male health worker (multi-purpose). These

health personnel will get additional support from a medical officer posted in the nearest APHC (Additional Primary Health Centre). A Sub Centre seemed to have its own infrastructure like a proper building with rooms for medical-check-up, small OPD, waiting room, labour room, medicine shop and own sanitation facility along with the arrangement of potable drinking water. Sub Centre should not be too close to an existing sub health centre/ PHC, As far as possible, no person has to travel more than 3 Km to reach the Sub centre.

6.2.2 Primary Health Centre (PHC)

The Primary Health Centre is the place where rural population can contact for the first time to a qualified doctor for their health problems. The 'Primary Health Centre' acts as a referral unit for six Sub Centres. PHC is required to be established at the level of 30,000 population in plain areas and for every 20,000 population in hilly/tribal/desert areas and for difficult regions. Primary Health Centre is basically located in the 'CD Block' Head Quarters. There is a lack of 46 percent PHCs in Bihar, total 3470 PHCs are required in the state. Actually, there is no Community Health Centre (CHC) in Bihar. Thus, Primary Health Centres (PHCs) function as Community Health Centres for the population of one lakh (**NRHM, 2009-10**). Therefore, PHCs are overloaded with work and cannot perform various emergencies and expert services due to CHCs lack of the availability of special services and skilled technical human resources. Additional Primary Health Centre (APHC) has been formed to serve at the population of 30,000 as PHC in Bihar (**NRHM, 2009-10**). Now Community Health Centre are being establishing in every district under National Health Policy.

Gradually, APHCs are being created for every thirty thousand of population instead of PHCs and the PHCs are being converted to CHCs (**NRHM, 2009-10**)

6.2.3 Additional Primary Health Centre (APHC)

As mentioned above that 'Additional Primary Health Centres' are working as Primary Health Centre with population size of 30000 in Bihar. As per (**NRHM, 2015**) there are 1243 additional Primary Health Centres running in the state, while a total 5205 are required. It means that there is 76 percent deficit (total 3962) of APHCs in Bihar.

6.2.4 Community Health Centre (CHC)

The Community Health Centre is the third tier in the health care system in the country. The Community Health Centre provides referral health care services for Primary Health Centre. Four PHCs are covered under one Community Health Centre. A CHC is established for every 1, 20,000 population in plain areas and for every 80,000 population in hilly/tribal/desert and difficult regions. There are a total of 70 new Community Health Centre as per **NRHM March (2015)** but 867 are required in the state. Thus, there is shortage of 92 Percent Community Health Centres in the state.

6.2.5. Sub Divisional Hospital (SDH)

The Sub-district or Sub-Divisional Hospital is a secondary referral level hospital. Sub-Divisional or Sub-District Hospital is above Community Health Centre and below the District Hospital in a district. It interlinks Sub-Centre, Primary Health Centre, Community Health Centre and the highest health centre i.e. the 'District Hospital. It also reduces the work load of the district hospital and receives referred cases from Community Health Centre, Primary Health Centre and Sub-Centre, particularly of emergency obstetrics and neonatal care services from its neighbouring region. It provides antenatal care and post natal care services to pregnant women, newborn care and helps in bringing down the maternal and early neonatal and neonatal mortality. Sub-Divisional Hospitals provide health care service to about 5-6 lakh people. In some of the states, each district is sub-divided into two or three Sub Divisional hospitals comprising 30-100 beds. There are only 45 Sub Divisional hospitals in Bihar, while it required 208. There is lack of a total 163 (76 percentage) Sub Divisional Hospital in the state.

6.2.6 District Hospital (DM)

District Hospital is the topmost and largest hospital in a district that provides the health care services to the urban and rural people in a defined geographical area. District Hospital is an important component of public health care services in India. It also works as the secondary level referral centre for Sub-Centre, PHC and CHC. Every District has a District Hospital i.e 763 District Hospitals in the country as per **(MoHFW, 31 March 2015)**. The number of beds varies from 75-500 depending upon the size of the population of the district **(MoHFW,2012)**.

Bihar records an acute deficit in healthcare units at all levels. It records 53 percent deficit in SC, 76 percent deficit in APHC, 46 percent in PHC and 78 percent in District Hospital. CHC is mainly absent here and thus, PHCs and APHCs face overcrowding and burden on

infrastructure. The actual number of Sub Centre is very low because most of the Sub Centres are available only on paper, not in reality. Bihar is one of the least urbanised states and most of its population reside in the villages, while some districts record high concentration of population. In the rural areas, private healthcare units are limited in number and people mainly rely on the public ones.

6.3 Infrastructure at Various Health Care Units in Bihar

6.3.1 Human Resource at Sub Centres

Table 6: 3 Man Power at Sub Centre in Bihar (2015)

Man Power at Sub Centre in Bihar (2015)				
Human Resource	In Position	Required	Deficit	Deficit (Percent)
ANM/Health Worker (Female) at SC	18935	20819.8	1321	6.3
Health Worker Male	1074	20819.8	19746	94.8
Source- Rural Health Statistics, MoHFW, Government of India (2015) Percentage deficit of Human resource at SC in Bihar= existing human resource/ required HR*100 Required SC = Total Population/5000* Deficit = required HR-Existing HR One SC per 5000 Population (as Indian Public Health Infrastructure Norm) Source- MHFW, Statistics Division, Government of India (2015)				

Each Sub Centre is managed by two health-workers; one male and one female staff probably an ANM (Auxiliary Health Midwives) and an MPW (Male Health Worker). A Lady Health Visitor (LHV) is appointed for every six Sub Centre with the duty of supervision. Bihar has only 9729 ANMs and only 1074 male health workers. The state requires additional 20819 women health workers as well as 20919 male health workers. Therefore, the state records an acute human resource deficit in the health sector; it is 94.8 percent for the males and 6.3 percent for females.

6.2.2 Physical Infrastructure at Sub Centres

Table 6: 4 Physical Facilities at Sub Centres in Bihar (31 March 2015)

Table 6.4 Physical Facility at Sub Centre in Bihar (31 March 2015)		
Facility	Total Number	Percentage
Total Number of SC	9719	-
SC with ANM Quarter	1303	13.4
ANM Living in SC Quarter	113	8.7
Without Regular Water Supply	4875	50.1
without Electricity	6364	65.4
<i>Source- Rural Health Statistics, MoHFW, Government of India (March 2015)</i>		
<i>Percentage of Facilities= Total Number of Facilities/ Total No of SC*100</i>		

Data reveals that only 13.4 percent Sub Centres (SC) have accommodation facility available for ANM. Only 8.7 percent ANMs live in Sub Centres quarter, 50.1 percent Sub Centre have no regular water supply, and 65.4 percent SCs are without the electricity facility.

6.3.3 Human Resources at Additional PHCs and PHCs

Table 6:5 Human Resources at Additional PHCs and PHCs in Bihar (2015)

Human Resource at PHCs and APHCs in Bihar (2015)					
Human Resource	Existing	Existing (Percent)	Required	Deficit	Deficit (Percent)
Total APHC &PHC	1776	-	-	-	-
Doctors	2521	Surplus	3470	949	27
Health Assistant (Female)/LHV	358	20.0	3470	3112	90
Health Worker Male	25	1.0	3470	3445	99
<i>Source- MoHFW, Statistics Division, Government of India (2015)</i>					
<i>Required PHC and APHC = Total Population of Bihar/ 30,000</i>					
<i>Deficit= (Required PHC/APHC)- (Exist PHC/APHC)</i>					
<i>Percent Deficit= Deficit/Required*100</i>					

PHC is manned by a Medical Officer (MO) supported by 1 paramedical and other staff. It acts as a referral unit for 6 Sub Centres. It has 4 to 6 beds and has one Pharmacist, one Nurse Mid-Wife (Staff Nurse), one Health Worker (Female)/ANM, one Health Worker (Male) / HLV, one Health Educator, one Health Assistant, one UDC, one LDC, one Lab Technician, one Driver, and four staff employed in the class IVth category (MoHFW,

2015). The number of health personnel is very less at the PHCs and APHCs in Bihar. There are only 20 percent Female Health Assistant/LHV, and only one percent male health workers in position at existing Additional PHCs and PHCs. Therefore, there is a deficit of 27 percent of doctors, 90 percent female health assistants and 99 percent male health workers at the various APHCs and PHCs.

6.4. Availability and Deficit of Health Care Units in the Study Districts

Table 6: 6 Health Care Units in Aurangabad and Jamui District, Bihar (2012-13)

Health Care Units in Aurangabad and Jamui District, Bihar (2012-13)		
Various Health Centre	Aurangabad	Jamui
Sub Centre (SC)	216	279
Additional PHC	58	48
Primary Health Centre (PHC)	11	10
Sub Divisional District Hospital (SDH)	1	0
Community Health Centre (CHC)	3	0
Referral Hospital	3	3
District Hospital (DH)	1	1
Number of Anganwadi Centres	2004	1397*
Source- District Health Action Plan NRHM, Aurangabad and Jamui (2012-13), *ICDS Bihar		

Table 6.6 reveals that Jamui district has 279 Sub Centres and Aurangabad has 216 SC units, but Aurangabad has 58 APHCs and Jamui has 48 PHUC units. Jamui has 10 PHCs while Aurangabad has 11. Aurangabad has one SDH and three CHCs but Jamui has neither SDH nor CHC. Each district has one referral hospital and one District Hospital. Aurangabad district has 2004 Anganwadi centres and Jamui has 1397 units. Anganwadi centres are the main service centres which provide child immunisation.

6.4.1 Primary Health Centre in Jamui District

Table 6:7 Availability and Deficit of Primary Health Centre (PHC) in Jamui District, Bihar (2012-13)

Availability and Deficit of Primary Health Centre (PHC) in Jamui, Bihar (2012-13)						
SN	CD Block	Population	In Position	Required PHC	Deficit	Deficit (Percent)
1	Aliganj	142127	1	5	4	80
2	Barhat	93383	1	3	2	67
3	Chakai	234823	1	8	7	88
4	Gidhaur	76165	1	3	2	67
5	Jamui	227512	1	8	7	88
6	Jhajhar	270603	1	9	8	89
7	Khaira	222216	1	7	6	86
8	Laxmipur	124115	1	4	3	75
9	Sikandra	153808	1	5	4	80
10	Sono	211270	1	7	6	86
	Total	1756022	10	59	49	83
<i>Source- District Health Action Plan NRHM, Jamui (2012-13)</i>						
<i>Required 1 PHC/30,000 Population Norm</i>						
<i>Required PHC= Total Population of Jamui/30,000.</i>						
<i>Deficit= Required PHC-Existing PHC,</i>						
<i>Percentage Deficit= Deficit/Required*100</i>						

There are 10 CD Blocks in Jamui district and each Block has a PHC, which is mostly situated in the CD Block head quarter. Data reveals that there is great deficit of Primary Health Centre in Jamui district. There should be 5 PHC in *Aliganj*, 3 PHC in *Barhat*, 8 in *Chakai*, 3 in *Gidhur*, 8 in *Jamui*, 9 in *Jhajhar*, 7 in *Khaira*, 4 in *Lakshmipur*, 5 in *Sikandara*, and 7 in *Sono* Block, thereby a total 59 Primary Health Centres (PHC) are required in *Jamui* district, while only 10 Primary Health Centre are currently running in the district.

Therefore, Jamui district is facing 83 percent deficit of PHCs. Regional variations can be seen at the Block level such as 80 percent in *Aliganj*, 67 percent in *Barhat*, 88 percent *Chakai*, 67 percent in *Gidhur*, 88 percent in *Jamui*, 89 percent in *Jhajhar*, 86 percent in *Khaira*, 75 percent in *Lakshmipur*, 80 percent in *Sikandara*, and 86 percent in *Sono* Block have deficit in Primary Health Centres. Overall, all CD Blocks have a great shortage of Primary Health Centres as per the population norm as given by the Government.

6.4.2 Primary Health Centre in Aurangabad District

Table 6: 8 Availability of Primary Health Centres in Aurangabad District, Bihar (2011-12)

Availability of Primary Health Centers in Aurangabad District, Bihar (2011-12)						
SN	CD Block	Population	No of PHC	Required	Deficit	Percentage Deficit
1	Daudnagar	154490	1	5	4	81
2	Haspura	160820	1	5	4	81
3	Goh	234400	1	8	7	87
4	Rafiganj	276831	1	9	8	89
5	Obra	226007	1	8	7	87
6	Aurangabad	180949	1	6	5	83
7	Barun	200052	1	7	6	85
8	Nabinagar	281252	1	9	8	89
9	Kutumba	226599	1	8	7	87
10	Deo	173216	1	6	5	83
11	Madanpur	211329	1	7	6	86
	Total	2325945	11	78	67	86
<p><i>Source-</i> District Health Action Plan NRHM, Aurangabad (2011-12) <i>Required 1 PHC/30,000 Population as IPHS Norm</i> <i>Deficit=Required-existing PHC,</i> <i>Percentage Deficit= Deficit/Required*100</i></p>						

There are 11 CD Blocks in Aurangabad district and each Block has a PHC. There should be 5 Primary Health Centres in *Daudnagar* Block, 5 in *Haspura*, 8 in *Goh*, 9 in *Rafiganj*, 8 in *Obra*, 6 in *Aurangabad*, 7 in *Barun*, 9 in *Nabinagar*, 8 in *Kutumba*, 6 in *Deo*, 7 Primary Health Centre *Madanpur* Block that is required in *Aurangabad* district. A total 78 Primary Health Centres are required in the *Aurangabad* district, while only 11 PHCs are presently working in the district.

As per the population norm, *Aurangabad* is also facing shortage of PHCs like *Jamui* district. There is a total 86 per cent deficit of PHCs in *Aurangabad* district. At Block level, the deficit percent varies, such as, 81 per cent deficit in *Daudnagar* Block, 81 per cent in *Haspura*, 87 per cent in *Goh*, 89 per cent in *Rafiganj*, 87 per cent in *Obra*, 83 per cent in *Aurangabad*, 85 per cent in *Barun*, 89 per cent in *Nabinagar*, 87 per cent in *Kutumba*, 83 per cent *Deo*, 86 per cent in *Madanpur* Block in case of PHCs.

6.4.3 Additional Primary Health Centres in Jamui District

Table 6: 9 Availability and Deficit of Additional Primary Health Centres in Jamui, Bihar (2012-13)

Availability of Additional Primary Health Centre (APHC) in Jamui, Bihar (2013)						
SN	CD Block	Population	APHC	Required	Deficit	Percent Deficit
1	Aliganj	142127	3	5	2	37
2	Barhat	93383	4	3	-1	Surplus
3	Chakai	234823	7	8	1	11
4	Gidhaur	76165	2	3	1	21
5	Jamui	227512	4	8	4	47
6	Jhajha	270603	6	9	3	33
7	Khaira	222216	7	7	0	No deficit
8	Laxmipur	124115	4	4	0	No deficit
9	Sikandra	153808	4	5	1	22
10	Sono	211270	7	7	0	No deficit
	Total	1756022	48	59	11	18
<p><i>Source-</i> District Health Action Plan NRHM, Jamui (2012-13) <i>Required 1APHC/30,000 Population as IPHS Norm,</i> <i>Deficit=Required-existing PHC,</i> <i>Percentage Deficit= Deficit/Required*100</i></p>						

Out of the ten Blocks, six Blocks show a deficit in APHC. *Barhat* is the only Block which records surplus; *Khaira*, *Laxmipur* and **Sono** record no deficit. However, Jamui Block records the highest deficit (47 percent), followed by *Aliganj*, *Jhajha* and *Gidhaur*. There are 48 additional Primary Health Centres operating in Jamui district, while 59 are required. At the Block level, the number of additional Primary Health Centre is not equally distributed. There are 3 APHCs in *Aliganj* functioning, while 5 are required, *Barhat* has surplus APHCs because 4 are already working and only 3 are required. *Chakai* has 7 APHCs and 8 are required, *Gidhaur* has 2 APHCs, while 3 are required, Jamui Block has only 4 APHCs, while 8 are required, *Jhajha* has 6 APHC, while 9 are required, *Kaira*, *Laxmipur* and *Sona* have no requirement of additional Primary Health Centre while *Sikandara* requires more.

Therefore, there is a deficit of 37 percent in *Aliganj* Block, 11 per cent in *Chakai*, 21 per cent in *Gidhur*, 47 per cent in *Jamui*, 33 per cent in *Jhajha*, and 22 percent in *Sikandara* Block that reflects an acute dearth of Primary Health Centres in the district concerned.

6.4.4 Additional Primary Health Centre in Aurangabad District

Table 6: 10 Availability of Additional Primary Health Centre in Aurangabad District, Bihar (2011-12)

Availability of Additional Primary Health Centre (APHC) in Aurangabad District, Bihar (2011-12)						
SN	CD Block	Population	No of APHC	Required	Deficit	Deficit (in Percentage)
1	Daudnagar	154490	4	5	1	22
2	Haspura	160820	4	5	1	25
3	Goh	234400	5	8	3	36
4	Rafiganj	276831	5	9	4	46
5	Obra	226007	4	8	4	47
6	Aurangabad	180949	5	6	1	17
7	Barun	200052	5	7	2	25
8	Nabinagar	281252	8	9	1	15
9	Kutumba	226599	8	8	0	00
10	Deo	173216	6	6	0	00
11	Madanpur	211329	5	7	2	29
	Total	2325945	59	78	19	24
<p><i>Source-</i> District Health Action Plan NRHM, Aurangabad (2011-12) <i>Required</i> 1APHC/30,000 Population as IPHS Norm, <i>Deficit=Required-existing PHC,</i> <i>Percentage Deficit= Deficit/Required*100</i></p>						

A total of 59 Additional Primary Health Centre are present in Aurangabad district in various CD Blocks. The distributional pattern is quite different in various blocks of the district. Table 6.10 shows that there are 4 APHCs, while 5 are required in *Daudnagar* Block, 4 units are present in *Haspura* and 5 are required, 5 centres present in *Goh* and 8 are required, 5 centres in *Rafiganj* while 9 are required, 4 in *Obra* Block while 8 are required, 5 in *Aurangabad* while 6 are required, 5 centres are in *Barun* while 7 are required, 8 centres in *Nabinagar* while 9 are required, *Kutumba* and *Deo* have 8 and 6 centres and there is no more required APHC, 5 centres are present in *Madanpur* and 7 centres are required.

A total of 78 Additional Primary Health Centres are required in *Aurangabad* district, while only 59 centres were in position by 2015. As per population norm, *Daudnagar* has 22 percent deficit of Additional Primary Health Centres, *Haspura* has 25 percent deficit, *Goh* has 36 percent deficit, *Rafiganj* has 46 percent deficit, *Obra* has 47 percent deficit, *Aurangabad* has 17 percent, *Barun* has 25 percent, *Nabinagar* has 15 percent, *Madanpur* has 29 percent deficit of Additional Primary Health Centre in Aurangabad District.

6.4.5 Sub Centres in Jamui District

Table 6:11 Availability and Deficit of Sub Centres in Jamui District, Bihar (2011-12)

Availability of Sub Centre in Jamui District, Bihar (2011-12)						
SN	CD Block	Population	In Position	Required	Deficit	Deficit (Percent)
1	Aliganj	142127	24	28	4	16
2	Barhat	93383	16	19	3	14
3	Chakai	234823	40	47	7	15
4	Gidhaur	76165	13	15	2	15
5	Jamui	227512	25	46	21	45
6	Jhajha	270603	39	54	15	28
7	Khaira	222216	38	44	6	14
8	Laxmipur	124115	21	25	4	15
9	Sikandra	153808	26	31	5	15
10	Sono	211270	37	42	5	12
	Total	1756022	279	351	72	21

Source- District Health Action Plan NRHM, Jamui (2012-13)
*Required = Population of Block/ 5000**
Deficit= Required-existing
*Percent of Deficit=deficit/required*100*

A total 279 Sub Centres are in position in Jamui district. The regional variation can be seen at CD Blocks level regarding availability of Sub Centres. *Aliganj* has 24 Sub Centres, while 28 centres are required, *Barhat* have 16 Sub Centres while 19 centres are required, *Chakai* has 40 Sub Centres but 47 are required, *Gidhaur* has 13 Sub centres and 15 centres are required, *Jamui* has 25 Sub Centres and 46 centre are required, *Jhajha* has 39 Sub Centres and 54 are required, *Khaira* has 38 operational Sub Centres while 44 centres are required, *Laxmipur* has 21 Sub Centres and 25 centres are required, *Sikandra* has 26 Sub Centres and 31 centres are required, and *Sono* Block has 37 Sub Centres, while 42 centres are required.

A total of 279 Sub Centres are functioning in Jamui district, while 351 Sub Centres are required in Jamui district. *Aliganj* Block has 16 percent deficit of Sub Centre, *Barhat* 14 per cent, *Chakai* 15 per cent, *Gidhur* 15 per cent, *Jamui* 45 percent, *Jhajha* 28 percent, *Khaira* 14 per cent, *Sikandra* 15 per cent, *Sono* 12 per cent deficit of Sub Centre in Jamui district of Bihar.

6.4.6 Sub Centre in Aurangabad District

Table 6:12 Availability and Deficit of Sub Centre in Aurangabad District, Bihar (2012-13)

Availability and Deficit of Sub Centre in Aurangabad District, Bihar (2012-13)							
SN	CD Block	Population	Village	SC Present	Required	Deficit	Percentage of Deficit
1	Daudnagar	206808	63	15	44	29	66
2	Haspura	160350	73	16	33	17	52
3	Goh	234019	76	21	49	28	57
4	Rafiganj	310962	216	20	63	43	68
5	Obra	226407	152	17	47	30	64
6	Aurangabad	282224	164	19	58	39	67
7	Barun	199745	201	19	42	23	55
8	Nabinagar	296679	331	23	64	41	64
9	Kutumba	226579	228	26	48	22	46
10	Deo	175139	121	18	36	18	50
11	Madanpur	196310	224	14	44	30	68
	Total	2515222	1849	208	528	320	61
<p><i>Source-</i> District Health Action Plan NRHM, Aurangabad (2012-13) <i>Required = Population of Block/ 5000*</i> <i>Deficit= Required-existing</i> <i>Percent of Deficit=deficit/required*100</i></p>							

Table 6.12 reveals that total 208 Sub Centres are available in Aurangabad district, while 528 are required. Therefore, there are deficits of 61 percent Sub Centres in the district. Regional variation can also be seen at the CD Block level. Only 15 Sub Centres were there in *Daudnagar* Block while 44 are required, 16 Sub Centres are in *Haspura* block while 33 are required, 21 Sub Centre are in *Goh* and 49 required, 20 Sub Centre are in *Rafiganj* and 63 required, 17 Sub Centre are in *Obara* block and 47 are required, 19 Sub Centres are in *Aurangabad* Block and 58 centres are required. In *Barun* Block, there are 19 operational Sub Centres and 42 centres are required, *Nabinagar* has 23 Sub Centres and 64 are required, *Kutumba* has 26 Sub Centres, while 48 centres are required, *Deo* has only 18 Sub Centres, while 36 are required, *Madanpur* has only 14 Sub Centres while 44 centres are required.

While Aurangabad district has 61 per cent deficit, the deficit varies for the blocks. *Kutumba* Block has 46 per cent, *Deo* Block has 50 per cent, *Haspura* has 52 per cent, *Goh* has 57 per cent, *Obara* has 64 per cent, *Nabinagar* has 64 per cent, *Daudnagar* has

66 per cent, *Aurangabad* has 67 per cent, *Rafigunj* has 68 per cent, and *Madanpur* has 68 per cent deficit of Sub Centres.

6.5 Availability and Deficit of Human Resource in Study Districts

6.5.1 Doctors

Table 6: 13 Availability of Doctors in Jamui District, Bihar (2009-10)

Doctors in Jamui District, Bihar (2009-10)				
	Sanctioned	In Position	Vacant	Vacant (Percent)
Doctor (Regular)	99	29	70	71
Doctor(Contractual)	38	24	14	37
Total Doctors	137	53	84	61
Source- District Health Society, Jamui (NRHM) 2009-10				

Table 6.13 indicate that 61 percent positions for doctors are vacant in Jamui district, 71 per cent positions for regular doctors and 37 per cent for contractual doctors are vacant in the district. Only 29 regular doctors and 24 contractual doctors are in position in the district.

Table 6: 14 Availability of Doctors in Aurangabad District, Bihar (2011-12)

Doctors in Aurangabad District, Bihar (2011-12)				
	Sanctioned	In Position	Vacant	Vacant (Percent)
Doctor (Regular)	177	64	113	64
Doctor(Contractual)	49	32	17	35
Total	226	96	130	58
<i>Source-</i> District Health Society Aurangabad (NRHM) (2011-12)				

In the case of Aurangabad District, 64 regular and 32 contractual doctors are in position, while 64 per cent positions for regular doctors and 35 per cent for contractual doctors are vacant in Aurangabad district. While 96 doctors are in position and 58 per cent seats are vacant in Aurangabad district.

6.5.2 ANM/Nurse Grade (A) / HLV

Table 6: 15 Availability of Nurses, ANM and HLV in Jamui District, Bihar (2009-10)

ANM/Nurse Grade (A)/HLV in Jamui District, (2009-10)				
Category	Sanctioned	In Position	Vacant	Vacant (Percent)
ANM (Regular)	230	213	17	7
ANM(Contractual)	212	153	59	28
Nurse Grade(A) Regular +Contractual	98	68	30	31
HLV	29	10	19	66
<i>Source-</i> District Health Society Jamui (NRHM) 2009-10				

In case of ANM, a total of 213 regular and 153 contractual are in position and only seven per cent for regular and 28 per cent for contractual seats are vacant in Jamui district. There are 68 Nurse Grade (A) on regular and contractual in position, while 31 percent seats are vacant. In addition, 10 HLVs are in position, while 66 percent seats are vacant for HLVs in Jamui district.

Table 6: 16 Availability of Nurses, ANM and HLV in Aurangabad District, Bihar (2011-12)

Nurses, ANM and HLV in Aurangabad District, Bihar (2011-12)				
Category	Sanctioned	In Position	Vacant	Percent Vacant
ANM (Regular)	340	256	84	25
ANM(Contractual)	308	208	100	32
Nurse Grade(A) Regular	22	8	14	63
Nurse Grade(A) Contractual	128	33	95	74
HLV	23	16	7	30
<i>Source-</i> District Health Society, Aurangabad (NRHM) (2011-12)				

In Aurangabad district, 256 regular ANMs and 208 contractual ANMs are in position while 25 percent for regular and 32 percent for the contractual post are vacant. Only 8 Nurse Grade A (Regular) and three contractual Nurse Grade 'A' are in position while 63 percent seats for regular and 74 percent for contractual are vacant in the District. In addition, 16 HLVs are in position, while 30 per cent seats are vacant.

6.6 Physical Infrastructure and Amenities in Study Districts

6.6.1 Primary Health Centre

Table 6: 17 Physical Infrastructures Available at PHCs in Aurangabad District, Bihar, (2012-13)

Physical Infrastructure at PHC in Aurangabad District, Bihar, (2012-13)	
Total PHCs	11
Rented Building	00
Government Building	11
Accommodation Facility for Personnel	11
Electric Connection	11
Water Connection	11
Toilet	11
Ambulance Facility	10
<i>Source-</i> District Health Society, District Health Action Plan Aurangabad (2012-13)	

There are 11 PHCs functioning and all are housed in own Government buildings and none are in rented buildings. All PHCs have accommodation facility for health staff such as ANM/Nurse/doctor/ male health staff. All PHCs are connected with electricity and water supply, and toilet facility is also available. Furthermore, 10 Ambulances are also available in PHCs in Aurangabad district.

Table 6: 18 Physical Infrastructures at PHC in Jamui District, Bihar (2009-10)

Physical Infrastructures at PHC in Jamui District, Bihar (2009-10)		
Total PHCs	10	Percent
Rented	0	0.0
Governmental	10	100
Accommodation Facility	NA	NA
Electric Connectivity	0	00
Water connectivity	0	00
Toilet	8	80
<i>Source-</i> District Health Society, District Health Action Plan Jamui (2009-10)		

Similarly, in case of Jamui district, there are 10 Primary Health Centres functioning, in which none are in rented building and all have their own Government Building but

unfortunately, all Primary Health Centres have no water connectivity or electricity connectivity. Eight PHCs have toilet facility out of 10 PHCs.

6.6.2 Additional Primary Health Centre

Table 6: 19 Physical Infrastructure at APHC in Aurangabad Districts, Bihar (2012-13)

Physical Infrastructure at APHC in Aurangabad Districts, Bihar (2012-13)		
Total APHCs	59	Deficit Percent
Rented Building	44	75
Government Building	15	25
Accommodation Facility	10	17
Electric Connectivity	8	14
Water Connectivity	0	0.0
Sanitary/ Latrine Facility	2	3
<i>Source-</i> District Health Society, District Health Action Plan Aurangabad (2012-13)		

There are a total of 59 ‘Additional Primary Health Centres’ in Aurangabad district out of which 75 percent centres are running in rented buildings and 25 percent in the Government building. Nearly 17 per cent Additional Primary Health Centres have accommodation facilities for health staff. Only 14 per cent Additional Primary Health Centres are connected with electricity, and only 3 percent centres have sanitary latrine and no centre has water connectivity.

Table 6: 20 Physical Infrastructures at APHC in Jamui Districts, Bihar (2009-10)

Physical Infrastructures at APHC in Jamui Districts, Bihar (2009-10)		
Total APHCs	48	Percent
Rented	1	-
Government Building	17	-
Under Construction	2	-
No Building	12	-
Accommodation Facility	0	0
Electric Connection	0	0
Water Connection	0	0
Sanitary/ Latrine Facility	0	0
Ambulance	1	
<i>Source-</i> District Health Society, District Health Action Plan Jamui (2009-10)		

There is no accommodation facility for health staff at Additional Primary Health Centres in Jamui district. All additional primary health centres are not connected with electricity supply, water supply and sanitary or latrine facility in Jamui district. Only one ambulance is available for the Additional Primary Health Centres.

6.6.3 Sub Centre

Table 6: 21 Physical Infrastructure at SC in Aurangabad Districts, Bihar (2012-13)

Physical Infrastructure at SC in Aurangabad District, Bihar, 2012-13		
Total SCs	(208)	Percent
Rented	125	60
Government Building	73	35
Accommodation Facility	38	18
Electric Connection	42	20
Water Connection	0	0.0
Sanitary/Latrine Facility	38	18
<i>Source-</i> District Health Society, District Health Action Plan ,Aurangabad (2012-13)		

Data shows that there are 208 Sub Centre available in Aurangabad district out of which 60 per cent are operational in rented buildings, while only 35 per cent operate in Government buildings. Only 18 percent Sub Centres have accommodation facility for health staff. Furthermore, only 20 percent Sub Centres are connected with electricity, none of the Sub Centres have water connectivity and only 18 percent centres have sanitary or latrine facility.

Table 6: 22 Physical Infrastructure at Sub Centres in Jamui District, Bihar (2009-10)

Physical Infrastructures at SC in Jamui Districts, Bihar (2009-10)		
Total SC	279	Percent
Rented Building	20	07
Government Building	34	12
<i>Panchayat Bhavan</i>	34	12
No Building	106	38
Data Not Available	85	30
Electricity Connectivity	0	0.0
Water Connectivity	0	0.0
Sanitary/ Latrine Facility	0	0.0
Source- District Health Society, District Health Action Plan Jamui (2009-10)		

A total of 279 Sub Centres available in Jamui district in which only 7 per cent centres are functioning in rented building, 12 per cent in Government Buildings, 12 per cent in the *Panchayat Bhavan*, 38 per cent centres have no building and 30 per cent centres have no data available in Jamui district. All Sub Centres are without electricity connectivity, water connectivity, and sanitary /latrine facility.

6.7. Availability and Deficit of *Anganwadi* Centres (AWC)

6.7.1. Jamui District

Table 6.13 reveals that a total of 1397 *Anganwadi* centres functioning in Jamui district, whereas 1756 centres are required. The distribution of *Anganwadi centres* is quite uneven. In *Aligunj*, 113 *anganwadi* centres are existing, *Barhat* has only 74 centres, *Chakai* has 187 centres, *Gidhur* has only 61 centres, Jamui Block has 181 centres, *Jhajha* has 216, *Khaira* has 177 centres, *Laxmipur* has 98 centres, *Sikandra* has 122 *Anganwadi* centres and *Sono* has 168 centres.

Therefore, there are deficit of 20 per cent *Anganwadi* centres in *Aligunj*, 21 per cent in *Barhat* block, 21 per cent in *Laxmipur*, 21 per cent in *Sikandara* Block, 20 per cent in *Chaki*, 20 per cent in *Gidhur*, 20 per cent in Jamui, 20 per cent in *Jhajha*, 20 per cent in *Kahira* and 20 per cent in *Sona* block.

Table 6: 23 Availability and Deficit of Anganwadi Centres (AWC) in Jamui, Bihar (2013)

Availability and Deficit of Anganwadi Centres (AWC) in Jamui, Bihar (2013)						
SN	CD Block	Population	In Position	Required	Deficit	Deficit (Percent)
1	Aliganj	142127	113	142	29	20
2	Barhat	93383	74	93	19	21
3	Chakai	234823	187	235	48	20
4	Gidhaur	76165	61	76	15	20
5	Jamui	227512	181	228	47	20
6	Jhajha	270603	216	271	55	20
7	Khaira	222216	177	222	45	20
8	Laxmipur	124115	98	124	26	21
9	Sikandra	153808	122	154	32	21
10	Sono	211270	168	211	43	20
	Total	1756022	1397	1756	359	20
<p><i>Source-Integrated Child Development Service (ICDS 2013)</i> <i>Required = Population / 1000 Population, Deficit= In position-Required</i> <i>Percentage=Deficit/required*100</i></p>						

6.7.2. Aurangabad District

Table 6: 24 Availability and Deficit of Anganwadi Centres in Aurangabad District, Bihar (2013)

Block Wise Availability of Anganwadi in Aurangabad, Bihar (2013)						
S.N.	CD Blocks	Population	No. of Anganwadi Centres	Required	Deficit	Percentage Deficit
1	Daudnagar	154490	167	154	-13	-8
2	Haspura	160820	125	161	36	22
3	Goh	234400	185	234	49	21
4	Rafiganj	276831	237	277	40	14
5	Obra	226007	179	226	47	21
6	Aurangabad	180949	222	181	-41	-22
7	Barun	200052	161	200	39	20
8	Nabinagar	281252	239	281	42	15
9	Kutumba	226599	185	227	42	18
10	Deo	173216	138	173	35	20
11	Madanpur	211329	166	211	45	21
	Total	2325945	2004	2326	322	13.8
<p><i>Source-ICDS 2013</i> <i>Required = Population / 1000 Population, Deficit= In position-required</i> <i>Percentage=Deficit/required*100</i></p>						

There are a total of 2004 *Anganwadi* centres functioning in *Aurangabad* district, while 2326 additional centres are required. The regional variations can be seen at block level. The *Daudnagar and Aurangabad* Blocks have surplus *Anganwadi* centres. *Hanspura* Block has 125 *Anganwadi* centres, *Goh* has 185 centres, *Rafigunj* has 237 centres, *Obra* Block has 179 centres, *Barun* has 161 centres, *Nabinagar* has 239 centres, *Kutumba* has 185 centres, *Deo* has 138 centres and *Madanpur* has 166 centres.

Therefore, there is a deficit of 22 per cent in *Hanspura* Block, 21 per cent in *Goh*, 14 per cent in *Rafigunj*, 21 per cent in *Obra*, 20 per cent in *Barun*, 15 per cent in *Nabinagar*, 18 per cent *Kutumba*, 20 per cent in *Deo* and 21 per cent in *Mandanpur* Block. A total of 13.8 percent deficit of *Anganwadi* centres in the district *Aurangabad* District.

6.8 Availability and Deficit of ASHA Workers in Study District

6.8.1 Jamui District

Table 6: 25 Block Wise Availability of ASHA Workers in Jamui District, Bihar (2012-13)

Block Wise Availability of ASHA Workers in Jamui District, Bihar (2012-13)						
SN	CD Block	Population	In Position	Required	Deficit	Percentage Deficit
1	Aliganj	142127	115	142	27	19
2	Barhat	93383	55	93	38	41
3	Chakai	234823	206	235	29	12
4	Gidhaur	76165	63	76	13	17
5	Jamui	227512	203	228	25	11
6	Jhajha	270603	212	271	59	22
7	Khaira	222216	238	222	-16	-7 surplus
8	Laxmipur	124115	103	124	21	17
9	sikandra	153808	115	154	39	25
10	sono	211270	217	211	-6	-3 surplus
	Total	1756022	1527	1756	229	13
<p><i>Source-District Health Action Plan NRHM, Jamui (2012-13)</i> <i>Required one ASHA /1000 Population</i> <i>Deficit= In position-required</i> <i>Percentage=Deficit/required*100</i></p>						

There are 1527 ASHAs working in Jamui district that exhibits 13 per cent deficit. There are a total of 115 ASHAs in *Aliganj* Block, *Barahat* has only 55, *Chakai* has 206, *Gidhaur* has 63, *Jamui* has 203, *Jhajha* has 212, *Khaira* has 238, *Laxmipur* has 103, *Sikandara* has 115 and *Sono* has 217 ASHAs.

There is a shortage of 19 per cent ASHAs in *Aligunj* block , 41 per cent in *Barhat*, 12 per cent in *Chaki*, 17 per cent in *Gihdur*, 11 per cent in *Jamui*, 22 per cent in *Jhajha*, 17 per cent in *Laxmipur* and 25 per cent in *Sikandara*. On the other hand, *Sona and Khaira* have surplus ASHAs.

6.8.2. Aurangabad District

Table 6: 26 Block Wise Availability of ASHA Workers in Aurangabad District, Bihar (2012-13)

Block Wise Availability of ASHAs in Aurangabad District, Bihar (2012-13)						
SN	CD Block	Population	No of ASHA	Required	Deficit	Percentage Deficit
1	Daudnagar	154490	152	154	2	2
2	Haspura	160820	148	161	13	8
3	Goh	234400	217	234	17	7
4	Rafiganj	276831	252	277	25	9
5	Obra	226007	210	226	16	7
6	Aurangabad	180949	157	181	24	13
7	Barun	200052	189	200	11	6
8	Nabinagar	281252	264	281	17	6
9	Kutumba	226599	215	227	12	5
10	Deo	173216	161	173	12	7
11	Madanpur	211329	195	211	16	8
	Total	2325945	2160	2326	166	7
Source-District Health Action Plan NRHM, Jamui (2012-13) Required one ASHA /1000 Population Deficit= In position-required Percentage=Deficit/required*100						

On the other hand, there is only 7 per cent deficit of ASHAs in Aurangabad. A total of 2160 ASHAs are working, while 2326 are required. *Daudnagar* Block has 152 ASHAs in position, 148 ASHAs are in position in *Haspura*, 217 in *Goh*, 252 in *Rafiganj*, 210 in *Obra*, 157 in *Aurangabad*, 189 in *Barun*, 264 in *Nabinagar*, 215 in *Kutumba*, 161 in *Deo*, 195 in *Madanpur*.

Daud Nagar Block has only 2 per cent deficit of ASHA workers, *Haspura* has 8 per cent, *Goh* has 7 per cent, *Rafiganj* has 9 per cent, *Obra* has 7 per cent, *Aurangabad* has 13 per cent, *Nabinagar* and *Barun* have 6 per cent, *Kutumba* has 5 per cent, *Deo* has 7 per cent, *Madanpur* has 8 per cent deficit of ASHAs in the district.

6.9 Role of SC, PHC, *Anganwadi* and ASHA Workers in the Study Areas: A Qualitative Analysis

Public Health Centres have been also selected for primary data and information collection in both the districts. Sample villages are served by these health centres. There is a Primary Health Centre in Jamhor and a Sub Centre in Lohara village in Aurangabad district, while there is an Additional Primary Health Centre in Tajpur and a Sub Centre in Amma Sarari village in Jamui district that are operational.

Sub Centre Lohara: A Sub-Centre is supposed to have its own building with a small OPD area and an examination room. In addition, Sub Centre is expected to have the provision of a labour room, a clinic room, a waiting area and toilet room. As per IPHS norms, Sub Centre should not be too close to an existing sub-centre/ PHC. As far as possible no person has to travel more than three Km to reach the Sub-centre, some communication network should be available there (road, communication, public transport, post office and telephone). Accommodation for the ANM/Male Health Worker should be available on rent in the village, if necessary, and can vary in size from 73.50 to 100.20 square meters depending on climatic conditions. But unfortunately, there is neither own building nor a rented building for the Sub Centre in *Lohara* village which is located in *Babubigha* a hamlet of the main village (*Lohara*). It runs in the corner (*Verandah*) of a private house which has been given by a villager. Thus, there is no room for the storage of immunization box or cold chain box, medicines, medical equipment etc. There is no table, chair, and dustbin, cupboard for keeping the records and registers, no drinking water, no toilet, and no electricity. The Sub Centre is in extremely poor condition. Only one ANM is posted and there is no male health worker. A 42 years old male respondent reported that “...*the ANM never comes to the Sub Centre. She hardly comes, once or twice in a month. She visits for only maintaining formality. However, she does come on immunization day. He added that she lives in a town which is 50 kilometre away from the Sub Centre.*” She has to travel 5 km by foot from *Ismailpur* railway station to Lohara Sub Centre. There is no *kacha* or *pucca* (*metalled* or *unmetalled*) road between *Ismailpur* railway station to *Lohara* village, but now an auto runs between two. Secondly, she comes by local train which does not run on time, returning home is very difficult in the evening for her. The ANM conducts the immunisation with the help and coordination of ASHA and *Anganwadi* workers. *Vaccines* box is provided by Ambulance from Block Primary Health Centre to the *Anganwadi* centre in the village. All messages, regarding child immunization, maternal and child health care, mid day meal, antenatal care,

monthly meeting and others thing at the Sub Centre are regulated by mobile phone from Primary Health Centres and other higher authorities. Thus mobile becomes very important tool to regulate ASHA, ANM and *Anganwadi* centre in the remote areas.

Primary Health Centre, Jamhor: The second sample unit is *Jamhor* in Aurangabad district and is served by a Primary Health Centre which is situated in the village. This is an old Primary Health Centre established in 1957. Almost all the infrastructure is available in this health centre. It is operational in its own Government building which has enough rooms available to perform various health care activities. It has a large campus. Accommodation facility is available and some nurses and ANMs reside in the health centre campus. A new building has been also constructed and the old one has been repaired. The health centre is connected with electricity and regular power supply. Regular tap water supply and hand pump are also available. Separate toilet facilities are available for both males and females and are in good working condition. Therefore, ice lined refrigerator large and small, deep freezer large and small, cold box, and vaccine carriers can be maintained. A total five doctors, ten female health workers, two IVth grade staff are working at the health centre. Telephone and mobile facility are also available. Every day vaccination is being provided to infants, children and pregnant mothers. Regular health education is also provided and medical officer visits the centre and monthly meetings are organised for ANMs and nurses at Block office. But there is lack of lady doctors, surgeons, pharmacists, laboratory, lab technicians, dressers, clacks, accountants, computer operators, sweepers and other staff. Night services are also not available. In addition, ambulance is also not available for the centre. There are problems in the regular supply of medicines.

Sub Centre, Amma Sarari: There is a Sub Centre in Amma Sarari village in Jamui district. The health centre has its own building consisting of two rooms. This is an old building which needs repairing and white washing. There is no power supply in the SC. Toilet is not available in the health centre premise. A hand pump is working for drinking water in the premise. One table and two chairs are there, but there are no dustbins, cupboards and other essential medical equipment. There is a great dearth of medicines, even basic cotton and bandage is not available for dressing. Two nurses are appointed there and conduct the immunization programme with the help of Anganwadi worker and ASHA. No male health worker is available to assist the female health worker at the health

centre. However, staff maintains the keep register and maintains all records regarding child immunization, maternal immunization and others information. Nobody visits this Sub Centre for supervision. This Sub-Centre appeared to be desolate since hardly any patient comes here for treatment.

Additional Primary Health Centre, Tajpur: The fourth and last sample village Tajpur is served by an Additional Primary Health Centre which has been newly established. There is a toilet room available but needs proper maintenance. Regular water and power are supplied to the health centre. Tables, chairs, cupboards, fan, cold box, and other important items are available at the health centre. One doctor and one nurse are appointed to serve the people. There is a great dearth of human resource at the Tajpur Additional Primary Health Centre. There is no lady doctor, male health workers, dressers, clerks, accountants and other health staffs. No accommodation facility is available for health staff. Therefore, doctors and nurses do not live in the health centre. In addition, regular medicines and drugs are not provided for distribution to the required person. Ambulances and vehicles are not found to carry patients for health services. *A 43 year old male villager states that health staff does not properly preserve the medicines. A small child had died after vaccination. Health staff is careless and insensitive regarding human life.* Thus, the acceptability of Government services has disappeared in this village and people hardly avail AHPC service.

Role of Anganwadi Worker and ASHA: *The Anganwadi* centre is not only for 'Integrated Child Development Services' (ICDS) but also for the child and maternal health care and child immunisation. One *Anganwadi* centre is assigned to a population of 1000 rural and urban areas and 700 in tribal and hill areas in India (**Humirah 2011**). ICDS started in 1975 to resolve the maternal and child health issues in the country. Integrated Child Development Services (ICDS) is the largest programme in the world which is running through *Anganwadi* centres all over the country (**Humirah 2011**). Integrated Child Development Services caters to children below six-years, pregnant women, nursing mothers, and adult girls (**Sandhyarani & Rao 2013**). The *Anganwadi* centre is run by an *Anganwadi* worker (AWW) who is a part-time honorary worker. She is a woman of the same village selected by *Gram Pradhan*. The minimum educational qualification of *the Anganwadi* worker is middle school or secondary school. She is assisted by one helper who is paid an honorarium. The helper does all kinds of jobs which

are offered by *Anganwadi* centres such as mobilisation of children to attend the centre, cooking food for children, and cleaning the school and other such work. *Anganwadi* is multifunctional in nature and performs varieties of services for the society. *Anganwadi* workers provide immunisation services to below six years old children, provide supplementary nutrition to less than six years old children, provide immunisation against tetanus to all the pregnant mothers, provide supplementary nutrition to pregnant and nursing women, especially to those from the lower income group, They also provide nutrition, health education and health checkups to all women in the age group of 15-45 years, antenatal care of pregnant mothers, postnatal care, caring for newborn babies, caring for all children under 6 years of age, referrals for serious cases of malnutrition or illness to PHCs/ CHC or district hospitals, provide non-formal preschool education to children of 3-5 years of age (Humirah 2011).

Actually, one of the most important objectives of the National Rural Health Mission (NRHM) is to provide a trained female community health activist to every village of the country to gain effective, efficient and affordable healthcare to the rural population (NRHM). Accredited Social Health Activist (ASHA) bridges the gap between community and public health care system in the county. ASHA must be a resident of the village, married/widow/divorced, and minimum 10th passed and between the age group of 25 to 45 years old. Capacity building has been developed through series of training episodes to acquire knowledge, skill, and confidence to perform her works and duties in rural villages and among public health personnel. ASHA is also multifunctional in nature and has to accomplish various health and social activities. Her duties include mobilising pregnant mothers for antenatal care services and postnatal check up and escorting them for institutional delivery, mobilising children and mothers for immunisation, family planning and birth control, besides she also creates awareness for contraceptives and prevention of sexually transmitted diseases, provide ORS, vitamins A and IFA tablets to women. She also assists the ANM in Home Deliveries (**National Health Mission, Government of India**).

In depth interviews of *Anganwadi* workers reveals that she and ASHA have the most important roles in the child immunisation process. *Anganwadi* workers provide the site and conduct immunisation sessions, arrange immunisation booths and assist ANMs on the day of immunisation. She also visits each and every household and informs the family members regarding immunisation date, time and venue. She distributes immunisation cards in which the name, the dose of vaccines and month of immunisation has been

mentioned. Since *Anganwadi* belongs to the same locality thus she knows each and every household's family members, parents of children, economic status of the household, the occupation of a family member, caste and religion of household, educational level, immunisation status of children in the household. *Anganwadi* worker and ASHA continue to contact with beneficiaries of the village. A 38 year old *Anganwadi worker* in Aurangabad district stated during focus group discussion (FDG) that “*we all know and understand the importance and necessity of immunisation of children*”. They explain the name of vaccines and associated diseases, the number of doses and age child for immunisation, interval between two doses. She further added “*we also know that vaccines preventable diseases are very dangerous for children. We get knowledge and information from regular training camp which is given monthly to ASHA and Anganwadi worker by the Government*”. They have to do various types of survey such as family survey, economic survey, enlisting beneficiaries, sick and at-risk children, under- weight children, malnourished children, Census of the village and other various surveys. A 36 year old *Anganwadi worker* in Aurangabad mentioned that “*we have to maintain 22 types of registers such as Pre-school children register, Nutrition Register, Child Card, Store Register, Take Home Register (THR), Survey Register, Immunization Register, Death And Birth Register, Adult Girl Register, Growth And Monitoring Chart of Malnourished Children, Pregnant Mother Register, Family Planning, Records Regarding Kishori Shakti Yojna, Janani Surksha Yojna And others. We have to maintain and submit financial expenditure which is given to the government, maintain expenditure bills and other such work.*” It is a really very large and vast work. It needs skilled and experienced persons who can properly perform the job. A further question has been asked to the respondent “how do you perform these tasks? They answered that “*..we cannot perform this large and vast work if our husband or son or other family member does not help us.*” So, husbands, sons or other family members play a vital role in ASHA and *Anganwadi* activities. Furthermore, the problems become more critical if an *Anganwadi* worker belongs to the older age group.

All *Anganwadi* workers are facing the problems of inadequate and poor infrastructure of the centres. Most of the *Anganwadi* centres are running without own building; They operate either in *Panchayat* Building, Primary School Building, Community Hall, Rented Building, Temples, Own House or any another place. There is not even enough sitting place for the parents of children on the day of immunisation.

Another most important problem faced by *the Anganwadi* worker is very poor honorarium. Only 2500 rupees per month is given to *Anganwadi* workers as honorarium and ASHAs get only 100 rupees on the immunization day. A 34 year old *Anganwadi* worker stated that “*we have to do a lot of hard work but we get very less honorarium and we do not belong to rich families. We have very less agricultural land and have no other sources of income. How can we survive with this low amount of money? People neither recognize our work nor respect us.*” The problems become more serious if the *Anganwadi* worker belongs to either land less households or nuclear families, is widowed or divorced. Same problems were observed with young mothers who have small babies. She has to go to field for work leaving her small baby in the house.

There is no proper and regular supervision of *Anganwadi* centres. Not a single Government official of ICDS or health departments ever visit any village to supervise, mobilise or encourage the *Anganwadi* worker and parents for child immunisation. In addition, not a single member of the village cooperates in child immunisation. Even the local Government like a *mukhiya*, *ward member* or others are not interested in the immunization of children in the village. Thus, there is a general lack of interest and willingness in the society towards immunization of children.

On the other hand, the *Anganwadi* worker and ASHA never visits isolated small hamlets (*Bigha*) which are also a part of the main village, like *Ragunathpur*, *Babubigh* in Lohara and *Sarai* in Amma. A 32 year old woman of the hamlet stated that “*ASHA or Anganwadi worker never visit our village and never inform us regarding any child and maternal health related benefits. We have to ask date and time for immunization ourselves. Our children do not go to the Anganwadi’s school. Anganwadi and ASHA come only for polio drops while, we are an integral part of the same village and we also come under the same Anganwadi centre*”. Actually the small hamlet comprise 10-15 households of Scheduled Caste or Backward Caste, 800-1000 meters away from the main village, lack of connectivity, and lack of willingness discourages the *Anganwadi* worker and ASHA to visit these small hamlets.

6.10. Conclusion

After studying the situation of health infrastructure it can be said that Bihar is suffering from great shortage of Sub Centres, Primary Health Centre, Additional Primary Health Centre, and Community Health Centres. The Community Health Centre is almost absent

from the public health system in Bihar. Situation regarding Sub Centre and PHCs are not different from others. About half of the rural population are not covered under the health centres. Actually, Community Health Centres have not been established in the state, therefore, PHCs are working as CHC, and APHCs are working as PHC in the state. But now CHCs are being established under the National Health Mission but the speed of establishment and construction of new CHCs, APHCs, and PHCs is very slow (**NRHM, Jamui 2009-10**). So many villages do not have Sub Centres. Within the available Sub Centres, availability of ANMs and male health workers are insufficient and the existing staff finds it very difficult to perform the health care service for large populations. The number of male health worker is very less and many positions are vacant. In case of physical facility, very few Sub Centres have accommodation facilities for ANM to reside at the sub centre. Among available accommodation facilities, ANM hardly lives at Sub Centre. Half of the Sub Centres do not have water supply, and electricity facility is also not available. Additional Primary Health Centres (APHC) and Primary Health Centres (PHC) are also suffering from great scarcity of human resources and physical resources, particularly male health workers are barely in position and female health workers also exhibit low percentage at Primary Health Centre and Additional Primary Health Centre in Bihar. Unfortunately, Primary Health Centres are not performing well due to non-availability of doctors, even if posted; doctors do not stay at the PHC's Head Quarter (HQ). Inadequate physical infrastructure and facilities, insufficient quantities of drugs and medicine, irregular and proper supply of drugs and medicines, lack of accountability to public and lack of community participation are the other problems in the state.

Jamui district has greater number of Sub Centres in comparison to Aurangabad district, while Aurangabad district has a higher number of Primary Health Centre and Additional Primary Health Centre than *Jamui* district. The numbers of Additional Primary Health Centres are more than double in Aurangabad district than Jamui district. There are no Community Health Centre and Sub Divisional Hospital in Jamui district, while Aurangabad has one Community Health Centre, one Referral Hospital and one Sub Divisional Hospital.

Number of the Additional Primary Health Centres is not sufficient in both the districts and large part of the population is facing the problem of inadequate health care services. Number of Sub Centres at block level are not equally distributed, therefore the percentage deficits also varies at Block level. Jamui and Jhajha Block, Jamui district and *Madanpur*,

Rafiganj and Aurangabad block in Aurangabad district demonstrate higher deficits of Sub Centre. Rest of the blocks have comparatively better figures but deficit exists.

The existing numbers of doctors are not adequate and the health centres are facing shortage of doctors, ANMs, Nurses, HLVs in both the districts. Actually, there is a dearth of medical officers. He is responsible for management of all human resources and physical resources such as drugs, medicines, and vaccines and other health equipments. He directs and distributes work and duties to men and women health staffs in the child immunization process. He regulates all existing Sub Centres in the Block. He leads the immunization and other health care services provided by the Government. Thus, active and skilled medical officers regulate all health staff and achieve the target established in the health policy. In the absence of doctors all health care services are not being administered properly in Bihar.

In Aurangabad district, the physical conditions are comparatively better than Jamui district because all PHCs are functioning in own government buildings and are connected with electric and water supply and toilet facility is available. In addition, accommodation facilities are available for health staffs in the PHC premise. Ambulance service is also operating in the PHC located at CD Blocks. On the other hand, in Jamui district, comparatively poor condition prevails because none of the PHCs have electricity and water supply. All PHCs are running without water supply, power supply, and toilet facility. The accommodation facility for health staff is also not available in Jamui district. Electricity and water supply are the most important infrastructure of health centres. Without electricity, it is impossible to store various vaccines and medicines. It is impossible to cater to emergency and serious cases. Most of the medical equipments are operated with electricity. Computer system will not work without electricity, and data management cannot be performed. Secondly, doctors and health staff have to work in difficult physical environment if electricity facility is not available, because they cannot enjoy fan or air-conditioning in hot summer season which is of six months. Similar problems are faced by the children and the parent. Furthermore, water supply is the second most important resource in the health centres. Water is used not only for drinking but also for various medical treatments, including cleaning wards, waiting rooms, offices, delivery places, operation places, for toilet facility and other thing. Toilet facility is third most important infrastructure of various health service units. Better physical infrastructure not only attracts patients but health staff, particularly doctors and female

health staff, who feel comfortable to visit the health centre regularly and perform their work and duties with ease.

There is no Sub Centre in Jamui district which has either water or power supply facility available. Mostly Sub Centres are functioning in rented buildings and *pachayat bhavan*. In *Jhajha, Sikandara Aligunj* Blocks, more than two third of the Sub Centres are operating in rented houses, while, in *Laxmipur, Barhat, Khaira and Gidhura* blocks most of the Sub Centre function in *panchat bhavan*.

In Aurangabad district, more than half of the Sub Centres are operating from rented houses. In *Goh* Block, all Sub Centres are functioning from rented houses, while about two thirds are in rented house in *Nabinagar, Kutumba, Obra Rafigunj and Haspura*. In *Daudnagar, Barun, Aurangabad, Madanpur* block, half of the Sub Centres function from their own buildings. There is no Sub Centre in *Aurangabad* district which has water supply facility available; while only 20 percent of the Sub Centres have power supply and only 18 percent have toilet facility available at the Sub Centres.

The existing number of *Anganwadi workers* is not adequate as per required population size in Jamui district. The distribution of *Anganwadi* centre is also quite uneven at the micro level. Some blocks have very high number of *Anganwadi* centres, whereas some blocks have very low number of *Anganwadi workers*. For instance *Barahat* and *Laxmipur* have a very low number in comparison to *Jhaha* and *Jamui* Block. In addition, all blocks have deficit of *Anganwadi* workers in Jamui district.

On the other hand, Aurangabad district is in a better position than Jamui district in terms of number of *Anganwadi* workers because there is low percent deficit of *Anganwadi* workers. *Daudnagar* and *Aurangabad* Blocks have surplus number of *Anganwadi* workers.

The numbers of ASHA workers present a better picture but additional numbers are required for the large population in Jamui district. Overall, there is a deficit of ASHA workers in Jamui district, although *Khaira* and *Sono* blocks have surplus numbers. In addition, the distribution of ASHAs at the micro level is uneven and the gap between highest and the lowest number is very large.

In Aurangabad district, the total number of ASHA workers is higher than Jamui district but percent deficit exists in Aurangabad as well. Furthermore, ASHAs and *Anganwadi*

workers face considerable problems since they are overloaded in paper work and in maintaining a large number of registers. This dissuades them from performing the routine immunization work. Low honorarium, lack of inactive improper infrastructure also limited their capacity.

References

Ashokan, A. (2010). Self reported morbidity, inpatient and outpatient care and utilisation of health care services in Rural Kasaragod, Kerala.

Humirah, I. (2011). The Anganwadi Worker in India, *Health Opine*

Lakshminarayanan, S. (2011). Role of government in public health: Current scenario in India and future scope. *Journal of Family and Community Medicine*, 18(1), 26.

Ransom, J., Schaff, K., & Kan, L. (2012). Is there an association between local health department organizational and administrative factors and childhood immunization coverage rates? *Journal of Health and Human Services Administration*, 418-455.

Roper, W. L., Baker Jr, E. L., Dyal, W. W., & Nicola, R. M. (1992). Strengthening the public health system. *Public Health Reports*, 107(6), 609.

Sankar, D., & Kathuria, V. (2004). Health system performance in rural India: Efficiency estimates across States. *Economic and Political Weekly*, 1427-1433.

Knowledge, Attitude, and Practices towards Child Immunization among Parents

7.0 Introduction

The knowledge of vaccine preventable diseases (VPD), associated vaccines, age at which vaccines should be administered, name of vaccines, number of diseases, interval between two doses, and perceptions regarding vaccination are important factors that play significant roles behind the success of Immunization coverage. All these factors are closely interrelated with the parents' educational level, community perceptions, social customs as well as availability of infrastructure and healthcare facilities in a given area. Among all these factors, parents' knowledge and awareness level play the most crucial role (**Yousif et al., 2013**). Parents with higher educational level are more likely to immunise their infants and children and follow the Immunization schedule properly (**David and Clyde, 1974**).

Tarrant and David (2001) have stated four barriers of child Immunization. These revolve around mother's knowledge, perception regarding vaccine, missed opportunity and other barriers. The most important barrier is knowledge barrier. Majority of the mothers cannot get their children immunised because they do not have any knowledge of child Immunization (**Angellia et al., 1999**). They do not even know which vaccine is for which disease, how it works and how it protects children from vaccine preventable diseases. They also do not have any idea of how diseases occurs and how do they spread (**Angellia et al.,1999**). However, the positive attitude of a parent toward child Immunization plays a play vital role in vaccines uptake (**Awodel et al., 2005**). **Angellia et al.,1999** observed that most of the women cannot uptake vaccines because they believe that vaccines are not useful for their child's health.

Tarrant and David (2001) found that elderly women do not believe in child Immunization in the first nation country. They believe that Immunization is not necessary and provides little benefit to the children. Therefore an attempt has been made in this chapter to explore the knowledge, attitude, and perception of a parent toward child Immunization in the study areas. On the basis of these findings, a perception based study has been conducted in the field areas to find out what the parents actually think of vaccination and VPDs. Knowledge,

attitude and perception of parents regarding vaccination has been also highlighted through Case Studies, FGDs and In-depth Interviews.

Methodology

The present chapter is based on Qualitative Methodologies for deciphering additional nuances of child immunization v.i.z. a) Focus Group Discussions, b) Case Studies and c) In-depth Interviews.

FGDs (spread over 45 minutes each) have been conducted on the issue of child Immunization and its success in the respective villages. The quantitative data has already provided information on the access and coverage of Immunization across the villages, but at the same time, it has not provided enough information regarding the causes of partial coverage or under-coverage. There exists a district-wise, as well as social group wise disparity in Immunization coverage. Thus, FGDs have been conducted to learn about the respondents 'knowledge, attitude and practices' regarding child healthcare with special reference to VPDs.

Participants were the parents of the children eligible for Immunization. A total of 24 FGDs have been conducted (6 in every village) across the four villages. Participants belonged to 20-49 years of age group and from various social groups. Though special focus has been given on Scheduled Castes and Other Backward Castes; Extreme Backward Castes have been also covered by conducting more than one FGD in one village. Besides, two FGDs have been conducted among the General Castes (so called upper caste respondents), one in Tajpur and another in Jamhor village.

Traditional societal norms created constraints in conducting the FGDs. General Caste women in Tajpur village were not allowed to interact with the researcher during the survey. Thus, this Focus Group remained devoid of women, only male participants interacted. One FGD has been conducted among Other Backward Caste group women, two FGDs with Extreme Backward Castes (1 for women and 1 for men) and two FGDs with Scheduled Castes (1 for women and 1 for men). In Amma Sarari village two FGDs have been conducted in among Other Backward Castes (one for men and one for women), two FGDs among Extreme Backward Castes (one for men and one for women) and two FGDs among Scheduled Castes

(one for men and one for women). Similarly, in Aurangabad district, a total of 12 Focus Group Discussions have been conducted, six in Lohara village and six in Jamhor village. Two FGDs have been conducted among Other Backward Castes (one for male and one for female), two for Extreme Backward Castes (one for male and one for female) and two Focus Group Discussions have been conducted with Scheduled Castes (one for male and one for female).

The Focus Group Discussions were very interactive. Every participant has been given equal chance to state their opinions and views without any hesitation. Less vocal and quiet women have been encouraged and given more space to share their opinions and experiences. The moderator / researcher balanced the dominance of one participant over the others.

The groups for FGD consisted of 8-10 members. The time-frame of the conversations ranged from 30-45 minutes until saturation would reach. A local dialect i.e. Magahi has been used for conducting the FGDs.

It has been observed that some participants, particularly women were silent and could not answer the questions regarding knowledge, attitude, and perception towards child immunization coverage. Also, some women declined to answer. However, after considerable motivation, many women were found to discuss openly their ideas of knowledge attitude and practices towards child immunization and other problems regarding child health care.

7.1 Mother's Knowledge Regarding Child Immunization

7.1.1 Immunization

In all focus group discussions, almost all participants expressed their awareness regarding the child Immunization programmes running in the state. It is no doubt a positive sign that people are at least aware of the Government's effort.

7.1.2 Childhood Diseases and Vaccine Preventable Diseases

Participants were not aware of vaccine preventable diseases, because those diseases have never occurred to their children. They have never heard of the names of Diphtheria, Pertussis, Tetanus, Tuberculosis and Hepatitis-B. The situation was found to be the same in all the villages. Participants reported:

“We do not know about Diphtheria, Pertussis, Childhood Tetanus and Childhood Tuberculosis because these diseases never occur to our children (FGD: Women participant Tajpur, Jamui district). Hepatitis-B is new diseases for us. We have never heard about it before.” (FGD: Women participants, Tajpur and Amma Sarari Jamui district).

“We know about Poliomyelitis and Measles. Three to four Poliomyelitis cases have occurred, that had affected children in our village, now they have grown up. Sometimes Measles occur among some children in our village.” (FGD: Women participants, Tajpur, Amma Sarari, Jamui district)

“We have not heard the name Diphtheria; it does not happen now. We do not know about Pertussis, and Childhood Tetanus, Childhood Tuberculosis and Hepatitis-B.” (FGD: Women participants, Amma Sarari village, Jamui District).

“Our children are more affected by Pneumonia, Diarrhoea, Fever, Cold and Whooping Cough.” (FGD: Women participants, Amma Sarari, Jamui district).

“In present times there are so many new diseases affecting infants. Nowadays the child born with diseases like jaundice. This is very common among new born babies. These did not happen during my times.” (FGD: Old woman participant, Amma Sarari, Jamui).

Similar findings have also been observed in Aurangabad district. *“Diseases like Pertussis, Childhood Tetanus, Childhood Tuberculosis and Hepatitis-B are unknown to us.” (FGD: Women participants, Lohara, Aurangabad).*

“Measles is more common in our village because it occurs every year in the summer season and at least 25 to 30 households get affected.” (FGD: Women participants, Lohara village, Aurangabad).

A 30 years old woman mentioned that “Pneumonia, Diarrhoea, Cold, and Fever are more serious diseases for our children, and they occur very frequently. We suffer considerably because of these. Vaccines are not available for these commonly occurring diseases. Neither do we have access to medicines or medical tests for these diseases. (FGD: Women participant, Lohara, Aurangabad).

However, a 40 years old woman in Jamhor, Aurangabad district expressed different views and stated that she knew about Pertussis and Childhood Tetanus, Pertusus according to her is called 'kukur khasi', where the child continues whooping, and is a very dangerous diseases, whereby the child becomes weak; but according to her it does not occur nowadays. (FGD: Woman participant, Jamhor).

“We are familiar with Poliomyelitis, i.e. the child becomes paralysed permanently for his/her entire life, it completely destroys the child’s future and if the child is a girl, she would face difficulty in getting married. Nobody wants to marry a disabled girl (FGD: Women participant, Jamhor, and Aurangabad).

7.1.3 Name of Vaccines

After discussions and interviews, the primary observation reveals that there is a lack of knowledge about VPDs among women in both the districts. Most women lack awareness about childhood vaccine preventable diseases in Jamui and Aurangabad districts.

One participant stated that she does not know the name of different vaccines which are given to children. “I know only about Measles and Poliomyelitis (FGD: Woman participant, Tajpur Jamui).

“I do not know the name of vaccines that should be given to small children, I know only about Measles and Poliomyelitis (FGD: Woman participant, Amma Sarari, Jamui).

“I have never heard the name of Hepatitis-B vaccine (FGD: Woman participant, Lohara Aurangabad).

Many other participants also expressed similar experiences regarding knowledge of the name of vaccines associated diseases in the study areas.

7.1.4 Numbers of Doses of Vaccines

A total of five vaccines are administered/provided free of cost for seven vaccine preventable diseases to every child, in which some vaccines require single doses, some are double doses, and some vaccines are multiple doses for the completion of full Immunization. Focus group discussions and interviews among women reveal that there is great lack knowledge of total number doses of the particular vaccines in the study areas. A 30 years old participant stated

that “*We do not know that how many doses of a particular vaccine should be administered to infants and children, we just give what is being told to us by the health functionary (FGD: Women participants, Tajpur, Jamui).*” This study is consistent with the findings from Central Ethiopia by **Etana B and Deressa (2012)**. They also found that the majority of the Ethiopian mothers do not know about the total number of sessions required for full Immunization of their children.

7.1.5 Age of the Child at Vaccination

The majority of the participants in FGD groups reported that they have no knowledge of correct time/period/months or age of children for Immunization against various childhood infectious diseases.

“We do not know when vaccination should start and when this should be completed” (FGD: Women participants, Tajpur, Aurangabad). Similar statement has been given by women in Amma village in Jamui.

“I do not know the exact age of my child. Also I do not know the age when the vaccination is to be given and for how long should this continue” (FGD: Woman participant, Lohar village, Aurangabad)

“There are so many vaccines that are provided free of cost by the Government. Each vaccine is different; some require one dose; some require three doses. Some vaccines are administered at intervals. Remembering these becomes very difficult for us.” (FGD: Male participants, Jamhor, Aurangabad).

“I am an agricultural labourer, and it becomes very difficult for me to remember which vaccine is to be given at what intervals. Also, it is difficult for me to take a day off in order to figure out which vaccination has to be given to my child.” (FGD: Male participant, Tajpur).

“Anganwadi madam and ASHA madam told us that some vaccinations should be given just after birth but we do not know which vaccine is for which disease.” (FGD: Women participants, Jamhor, Aurangabad.) A similar study has been conducted in Central Ethiopia by **Etana and Deressa (2012)** as mentioned earlier, that also states that there is less

knowledge among mothers about the age at which child Immunization should begin and the time taken for the schedules to be completed in central Ethiopia.

7.1.6 Interval between Two Doses of Vaccines

We are uneducated and hence it is very difficult for us to understand the interval period between two doses of the same vaccine. My child has received the first dose but I am confused when to administer the second dose. The Anganwadi madam has told me to bring my child next month but this is very difficult for me to understand.” (FGD: Woman participant, Tajpur Jamui).

In Aurangabad district, 25 years old woman mentioned that Anganwadi or ASHA madam asks her to come at the intervals of one and half months. (FGD: Woman participant, Jamhor, Aurangabad).

In agrarian underdeveloped regions it thus becomes difficult for child Immunization to succeed. Poverty, illiteracy, ignorance, lack of awareness and lack of time on part of the marginalized communities make the process even more difficult. Even if the first dose is administered, dropouts rate are very high. This study can be corroborated with similar findings observed in Ethiopia that indicate that lack of awareness about child Immunization, knowledge of childhood vaccine preventable diseases, name of vaccines, age at which the child starts being immunised are other such important factors that stand in the way as serious bottlenecks to achieve the goal of the Immunization programme. For completion of the Immunization schedule it is very necessary the mother has the knowledge of the name of vaccines and childhood diseases that can be prevented by specific vaccines (**Etana and Deressa 2012**). High level of illiteracy especially female illiteracy is one of the most important underlying factors of ignorance about childhood and vaccine preventable diseases (**Angelillo et al., 1999**).

Agrawal and Kumari (2014) also mentioned that the most common reason for less Immunization coverage is the lack of proper knowledge about the time of the next dose or the correct schedule of Immunization.

7.2 Father's Knowledge Regarding Child Immunization

It is well documented that the father is main resource provider and the ultimate person in the family for taking household decision. However, as it has emerged through the focus group discussions that many of the landless agricultural labourers due to illiteracy, poverty and ignorance have a hand to mouth existence and do not take children's Immunization seriously. Though they may be aware that child Immunization programme is running in the village, yet they are ignorant of the name of vaccines and associated childhood diseases, the number of doses, the interval between two doses, perfect age of the child to begin vaccination and others things that matter in child Immunization coverage. Moreover, as per the patriarchal norms, from birth to the upbringing of children falls within the domain of women's work load and hence father's are hardly involved in Immunization and consequently do not have the adequate knowledge of Immunization.

7.2.1 Immunization Schedule

Most of the participants of the FGDs were found to be familiar with child Immunization programme which is running through the Anganwadi centres in both of the districts. *A 25 years old female respondent in Lohara village responded that "I know that Immunization is conducted by ASHAs and Anganwadi workers but I do not know what kind of Immunization is provided (FGD Aurangabad, and Jamui).* Thus it has been found that most of the fathers and mothers in particular were completely ignorant about the types of vaccines and the Immunization schedule required for complete coverage.

7.2.2 Childhood Diseases and Vaccination

It was also found from the focus group discussions that parents were mostly of the opinion that serious diseases or childhood diseases do not occur among children in both the districts. The stated that *"we do not know about vaccine preventable diseases that occurs in children. We know only about Pneumonia, Diarrhoea, cold, cough and fever (FGD: Male participant, Tajpur, Jamui).* Other participants of FGDs also made similar statements which exhibit the level of ignorance that persists in the community. Many a times, it was also found, that they visit the doctor only when the problem or fever persists. *"I do not understand about childhood diseases, but I visit the doctor with my wife only when my child suffers from fever continuously."* (FGD: Male participant, Lohara Aurangabad).

A majority of the male respondents reported that *“we do not have any knowledge of childhood diseases.”* A 32 years old man in Jamhor village said that *“I know that children fall sick very frequently, but I do not know the name for particular diseases. I know only about fever, diarrhoea, pneumonia, cold, and whooping cough as these are the commonly occurring diseases among infants and children.”* Another two respondents also supported the same statement in Jamhor and Aurangabad. (FGD: Male participants, Jamhor and Aurangabad).

In contrary to the general ignorance and apathy, a 36 years old man from the same village reported a somewhat different statement. *“I know about Diphtheria, Pertussis, Tetanus, Measles and Polio. I also know about Hepatitis-B. Many of these are communicable diseases. I even know about Japanese Encephalitis that occurs among small children. I have learnt about this from the newspaper. Children are often infected by this disease in my district as well as my neighbouring district i.e. Gaya. Often many children die every year in the district hospital from the same disease. This was being reported in the first page of the newspaper, nearly every day.”* (FGD: Male participant, Jamhor and Aurangabad).

Two other men also supported the same statement and admitted that *“there is the advertisement of childhood diseases in the newspapers.”* A 27 years old man stated that *“Pulse Polio Programme is big programme and a lot of propaganda is being done through the mass media. Messages are posted everywhere in the form of posters/banners in our villages such as the market place, (PHCs) hospitals, bus/auto stands, railway station, parking, small restaurants, private hospitals/dispensaries, and in other public places.”*

On being asked about the source of information of childhood diseases i.e. newspaper circulation, a 35 years old man stated that *“almost all educated persons, job seekers and students preparing for SSC, Railway, banking and other competitive examinations, bring newspapers to their home for improving general knowledge. Secondly, we go the market in the morning or evening where we read newspapers at the local tea book/magazine stall or other shops. We often go to the railway station where also there are tea and book stalls, newspaper and magazine shops. The shopkeeper belongs to our villages and we know each other.”* (FGD: 30 years old young man, Jamhor). *“Also about 30 percent households have the television, where messages are broadcasted* (FGD: 30 years old young man, Jamhor).

7.2.3 Name of Vaccines

The primary findings emanating from the qualitative study reveals that none of the men know the name of vaccines and associated diseases in both of the districts. *A 30 years old man mentioned that “we do not know either the name of vaccine nor associated diseases. We know only about Polio and Measles.” (FGD: Male participant, Amma Sarari Village Jamui).*

A 25 years old man reported that “I know the name of Measles vaccine.” He narrated his own story that “when I used to go to the school in class two or three, a lady health staff had come to our school for injecting Measles vaccine. All of us (meaning the children) were very frightened. On hearing about the needle and the injection, I ran away from the school to the surrounding crop fields to hide myself, so that the lady health personnel cannot find me. My school teacher used to look for me for vaccination. Finally some of my friends caught me and brought me in front of my teacher. They convinced me that this is painful but you will not fall sick from measles and finally I had been vaccinated. That is how I remember the name of the Measles vaccine.”

Therefore, it was found that some of the men in Aurangabad district had knowledge about Measles and Polio vaccines.

7.2.4 Numbers of Doses of Vaccines

During the focus group discussions not even a single person (male or female) have been found to have knowledge about the number of doses of associated vaccines. *“We do not know which vaccine is a single dose, which vaccines are double doses or which vaccines are triples doses (FGD: 30 years old man in Lohara village, Aurangabad). Similar answers have been given by respondents in Tajpur and Amma Sarari village in Jamui district and Jamhor in Aurangabad district.*

7.2.5 Age of the Child at Vaccination

It has been observed during the field survey that the population of the study area are ignorant regarding the age of their children in terms of years, months and days for the administration of various types of vaccines. Question were asked to mothers in study area regarding the age at which DPT, BCG, Measles, Polio and Hepatitis-B vaccines should be given to the child. There were absolutely silent and had no clues at all. Some of them stated that *“we do not*

know the exact age of the child for Immunization” (FGD: Jamui and Aurangabad Districts). This was found in both the districts, as Aurangabad was no better.

7.2.6 Interval between two Doses of Vaccines

Similarly, the FGDs reflected that parents did not know also about the number of doses and the interval period between the doses particularly with respect to the *second dose and third dose of the DPT, Polio, and Hepatitis-B in both Jamui and Aurangabad districts. The male respondents stated that since the mothers take their children for vaccination, they have no idea about either the number of doses or the intervals. However, on investigating further it was revealed that mothers too had no idea of the interval between the doses. (FGD: Male and Female participant, Jamui and Aurangabad).*

The poor knowledge among the fathers regarding child vaccination, the name of diseases, the name of the vaccine, the age of Immunization, the numbers of doses, the interval between two doses reveal that they are not involved in any manner in child health care and child Immunization. So they have no interest to know about child Immunization. Cultural and social factors are also responsible for poor knowledge regarding child Immunization among fathers of children. A 30 years old father stated that child care is the duty of the mother since the father is responsible for providing food, clothes and shelter (*Lohara, Aurangabad*). Furthermore, almost fathers are farmers or agricultural labourers or construction workers, so their entire day is spent in work and there is a huge trade-off between missing work to get the child immunised. Moreover, low level of education might be one of the reasons for poor knowledge regarding child Immunization among fathers in the rural setting.

7.3 Attitude, Belief and Perception

Misconceptions, indifferent attitudes and lack of faith and belief in modern medicines result in unnecessary delay in child Immunization (**Angellia I.F. et.al 1999**). This was also found true for the study areas. In general, it was noticed that there was an apathy, ignorance and misconception about modern allopathic medicines, particularly with respect to infants and small children. In this respect the service providers also failed to create awareness among the population in the study areas.

7.3.1 Importance of Immunization

Although the majority of the participants knew about child Immunization, they do not understand the primary benefit of Immunization. A 30-year-old woman in Aurangabad district said that *“we do not know the benefit of Immunization”*. Another woman mentioned that *“I know that Immunization protects our children from Polio, but no child in my village has suffered from disability or paralyses arising out of a Polio attack in the recent past. Otherwise, we had always the fear of our children contracting the disease. But after the Polio vaccine is being given to our children we are now free from this fear.”* (FGD: Woman participant, Jamhor Village Aurangabad district). This finding is also consistent with the study of Uganada conducted by **Etana (2012)**.

7.3.2 Childhood Diseases and Vaccination

The FGDs also brought to the fore various misconceptions and opinions in both the districts surveyed during the present research work.

“We know Tetanus occurs to young children if there is a cut on any part of the body by a metal but it does not occur to small children.” (FGD: Male and Female participant, Jamui and Aurangabad Districts)

In contrast to the above statement, a 40 years old woman in Lohara village said that *“there is also the possibility of tetanus to both newborn baby and mother after delivery because often the umbelical cord is cut by a blade or a knife that is not disinfected, resulting in the possibility of Tetanus.”* On introspection it was found that this lady i.e. is a Scheduled Caste woman who worked as a midwife in the village. (Aurangabad)

Certain misconceptions were also observed regarding childhood diseases like Tuberculosis cannot occur in infants and children, *“Tuberculosis occurs to young or old men due to smoking bidi and cigarette (FGD”* Male and Female participants Jamui, Aurangabad).

One of the male respondents stated that *“Polio caused due to polluted air.”* (FGD: Male participant, Lohara, Aurangabad)

A 32 years old female respondent in Tajpur village in Jamui district admitted that *“we do not know how diseases occur to children, how they contract these and how a particular disease spreads.”*(FGD: Female participant, Tajpur, Jamui).

Many of the participants were also found to be highly superstitious regarding certain childhood diseases, *“Measles (locally called ‘mata’) occurs among children when Goddess*

Durga becomes angry. So we during Measles medicines should not be given to the sick child.” (FGD: Male participant, Jamui and Aurangabad).

Again some men stated that *“Hepatitis-B infection occurs only in urban areas, but not in villages because things are different in urban areas due to the high level of pollution.” (FGD: Male participant, Jamui and Aurangabad).*

Thus it was found that superstitions and misconceptions stood in the way of modern medicines that can ward off many childhood diseases,

Majority of the mothers believed that God gives his blessings or curse them. The curse stands out as ‘evil’ and affect infants and children. A 39 years old female respondent in Lohara village in Aurangabad district stated that some women in her village does black magic whereby she sends evil to harm her children. Thus children in her village get infected by diseases and sometimes these may also be life threatening and can cause death to the young infants. She further stated the some women who are childless often inflict omen or curse through the ‘evil eye’ that results in childhood diseases. Sometimes neighbours are also jealous and their ‘curse affects young children. To ward off these problems the female respondent visits an old man who knows magic or mantras and can cure the sick child by performing some rituals. Such was the nature of superstitions and blind faithfulness of illiterate mothers in the study areas.

Most of the parents as it had emerged from the qualitative survey blindly believed weather and climate to be the cause of childhood diseases. *A 35-year-old man relegated particular diseases to specific seasons for example, “cold, cough, pneumonia and others diseases occur during the winter season. Measles occur in the summer season and diarrhoea in rainy season.” (FGD: Male participant, Amma Sarari Jamui).*

“Transitional period between two seasons is more difficult, and children are more vulnerable to fall sick.” (FGD: Male participant, Lohara, Aurangabad)

It was found during the qualitative survey that the general perception among some parents was that many childhood diseases are seasonal and are naturally occurring. Hence there is nothing serious about these diseases. This perception stood in the way of considering child Immunization seriously by the some villagers, particularly with respect to the vaccine preventable diseases.

7.3.3 Vaccination

A mixed reaction has been noticed regarding the usage of different vaccines for child Immunization in both the districts. Some of the positive responses noted were: *“Vaccines give power and energy to the children” (FGD Amma sarai Jamui); “vaccines prevent our children from being sick (FGD Lohara Aurangabad) and “vaccination make our children stronger and healthier” (FGD Lohara Aurangabad).*

However, some of the parents have expressed about the infrastructural problems of inadequate storage facilities in the rural health units that raise serious questions about the reliability of these vaccines. *“The reliability of vaccine storage condition in rural health unit is suspicious” (FGD Tajpur, Jamui).* Such problems have been also noted by **(Braka et al., 2012)** in a study of child Immunization in Uganda.

7.3.4 Severity of Diseases

All FGD participants expressed their concern regarding childhood diseases. Accordingly, diseases are dangerous for children, particularly the chronic or acute ones. *“No disease is good for the child and brings considerable damage for the healthy functioning of the child” (FGD Jamui and Aurangabad).*

7.3.5 Effectiveness of Vaccination

All FGDs participants did realise the effectiveness of vaccines and also admitted that they are beneficial for child health in both of the districts. However, lacklusture was observed in complete Immunization or in other words even if some doses had been administered the drop outs had been high. A 40 years old man mentioned that *“now polio doesnot occur among the children in our village. I have not seen any Polio attack for a long time in our village. Otherwise, before the Pulse Polio Programme we always had the fear that our children may get an attack of Polio anytime. (FGD: Amma Sarai, Jamui).* On the other hand, in Aurangabad, a 35 years old woman raised serious doubts regarding the Measles vaccine. *She said that “every year there is a Measles outbreak in my village in spite of children being administered the respective vaccine. So what is the utility of administering the dose ? (FGD:*

Woman participant, Lohara, Aurangabad). A similar finding has also been observed by **(Barka et al., 2012)** in Uganda.

7.3.6 Side Effects of Vaccination

Although, the majority of the respondents knew that vaccines are beneficial for the child's health they also expressed their anxiety of the side effects of the vaccines. In all FGDs, almost all participants complained of high fever, and heavy pain at injection site and restlessness among children who have been injected with vaccines.

A 30 years old woman stated that *“our child suddenly falls sick after administration of vaccines. They suffer from high fever and terrible pain, and cannot sleep for the whole night. Often uneasiness and restlessness result in excessive crying. This is very painful for us as it disturbs the normal routine of the entire family.”* (FGD” *Woman participant, Lohara Village, Aurangabad*). Similar problems have been highlighted by all other participants in Jamui and Aurangabad districts. Often, these side effects of Immunization create a fear among parents. Side effects of vaccines have also been observed by **(Barka et al., 2012)** in Uganda.

7.3.7 Fear of Injectable / Needles during and after Vaccination

Fear of the needle is universal among women in both of the districts in Jamui and Aurangabad. Most of the vaccines are administered by injection in the muscular part of the body, apart from the Polio drop, that is administered orally. A 31 years old woman in Lohara village stated that *“my baby is four months old and has a tender body, I am a mother, and how can I withstand her pain and agony arising out of the needle insertion?”* (FGD: *Woman participant, Lohara village Aurangabad*). This kind of sentiment has been also expressed by other women in Jamui district.

However, two women in Jamhor village Aurangabad mentioned that *“in spite of the fear of needle we go for vaccination because it protects our child from dangerous diseases* (FGD: *Women participants, Lohara, Aurangabad*).

Case Study - *A 28 years old woman reported that “I have a one-year-old male child. I had gone to my father’s home for two months after delivery with my baby. When I came back to my husband’s house, I had forgotten the respective dates for vaccination. So I visited the vaccination booth on the day when immunisation was being conducted. The ANM administered my child three due doses of vaccines, all on the same day. Three injections were administered together on the same day. This was quite heavy dose for my child who fell terribly sick suddenly after vaccination, during the night. He got high fever, heavy pain at the site of injection as well as on the whole body. He was restless, and continued weeping loudly. At last, out of desperation, I had to go to a local private doctor with my child. He gave medicines that gave some relief to my ailing child who then fell asleep. The ANM does not understand this problem. She has to do her duty only. She does not correctly advise to us what to do if the child falls ill after vaccination (Woman respondent, Jamhor, Aurangabad District).*

A similar finding has also been observed in a study in Canada by **Tarrant Marie and Gregory David 2001** expressing the side effects of vaccines. The author expresses that parents find it hard to understand why a small infant has to be given so many injections thereby causing unnecessary pain and agony.

7.3.8 Child Morbidity and Vaccination

In all FGDs, almost all participants reported that mothers do not go for vaccinating their children if the infants are sick on the day of Immunization. *“We do not go to vaccination if or child is sick. (FGD: women participants, Jamui and Aurangabad districts).* A 30 years old woman added that *“ The ANM also does not give any vaccine if our children are sick or unwell on the Immunization day (Lohra Aurangabad).* Therefore child morbidity often deters Immunization programme and may result in drop outs from the vaccination schedule.

A similar finding has also been observed in the study conducted in the first nation of the world by Tarrant Marie and Gregory David (2001). The scholars reveal that if the child was sick on the Immunization date, or when Immunization was due, mothers do not not take their children for vaccination and have to wait until the child becomes well. Therefore child

morbidity hampers the Immunization schedule as doses cannot be administered to a sick child.

7.3.9 Teething of Children and Vaccination

The majority of the women stated that they do not take their children for Immunization during teething. This is because during teething the child suffers from dehydration, fever, and weakness (FGD Jamui and Aurangabad district). But very few women revealed that they had no idea of what to do during teething. A 31 years old woman in Amma Sarari village in Jamui district stated that *“I do not understand, what I should do during such a problem? Should I give medicines for teething or for other diseases during this situation?”*

7.3.10 Trust in Allopathic Medicines

The majority of the respondents expressed their trust in allopathic medicines in both of the districts (FGD: Male and Female participants, Jamui and Aurangabad district). A 26 years old woman reported that *“we use allopathic medicines when our child gets sick because it works fast and cures soon (FGD: Women participant, Jamhor, Aurangabad)*. Another respondent expressed *“we use allopathic medicines for minor and short term diseases while homoeopathic or herbal medicines for serious and long term diseases.”* Similar, findings have been reported in Jamui district.

But in the case of Measles, there are quite different attitudes and practices. A 40 years old women attributed that *“Measles is given by Goddess Durga, and we do not give any medicines to the affected children. It would cure automatically itself after nine days. A sick person does not go to outside from the room until nine days are over. He/She has to live in a separate room for nine days. But on the 9th day in the early morning, the patient/ child is carried to the courtyard and herbal medicated cold water is poured over his/her body. Also performing rituals and worshipping Goddess Durga are other things to be done with religious sincerity. In addition, the whole house, rooms, clothes, bedsheets and other things have to be washed and cleaned. Now the patient can eat normal food and go to outside the house leading a normal life.”* Other men and women also narrated the same story in both of the districts (FGD: Men and Women participants, Jamui and Aurangabad).

7.3.11 Trust in Government Agencies

Almost participants in FGDs in Aurangabad district expressed their trust in Government agencies and in Immunization programme. But in Tajpur village, Jamui district participants expressed a complete distrust with Government agencies. A 34 years old man stated that *“a child had died after administration of vaccines. He further added that either the vaccine was outdated, or the vaccine was a duplicate and not original. He further expressed that it is also possible that the medicine was not stored properly in an ice box. This is the carelessness of health staff. They are insensitive and play with young lives.”* (FGD: Male participant, Tajpur, Jamui District). Thus some of the participants expressed serious doubts on the reliability of vaccines, their improper storage and also mismanagement in maintenance etc. in Jamui District.

7.3.12 Attitude and Behaviour of Health Service Providers

The attitude and behaviour of health care providers play a vital role in the maximum utilisation of public health care facilities (**Mannava et al., 2015**). Negative attitude of health personnel discourages the utilisation of public health care services whereas positive attitude, cooperation and friendly behaviour make health programmes and schemes succeed. (**Jonas, 2017**). ANMs, other Anganwadi workers and ASHAs are the key personnel responsible for the success or otherwise of child Immunization programme in the study areas.

In Aurangabad district an Anganwadi worker expressed positive attitude. This is quite unlikely in comparison to Jamui district, because she has been living the Jamhor village for over ten years, and over the period of time she has developed considerable rapport with each and every individual in the village. A 34-year-old Scheduled Caste woman mentioned that *“the nurse of our health centre is very good and helpful. When I visit the health centre for vaccinating my child, she takes my child in her lap and loves him, talks with me while administering the vaccine. Her loving nature has earned her respect by one and all in the village.*

Respondents of Tajpur village in Jamui district reflected different experiences. They reported that the ANM in their village travels from another village. Hence she is often late for work and also leaves early much before the centre closes for the day. A 35 years old respondent in Jamui district stated that *“the ANM is careless, less friendly and come occasionally. She does*

not convince and encourage parents for Immunization. She only does her duty (FGD: Woman participant, Jamui). Another reason is that the primary health centre has been newly established in Tajpur village. Thus very few people visit the health centre for health care service utilisation.

Carelessness and irregularity of Anganwadi workers have been also reported from Lohara and Amma villages. One of the Anganwadi workers was not found during the working time on the day of the field visit by the researcher in Lohara village in Aurangabad. Five or six children were found sitting with notebooks and pencils. This was the picture at 11 o'clock on the day of Immunization. The ANM lives just next to the Anganwadi centre. One person stated that *“she does not come sometimes and nobody questions her for this. She is very prodigious and ignorant. She has very less interaction with rest of the villagers and people are not happy with her working style.”* However, the research scholar was able to meet other health functionaries i.e. ASHAs and Anganwadi workers of the Lohara village. They represented higher confidence and interaction levels; and also communicated their views and opinion openly. Respondents were also found satisfied with their behaviour.

Some case studies have been conducted in the study areas and have been presented below.

Case Study: 7.1

Mrs Seema Devi is married to Ganesh Manjhi. She is 30 years old and her husband is 32 years old. She got married at the age of 15 years. They belong to Mushahar community (Scheduled Caste). They live in the hamlet of Lohara village named *Raghunathpur* in Aurangabad district. They have five children, three daughters, and two sons. Both the husband and wife both are illiterates and uneducated. There are seven family members in their household; five children, and two parents. They work as agricultural labourers for their livelihood on the crop fields of another landholder. They have no agriculture land of their own. They belong to BPL family and have a job card. But they do not get the regular job under Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA). They live in a *kaccha* house made up of mud and thatch, having one room and one balcony. Both the husband and the wife have to work every day to meet their ends. They go for work in the morning around 9 o'clock and come back by five o'clock. If they do not go to work, they will not get food for survival. Both the parents do not get time to visit the health centre for

immunising their children, though out of great difficulty they had been able to administer the Polio drops to their children. Seema Devi mentioned that the Anganwadi worker or ASHA never visits their village nor informs them for Immunization. Seema Devi also regretted that her husband does not take an interest in child care and never helps her in immunising the child.

Case study: 7.2

Mrs Rukmini got married to Suresh Manji at the age of 15 years in the village Lohara (Raghunathpur), in Aurangabad district. She is now 28 years old. She has three children (two daughters and one son). She belongs to the Mushahar community of the Scheduled Caste group. She and her husband both are illiterates. They are the agricultural labourers living in a one roomed *Kacha* house. There are five members in their household. She lamented that her husband is an alcoholic and does not shoulder any responsibility of the household. Suresh does not bother about children. Every day he drinks, and spends more than fifty per cent of his earning in purchasing local liquor. Moreover he often quarrels with his wife and sometimes also beats her. In this situation, it is very difficult to take care of the children by Rukmini. Also, it was noticed that the health centre where Immunization is conducted is about 1km from the main village. She also lamented that the ASHA and Anganwadi worker never visit their village and inform them about Immunization.

Case Study 7.3

Rita Devi (27) and her husband Rajesh Vishvakaama (30) are husband and wife. They live in Lohara village in Aurangabad district. Rita is not educated, but her husband has attained education up to class five. Her husband is terminally ill for more than five years. He is immovable and seriously bedridden. All family members are troubled by his illness as a lot of money has been spent on his ailment. They live in a joint family with eight family members and Rita has a 12-months old son. Her house is located beside the ASHAs house. The ASHA always convinces and motivates her for her child's Immunization. In spite of this, it was found that family problems, lack of willingness and lack of awareness deters Rita Devi to get her child immunised.

Case Study 7.4

Surendra Manji (31) and Mira Devi (28) are husband and wife and residents of Lohara village in Rafigunj block in Aurangabad district. They belong to the Mushahar community and both are illiterates. They are economically very poor and have five children, three sons and two daughters. Mira got married at the age of 16 years. She and her husband both are labourers. They have no agricultural land. They live in a one roomed *kaccha* house. There is no source of drinking water in the household premise. Mira Devi has to fetch drinking water from outside the house from the Government hand-pump. There is no toilet facility in the household either. Kerosene oil is used for lighting and cow dung is used as fuel. There is no radio/TV/Mobile or any other source of entertainment in the household. Besides these, they have no assets as they are poverty stricken. Mira Devi's daily routine work consists of waking up at dawn for finishing the household chores and by 8:30 am she leaves for work. Her fifth child is one and half years old daughter. She has to carry her youngest child to her workplace as there is no one to cater to the child. She has very less time for Immunization. Mira Devi expressed her willingness to immunise her children, but her schedule of work does not leave her any time to visit the Immunization booth. Neither her family cooperate with her, nor does her husband have any interest to this effect. This exhibits her helplessness to go for health care of her children even if she wants so.

Case Study 7.5

Mrs Asha Devi (21) was married to Nandkishor Manjhi (23) at the age of 17 years. They live in Lohara village in Rafigunj block in Aurangabad district and belong to the Mushahar community. Asha Devi has attained middle-level education, and her husband has also studied till the fifth standard. She has one and a half-year-old son. She has very small family size; only her mother-in-law lives with her. She has no any agriculture land. It is very difficult to survive in the village because there is hardly any job available. Therefore her husband has migrated to Ludhiana (Punjab) and has joined a factory. Her husband has given her a small mobile handset for communication, and she regularly communicates with him. Not only that, she also helps others in times of need, particularly if anyone is sick or in trouble. Her husband remits money every month and Asha Devi in addition also works in the agricultural fields as a share cropper and earns food grains in return. She is thereby a very independent woman and is an exemplary of women's autonomy in a marginalised situation. She goes to

the private health clinic at Rafigunj, situated 15 km away from the village to get her child treated during illness. She believes that vaccines are essential for child health. She does not believe that diseases are inflicted by God's anger.

Case Study 7.6

Lalita Devi (35) and her husband Raj Kishore live Sarari hamlet of Amma village in Jamui district. They are economically poor and belong to a socially backward community. Both the husband and wife both are illiterates. Raj Kishore works as a household assistant in a rich family in the Jamui town. He has to do the multi-tasking in the town. During cultivation he has to go to his employer's village to organise and perform agricultural activities. He also has a small piece of agricultural land, but he does not practice agriculture due to paucity of time. He often stays away from his home. His wife has to do all the agricultural activities and also rear their cattle. Lalita has four children, three daughters and one son. The children go to the nearby school in the village. Lalita's son is only two years old. She has to do considerable domestic work and as well as agricultural work. She wakes up early in the morning, firstly cleans the entire house and gives fodder and water to the cattle. After that, she goes to the kitchen to prepare breakfast and lunch. After that, she has to go to the crop field. Her house is located in the hamlet of the main village. The Anganwadi centre and Immunization booth are located in the main village i.e. Amma 500 meters away from her house. There is the lack of time in the morning, but in spite of that she takes her children regularly for immunization. Asha Devi had represented an outstanding example of under taking regular Immunization of her children in the study region.

Case Study 7.7

Devanti Devi (30) and husband Suresh Chaudhari (35) belong to *Pasi* community (Scheduled Caste). They live in Tajpur village in Aligunj block in Jamui district. They are economically very poor and uneducated. They have four children, two sons and two daughters. The first child is ten years old, secondly is eight years old, third is six years old, and the last one is only 20 months old. The children are not sent to schools. They play the whole day in front of their hut made up of wood and date leaves. Devanti Devi brings drinking water from the Government hand pump outside their house. Wood and dried leaves are used as cooking fuel and kerosene oil is used for lighting the house. They have no agricultural land. They are

neither interested in cultivation nor want to work as labourers. Devanti's husband collects toddy from the date palm trees and sells this. During the off season they also make the mats, brooms, baskets, and other handicraft items that are for sale in the nearest market. Living environment is extremely deplorable with dirt and filth all around their house. Men sit all around drinking toddy local liquor). ASHAs and Anganwadi workers do not visit their house.. Devanti Devi and her family are unaware about child Immunization because they live in an isolated place. Child health care health practice is very poor in this household as the members still dwell in primeval age.

Case Study 7.8

Sujata devi is 32 years old lives in Tajpur village in Jamui district. She has three children, two sons and one daughter. The daughter is one and half years old. Her husband had died two years back. She has two brothers-in-law but they live in separate houses. After the death of her husband, her brother-in-law and her wife often quarrel with her. They have thrown her out from the joint family household. Now she is absolutely alone. She is not educated. She has neither any agricultural land. So she has to do work as agricultural labour on others farm for her livelihood. Her economic condition is very poor. She has a one roomed *kaccha hutment*. Most of the time she has to work from outside to make their ends meet. Otherwise, it will be very difficult to survive. In her struggle for survival she cannot even think of vaccination or taking care of her children's health.

7.4 Conclusion

The study reveals that there is very poor knowledge of life threatening vaccine preventable diseases among people especially about Diphtheria, Pertussis, Tetanus and Hepatitis-B in both the districts. Neither do they know about the time when these vaccines have to be administered nor the particular doses of each vaccine. Not a single respondent knew about these childhood diseases. But the name of Poliomyelitis and Measles were very common and were known to everybody in both the districts. Measles was more commonly known in Aurangabad district because of its occurrence.

ASHAs and Anganwadi workers frequently visit the household for child Immunization in Aurangabad district. As soon as ASHA or Anganwadi workers visit the household, people come to understand that they have come for vaccination. However, there was more

communication and interaction between the Anganwadi worker and people in Jamhor village. This was because of her friendly and interactive nature. Therefore, people of Jamhor in Aurangabad were found to be more aware, active and progressive towards child Immunization, and the poorest of the poorest sought Immunization. Even the lowest caste groups i.e. *Dom and Sudhi* also immunised their children in Jamhor village. Jamhor is also a small rural market centre having exposure to modern civilization.

On the other hand in Jamui both the sample villages were found to be in a primitive stage. The ASHAs and Anganwadi workers also did not visit the households regularly in Tajpur village. Therefore, there has been a lack of communication and interaction between the Anganwadi workers and mothers. Secondly, the Anganwadi centre had been newly established in Tajpur village and the Anganwadi worker belonged to a higher caste and hence avoided visiting the Scheduled Caste households.

Misconception about vaccination has been found in both the districts. Parents were found to have fear of the side effects of vaccination particularly injectables. It has been also found that vaccination is the responsibility of mothers and fathers hardly were involved in the process. Also during the sickness of children or during teething of the child, mothers avoided vaccinating their children. Parents in both the districts do believe in allopathic medicine. They have trust in Government services, except in Tajpur.

However, it has been noticed that even if parents had knowledge of allopathic medicines, they were reluctant to take their children for Immunization. This was because of widespread poverty, lack of awareness, superstitions and belief in rituals.

A more concerted effort has to be placed by health functionaries in service delivery, who were mostly found overloaded with paperwork rather than Immunization. Also holistic interventions are required for alleviating poverty in the region as well as that of spreading awareness about child health care. Patriarchal norms also stood in the way of women's autonomy, and hence even if the mothers wanted to go for Immunization they were severely handicapped. The fertility levels were also found to be quite high and hence the vicious cycle of poverty stood against child health care in the entire region.

References

- Ahmed, S. M., Adams, A. M., Chowdhury, M., & Bhuiya, A. (2000). Gender, socioeconomic development and health-seeking behaviour in Bangladesh. *Social Science & Medicine*, 51(3), 361-371.
- Angelillo, I. F., Ricciardi, G., Rossi, P., Pantisano, P., Langiano, E., & Pavia, M. (1999). Mothers and vaccination: knowledge, attitudes, and behaviour in Italy. *Bulletin of the World Health Organization*, 77(3), 224-229.
- Awodele, O., Oreagba, I. A., Akinyede, A., Awodele, D. F., & Dolapo, D. C. (2010). The knowledge and attitude towards childhood Immunization amongst mothers attending the antenatal clinic in Lagos University Teaching Hospital. *Tanzania Journal of Health Research*, 12(3), 172-177.
- Bosu, W. K., Ahelegbe, D., Edum-Fotwe, E., Bainsong, K. A., & Turkson, P. K. (1997). Factors influencing attendance to Immunization sessions for children in a rural district of Ghana. *Acta Tropica*, 68(3), 259-267.
- Braka, F., Asiiimwe, D., Soud, F., Lewis, R. F., Makumbi, I., & Gust, D. (2012). A qualitative analysis of vaccine safety perceptions and concerns among caretakers in Uganda. *Maternal And Child Health Journal*, 16(5), 1045-1052.
- Coburn, D., & Pope, C. R. (1974). Socioeconomic status and preventive health behaviour. *Journal of Health and Social Behavior*, 67-78.
- Ganle, J. K., Obeng, B., Segbefia, A. Y., Mwinyuri, V., Yeboah, J. Y., & Baatiema, L. (2015). How intra-familial decision-making affects women's access to, and use of maternal health care services in Ghana: a qualitative study. *BMC Pregnancy And Childbirth*, 15(1), 173.
- Henderson, L., Millett, C., & Thorogood, N. (2008). Perceptions of childhood Immunization in a minority community: the qualitative study. *Journal of the Royal Society of Medicine*, 101(5), 244-251.
- jahn, a., & aslam, a. (1995). Fathers' perception of child health: a case study in a squatter settlement of karachi, pakistan. *Health Transition Review*, 191-206.
- Shaikh, B. T., & Hatcher, J. (2005). Health seeking behaviour and health service utilisation in Pakistan: challenging the policy makers. *Journal of Public Health*, 27(1), 49-54.
- Tarrant, M., & Gregory, D. (2001). Mothers' perceptions of childhood Immunizations in First Nations communities of the Sioux Lookout Zone. *Canadian Journal of Public Health*, 92(1), 42.
- Yousif, M., Albarraq, A., Abdallah, M., & Elbur, A. (2013). Parents' knowledge and attitudes on childhood Immunization, Taif, Saudi Arabia. *J Vaccines Vaccine*, 5(215), 2.
- Jonas, K., Crutzen, R., van den Borne, B., & Reddy, P. (2017). Healthcare workers' behaviours and personal determinants associated with providing adequate sexual and

reproductive healthcare services in sub-Saharan Africa: a systematic review. *BMC Pregnancy and Childbirth*, 17, 86.

Mannava, P., Durrant, K., Fisher, J., Chersich, M., & Luchters, S. (2015). Attitudes and behaviours of maternal health care providers in interactions with clients: a systematic review. *Globalisation and Health*, 11, 36.

Kesieme, E. B., Uwakwe, K., Irekpita, E., Dongo, A., Bwala, K. J., & Alegbeleye, B. J. (2011). Knowledge of hepatitis B vaccine among operating room personnel in Nigeria and their vaccination status. *Hepatitis Research And Treatment*, 2011.

8

Summary and Conclusion

8.0 Introduction

Bihar is one of the Indian states that has persistently exhibited a poor performance in developmental indicators. Demographically also, the state lags behind in fertility, mortality and ranks very poorly in human development index. Therefore, an attempt has been made in the present study to explore the health care utilisation of infants and children through an introspection of the status of immunization. The present thesis is hence titled as ‘Status of Childhood Immunization in Bihar: A Comparative Study of Jamui and Aurangabad Districts’.

The Government of India is sincerely trying to promote immunization coverage against Vaccine Preventable Diseases namely Measles, Tuberculosis, Pertussis, Diphtheria, Tetanus, and Poliomyelitis to reduce and eliminate mortality, morbidity and disability among children. Vaccines are provided free of cost throughout the country to each and every individuals. Percentage of immunization coverage has increased during last three decades after adaptation of Universal Immunization Programme but this is far from the target. The UN Inter-Agency Group on Child Death, Level and Trends of Child Mortality 2013, also state that India experiences the lowest child immunization rate of any country in the world. Furthermore, gross disparities can be seen at the regional level and among various social groups. States like Himachal, Punjab, Tamil Nadu, Kerala and Karnataka show better performance, while Uttar Pradesh, Bihar, Meghalaya, Madhya Pradesh, Tripura, Bihar, Manipur, Rajasthan, and Assam present poor performance, having lower child immunization coverage than the national level. Therefore, two districts have been selected for the present study from Bihar, on the basis of percentage of full immunization coverage. First one is a better performing district i.e. Aurangabad and the second one is Jamui, which is a poor performing district of Bihar. Primary survey has been conducted at the household level and for the health service providers. A total of about six hundred households have been selected on the basis of households having children (12-23 months of age) eligible for immunization. Mothers’ of the children are the main respondents, but fathers' responses have been also recorded for analysing the role of fathers in child immunization. Socio-economic status of households and demographic correlates of child immunization have been analysed through various statistical techniques such as Logistic

Regression Analysis, Cross Tabulation and Chi-square tests. In addition, qualitative research techniques such as In-depth Interviews, Case Studies, and Focus-Group discussion have been also conducted. Furthermore, role of health infrastructure and health functionaries have also been analysed. ANMs Anganwadi workers and ASHAs have been interviewed to fulfil the requirement of the study.

Therefore the present study has aimed to ascertain the status of immunization and present an analysis of the role played by background factors in child immunization in India and Bihar. The study has also aimed to bring forth the influence of socio-economic characteristics of the parents in child immunization in the study areas. Knowledge, Attitude, and Practices towards child immunization, role played by existing health infrastructure and service providers in child immunization coverage have also been analysed in great detail.

The present study has been divided into eight chapters. The chapter-wise findings are given below:

8.2 Summary and Findings of the Study

Chapter I: The **First Chapter** is the **introductory section** of the study that contains introduction to immunization and statement of the problem, that give us the basic rationale for undertaking the study. Extensive literature has been surveyed under various sub-headings, for understanding and identifying the factors responsible for low immunization coverage in the study areas. Literature review reveals that socio-economic and demographic factors play significant role in child immunization process. The literature review has also highlighted the knowledge, attitude, and practices of parents towards childhood diseases and child immunization. Role of health infrastructure and health functionaries have been also surveyed. In addition, India's immunization programmes and policies have been reviewed with a special reference to access to health care infrastructure and quality of services. Finally, based on the inferences attained from the extensive literature survey, a conceptual frame work has been constructed to understand the mechanisms behind child immunization process, and for analysing the processes involved. Furthermore, objectives of the study, research questions, data sources, methodology and survey design and survey instruments, sampling of study areas and organization of the thesis have been covered in this section.

The **Second Chapter** is entitled as “**Child Survival Issue: A Global Overview**. This chapter has been analysed on the basis of various secondary data sources. An attempt has been made to evaluate the Millennium Development Goals (MDGs) (2000), Global Immunization: Vision and Strategy’ (GIVS) (2005), and ‘Sustainable Development Goals’ (SDGs) in the light of child immunization coverage and reduction of infant mortality rate and under-five mortality rate at the global level. The findings reveal that a substantial reduction has been recorded in infant mortality rate and under 5 mortality rates at the global level. Many countries of the world have achieved Millennium Development Goals. Most of the African and South Asian countries however could not achieve the MDGs and are currently experiencing low immunization coverage. Therefore, infant mortality and under-five mortality rate is still high in these regions.

Within the South Asian sector, Sri Lanka’s performance regarding child immunization coverage has been indeed incredible. Sri Lanka is the first South Asian country that has achieved the ‘Millennium Development Goals’. Furthermore, Bangladesh, Bhutan, and Nepal also record higher childhood immunisation coverage in the South Asian region, whereas India and Pakistan present poor performance; even though Infant and under-five mortality rate have declined in the South Asian region after the adoption of Millennium Development Goals during the last two decades.

India represents a contrasting picture as far as child immunization is concerned. Regional variations can be seen at the State and District level in child immunization coverage in India. Union territories presents higher child immunization coverage in comparison to big states. Himachal Pradesh, Punjab, Tamil Nadu, Kerala and Karnataka are better performing states, whereas Uttar Pradesh, Meghalaya, Madhya Pradesh, Tripura, Bihar, Manipur, Rajasthan and Assam are poor performing states.

Bihar demonstrates very low immunisation coverage in the country. Within the state, immunization coverage is uneven across the districts. Saran district has the highest immunization coverage that is higher than the national and the state level, whereas Jamui has much lower immunization coverage than the national and state level.

Infant mortality rate and under 5 mortality rate have declined between two decades due to Universal Immunization Programme and Millennium Development Goals, but more vigorous and continuous efforts are required, particularly to achieve the new global target, i.e. zero preventable child deaths by the year 2030.

‘Profile of the Study Areas’ is the subject matter of **Chapter Three**, that covers the geographical, socio-economic, demographic characteristics of Bihar in general; Jamui and Aurangabad districts and sample villages in particular. The economy of Bihar is dominated by the agricultural sector that contributes one fourth in the ‘State Gross Domestic Product’ (SGDP). Agriculture is the principal activity of people of the state, in which two third of the population are engaged for their employment and livelihood. Bihar has the lowest number of industries in the country that is one of the important factors of high unemployment rate, poverty and out migration. Bihar is also one of the least urbanized states. Literacy rate, especially female literacy is very low in the state. Sex ratio is below national level, but child sex ratio is above the national level. Bihar experiences high infant mortality rate, particularly female infant mortality rate, under 5 mortality, neonatal mortality rate, post neonatal mortality rate and maternal mortality ratio in the country. Furthermore, Crude Birth Rate, General Fertility Rate, Total Fertility Rate, and Natural Growth Rate are also much higher than the national level. Utilization of antenatal care services is comparatively low in the state. Percentage of home deliveries is still very high as compared to institutional deliveries. All these health and demographic indicators present poor health outcomes in Bihar.

Aurangabad and Jamui districts have been selected for the present study. Aurangabad district is not only larger in terms of area, but also in terms of population size with respect to Jamui district. The decadal growth rate is higher in Jamui district marginally in comparison to Aurangabad district. Aurangabad district presents higher sex ratio than Jamui district. Infant mortality rate, female infant mortality rate, under-five mortality rate, crude death rate, neonatal mortality rate and post neonatal mortality rate are higher in Jamui than in Aurangabad district. Furthermore, Aurangabad district recorded high literacy rate, especially female literacy rate in contrast to Jamui district.

Chapter Four provides the analysis of **Child Immunization in India and Bihar: Socio-economic and Demographic Correlates**. Here, Bihar has been compared with the national level. A research question has been also framed for this chapter- *‘What are the linkages between household characteristics and child immunization?’* The answer to this question has been investigated for India as well as for Bihar. This chapter is based on the secondary data sources. Major findings reveal that socio-economic and demographic factors play important roles in child immunization coverage. Maternal age, birth order, sex of child, work status, religion, caste, wealth index, place of residence, utilization of

full antenatal care and utilization of post natal care services, place of delivery are significant factors in India, whereas maternal age, birth order, religion, caste, wealth index, utilization of antenatal care services and place of delivery are significant factors in Bihar.

Middle age group mothers represent maximum utilisation of immunization for their children against Vaccine Preventable Diseases. Children belonging to the first birth order are more immunized than higher birth order children. Gender discrimination can be also seen regarding child immunization coverage. Female children are less immunized in comparison to male children. Those mothers who were not working since the last 12 months are more likely to immunize their children in comparison to working mothers. The highest child immunization coverage has been reported among the Sikh religious group, whereas lowest child immunization coverage has been reported among Muslims in India. In Bihar, Hindu population shows higher immunization coverage than other minority religious groups. Child immunization coverage varies among various social groups. The Scheduled Caste and Scheduled Tribes are less likely to immunize their children in comparison to General Caste population. Children belonging to the richest sections of the society are more immunized than the poorer sections of the society.

Again it was found that urbanization has an impact on immunization coverage as children living in urban areas are more immunized than rural areas. Those women who received at least three antenatal care and post natal care services are more likely to immunize their children. Those children who have been born at home have less chance of being immunized.

Chapter Five has been entitled as **Influence of Socio-economic and Demographic Characteristics on Child Immunization Coverage in Study Areas**. This analysis of this chapter has been based on the research question - *“In what manner does socio-economic characteristics of parents influence child immunization in the study areas?”* This chapter is based on primary data sources, emanating out of the field survey in the sampled regions. The major findings present that higher birth order, 30-34 years age group mothers, caste, high standard of living, work status, women’s autonomy, and family cooperation appeared as significant factors in Aurangabad district. However in Jamui district, mothers and fathers who have studied up to high school and above level of education, other backward caste group, work status, women’s autonomy and family cooperation are found to be the significant factors.

In Aurangabad district, higher birth order children have less chance of immunization than low birth order children. Immunization coverage of children are higher among the 30-34 years old age group mothers.

Child immunization coverage varies with social stratification that shows a decline from general castes to scheduled castes. Children belonging to the richest section of the society present better performance in immunization coverage. Working mothers get less chance to immunize their children. Women's autonomy has strong positive effect on child immunization coverage in the study area. Cooperation received from the family also play an important role in child immunization coverage in Aurangabad district.

In Jamui district, those children whose mothers and fathers have studied up to high school and above have higher possibility to immunize their children than illiterate and less educated parents. Children belonging to other backward caste are more likely to be immunized. Women's autonomy and family cooperation also positively influence child immunization coverage in Jamui district.

Dropouts have also been reported in multi-dose vaccine in both the districts. Jamui district indicates a higher dropout rate than Aurangabad district. Dropout in OPV uptake is almost equal in both the districts. In the case of DPT and Hepatitis-B uptake, Jamui demonstrates a higher dropout rate in comparison to Aurangabad district. The dropout rate is not equally distributed among various socio-economic categories of households. Children belonging to poorer sections of the society, uneducated families, deprived and minority sections of the society and working mothers indicate higher dropout rate regarding multi-dose vaccines uptake. Lack of time among mothers, sickness of the child on the day of immunization, not remembering the date for immunization, unavailability of the child due to a visit to the relative's place, fear of side effects of injectables / vaccines and in general lack of parental knowledge of multi-dose vaccines have been the other factors associated with higher dropouts in multi-dose vaccine uptake.

Role of Health Infrastructure and Health Provisioning in Child Immunization Coverage in the Study Areas is the subject matter of **Chapter Six**. Two research questions have been examined in this chapter. The first one is *“what is the relationship between health infrastructure and health provisioning in child immunization coverage in the study areas?”* The second research question is *“What are the problems and constraints for full immunization coverage in study areas?”* Findings exhibit that poor health infrastructure and service delivery are salient factors inhibiting child immunization

in Bihar. There is a big shortage of various public health units in the state. Existing Public Health Centres are facing lack of ANMs, male health workers, doctors, laboratory technicians, clerks, pathologists, lady doctors and other human resources. Physical infrastructure is also in a very poor condition at various Public Health Units, such as buildings, electricity, beds, water supply, laboratories, regular supply of drugs, medicines, cold storage facilities and other equipments.

Although, Aurangabad district has a higher number of various public health units in comparison to Jamui district, but both districts are facing great shortage of number of ANMs, Nurses, HLVs, male health workers, doctors, and other human resources. Jamui district is facing a much higher scarcity of doctors, Nurses, ANMs, HLVs, and others staffs in contrast to Aurangabad district. Physical infrastructures in various health units are comparatively better in Aurangabad district than Jamui district because all the PHCs are functioning in their own government buildings. Almost all Primary Health Centres are connected with electricity, water supply, toilet facility, and accommodation facility. Ambulance services are also operating in the Blocks. On the other hand, in Jamui district, majority of PHCs have no power supply, no water supply, no toilet facility, and accommodation facilities are also not available for health functionaries.

The situation is more critical for sub centre in Jamui district. There is no sub-centre in Jamui district that has either water supply or electricity. Most of sub health centres do not have their own buildings. These are functioning in rented buildings and in *Panchayat Bhavans*.

The existing number of *Anganwadi* workers and ASHAs are higher in Aurangabad district than in Jamui district, but they are not adequate as per the required population norm in both the districts. In addition, the distribution of ASHAs and Anganwadi workers are uneven at the Block level. Some Blocks have a surplus number of ASHAs and Anganwadi workers, while some Blocks are facing shortage of ASHAs and Anganwadi workers. Furthermore, ASHAs and Anganwadi workers are mostly overloaded with paper work, i.e. maintaining files and registers, while they are paid very low honorarium. This acts as disincentives in motivating the service clientele and in awareness generation. Inadequate and irregular supply of medicines, problems related to storage; management and distribution of drugs and medicines are other serious problems at health centres in Bihar. Undeveloped transportation and communication facilities are also serious handicaps standing in the way of achieving the target of full immunization coverage.

Lack of motivation, unwillingness, rude behaviour towards beneficiaries and absenteeism also prevail among health personal.

An attempt has been made to explore the **Knowledge, Attitude, and Practices of the Parents towards Child Immunization in the Study Areas** in Chapter Seven.

This chapter is based on an examination of the research question - *Does Knowledge, Attitude, and Practices of the parents influence child immunization in the study area?*

This chapter is entirely based on the primary qualitative information. Findings of the present chapter present that knowledge regarding life threatening vaccine preventable diseases, name of associated vaccines, number of doses and interval between two doses of vaccines is very poor among parents in both the districts. Nobody knows the correct date / month / year or age of children who are to be immunized. The name of Poliomyelitis and Measles are common and well known to everybody in both the districts due to mass media advertisements and the occurrence of these diseases in the sampled areas. Measles is more common in Aurangabad district because it occurs annually in the sampled villages.

Misconceptions regarding childhood diseases prevail among the general population of both the districts. Fear arising out of muscular injections that are given to small children have been reported by mothers of children. It has been also found that fear of side effects arising out of vaccination often hampers the immunization process. Moreover, infant and child morbidity at the time of immunization hampers the process; as mothers do not take their child for immunization, if the child happens to be sick. Also they do not go for vaccination during teething of their infants. These problems sometimes also result in dropout particularly in multi-dose vaccines. It was found that the population of both districts have faith in allopathic medicines but prevailing misconceptions and rituals often deter them from modern practices. They also have trust in Government services, but the people of Tajpur village do not trust in the government provided health services. Majority of the mothers believe that children fall sick due to weather changes, and this is quite natural. Ignorance, illiteracy, unawareness and in general an apathy towards immunization has been noticed in the study areas; arising out of broader problems of poverty and lack of job opportunities. Patriarchal mindsets of families are also partially responsible for this poor situation. Again, there are also serious problems on the health delivery side. Many of the health functionaries were found to play a passive role, being

overloaded with paperwork, poor honorarium and inadequate infrastructure support base. Therefore, this study indicates that knowledge, attitude and practices play important roles in child immunization coverage, as lack of these has resulted in a poor coverage in immunization in the sampled regions.

Chapter Eight is the present chapter that presents an entire summary of the present research along with the major conclusions emanating out of the study. This chapter also delves into the policy implications arising out of this research work. Besides, a section on limitations of the study along with the scope for further research has been indicated.

8.3 Conclusions and Policy Implication

The study clearly shows that Bihar is suffering from under-immunization in the country. Hence, the rate of child immunization coverage is poor and is not showing any substantial improvements. Overall backwardness in the level of development is responsible for the poor immunization coverage in the state. Public Health Infrastructure are in miserable condition in Jamui district, whereas Aurangabad district has a slightly better condition. Both districts are facing huge shortage of human resources as well as physical resources in existing public health centres. Poor knowledge and misconception regarding childhood diseases and vaccination are the major reasons for low immunization coverage in the study areas. High illiteracy, poverty, less involvement of male members in child immunization process and lack of cooperation of other family members in this regard are other important factors for poor immunization coverage.

Therefore, child immunization coverage is a complex and multi-faceted problem that require multiple strategies to address it, on both sides, i.e. health provisioning side (supply side) and demand (beneficiaries) side. Therefore, various measures should be taken while formulation holistic and inclusionary policies.

From beneficiaries' point of view, Immunization Programme and Policies should be targeted towards female children. Female children should be equally treated as male children. Parental education, particularly female education, should be improved and uneducated people should be prioritized to immunize their children. Government should give more emphasis to the poverty stricken and working mothers. Apart from this, the socially deprived sections of the society and minority population groups should also be brought under focus in the health policy. In addition, special immunization sessions should be organized for hamlets or outliers of villages and 'Maha-Dalit localities in the

form of *out-reach services*. There is also need of involvement of local government i.e. *Gram Panchayat* and community in child immunization programme implementation.

Public Health Centres play an important role in implementation of health programmes and policies in the country. Therefore, new Public Health Units should be developed in adequate numbers in the state. Within existing Public Health Centres; trained and efficient human resources should be deployed. Special vacancies should be made available for male health workers to fulfill the big shortage of male workers at sub health centre and primary health centres. In addition, physical infrastructure should be developed such as repairing of the old buildings, storage rooms, ensure proper and regular electricity supply, water supply, toilet facility, accommodation, and other facilities. Community health centre should be brought in existence, which is not operational in Bihar. Community health centre provides not only referral services to the primary health centres and additional primary health centre, but it also provides administrative support. Child immunization process cannot be possible without adequate number of ambulances and vehicles that are required at all health centres.

Sub Centre and Anganwadi centre are at the front in child immunization programme. Thus, sub centre and Anganwadi centre should be more prioritized in strengthening the public health units. Anganwadi centres often suffer from the problem of not having their own building, site, and space; as they happen to be the main vaccine supply centres in the villages. Excessive workload especially in register maintenance by Anganwadi workers and ASHAs should be minimized so that they can perform in a better way. Their honorarium should be increased and their extensive and hard work should be recognized. Regular and proper training and capacity building programmes should be organized for Anganwadi workers, ASHAs and ANMs. Regular and proper counseling and motivation camps should also be organised for all male and female health workers in health centres and for Anganwadi workers as well as for functionaries from district hospitals; to imbibe cooperative and sympathetic behaviour, so that every mother is motivated to visit the health facility for child immunization without any fear or hesitation. Health personal should be more cooperative, sympathetic and helpful for the illiterate, poor and deprived sections of the society, minority and rural population.

Regular and sufficient supply of vaccines, AD syringes should be ensured. Storage of vaccines, replacement and repair of vaccinators, cold box, deep freezer and other equipments should be maintained at health centres.

The importance of developed means of transportation and communication cannot be ignored to achieve the target of child immunization coverage. The entire village should be linked with metal roads, so that vaccines can be delivered to remote areas. ASHAs and Anganwadi workers are the only source of information regarding child immunization. No posters, banners, pamphlets or other sources of visual information are available in rural areas. Thus, print media as well as mass media exposure should be improved.

Knowledge regarding childhood vaccine preventable diseases and associated names of vaccines, correct time, interval or age of children for immunization and related immunization education programmes should be initiated at the village level. Misconceptions regarding vaccination and childhood diseases should be explained to the rural population. Perfect knowledge of side effect of vaccines and how to tackle these problems should be explained to mothers. The social and economic benefits arising out of a better immunization coverage should be espoused along with physical and cognitive benefits of children.

Last but not the least improvements in child immunization programme cannot be seen in isolation to poverty alleviation and employment generation programmes. This is because overt poverty was found to be a root cause of the ignorance in the study region. Linked to poverty and ignorance are also the questions of high fertility, and childhood morbidity. Thus different policies have strong inter-linkages and these must be explored in order to successfully implement immunization programmes.

8.4 Limitations of the Study and Scope for Further Research:

The present research has delved only into certain aspects affecting child immunization. However, there are many other areas that need further research. Effective cold chain management play vital role in child immunization coverage. That is the backbone of child immunization programme. A robust study required to introspect cold chain management system, storage and maintenance of vaccines. Secondly, child immunization is a very cost effective health intervention programme. Therefore, economic and financial aspects of the Government should be also analyzed in order to study the child immunization coverage. In this regard, the role played by the State and Local Governments also needs to be analysed further.

Bibliography

Acharya, S. (2010). Caste and patterns of discrimination in rural public health care services. *Blocked by Caste: Economic Discrimination in Modern India (New Delhi: Oxford University Press, 2010)*, 208-229.

Acharya, S., & Kanitkar, T. (1995). Maternal and child mortality: a study of village Nirpura district Meerut (UP). Research Series 95. Mumbai: IIPS.

Agrawal, S. C., & Kumari, A. (2014). Immunization Status of Children and the Influence of Social Factors: A Hospital Based Study in Western Uttar Pradesh. *Pediatric Infectious Disease*, 6(1), 25-30.

Ahmed, S. M., Adams, A. M., Chowdhury, M., & Bhuiya, A. (2000). Gender, socioeconomic development and health-seeking behaviour in Bangladesh. *Social Science & Medicine*, 51(3), 361-371.

Al-Taiar, A., Clark, A., Longenecker, J. C., & Whitty, C. J. (2010). Physical accessibility and utilization of health services in yemen. *International Journal of Health Geographics*, 9(1), 38.

Angelillo, I. F., Ricciardi, G., Rossi, P., Pantisano, P., Langiano, E., & Pavia, M. (1999). Mothers and vaccination: knowledge, attitudes, and behaviour in Italy. *Bulletin of the World Health Organization*, 77(3), 224-229.

Antai, D. (2009). Faith and child survival: the role of religion in childhood immunization in Nigeria. *Journal of Biosocial Science*, 41(01), 57-76.

Arif, G. M. (2004). Child health and poverty in Pakistan. *The Pakistan Development Review*, 211-238.

Arnold, F., Choe, M. K., & Roy, T. K. (1998). Son preference, the family-building process and child mortality in India. *Population studies*, 52(3), 301-315.

Ashokan, A. (2010). Self reported morbidity, inpatient and outpatient care and utilisation of health care services in Rural Kasaragod, Kerala.

Awodele, O., Oreagba, I. A., Akinyede, A., Awodele, D. F., & Dolapo, D. C. (2010). The knowledge and attitude towards childhood Immunization amongst mothers attending the antenatal clinic in Lagos University Teaching Hospital. *Tanzania Journal of Health Research*, 12(3), 172-177.

Awoyemi, T. T., Obayelu, O. A., & Opaluwa, H. I. (2011). Effect of distance on utilization of health care services in rural Kogi State, Nigeria. *Journal of human Ecology*, 35(1), 1-9.

Babalola, S., & Fatusi, A. (2009). Determinants of use of maternal health services in Nigeria-looking beyond individual and household factors. *BMC Pregnancy And Childbirth*, 9(1), 43.

Bardenheier, et al., (2004). Factors associated with underimmunization at 3 months of age in four medically underserved areas. *Public Health Reports*, 119(5), 479-485.

Baru, R. V. (1998). Private health care in India: social characteristics and trends. New Delhi: Sage Publications.

Baru, R., Acharya, A., Acharya, S., Kumar, A. S., & Nagaraj, K. (2010). Inequities in access to health services in India: caste, class and region. *Economic and Political Weekly*, 49-58.

Bashshur, R. L., Shannon, G. W., & Metzner, C. A. (1971). Some ecological differentials in the use of medical services. *Health Services Research*, 6(1), 61.

Belli, P. C., & Appaix, O. (2003). *The economic benefits of investing in child health*. World Bank, Washington, DC.

Benjamins, M. R., & Brown, C. (2004). Religion and preventative health care utilization among the elderly. *Social Science & Medicine*, 58(1), 109-118.

Benjamins, M. R., & Brown, C. (2004). Religion and Preventative Health Care Utilization among the Elderly. *Social Science & Medicine*, 58(1), 109-118.

Bhalotra, S. (2010). Fatal fluctuations? Cyclicity in infant mortality in India. *Journal of Development Economics*, 93(1), 7-19.

Bhatia .J.C. and Cleland J. (1995) "Determinants of maternal care in region of south india", *Health Transition Review*, 5(2) 127-142

Bihar through Figures. (2013): Government of Bihar.

Bihar: Road Map for Developemnt of Health Sector a Report of the Task Force on Bihar Government. (2007, August), New Delhi: Government of India.

Blau, D. M. (1999). The effect of income on child development. *Review of Economics and Statistics*, 81(2), 261-276.

Bosu, W. K., Ahelegbe, D., Edum-Fotwe, E., Bainsong, K. A., & Turkson, P. K. (1997). Factors influencing attendance to Immunization sessions for children in a rural district of Ghana. *Acta Tropica*, 68(3), 259-267.

Braka, F., Asiiimwe, D., Soud, F., Lewis, R. F., Makumbi, I., & Gust, D. (2012). A qualitative analysis of vaccine safety perceptions and concerns among caretakers in Uganda. *Maternal And Child Health Journal*, 16(5), 1045-1052.

Bronte-Tinkew, J., & Dejong, G. F. (2005). Do household structure and household economic resources predict childhood immunization? Evidence from Jamaica and Trinidad and Tobago. *Population Research and Policy Review*, 24(1), 27-57.

Bronte-Tinkew, J., & Dejong, G. F. (2005). Do Household Structure and Household Economic Resources Predict Childhood Immunization? Evidence from Jamaica and Trinidad and Tobago. *Population Research and Policy Review*, 24(1), 27-57.

Brooks, C. H. (1973). Associations among distance, patient satisfaction, and utilization of two types of inner-city clinics. *Medical Care*, 373-383.

Chanchal D. (February 2016), Yojana

Child Immunisation Coverage (2016) WHO

Choe and T. K Roy (1998), "Son Preference, The Family- Bulding and Child Mortality in India" *Population Studies*, Vol. 52, No 3,pp 301-315.

Coburn, D., & Pope, C. R. (1974). Socio-economic status and preventive health behaviour. *Journal of Health and Social Behavior*, 67-78.

Cohen, S. (1999). Social status and susceptibility to respiratory infections. *Annals of the New York Academy of Sciences*, 896(1), 246-253.

Countdown To 2015 Decade Report (2000-2010), "Maternal, New Born & Child Survival", WHO. 2012

Dempsey, et.al (2008). The role of economic information in decision-making by the advisory committee on immunization practices. *Vaccine*, 26(42), 5389-5392.

Desai and Alva (1998), "Maternal Education and Child Health: Is there a strong causal relationship?" *Demography* Vol. 35, No 1, pp 71-81

Diddy Anti (2009), Faith and Child Survival; The Role of Religious in Childhood Immunization in Nigeria, *Journal of Biosocial Science*, pp.57-76

Dombkowski et al. (1974), "Risk Factors for Delay in Age – Appropriate Vaccination “ , *Public Health Report* , Vol. 119, No 2, pp 144- 155

Dombkowski, K. J., Lantz, P. M., & Freed, G. L. (2004). Risk factors for delay in age-appropriate vaccination. *Public Health Reports*, 119(2), 144-155.

Drèze and Sen (2002) *India: Development and Participation*, p336, Oxford University Press

Dyer. (2005). Some countries will not achieve millennium development goals for health by 2015, WHO says. *BMJ: British Medical Journal*, 330(7496), 863.

Economic Survey.(2014-15), Government of Bihar.

Elo, I. T. (1992). Utilization of maternal health-care services in Peru: the role of women's education. *Health Transition Review*, 49-69.

Estimates developed by the un inter-agency group for child mortality estimation, New York, USA

Feikin, et al., (2009). The Impact of Distance of Residence From a Peripheral Health Facility on Pediatric Health Utilisation in Rural Western Kenya. *Tropical Medicine & International Health*, 14(1), 54-61.

Fekin R. Daniel et.al (2009), "The Impact of Distance of Residence from a Peripheral Health Facility on Pediatric Health Utilistions in Rural Western Kenya" *Tropical MedicineaAnd International Health*, Vol. 14, pp 54-61.

Ganle, J. K., Obeng, B., Segbefia, A. Y., Mwinyuri, V., Yeboah, J. Y., & Baatiema, L. (2015). How intra-familial decision-making affects women's access to, and use of maternal health care services in Ghana: a qualitative study. *BMC Pregnancy And Childbirth*, 15(1), 173.

Global immunisation data. (July 2014) WHO

Global immunisation News September (2014) WHO

Henderson, L., Millett, C., & Thorogood, N. (2008). Perceptions of childhood Immunization in a minority community: the qualitative study. *Journal of the Royal Society of Medicine*, 101(5), 244-251.

Himanshu. (2007). Recent trends in poverty and inequality: some preliminary results. *Economic and Political Weekly*, 497-508.

Hughart, N., Strobino, D., Holt, E., Guyer, B., Hou, W., Huq, A., & Ross, A. (1999). The Relation of Parent and Provider Characteristics to Vaccination Status of Children in Private Practices and Managed Care Organizations in Maryland. *Medical care*, 44-55.

Immunisation and Vaccine Development South-East Asia Region (2014) WHO

Immunisation, Vaccines and Biological, World Immunisation Week .(2012) WHO

Jahn, A., & Aslam, A. (1995). Fathers' perception of child health: a case study in a squatter settlement of karachi, Pakistan. *Health Transition Review*, 191-206.

Jain Devaki (1985) The household trap : report on field survey of female activity pattern. In *Tyranny of the Household: Investigating Essays on women's Work*. New Delhi: Shakti Books.

Jonas, K., Crutzen, R., van den Borne, B., & Reddy, P. (2017). Healthcare workers' behaviours and personal determinants associated with providing adequate sexual and reproductive healthcare services in sub-Saharan Africa: a systematic review. *BMC Pregnancy and Childbirth*, 17, 86.

Kadri, A. M., Singh, A., Jain, S., Mahajan, R. G., & Trivedi, A. (2010). Study on immunization coverage in urban slums of Ahmedabad city. *Health and Population: Perspectives And Issues*, 33(1), 50-54.

Kam, E. L. P. (2011). Evaluating Immunization Rates and Barriers to Immunization For Children 1 to 5 Years Old in Rural India. Mount Sinai School of Medicine.

Kent, R., & MacRae, M. (2010). Agricultural livelihoods and nutrition—exploring the links with women in Zambia. *Gender & Development*, 18(3), 387-409.

Kesieme, E. B., Uwakwe, K., Irekpita, E., Dongo, A., Bwala, K. J., & Alegbeleye, B. J. (2011). Knowledge of hepatitis B vaccine among operating room personnel in Nigeria and their vaccination status. *Hepatitis Research and Treatment*, 2011.

Kravdal, Ø. (2004). Child mortality in India: the community-level effect of education. *Population Studies*, 58(2), 177-192.

Kumar, A., & Mohanty, S. K. (2011). Socio-Economic Differentials in Childhood Immunization in India, *Journal of Population Research*, 28(4), 301.

Kumar, D., Aggarwal, A., & Gomber, S. (2010). Immunization status of children admitted to a tertiary-care hospital of north India: reasons for partial immunization or non-immunization. *Journal of Health, Population and Nutrition*, 300-304.

Lakshminarayanan, S. (2011). Role of government in public health: Current scenario in India and future scope. *Journal of Family and Community Medicine*, 18(1), 26.

Lalou, R., & LeGrand, T. K. (1997). Child mortality in the urban and rural Sahel. *Population an English Selection*, 147-168.

Lawn, J. E., Costello, A., Mwansambo, C., & Osrin, D. (2007). Countdown to 2015: Will the millennium development goal for child survival be met?. *Archives of Disease in Childhood*, 92(6), 551-556.

Lee, S. H., & Mason, A. (2005). Mother's education, learning-by-doing, and child health care in rural India. *Comparative education review*, 49(4), 534-551.

Levin, J. S., & Markides, K. S. (1986). Religious attendance and subjective health. *Journal for the Scientific Study of Religion*, 31-40.

Maccoby, E. E., & Martin, J. A. (1983). Socialization in the context of the family: Parent-child interaction. *Handbook of child psychology: formerly Carmichael's Manual of child psychology/Paul H. Mussen, editor*.

Mancher J. (1986). Women's work and poverty: women contribution of household maintenance in south India", pp 99-119 in A Home Divided: women and income in the third world, D. Dwyer and J. Bruce. Stanford: Stanford University Press.

Mannava, P., Durrant, K., Fisher, J., Chersich, M., & Luchters, S. (2015). Attitudes and behaviours of maternal health care providers in interactions with clients: a systematic review. *Globalisation and Health*, 11, 36.

Mathew, J. L. (2012). Inequity in childhood immunization in India: a systematic review. *Indian pediatrics*, 49(3), 203-223.

Matthews, Z., & Diamond, I. (1997). Child immunized in Ghana: the effects of family, location and social disparity. *Journal of Biosocial Science*, 29(03), 327-343.

McGuirk, M. A., & Porell, F. W. (1984). Spatial patterns of hospital utilization: the impact of distance and time. *Inquiry*, 84-95.

Mencher, J. (1988). Women's work and poverty: Women's contribution to household maintenance in South India. *A home divided: Women and income in the Third World*, 99-119.

Mencher, J. P. (1980). The lessons and non-lessons of Kerala: Agricultural labourers and poverty. *Economic and Political Weekly*, 1781-1802.

- Merten, S. et.al.(2015). Gender determinants of vaccination status in children: evidence from a meta-ethnographic systematic review. *PloS one*, 10(8), e0135-222.
- Mishra, V., Roy, T. K., & Retherford, R. D. (2004). Sex differentials in childhood feeding, health care, and nutritional status in India. *Population and Development Review*, 269-295.
- Mittal, A., Singh, J., & Ahluwalia, S. K. (2007). Effect of maternal factors on nutritional status of 1-5-year-old children in urban slum population. *Indian Journal of Community Medicine*, 32(4), 264.
- Mohamud, et.al. (2014). Immunization coverage of 12–23 months old children and associated factors in Jigjiga District, Somali National Regional State, Ethiopia. *BMC Public Health*, 14(1), 865.
- Mohindra, K. S., Haddad, S., & Narayana, D. (2008). Can Microcredit Help Improve the Health of Poor Women? Some Findings from A Cross-Sectional Study in Kerala, India. *International Journal for Equity in Health*, 7(1), 2.
- Moïsi, J. C. et al. (2010). Spatial and socio-demographic predictors of time-to-immunization in a rural area in Kenya: Is equity attainable?. *Vaccine*, 28(35), 5725-5730.
- Müller, I., Smith, T., Mellor, S., Rare, L., & Genton, B. (1998). The effect of distance from home on attendance at a small rural health centre in Papua New Guinea. *International Journal of Epidemiology*, 27(5), 878-884.
- Narayana, D. L. (1979). Economics of Sriculture in Rayalaseema.
- Navaneetham, K., & Dharmalingam, A. (2002). Utilization of maternal health care services in Southern India. *Social Science & Medicine*, 55(10), 1849-1869.
- Nayar, K. R. (2011). Gaps In Goals: The history of goal-setting in health care in india. *Oman Medical Journal*, 26(1), 1.
- Nilanjan, P. (2006). Universal Immunization programme in India: the determinants of childhood immunization. this paper was presented at the 42nd Annual Conference (5-7 Jan, 2006) of The Indian Econometric Society (TIES), held at GND Univ., Amritsar, India.
- Nwakoby, B. N. (1994). Use of obstetric services in rural Nigeria. *Journal of the Royal Society of Health*, 114(3), 132-136.
- Padmanabha, P. (1992). Integrating family welfare and development programmes: some organisational considerations. *Economic and Political Weekly*, 89-91.
- Pande, R. P. (2003). Selective gender differences in childhood nutrition and immunization in rural India: the role of siblings. *Demography*, 40(3), 395-418.
- Paterno Anna, Child Mortality and the Millennium Development Goals: Characteristics, Trend and Determinist

- Paul, V. K. et.al. (2011). Reproductive health, and child health and nutrition in india: meeting the challenge. *The Lancet*, 377(9762), 332-349.
- Pearce, L. D., & Axinn, W. G. (1998). The impact of family religious life on the quality of mother-child relations. *American Sociological Review*, 810-828.
- Penchansky, R., & Thomas, J. W. (1981). The concept of access: definition and relationship to consumer satisfaction. *Medical Care*, 19(2), 127-140.
- Peters, D. H., Garg, A., Bloom, G., Walker, D. G., Brieger, W. R., & Hafizur Rahman, M. (2008). Poverty and access to health care in developing countries. *Annals of the New York Academy of Sciences*, 1136(1), 161-171.
- Phukan, R. K., Barman, M. P., & Mahanta, J. (2008). Factors associated with immunization coverage of children in Assam, India: over the first year of life. *Journal of Tropical Pediatrics*, 55(4), 249-252.
- Pruitt, R. H., Kline, P. M., & Kovaz, R. B. (1995). Perceived barriers to childhood immunization among rural populations. *Journal of Community Health Nursing*, 12(2), 65-72.
- Raghupathy, S. (1996). Education and the use of maternal health care in Thailand. *Social Science & Medicine*, 43(4), 459-471.
- Rani, M. U., & Rao, K. C. (1995). Socio-economic and demographic factors as predictors of nutrition and health knowledge of mothers in rural Andhra Pradesh. *Journal of Research APAU*, 23(2), 12-16.
- Ransom, J., Schaff, K., & Kan, L. (2012). Is there an association between local health department organizational and administrative factors and childhood immunization coverage rates? *Journal of Health and Human Services Administration*, 418-455.
- Roper, W. L., Baker Jr, E. L., Dyal, W. W., & Nicola, R. M. (1992). Strengthening the public health system. *Public Health Reports*, 107(6), 609.
- Rutstein, S. O. (2000). Factors associated with trends in infant and child mortality in developing countries during the 1990s. *Bulletin of the World Health Organization*, 78(10), 1256-1270.
- Rutstein, S. O. (2000). Factors Associated With Trends in Infant and Child Mortality in Developing Countries During the 1990s. *Bulletin of the world health organization*, 78(10), 1256-1270.
- Sankar, D., & Kathuria, V. (2004). Health system performance in rural India: Efficiency estimates across States. *Economic and Political Weekly*, 1427-1433.
- Schaffer, S. J., & Szilagyi, P. G. (1995). Immunization status and birth order. *Archives of pediatrics & Adolescent Medicine*, 149(7), 792-797.

- Shaikh, B. T., & Hatcher, J. (2004). Health seeking behaviour and health service utilization in Pakistan: challenging the policy makers. *Journal of Public Health*, 27(1), 49-54.
- Sheldon (1999), "Social Status and Susceptibility to Infection" department of psychology Carenegie Mellon University paper-294, PP. 216-253.
- Short, S. E., Chen, F., Entwisle, B., & Fengying, Z. (2002). Maternal work and child care in China: a multi-method analysis. *Population and Development Review*, 28(1), 31-57.
- Shour E. susan et.al (2002). Maternal work and child care in china: A multi-Method Analysis, *Population and Development Review*, Vol.28, No 1, PP 31-57.
- Shrivastwa, N., Gillespie, B. W., Kolenic, G. E., Lepkowski, J. M., & Boulton, M. L. (2015). Predictors of vaccination in India for children aged 12–36 months. *American Journal of Preventive Medicine*, 49(6), S435-S444.
- Singh, P. K. (2013). Trends in child immunization across geographical regions in India: focus on urban-rural and gender differentials. *PloS one*, 8(9), e73102.
- Streatfield, K., Singarimbun, M., & Diamond, I. (1990). Maternal education and child immunization. *Demography*, 27(3), 447-455.
- Subaiya, S. et al. (2015). Global routine vaccination coverage, 2014. *MMWR. Morbidity and Mortality Weekly Report*, 64(44), 1252-1255.
- Tarrant, M., & Gregory, D. (2001). Mothers' perceptions of childhood Immunizations in First Nations communities of the Sioux Lookout Zone. *Canadian Journal of Public Health*, 92(1), 42.
- Thomas, D. (1990). Intra-household resource allocation: An inferential approach. *Journal of Human Resources*, 635-664.
- Thomson, E., Hanson, T. L., & McLanahan, S. S. (1994). Family structure and child well-being: *Economic Resources Vs. Parental Behaviors*. *Soc. F.*, 73, 221.
- Tran, T. K., Gottvall, K., Nguyen, H. D., Ascher, H., & Petzold, M. (2012). Factors Associated with Antenatal Care Adequacy in Rural and Urban Contexts-Results from two Health and Demographic Surveillance Sites in Vietnam. *BMC Health Services Research*, 12(1), 40.
- Tupasi et al. (1988). Determinants of morbidity and mortality due to acute respiratory infections: implications for intervention. *Journal of Infectious Diseases*, 157(4), 615-623.
- UNICEF (2015), Millennium Development Goals (MDG) Statistics and Monitoring United Nation children's Fund (2015) level and trend in child mortality, Report 2015
- United Nation Development Programme, 'Human Development Index' Report 2015
- Vandewater, E. A., & Lansford, J. E. (1998). Influences of family structure and parental conflict on children's well-being. *Family Relations*, 323-330.

Vashishtha, V. M., & Kumar, P. (2013). 50 years of Immunization in India: Progress and Future.

Waldhoer, T., Haidinger, G., Vutuc, C., Haschke, F., & Plank, R. (1997). The impact of sociodemographic variables on immunization coverage of children. *European journal of epidemiology*, 13(2), 145-149.

World Health Organization. (2012). Countdown to 2015: taking stock of maternal, newborn & child survival: decade report (2000–2010).

Yousif, M., Albarraq, A., Abdallah, M., & Elbur, A. (2013). Parents' knowledge and attitudes on childhood Immunization, Taif, Saudi Arabia. *J Vaccines Vaccine*, 5(215), 2.

Appendix

Appendix 1.1

DPT-3 Coverage, 1Years Old children in world. (2014)											
Counties	Perceage	Counties	Perceage	Counties	Perceage	Counties	Perceage	Counties	Perceage	Counties	Perceage
Antigua and Barbuda	99	Sri Lanka	99	Spain	97	United Kingdom	95	Jamaica	92	Côte d'Ivoire	67
Bahrain	99	Thailand	99	Tajikistan	97	Uruguay	95	Latvia	92	Nigeria	66
Belgium	99	Uzbekistan	99	United Republic of Tanzania	97	Viet Nam	95	Nepal	92	Iraq	64
Bhutan	99	Albania	98	Bahamas	96	Argentina	94	Trinidad and Tobago	92	Vanuatu	64
Brunei Darussalam	99	Finland	98	Canada	96	Azerbaijan	94	Guinea-Bissau	80	Papua New Guinea	62
China	99	Ghana	98	Cuba	96	Barbados	94	Panama	80	Guinea	51
Cook Islands	99	Guyana	98	Gambia	96	Bolivia (Plurinational State of)	94	San Marino	80	Liberia	50
Cyprus	99	Japan	98	Germany	96	Denmark	94	Philippines	79	Haiti	48
Czech Republic	99	Jordan	98	Ireland	96	Egypt	94	Djibouti	78	Central African Republic	47
Fiji	99	Nicaragua	98	Kyrgyzstan	96	Eritrea	94	Indonesia	78	Chad	46
France	99	Portugal	98	Lesotho	96	Israel	94	Marshall Islands	78	Syrian Arab Republic	43
Greece	99	Saint Vincent and the Grenadines	98	Netherlands	96	Italy	94	Mozambique	78	Somalia	42
Hungary	99	Saudi Arabia	98	Switzerland	96	Libya	94	Uganda	78	South Sudan	39
Iran (Islamic Republic of)	99	Swaziland	98	Turkey	96	Romania	94	Venezuela (Bolivarian Republic of)	78	Equatorial Guinea	24
Luxembourg	99	Sweden	98	Algeria	95	Sudan	94	Ethiopia	77		
Maldives	99	Tunisia	98	Bangladesh	95	United Arab Emirates	94	Mali	77		
Malta	99	Turkmenistan	98	Belize	95	United States of America	94	Timor-Leste	77		
Monaco	99	Andorra	97	Botswana	95	Armenia	93	Ukraine	76		
Mongolia	99	Belarus	97	Burundi	95	Brazil	93	Afghanistan	75		
Morocco	99	Cambodia	97	Cabo Verde	95	Democratic Republic of Congo	93	Kiribati	75		
Niue	99	Dominica	97	Croatia	95	El Salvador	93	Myanmar	75		
Oman	99	Grenada	97	Kazakhstan	95	Estonia	93	Guatemala	73		
Poland	99	Malaysia	97	Kuwait	95	Lithuania	93	Madagascar	73		
Qatar	99	Mauritius	97	Nauru	95	New Zealand	93	Pakistan	73		
Republic of Korea	99	Russian Federation	97	Palau	95	Norway	93	Benin	70		
Rwanda	99	Saint Kitts and Nevis	97	Sao Tome and Principe	95	Serbia	93	Gabon	70		
Saint Lucia	99	Singapore	97	Slovenia	95	Australia	92	South Africa	70		
Seychelles	99	Slovakia	97	The former Yugoslav Republic of Macedonia	95	Chile	92	Niger	68		

Appendix 1.2

HepB3, 1 YEARS ODL (2014)									
Countries	Percentage	Countries	Percentage	Countries	Percentage	Countries	Percentage	Countries	Percentage
Antigua and Barbuda	99	Cambodia	97	Netherlands	95	Congo	90	Philippines	79
Bahrain	99	Dominica	97	Sao Tome and Principe	95	Malta	90	Djibouti	78
Bhutan	99	Grenada	97	Uruguay	95	Tuvalu	90	Indonesia	78
Brunei Darussalam	99	Israel	97	Viet Nam	95	United States	90	Mozambique	78
China	99	Mauritius	97	Argentina	94	Bosnia and Herzegovina	89	Uganda	78
Cook Islands	99	Russian Federation	97	Azerbaijan	94	Dominican Republic	89	Venezuela	78
Czech Republic	99	Singapore	97	Barbados	94	Senegal	89	Ethiopia	77
Fiji	99	Slovakia	97	Bolivia (Plurinational State of)	94	Lao People's Democratic Republic	88	Mali	77
Iran (Islamic Republic of)	99	Tajikistan	97	Egypt	94	Namibia	88	Timor-Leste	77
Maldives	99	The former Yugoslav Republic of Macedonia	97	Eritrea	94	Peru	88	Afghanistan	75
Monaco	99	Turkmenistan	97	Italy	94	Solomon Islands	88	Canada	75
Mongolia	99	United Republic of Tanzania	97	Libya	94	Yemen	88	Kiribati	75
Morocco	99	Andorra	96	Lithuania	94	Cameroon	87	Myanmar	75
Niue	99	Bahamas	96	Luxembourg	94	Germany	87	South Africa	74
Palau	99	Brazil	96	Romania	94	Montenegro	87	Guatemala	73
Qatar	99	Cuba	96	Sudan	94	Paraguay	87	Madagascar	73
Republic of Moldova	99	Cyprus	96	United Arab Emirates	94	Togo	87	Pakistan	73
Rwanda	99	Gambia	96	Armenia	93	Zambia	86	Syrian Arab Republic	71
Saint Lucia	99	Greece	96	Democratic Republic of Congo	93	Honduras	85	Benin	70
Seychelles	99	Kuwait	96	El Salvador	93	Suriname	85	Gabon	70
Sri Lanka	99	Kyrgyzstan	96	Estonia	93	Mauritania	84	India	70
Thailand	99	Lesotho	96	New Zealand	93	Mexico	84	Niger	68
Uzbekistan	99	Malaysia	96	Chile	92	Austria	83	Côte d'Ivoire	67
Albania	98	Poland	96	Jamaica	92	Ecuador	83	Nigeria	66
Belgium	98	Spain	96	Latvia	92	Micronesia (Federated States of)	83	Vanuatu	64
Ghana	98	Turkey	96	Nepal	92	Sierra Leone	83	Iraq	62
Guyana	98	Algeria	95	Republic of the Congo	92	France	82	Papua New Guinea	62
Jordan	98	Bangladesh	95	Serbia	92	Tonga	82	Guinea	51
Nicaragua	98	Belize	95	Trinidad and Tobago	92	Kenya	81	Liberia	50
Oman	98	Botswana	95	Australia	91	Lebanon	81	Haiti	48
Portugal	98	Bulgaria	95	Burkina Faso	91	Angola	80	Central African Republic	47
Saint Kitts and Nevis	98	Burundi	95	Costa Rica	91	Comoros	80	Chad	46
Saint Vincent and the Grenadines	98	Cabo Verde	95	Georgia	91	Democratic Republic of Congo	80	Ukraine	46
Saudi Arabia	98	Croatia	95	Malawi	91	Guinea-Bissau	80	Somalia	42
Swaziland	98	Ireland	95	Samoa	91	Panama	80	Sweden	42
Tunisia	98	Kazakhstan	95	Zimbabwe	91	San Marino	80	Equatorial Guinea	24
Belarus	97	Nauru	95	Colombia	90	Marshall Islands	79		

Appendix 1.3

Polio-3 ,1 years old(2014)									
Countries	Percenta	Countries	Percenta	Countries	Percenta	Countries	Percenta	Countries	Percenta
Bahrain	99	Saint Luci	99	Singapore	97	Lesotho	95	Saint Kitts	93
Belgium	99	Seychelles	99	Slovakia	97	Nauru	95	Serbia	93
Brunei Darussa	99	Sri Lanka	99	Spain	97	Palau	95	United Sta	93
China	99	Thailand	99	United Re	97	Poland	95	Argentina	92
Cook Islands	99	Uzbekista	99	Antigua an	96	Sao Tome	95	Australia	92
Cuba	99	Albania	98	Bahamas	96	Slovenia	95	Chile	92
Cyprus	99	Bhutan	98	Botswana	96	United Ki	95	Latvia	92
Czech Republic	99	Cambodia	98	Brazil	96	Uruguay	95	Nepal	92
Democratic Pec	99	Finland	98	Canada	96	Denmark	94	Republic of	92
Fiji	99	Ghana	98	Ireland	96	Egypt	94	Zimbabwe	92
France	99	Jordan	98	Netherlan	96	Eritrea	94	Burkina F	91
Greece	99	Mauritius	98	Switzerlan	96	Israel	94	Colombia	91
Hungary	99	Portugal	98	The forme	96	Italy	94	Costa Ric	91
Iran (Islamic Re	99	Saudi Ara	98	Turkey	96	Jamaica	94	Georgia	91
Japan	99	Swaziland	98	Viet Nam	96	Kuwait	94	Monteneg	91
Luxembourg	99	Sweden	98	Algeria	95	Libya	94	Samoa	91
Maldives	99	Tunisia	98	Armenia	95	Romania	94	Congo	90
Malta	99	Turkmenis	98	Banglades	95	Solomon I	94	Dominicar	90
Monaco	99	Andorra	97	Barbados	95	Sudan	94		
Mongolia	99	Azerbaijan	97	Belize	95	Tajikistan	94		
Morocco	99	Belarus	97	Bolivia (P	95	Trinidad a	94		
Nicaragua	99	Dominica	97	Burundi	95	United Ar	94		
Niue	99	Gambia	97	Cabo Ver	95	El Salvado	93		
Oman	99	Guyana	97	Croatia	95	Estonia	93		
Qatar	99	Malaysia	97	Germany	95	Lithuania	93		
Republic of Ko	99	Russian F	97	Kazakhsta	95	New Zeal	93		
Rwanda	99	Saint Vinc	97	Kyrgyzsta	95	Norway	93		

Appendix 1.4

BCG 1 Year old (20140)									
Countyie	Percenta	Countyie	Percenta	Countyie	Percenta	Countyie	Percenta	Countyie	Percenta
Albania	99	Sri Lanka	99	Egypt	96	Monteneg	91	Central A	74
Algeria	99	Swaziland	99	El Salvado	96	Democrat	90	Ireland	74
Argentina	99	Thailand	99	Gambia	96	Jamaica	90	Nigeria	74
Armenia	99	The forme	99	Georgia	96	Qatar	90	Liberia	73
Banglades	99	Turkmenis	99	Mexico	96	Sierra Lec	90	Vanuatu	73
Bhutan	99	Tuvalu	99	Russian F	96	United Ar	90	Yemen	73
Bolivia (P	99	United Re	99	Saint Vinc	96	Colombia	89	Guinea	72
Brazil	99	Uruguay	99	Viet Nam	96	Ecuador	89	Kiribati	72
Brunei Da	99	Uzbekista	99	Congo	95	Marshall I	89	Equatoria	71
Cabo Ver	99	Zimbabwe	99	Estonia	95	Monaco	89	Micronesi	70
China	99	Azerbaijan	98	Iraq	95	Saint Luci	89	Chad	59
Cook Isla	99	Belarus	98	Jordan	95	Tonga	89	South Sud	46
Cuba	99	Belize	98	Kazakhsta	95	Benin	88	Somalia	37
Dominicar	99	Bosnia an	98	Paraguay	95	Lesotho	87	Sweden	26
Fiji	99	Botswana	98	Samoa	95	Philippines	87		
Ghana	99	Burkina F	98	Sao Tome	95	Afghanista	86		
Guyana	99	Chile	98	Senegal	95	Djibouti	86		
Hungary	99	Croatia	98	Sudan	95	Honduras	86		
Iran (Islan	99	Democrat	98	Tunisia	95	Myanmar	86		
Kuwait	99	Dominica	98	Turkey	95	Pakistan	85		
Libya	99	Lithuania	98	Ukraine	95	Côte d'Iv	84		
Malaysia	99	Mauritania	98	Venezuela	95	Cameroon	82		
Maldives	99	Nicaragua	98	Zambia	95	Lao Peop	82		
Mongolia	99	Romania	98	Guinea-Bi	94	Angola	81		
Morocco	99	Saudi Ara	98	Peru	94	Kenya	81		
Nauru	99	Serbia	98	Cambodia	93	Papua Ne	81		
Nepal	99	Seychelles	98	Indonesia	93	Syrian Ar	81		
Niue	99	Tajikistan	98	Japan	93	Costa Ric	80		
Oman	99	Bulgaria	97	Mozambic	93	Mali	79		
Panama	99	Eritrea	97	Poland	93	Timor-Les	79		
Portugal	99	Kyrgyzsta	97	Uganda	93	South Afr	77		
Republic o	99	Malawi	97	Burundi	92	Comoros	76		
Rwanda	99	Mauritius	97	Latvia	92	Haiti	76		
Saint Kitts	99	Namibia	97	Gabon	91	Niger	76		
Singapore	99	Republic o	97	Guatemala	91	Ethiopia	75		
Solomon I	99	Togo	97	India	91	Madagasc	75		

Appendix 1.5

Under Five Child Mortality in MDG Region 2015								
	1990	1995	2000	2005	2010	2015	Annual Reduction Rate (2000-15)	MDG Target 2015
Developed	15	11	10	8	7	6	3.5	5
Developing	100	94	83	69	57	47	3.9	33
N Africa	73	57	44	35	28	24	4.1	24
Sub-Saharan Africa	180	172	154	127	101	83	4.1	60
S. America Caribbean	54	42	32	25	24	18	3.9	18
Caucasus & Central Asia	73	74	63	49	39	32	4.6	24
East Asia	53	46	37	24	16	16	8.1	11
South Asia	126	109	92	76	62	51	5.3	42
S.E.Asia	72	59	49	40	33	24	3.9	24
West Asia	66	54	43	35	27	22	3.9	22
Oceania	74	70	67	64	57	51	4.3	25
World	66	85	76	63	52	43	3.9	30
Source-UNICEF, WHO, World Bank 2015								

Appendix 1.6

Table 1.7 Full Vaccination among 12-13Months Old Children in Bihar					
S.N.	Districts	Per cent	S.N.	Districts	Per cent
1	Saran	67	19	Rohtas	41.5
2	Aurangabad	60.7	20	Supaul	41.5
3	Vaishali	59.3	21	Begusarai	41
4	Gopalganj	55.4	22	Purnia	39.4
5	Nalanda	55.2	23	Patna	39.1
6	Muzaffarpur	54.9	24	Banka	37.6
7	Khagaria	52.3	25	E. Champaran	37.3
8	Siwan	51.8	26	Sitamarhi	36.8
9	Bhagalpur	49.7	27	Lakhisarai	36.6
10	Samastipur	47.8	28	Gaya	35.7
11	Nawada	46.5	29	Katihar	34.8
12	Darbhanga	45.8	30	Araria	33.3
13	Madhepura	45.2	31	Bhojpur	33.3
14	Jehanabad	44.7	32	Buxar	33.3
15	Sheikhpura	44.4	33	Sheohar	27.4
16	Munger	43.2	34	W. Champaran	27.1
17	Madhubani	43.1	35	Kaimur	24.9
18	Saharsa	43	36	Kishanganj	23.6
			37	Jamui	19.1
Source- District Level Health Survey (2007-08)					

Appendix 1.7

Dropout in Multi Doses Vaccines in Jamui and Aurangabad District				
	Jamui		Aurangabad	
DPT	No. Case	Percentage	No case	Percentage
Continued	221	73.7	210	69.8
Dropout	67	22.3	61	20.3
Not having DPT	12	4.0	22	7.3
OPV				
Continued	230	76.4	242	80.7
Dropout	51	16.9	48	16
Not having OPV	20	6.6	10	3.3
Hepatitis-B				
Continued	186	62	210	69.8
Dropout	93	31	61	20.3
Not having Hep-B	18	6	22	7.3

Source- Computed from Primary Survey (2015)