INFLUENCE OF WOMEN MALNUTRITION ON INFANT MORTALITY IN ORISSA: EVIDENCE FROM NFHS-2 (1998-99) AND NFHS-3 (2005-06)

Dissertation submitted to School of Social Sciences, Jawaharlal Nehru University in partial fulfillment of the requirement of the award of the degree of

MASTER OF PHILOSOPHY

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DECLARATION

I, Sasmita Jena, declare that the dissertation entitled "**Influence of Women Malnutrition on Infant Mortality in Orissa: Evidence from NFHS-2 (1998-99) and NFHS-3 (2005-06)**" submitted by me for the award of the degree of Master of Philosophy of Jawaharlal Nehru University is my bonafide work. The dissertation has not been submitted for any other degree of this university or any other university.

SASMITTA JENA

CERTIFICATE

We recommended that this dissertation be placed before the examiners for evaluation.

July 25, 08

(Prof. MURALI DHAR VEMURI)
Supervisor

(Prof. R.K SHARMA)
Chairperson

Dedicated

To my Bhagban Jagannath

Swami

ACKNOWLEDGEMENT

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Date: July, 2008   **(Sasmita Jena)**

Place: New Delhi

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Acronyms

ANM	Auxiliary Nurse Midwives
AWW	Anganwadi Worker
BMI	Body Mass Index
CED	Chronic Energy Deficiency
EDHS	Egypt Demographic Health Survey
FAO	Food and Agriculture Organization
FFM	Fat Free Mass
FM	Fat Mass
GNP	Gross National Product
HIV	Human Immune Virus
ICDS	Integrated Child Development Services
ICMR	Indian Council of Medical Research
IDECG	International Dietary Energy Consultancy Group
IFA	Iron and Folic Acid
IIPS	International Institute for Population Science
IMR	Infant Mortality Rate
LBW	Low Birth Weight
LHV	Lady Health Visitor
MOHFW	Ministry of Health and Family Welfare
NFHS	National Family Health Survey
NFI	Nutrition Foundation of India
NINDS	National Institute of Neurological Diseases and Stroke
NMMP	National Mid-day Meals Program
NMR	Neonatal Mortality Rate
OBC	Other Backward Caste
PDS	Public Distribution System
PEM	Protein Energy Malnutrition
PNMR	Post-Neonatal Mortality Rate

PRC	Population Research Centre
SC/ ST	Schedule Caste/ Schedule Tribe
SPSS	Software Package in Social Sciences
SRS	Sample Registration System
TBA	Trained Birth Attendant
TT	Tetanus
UN	United Nation
UNICEF	United Nations Children's Fund
USAID	United State Agency for International Development
WHO	World Health Organization

Introduction

Chapter 1

INTRODUCTION

However much a mother may love her children, it is all but impossible for her to provide high-quality child care if she herself is poor and oppressed, illiterate and uninformed, anemic and unhealthy, has five or six other children, lives in a slum or shanty, has neither clean water nor safe sanitation, and if she is without the necessary support either from health services, or from her society, or from the father of her children.

Vulimiri Ramalingaswami, "The Asian Enigma"

Health is a common concept in every society. All societies have their concepts of health. Health is the absence of disease. "Health" is like such terms which most people find it difficult to define although they are confident of its meaning. The most important definition of health is that given by the World Health Organization (1948) in the preamble to its constitution, which is as follows: "Health is a state of complete physical, mental and social wellbeing and not merely an absence of disease or infirmity". Health is multifactorial. Health is affected by individual, families, community and society in which he or she lives. It is found that what man is and to what diseases he may fall victim depends on a combination of two sets of factors- his genetic factors and the environmental factors to which he is exposed. The health of individuals and whole communities may be considered to be the result of many interactions. Only a brief indication of the more important determinants or variables is shown in (Figure-1.1).

Health is affected by biological factors that mean it depends upon genetic factors of man. The way people live which is called behavioural factors also affects human health. In developing countries such as India where traditional lifestyles still persist. Lack of sanitation, poor nutrition, personal hygiene, elementary human habits, customs and cultural patterns are main cause for illness and death. Environment has direct impact on the physical, mental and social well-being of those living in it. The socio-economic factors like education and occupation of man affects health directly. Health care services has important role for individual health. Gender-plays a major role for health of

individual. Other factors like human rights, aging, science and technology, information and communication, equity and social justice also affects health of human being.

Determinants of Health
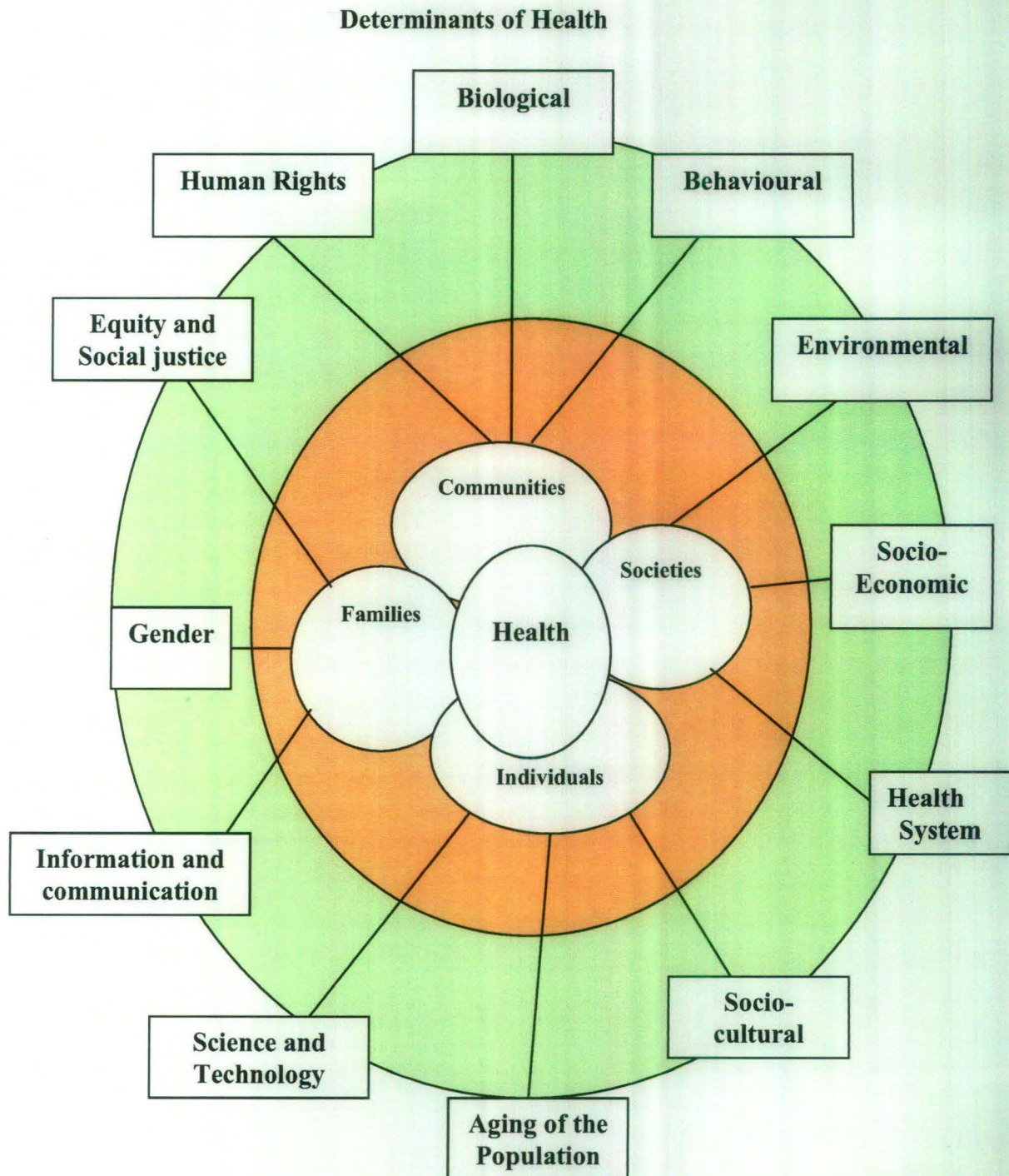
Figure-1.1

Source: *WHO (1998)*

1.1 SCENARIO OF MALNUTRITION

Nutrition is related to health. It plays a major role for body growth, development and maintenance. Food means not only proteins, fats, minerals, vitamins and other nutrients- but it is a part of security and civilization. Nations and civilizations are linked together not only by ideas, but also bread. Hunger and malnutrition is a problem in every region and have created problems for human being and threatened peace in every moment. Malnutrition is "over consumption or under consumption of any essential nutrient". Hunger has no boundaries; it affects the young, the old, the healthy, the sick, the working, and the unemployed. But among some groups of people like women and children under nutrition is more prevalent. Within any country, malnutrition is likely to be more prevalent in rural areas. The World Bank (World Development Report 1990:238) calculated that, among the forty-two countries they classified as low-income in 1988, 65 percent of the populations are rural. Rural incomes are usually below urban incomes and under nutrition are strongly related with low-income populations. It is said that majority of the world's hungry are rural.

Malnutrition is created by human being itself. It starts from birth and ends with death. It is a disease of human societies. The nutritional status of a child depends on his or her past nutritional history. In many times the nutritional status of mother affects the child's nutrition. In (Figure-1.2) it has shown that how nutritional status of woman of child-bearing age affects neonatal and infant nutritional status. If woman of child-bearing age is malnourished it will affect her pregnancy due to absence of nutrition because during pregnancy woman need some extra nutrient for development of her child in the womb. So it will create anemia among woman due to deficiency of iron and minerals. If pregnant woman is malnourished then during lactation period it will affect neonatal and infant nutritional status this is because of less breast- feeding. If infant is not properly breastfeed then it will affect his or her nutritional status because mother milk is very important for infant health. Like that if nutritional status of infant is not good it will affect more girls' nutritional status and nutritional status at puberty which is also important because it will affect women of child bearing age.

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Influence of each generation's nutritional status on the following generation
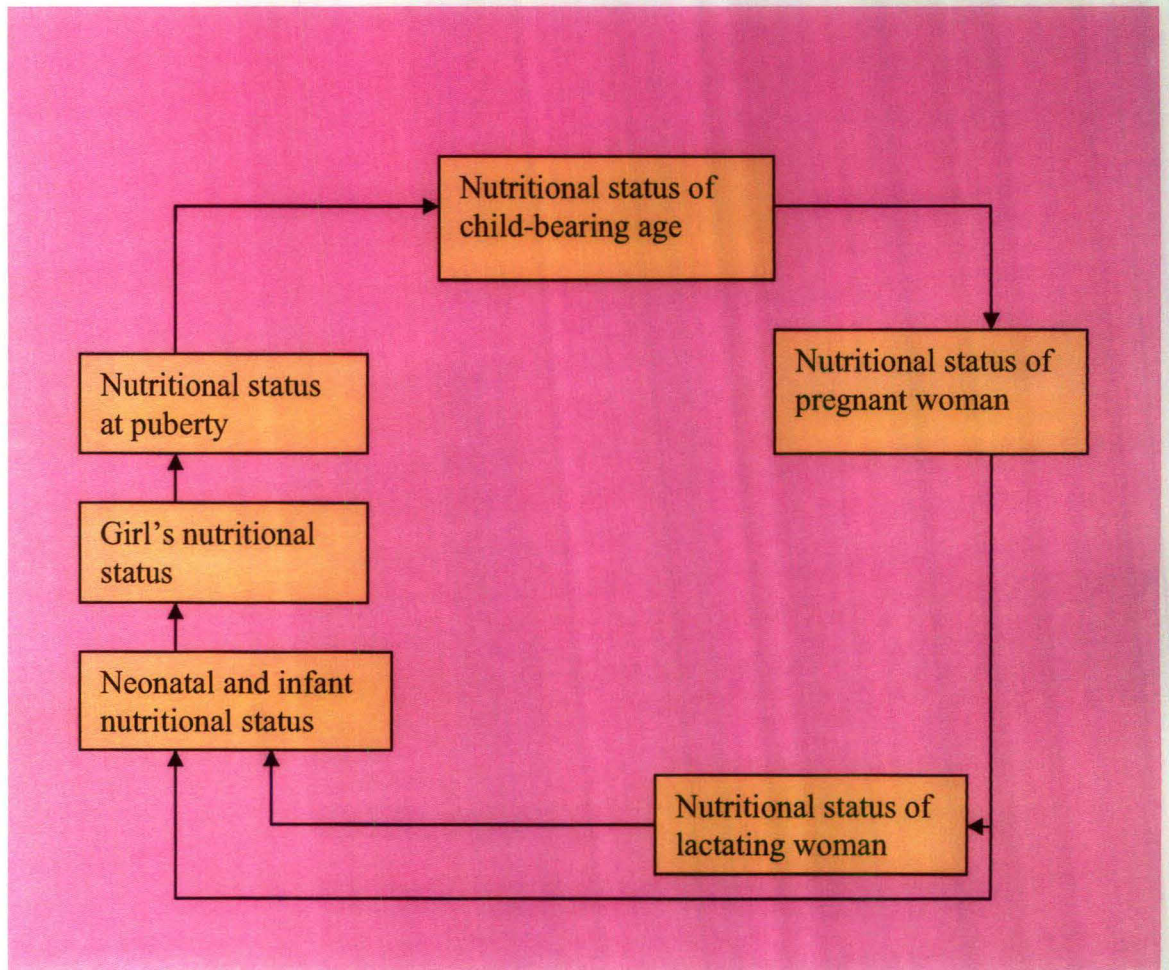
Figure-1.2

Source: *Jean- Gerard Pelletier (1993)*

Malnutrition is like an iceberg. Pregnant women, nursing mothers and children are more vulnerable to effects of malnutrition in India. There are about 460 million people- 15 percent of the world's population, excluding China – who are malnourished according to FAO reports. Malnutrition among children under the age of 5 years creates the situation more serious. On a global scale the five principal nutritional deficiency diseases are kwashiorkor, marasmus, xerophthalmia nutritional anaemias and endemic goiter (Park, 2007).

Malnutrition, 'the silent killer', creates widespread distress, especially in developing countries like India. Malnutrition is caused by different factors-physiological, personal, social, cultural, economical and political at a specific time for a given individual. Food shortage may be a leading cause of malnutrition in over-populated regions. But deeper analysis of the situation states that an insufficient food supply is not only responsible for malnutrition in the world. Ignorance and illiteracy, prevailing attitude to and superstitions about food play an equally important role in the spread of malnutrition among a given population. It has rightly been said: *'Teach a mother to be healthy and she will teach the rest of mankind'*. But the role of women as nutritional caretakers and health providers has been given less respect (Gabr, 1994).

Various factors affecting Malnutrition
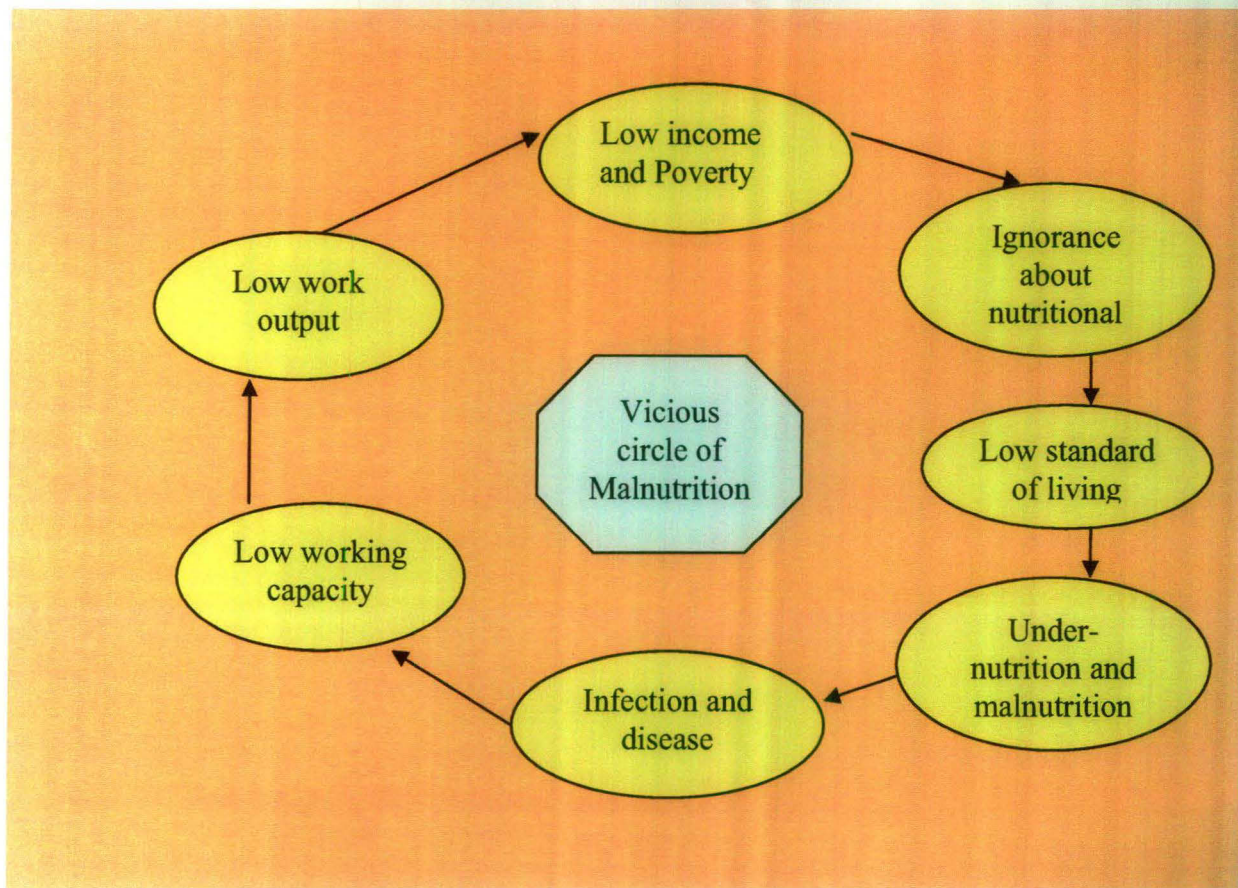
Figure-1.3

Source: *Devadas et al., 1993*

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Malnutrition occurs among major section of the poor. Mainly women and children are the result of poverty, chronic diseases and persistent hunger. High levels of illiteracy, low purchasing power, inadequate household food security, poor environmental sanitation, poor housing, lack of safe drinking water and lack of regular employment has adverse effect on malnutrition (Mahadevan, 2005). The various factors influencing malnutrition in a community is shown in (Figure-1.3). This is like a vicious circle. Infection and disease among women loses her capacity to do work that makes low out put. This creates poverty and low income among women. They have less money for nutritious food. Also they have lower standard of living which creates malnutrition and further disease created by malnutrition.

State differentials in nutritional status for women are shown in (Figure-1.4). The percentage of women who are short (height less than 145 cm) is highest in Meghalaya and Tripura and lowest in Haryana, Punjab, Jammu and Kashmir, and Rajasthan. The mean BMI varies very little from one state to another. The proportion of women who are too thin is particularly high in Bihar and Chhattisgarh and Jharkhand and lowest in Delhi, Punjab, and several of the small northeastern states. The percentage of women who are overweight or obese is highest in Punjab followed by Kerala and Delhi. In Orissa more women are undernourished comparison to other states.

The prevalence of anemia varies considerably among the states; (Figure-1.5). The prevalence of anemia for women is very high in all of the states in the East Region, especially Jharkhand and Bihar where more than two-thirds of women are anemic. In Orissa the percentage of anemic women are also higher. Other states with particularly high levels of anemia are Tripura and Assam, Andhra Pradesh and Meghalaya (for women). Kerala, Manipur, Goa, and Punjab have the lowest prevalence of anemia for women. Even in these states, however, more than one-third of women are anemic. Severe anemia is most prevalent in Assam women.

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LEVEL OF NUTRIONAL STATUS AMONG WOMEN, INDIA, 2005-06
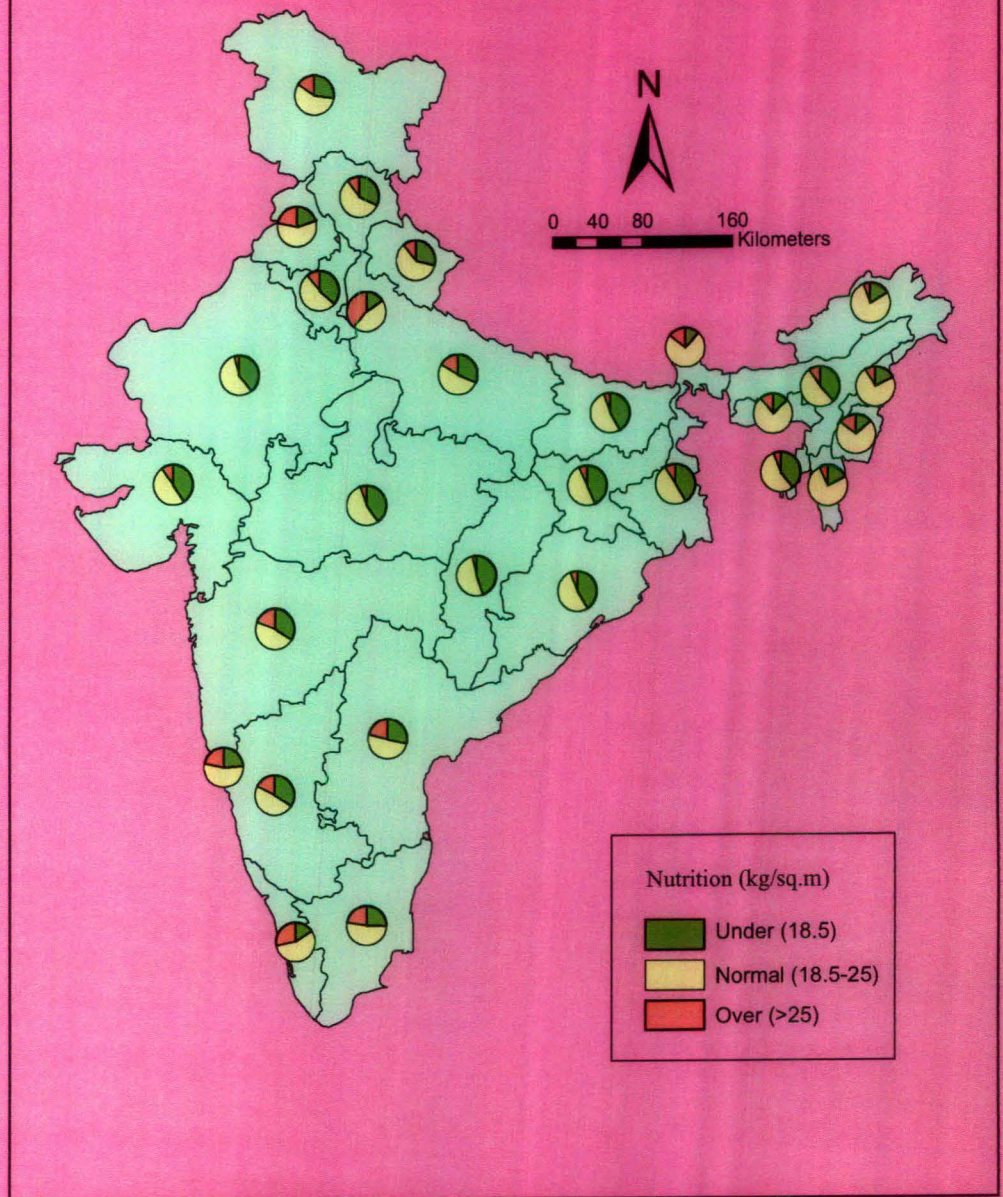
Figure-1.4

Source- *IIPS (2007)*

LEVEL OF ANAEMIA AMONG WOMEN INDIA, 2005-06

gm/decimal
- Svere (<7)
- Moderate (7-9.9)
- Mild (10 - 11.9)
- Not anaemic (>11.9)
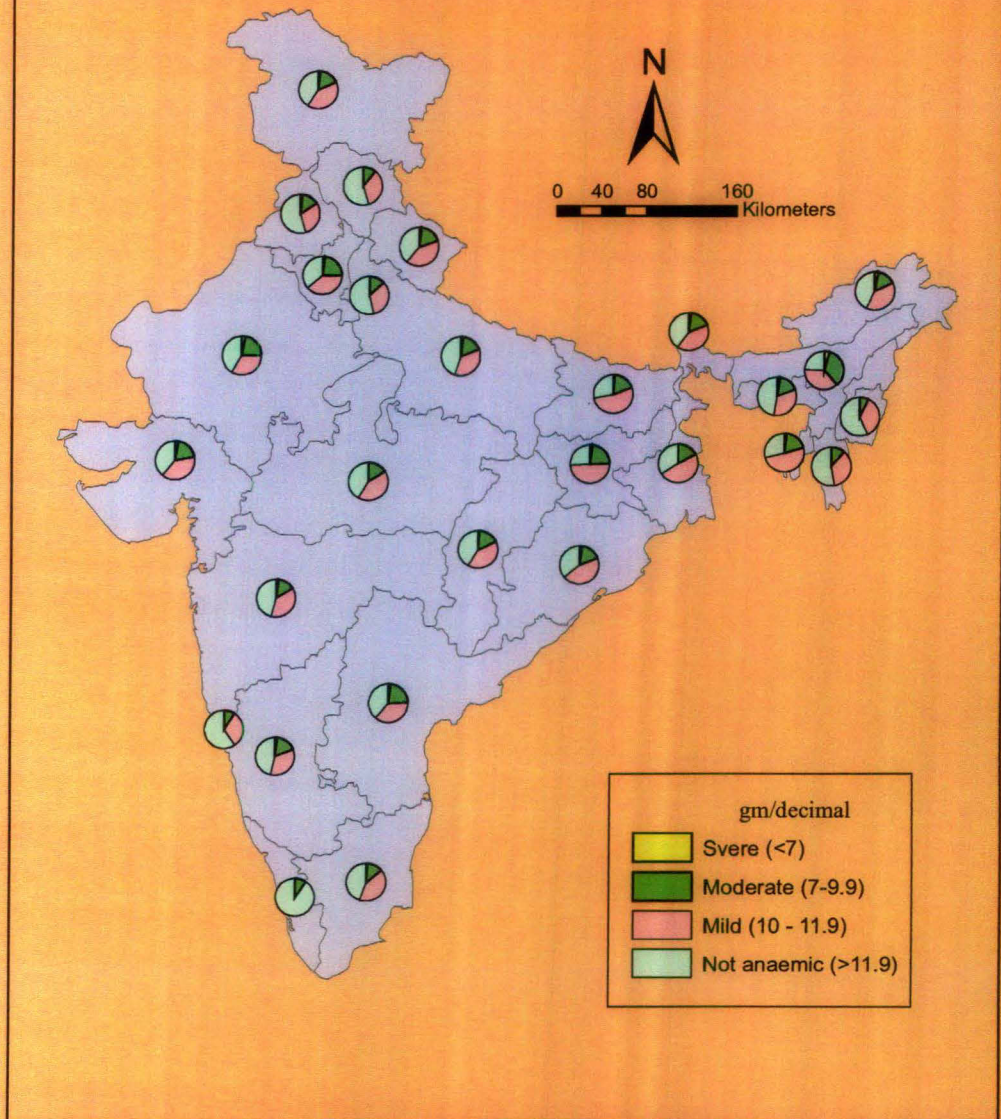
Figure-1.5

Source- *IIPS (2007)*

1.2 SCENARIO OF INFANT MORTALITY

Mortality rates are good indicators to measures the level of health and health care in different societies. They also help in assessing the overall socio-economic development of a country and correlate well with certain economic variables such as GNP (Gross National Product). The infant mortality rate is a refined and sensitive index of the total social environment of a community. It reflects the state of public health and hygiene, environmental sanitation, cultural practices about feeding and clothing and socio-economic development. In the developed countries, infant mortality due to environmental factors has been largely controlled, but in developing countries, these factors are still uncontrolled. The magnitude and range of infant mortality are equally important for their effect on the future growth of population in countries where the population numbers are problematic in the sense of too many in relation to the total set of relevant economic and social factors.

For demographic statistical prospects, all children under one year of age are considered 'infants' and so the term 'infant mortality' refers to mortality among children of less than one year of age. Neonatal mortality is death among infant within four weeks and death among infant between one to eleven months is called post-neonatal mortality. The infant mortality rate may be defined as the number of infant deaths that occur per thousand live births in any population in one calendar year. IMR is universally regarded not only as a most important indicator of the health status of a community but also of the level of living of people. It is a major indicator for child and maternal health. Infant mortality has special importance because: (a) infant mortality is the largest single age-category of mortality; (b) deaths at this age are due to different diseases and (c) infant mortality is affected rather quickly and directly by specific health programmes and hence may change more rapidly than the general death rate (Park, 2007).

The level of infant mortality varies between different regions or country. According to 2004 the world average of IMR has been estimated at about 54 per 1000 live births. However, IMR varies from 5 per 1000 live births in the developed countries to 98 per 1000 live births in the developing countries (Table-1.1). The average in the developing countries was 59 per 1000 live births. Infant mortality is declining significantly. The drop is greatest for the developed countries and lowest for least developed countries. The developed world had a much greater reduction in infant mortality compared to child mortality; while in the developing world the situation was reverse (UNICEF, 2006).

Table 1.1: Infant Mortality Rate in selected Countries, 1990 and 2004

Country	1990	2004
India	85	58
Sri Lanka	26	12
Bangladesh	100	56
Pakistan	100	80
Thailand	31	18
Myanmar	91	76
China	38	28
Nepal	100	59
New Zealand	8	5
USA	9	7
UK	8	5
Japan	5	3
World	65	54

Source: *UNICEF, (2006)*

Neonatal mortality is largely preventable by good health care. Much of the variations between developed and developing world in death among newborn can be explained by differences in antenatal care-about half of all pregnant women in the least developed countries have no antenatal care and 7 out of 10 babies are born without the help of a trained birth attendant. The other major factors being malnutrition and high parity of the mother, low birth weight of the baby and congenital anomalies (Park, 2007).

The causes of infant mortality are multifactorial. The principal causes of infant mortality in India are low birth weight (51%), respiratory infections (17%), diarrhoeal diseases (4%), congenital malformations (5%) and cord infection (2%), birth injury (3%) and unclassified about (18%). Neonatal deaths make a major contribution to infant mortality (Figure-1.6).
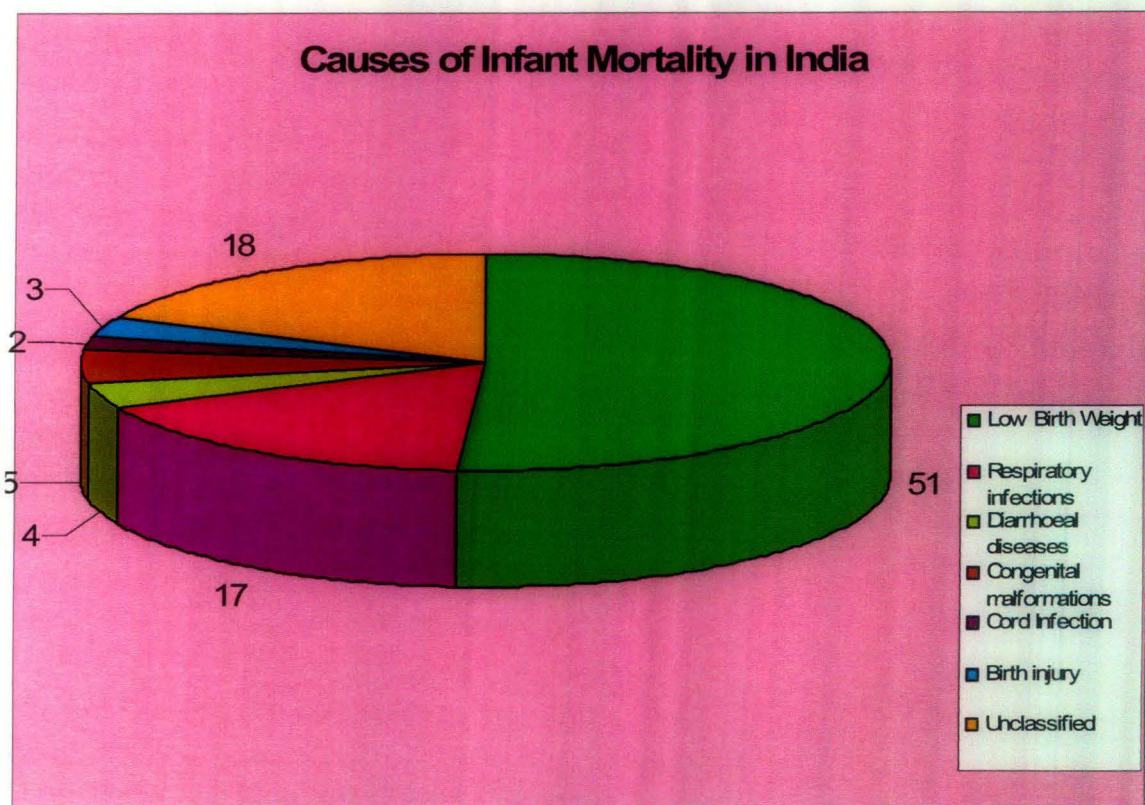
Figure-1.6

Source: *WHO (2005)*

Malnutrition is the main cause of illness and death among infants and children in India and other tropical developing countries. It is known that malnutrition apart from its direct effects on general health also exerts an indirect effect by lowering resistance to infectious diseases. However, the exact magnitude of the contribution of malnutrition to total infant mortality is difficult to assess in view of other interrelated factors. Majority of population in India are from poor families, are not only undernourished but live under incredibly unhygienic and insanitary conditions. So malnutrition and other factors are responsible

for the high infant mortality in India and other developing countries and there is no doubt that malnutrition is a highly important factor (Chandrasekhar, 1972).

A W.H.O. Expert Committee in their report on Nutrition in Pregnancy and Lactation (1965) points out: 'Reports from many parts of the world have illustrated a general association between low birth weights, high foetal and infant mortality rates and diets of poor nutritive value and it seems reasonable to conclude that under nutrition and malnutrition among mothers, especially in the developing countries, contribute towards impaired maternal, foetal and infant health and vitality'. These and similar considerations led an earlier committee, the joint F.A.O./W.H.O. Expert Committee on Nutrition (1962), to plead as follows: 'Expectant and nursing mothers, infants and children constitute vulnerable groups of a population from the nutritional standpoint and merit special consideration. The usual diets of women in most of the developing countries have been found nutritionally inadequate and the special needs of pregnancy and lactation seem to have received little consideration. Hence the states of physiological stress may aggravate chronic dietary inadequacy and thus adversely influence the course and outcome of pregnancy, foetal growth and the health and growth of the infant. It must be emphasized, therefore, that a high priority should be given to a study of maternal and infant malnutrition and of possible preventive measures.'

1.3 IMPORTANCE OF THE STUDY

The nutritional status of poor women in rural area is far from what is desired. In spite of different programmes against nutritional anemia targeted at the expectant and lactating mothers, these women continue to suffer from severe anemia. With early and multiple pregnancies, women miss the opportunity of attaining full bodily growth. The low nutritional status of women in India applies to all the age groups but is more prevalent in the lowest socio-economic groups; the low nutritional status of women is mainly due to poverty and the burden of family responsibilities in the lower income groups.

Women in developing countries are more malnourished than men. The extra biological demands due to menstruation, pregnancy and lactation have made nutritional deficiencies the most widespread and disabling health problem among women. For example, low birth weight in newborns is partly a reflection of poor maternal nutrition. The most serious problem afflicting women is lack of adequate nutrition. Girls and women get the less nutrition because of the social customs, poverty and their poor social status. A healthy diet is not necessarily an expensive one. It contributes to the physical, the mental and social well-being of all the members of the family. Man does not always instinctively choose the right nutrition for maintaining, his health. He is influenced by religion, culture, social status, traditions and beliefs for his food habits.

The population of Orissa mainly depends on agriculture and around half of them are living below poverty level. Malnutrition in Orissa varies widely across region, age, gender, social groups; and several socio-economic factors and cultural practices determine the malnutrition status. Drought, famine and scanty of work in many places of Orissa, particularly in tribal areas are the main cause for food insecurity, which leads to severe malnutrition. The cultural taboos and improper feeding practices during postnatal and antenatal stages resulted malnutrition among children.

Among 35 States and Union Territories of India Orissa is one of them. Orissa attained statehood in 1936 on the basis of language but the princely states were merged after 1948 to form 13 districts. Later in 1990 these districts were divided into form 30 districts having 314 blocks. There are a total of 51,349 villages as per the 2001 Census. The number of towns in the State has increased from 124 in 1991 to 138 as per the 2001 Census.

According to 2001 census total population in Orissa is 36.70 million and the number of women in Orissa is 18.01 million, which is 49.07% of the total population of the State, which is slightly less than 49.27% as per 1991 Census. Out of these total women, 86% live in the rural areas. The density of the population in Orissa has increased from 203 in 1991 to 236 in 2001 that is less than the all India population density. In Orissa higher

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number of population are in rural areas and very less number of people live in urban areas (Figure-1.7).

Total Population in India and Orissa according to 2001 census

	Total	Rural	Urban
India	1025.25	740.26	284.99
Orissa	36.7	31.21	5.5
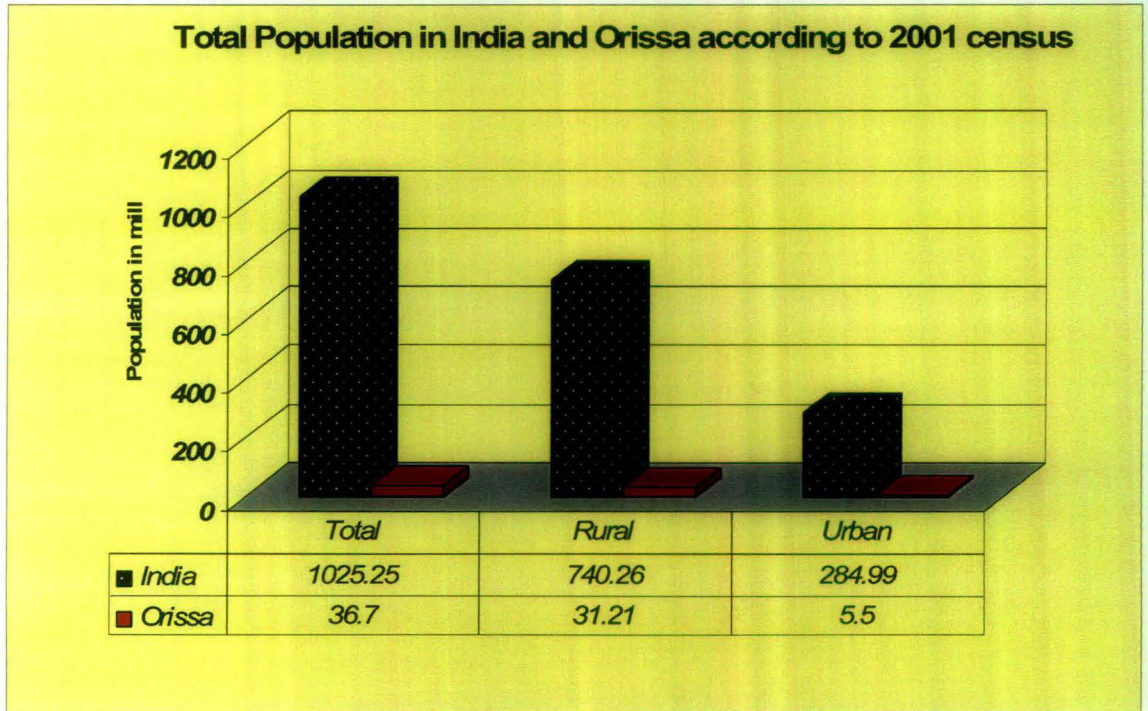
Figure-1.7

Source: *Registrar General of Census Commissioner, 2001*

Total SC and ST Populatin in Orissa between 1991 and 2001Census

	SC	ST
1991	5.13	7.03
2001	6.08	8.14
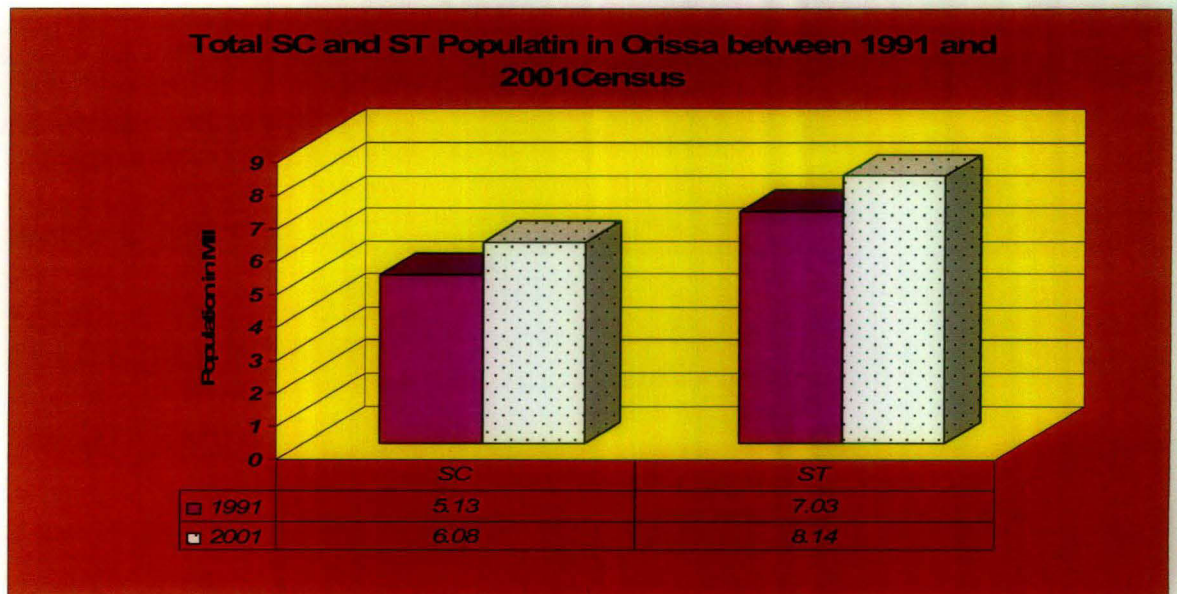
Figure-1.8

Source: *Registrar General of Census Commissioner, 2001*

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The Scheduled Castes and Tribes in the State of Orissa compose a total of 12.16 million, which is 38.41 % of the State's total population according to 1991 census. The STs are spread all over the state and comprise of 22.21% against an all India average of 8%. Orissa has the highest percentage of ST population after the North Eastern states. The uniqueness of the Orissa is that there are about 62 tribes residing with their specific culture and living standards, which is the highest among all the states of the country. SC comprise of 16.20 % of the total population of the state, which is more or less comparable to the all India percentage. According to 2001 Census, SCs & STs make up 14.22 million populations in the state comprising of 38.74% of the total population of Orissa. 49.5% of the SC populations are females whereas 50.10% of ST populations are females (Figure-1.8).
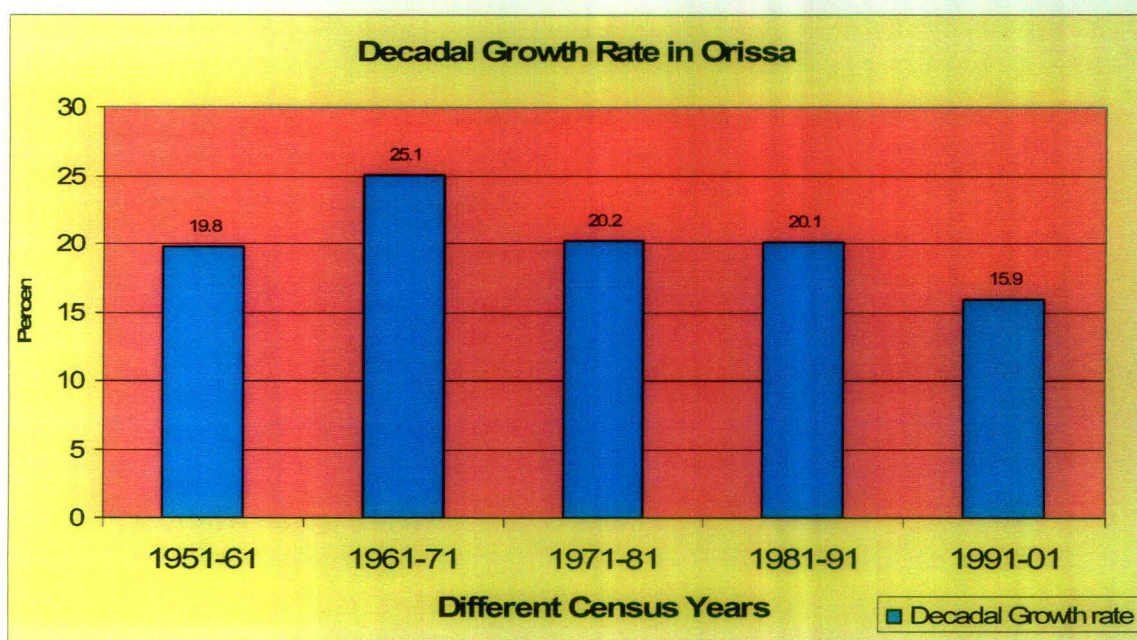
Figure-1.9

Source: *Registrar General of Census Commissioner, 2001*

The population growth in the State has been showing a varying trend over the past one century. The decadal growth in percentage has been the highest in 1971, which has subsequently and continuously declined over the last three Census years. As per 2001 census, the decadal growth of Orissa stood at 15.94% whereas that of India stood at 21.34% (Figure-1.9). During the last decade of 1991 the population growth rate was 1.6%

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per annum. 2001 Census shown that population growth and its link to fertility is under control and that the women of Orissa have shown responsible reproductive behaviour.

The Sex ratio (Number of females per 1000 males) is an important indicator on the Status of women. Favourable sex ratio (more than 1000) indicates that female survival is not hampered and the conditions are conducive for the overall growth and longevity of the girl child leading to women hood. The Sex ratio of Orissa has always been better than the national figure and as per the 2001 Census it stands at 972 while the all India figure is 933. During the 1901 Census the Sex ratio of the State was 1037. The decline of the Sex ratio of the State over the last century is indicative of the deterioration of the social environment (Figure-1.10). The Sex ratio of Orissa has declined by 65 points while that of India has declined by 39 points during the period 1901- 2001.
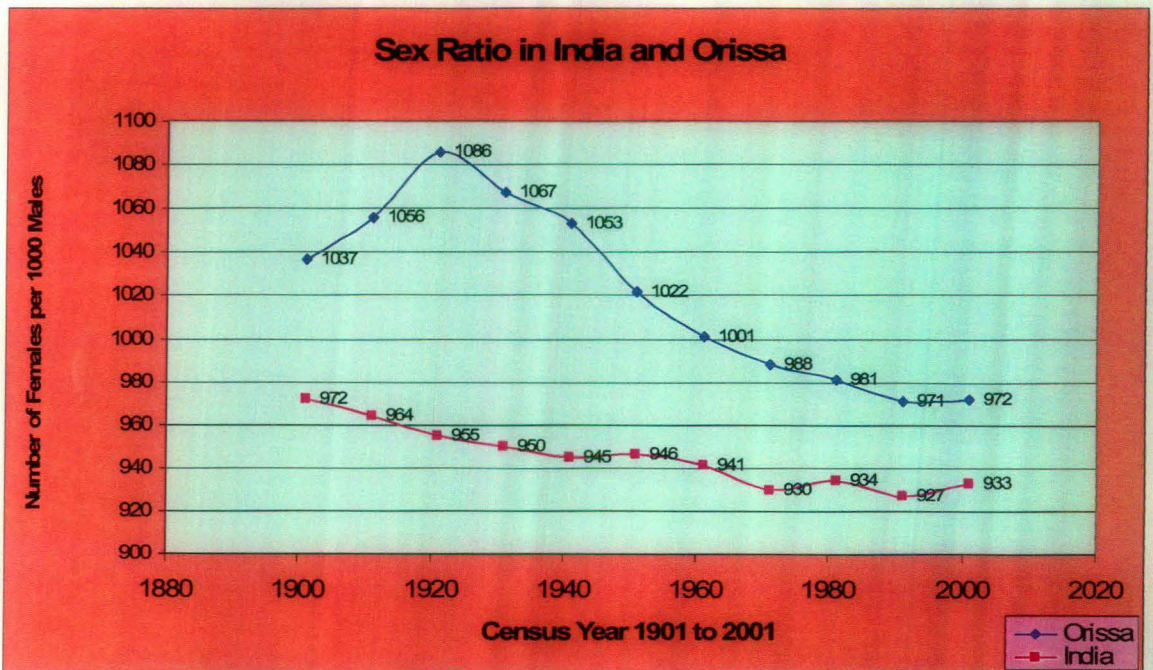
Figure-1.10

Source: *Registrar General of Census Commissioner, 2001*

Sex Ratio for child population (0-6 years) in Orissa and India

Number of females per 1000 m

967
950
945
927

Orissa   India

Sex Ratio in between 1991 and 2001

■ 1991
■ 2001
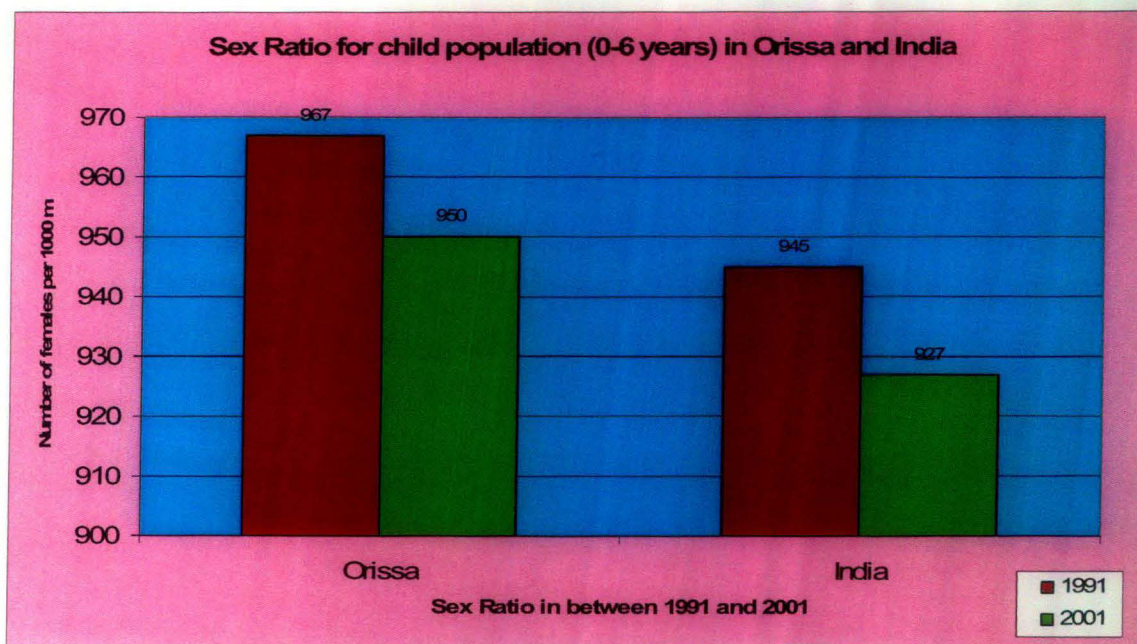
Figure-1.11

Source: *Registrar General of Census Commissioner, 2001*

Literacy rate in between India and Orissa according to 2001 Census

Percntag

63.61
75.95
50.97
65.38
75.85
54.116

Persons   Males   Females

Population

■ Orissa
■ India
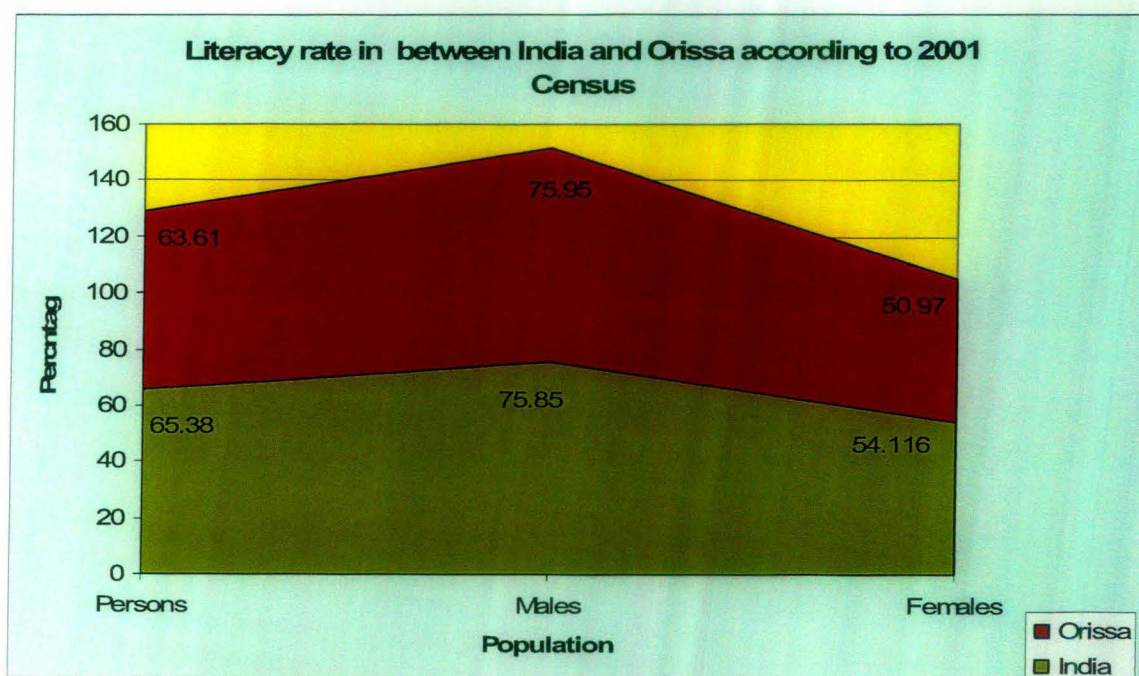
Figure-1.12

Source: *Registrar General of Census Commissioner, 2001*

The Child Sex ratio has even more alarming picture though the figures are better than the all India estimates. The 0-6 year child population has a Sex ratio of 950 as per the 2001 Census which is a decline of 17 points over the 1991 data (Figure-1.11).

The literacy rate is lower in Orissa than India. In Orissa the literacy rate is 63.61 but for India it is 65.35. Male literacy rate is nearly same to both India and Orissa. But Female literacy rate is higher in India than Orissa (Figue-1.12).

Total Fertility Rate in India and Orissa according to NFHS-1, NFHS-2 and NFHS-3

	NFHS-1	NFHS-2	NFHS-3
Orissa	2.53	2.19	1.89
India	2.7	2.27	2.06
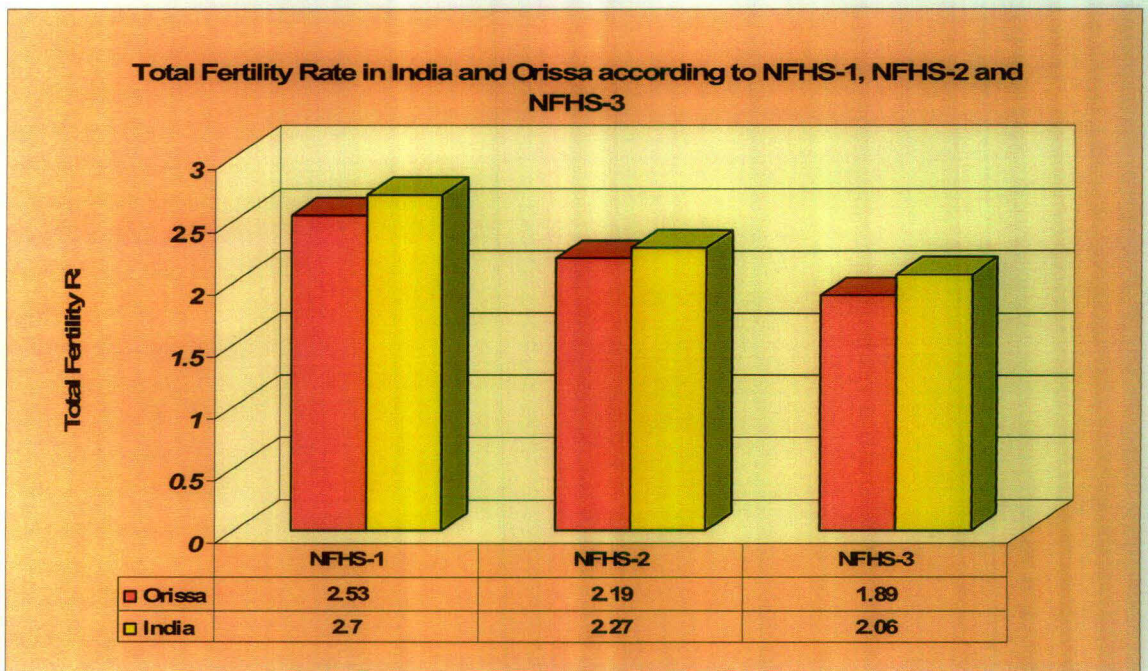
Figure-1.13

Source: *IIPS, 2007*

(Figure-1.13) shows fertility levels and trends in India and Orissa for NFHS-1, 2 and 3. There is a wide diversity of fertility levels among India and Orissa. In comparison to urban area total fertility rate is higher in rural area both in India and Orissa. Among India and Orissa total fertility rate is higher in India than Orissa in both urban and rural areas. In comparison to NFHS-1 total fertility rate is lower in NFHS-2 and 3 in both India and Orissa. This is something of a surprise, given that Orissa has reached an advanced stage in the fertility transition with a total fertility rate of 1.89 compared with India 2.06 total fertility rate. The state has also achieved substantially higher antenatal care coverage as compared with the other bigger states. The proportion of women receiving at least one

antenatal care visit was 86 percent in Orissa compared with 34 percent in Bihar and 66 percent in Uttar Pradesh. Thus, Orissa is something of a demographic paradox, with better ANC coverage and greater reduction of fertility than other states but infant mortality is high.

There is importance for the study of infant mortality because in many under-developed countries one out of every five, sometimes even one out of every four infants, dies before completing its first year of life. According to SRS (Sample Registration System), 2004 the infant mortality is highest in Madhya Pradesh. After that Orissa has higher infant mortality that is 77 per 1000 live births and lowest in Kerala i.e. 12 per 1000 live births. Other states like Uttar Pradesh and Rajasthan has higher infant mortality. Among all the states infant mortality is higher in rural areas then urban areas. This may be because of less education and income among women in rural areas. They have also less idea for nutritional care which creates more infant mortality among infant of rural women (Table-1.2). The main causes of infant death are poor maternal health, low birth weight, malnutrition, infections and diseases such as diarrhoea and malaria.

Table 1.2: Infant mortality in India, 2004

State	Rural	Urban	Combined
Andhra Pradesh	65	39	59
Assam	69	38	66
Bihar	63	47	61
Gujarat	62	38	53
Haryana	66	47	61
Karnataka	54	38	49
Kerala	13	9	12
Madhya Pradesh	84	56	79
Maharashtra	42	27	36
Orissa	**80**	**58**	**77**
Punjab	50	36	45
Rajasthan	74	42	67
Tamil Nadu	45	35	41
Uttar Pradesh	75	53	72
West Bengal	42	32	40
All India	64	40	58

Source: *Government of India, 2006*

According to NFHS-3, 2005-06 like Infant mortality, Neonatal and Post-neonatal mortality is higher in Orissa. Neonatal mortality is 45 per 1000 live births and Post-neonatal mortality is 19 per 1000 live births (Table-1.3). Post-neonatal mortality is higher in Orissa. Infant deaths occur at the neonatal stage in the first month of life is due to poor newborn-care facilities provided in the state.

Table 1.3: Mortality in Infancy in Major States of India, 2006

States	Neo natal mortality	Post neonatal mortality	Infant mortality
Andhra Pradesh	40.3	13.2	53.5
Assam	45.5	20.6	66.1
Bihar	39.8	21.9	61.7
Gujarat	33.5	16.2	49.7
Haryana	23.6	18.1	41.7
Himachal Pradesh	27.3	8.9	36.1
Karnataka	28.9	14.3	43.2
Kerala	11.5	3.8	15.3
Madhya Pradesh	44.9	24.7	69.5
Maharashtra	31.8	5.7	37.5
Orissa	45.4	19.3	64.7
Punjab	28	13.7	41.7
Rajasthan	43.9	21.4	65.3
Tamil Nadu	19.1	11.2	30.4
Uttar Pradesh	47.6	25	72.7
West Bengal	37.6	10.4	48
All India	39	18	57

Source: *IIPS, 2007*

In NFHS-3, 2005-06 it is found that among different states Neonatal and Post-neonatal mortality is highest in major states like Madhya Pradesh and Uttar Pradesh. After those neonatal and post-neonatal mortality is higher in Orissa. In comparison to NFHS-3 infant, neonatal and post-neonatal mortality is higher in NFHS-2 and NFHS-1(Figure-1.4 &1.15).
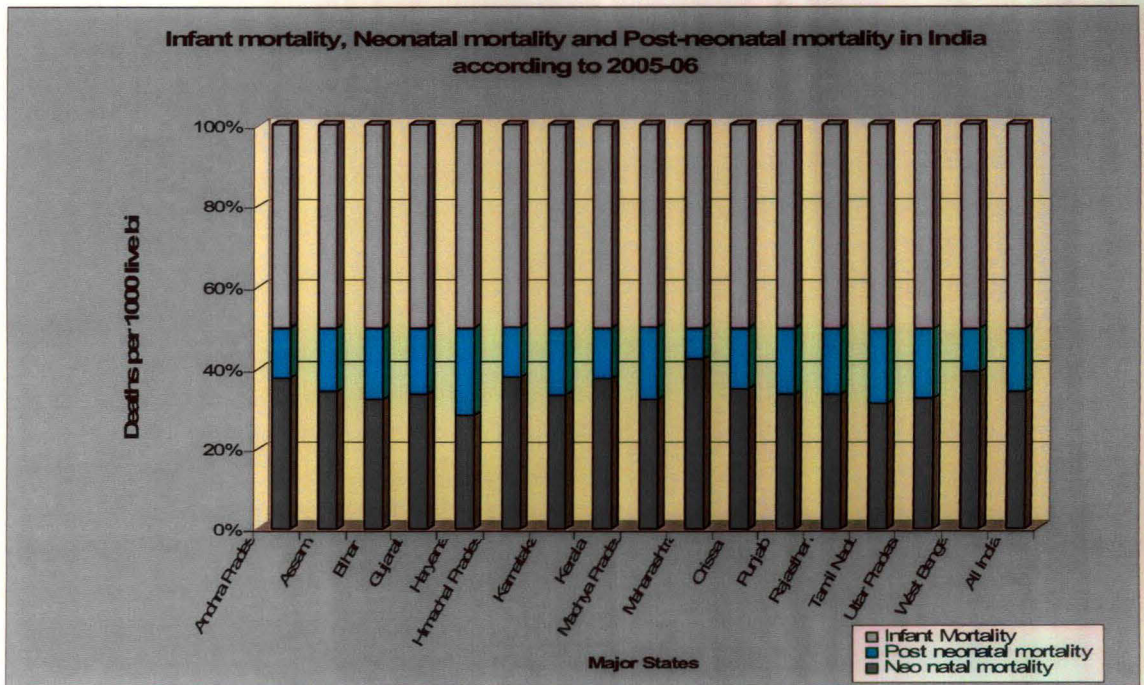
Figure-1.14

Source: *IIPS, 2007*
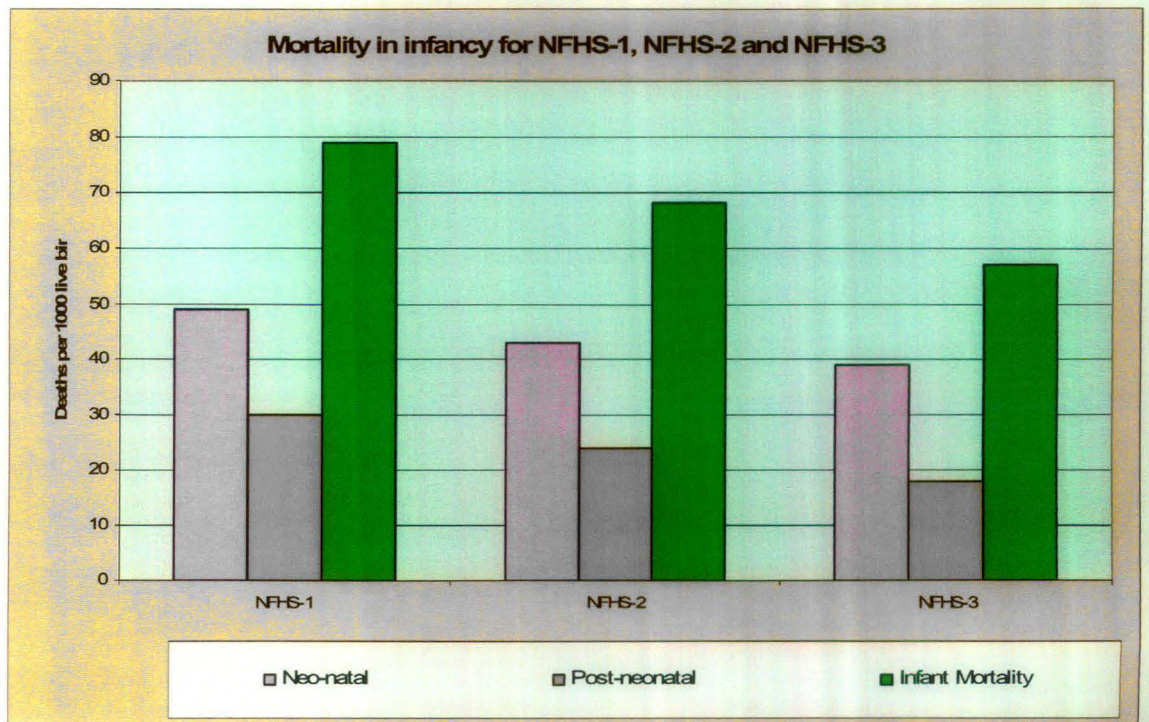
Figure-1.5   TH-15439

Source: *IIPS, 2007*

Since infant mortality often serves as a key development indicator, reflecting the combined effects of socio-economic growth, Orissa's high infant mortality rate is significant. A large number of people in the state live below the poverty line, and the lack of basic infrastructure facilities like roads and transportation, especially in the interiors, makes the existing healthcare services inaccessible to many. In Orissa, an infant's problems begin as soon as it is conceived. The most important cause of infant death is maternal malnutrition and lack of antenatal care for mothers. Maternal malnutrition and the absence of antenatal care lead to the birth of underweight (less than 2,500 gm) babies who are more susceptible to infections and diseases.

Compared to Kerala, which has the best IMR (14 per 1,000 live births) figures in India, and where almost all deliveries take place in hospitals and private clinics, only 22.6% of births in Orissa are institutional. Relatives and untrained persons attend nearly 66.5% of births (NFHS 2). The reasons for the state's low institutional delivery rate are lack of physical access to institutions, poor facilities available at institutions, and the costs involved in purchasing drugs and undergoing treatment.

Malnutrition among children is also more prevalent in Orissa and is an underlying and contributing factor in infant mortality. While 46.7% of under-threes in India are moderately or severely malnourished, in Orissa the figure is 54.4%. The lack of appropriate antenatal care creates the problem. According to NFHS 2, only 47% of women had three or more check-ups; only 34% had a check-up during the first trimester. Only 21.4% of women receive all the recommended aspects of antenatal care (three or more check-ups, with at least one in the first trimester, two or more TT injections or booster, IFA tablets for three months or more). Of the 77% home deliveries, only 14% are attended by health professionals (ANMs, LHVs, midwives, nurses or doctors). While nearly 29% of deliveries are attended by a trained birth attendant (TBA) (the rest, by untrained attendants like relatives and friends), only 19% of women have been seen by a healthcare provider within two months of delivering.

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Although the government-sponsored ICDS (Integrated Child Development Scheme) has managed to generate greater awareness, the effects have been far from adequate. Though Anganwadi workers (AWWs) play a major role in persuading pregnant women, adolescent girls and their family members to access healthcare facilities, they and other ICDS staff are not trained or equipped to care for LBW babies or sick newborns.

1.4 OBJECTIVES

The major objectives of the present study are,

- To assess the levels of malnutrition among women in Orissa.
- To study the associated influence of malnutrition among women and infant mortality in Orissa
- To find the linkage between malnutrition among women and infant mortality, and
- To compare the influence of malnutrition on infant mortality in Orissa among NFHS-II (1998-99) and NFHS-III (2005-06).

1.5 ORGANISATION OF THE STUDY

The study of the influence of women malnutrition on infant mortality in Orissa is spread over five chapters. A review of literature is presented in the second chapter. Chapter three shows the conceptual framework for the analysis on the basis of objectives. This chapter also explains the different dependent and independent variables and the data and methodology adopted. Chapter four describes in detail the analytical results of the effect of background variables on malnutrition and infant mortality. This also contains effects of women malnutrition on infant mortality. It also shows a comparative study between National Family Health Survey II and III in Orissa. The fifth chapter concludes the study by suggesting some policy implications that the government could pursue for improving the nutritional status of women and infant through various programmes.

Chapter 2

Literature Review

CHAPTER-II

REVIEW OF LITERATURE

"The quality of care and feeding offered to children is critically dependent on women's education, social status and workload."
UN Sub-Committee on Nutrition

This chapter contains review of literature, which was conducted by previous researcher on different factors that influence women malnutrition and infant mortality and factors responsible for infant mortality by malnourished women. In this study, brief reviews of the different demographic and socio-economic variables as well as maternal factors responsible for infant mortality are discussed.

Different studies from time to time on different regions have tried to identify the impact of women malnutrition on infant mortality. Thus, there have been studies to find out the determinants of malnutrition among women and how it causes infant mortality.

From the study it has been observed that unfortunately, ten million babies die every year in the world before reaching their first birth day (UN, 1983). In India, one out of every three babies born has low birth weight, one in eight dies before its first birth day and an estimated three million die each year from conditions which could be prevented by oral dehydration therapy and immunization alone (UNICEF, 1985).

From the previous study by NFI (2005) it has been found that nutritional anemia due to iron and folate deficiency is a major global public health problem. Low dietary intake and poor iron and folic acid taken are major factors responsible for high prevalence of anemia in India. Hospital and community based studies conducted by ICMR and other research agencies have shown that prevalence of anemia is highest in pregnant women estimated prevalence range between 50-90 percent. Association between anemia and adverse pregnancy outcome including increase in maternal morbidity and mortality, higher incidence of pre-term and low birth weight deliveries and associated high neonatal

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morbidity and mortality have been demonstrated when maternal hemoglobin level falls below 8g/dl.

It has been found that iron deficiency and anemia are the most prevalent nutritional deficiencies in the world. The body uses iron to produce hemoglobin, a protein that transports oxygen from the lungs to other tissues in the body via the blood stream, and anemia is defined as having a hemoglobin level below a specific level (less than 12 grams of hemoglobin per deciliter of blood [g/dl] in non pregnant women; less than 10 g/dl in pregnant women). Most women who develop anemia in less developed countries are not consuming enough iron-rich foods or are eating foods that inhibit the absorption of iron. Anemia affects about 43 percent of women of reproductive age in less developed countries. Women are especially susceptible to iron deficiency and anemia during pregnancy, and about half of all pregnant women in less developed countries are anemic, although rates vary significantly among regions. Iron deficiency and anemia cause fatigue, reduce work capacity, and make people more susceptible to infection. Severe anemia places women at higher risk of death during delivery and the period following childbirth. Recent research suggests that even mild anemia puts women at greater risk of death. A variety of nutritional deficits, including iron deficiency and insufficient caloric intake, can increase a woman's chances of having a low birth-weight infant. Low birth weight affects more than 20 million infants in less developed countries every year and is the strongest determinant of a child's survival. Infants with low birth weight account for the majority of infant deaths in the first week of life in many less developed countries and are at higher risk of death throughout infancy. Low birth-weight infants often suffer from developmental problems and a greater susceptibility to illness. Low birth weight is also associated with a higher burden of disease and early mortality (Ransom. 2003).

From the study it has been observed that micronutrient deficiencies in mothers place their infants at risk, since the fetus receives essential nutrients from the mother. Even mild maternal malnutrition can impair fetal development. Anemia is responsible for about 35 percent of preventable low birth weight: Because less iron is transferred from anemic mothers to their fetuses, babies are at risk of iron deficiency and anemia early in infancy. Infants born to mothers with anemia are at greater risk of low birth weight, premature

birth, and impaired cognitive development. Low maternal stores of vitamin A compromise children's stores of vitamin A, putting those children at greater risk of illness and death. A recent study showed that providing vitamin A supplements to pregnant women with HIV in Malawi improved birth weight and neonatal growth and reduced the prevalence of anemia in infants, as well as reducing rates of HIV transmission from mothers to infants. Mothers who do not consume enough iodine are more likely to miscarry or have a stillborn child. The physical growth and mental development of the children who do survive is often severely impaired, and children may suffer irreversible mental retardation. In areas where iodine deficiency is widespread, providing iodine supplements to pregnant women has led to decreased infant mortality and higher birth weights. Folate deficiency at the time of conception can cause neural tube defects in infants, and maternal zinc deficiency is associated with preterm delivery, low birth weight, and increased infant mortality. Other B vitamins, including B6 and B12, are important for ensuring children's healthy neurological development (Elder, 2003).

It has also found that adolescent girls are particularly vulnerable to malnutrition because they are growing faster than at any time after their first year of life. They need protein, iron, and other micronutrients to support the adolescent growth spurt and meet the body's increased demand for iron during menstruation. Adolescents who become pregnant are at greater risk of various complications since they may not yet have finished growing. Pregnant adolescents who are underweight or stunted are especially likely to experience obstructed labor and other obstetric complications. There is evidence that the bodies of the still-growing adolescent mother and her baby may compete for nutrients, raising the infant's risk of low birth weight (defined as a birth weight of less than 2,500 grams) and early death (Elder, 2003).

Previous study shows that women are more likely to suffer from nutritional deficiencies than men for different reasons like women's reproductive biology, low social status, poverty, and lack of education. Socio cultural traditions and disparities in household work patterns can also increase women's chances of being malnourished. Globally, 50 percent of all pregnant women are anemic, and at least 120 million women in less developed countries are underweight. Research shows that being underweight hinders women's

productivity and can lead to increased rates of illness and mortality. In some regions, the majority of women are underweight: In South Asia, for example, an estimated 60 percent of women are underweight. Many women who are underweight are also stunted, or below the median height for their age. Stunting is a known risk factor for obstetric complications such as obstructed labor and the need for skilled intervention during delivery, leading to injury or death for mothers and their newborns. It also is associated with reduced work capacity (Ransom, 2003).

(Elder, 2003) study it has been found that malnutrition in women leads to economic losses for families, communities, and countries because malnutrition reduces women's ability to work and can create problems for future generations. Countries where malnutrition is common must deal with its immediate costs, including reduced income from malnourished citizens, and face long-term problems that may be related to low birth weight. Illnesses associated with nutrient deficiencies have significantly reduced the productivity of women in less developed countries. It is difficult to determine exactly what proportion of those losses are due to maternal malnutrition, but recent research indicates that 60 percent of deaths of children under age 5 are associated with malnutrition — and children's malnutrition is strongly correlated with mothers' poor nutritional status. Illness associated with nutrient deficiencies has significantly reduced the productivity of women in less developed countries. A recent report from Asia shows that malnutrition reduces human productivity by 10 percent to 15 percent and gross domestic product by 5 percent to 10 percent.

From study in Bangladesh it has been found that periods of foetal and infant growth largely influence child malnutrition; these are the periods when maternal nutrition has its strongest influence. Low birth weight defined as a birth weight less than 2500 grams is a huge problem; LBW rates in Bangladesh are one of the highest in the world. An increase of 100 g in mean birth weight is associated with a 30-50 percent reduction in neonatal mortality (Ahmed, 2006).

Islam (2006) study found that for women in Bangladesh, generally life consists of high mortality, malnutrition and ill health. Women's general health care is greatly ignored and they face special health hazards due to severe anemic condition, poor health, inadequate nutrition, multiple pregnancies, abortion etc. Although a housewife has to take care of the health of all members of the family, there is hardly anyone to take care of hers. The daily per capital calorie intake of women (1599k. cal) is lower than that of a man (1927k. cal). The life expectancy of females (60.5) is lower than that of males (60.7 years). Women's low social status and poverty are in turn lead to their poor health, high fertility and lack of access to essential health care. The ultimate outcome of these latter three factors is a high maternal mortality rate. The average weight of a Bangladeshi woman is about 40.9 kg, which is less than the mean weight of women in most third world countries. The low weight is a reflection of food deprivation. Poor environmental sanitation and lower food intake of female give them lower resistance capacity, thereby rendering them more vulnerable to diarrhea and communicable diseases, which cause the highest said that women are biologically more resistant to adverse health situation than men, women in Bangladesh have a lower life expectancy at birth (53.4) than men (54.2). Now the death rate of girl children is higher than boy children. Women are also gravely exposed to the dangers of childbirth. The maternal mortality rate of 444 per 100,000 live births is one of the highest in world. A pervasive gender differential in entitlement of food nutrition and care leads to a higher death rate of girl children than boy children. In effective use of indigenous abortion related methods yearly cause about 10,000 women's death in the country. Empirical data from a nutrition study in Matlab area shows that family allocation of food and health care discriminates against female children and causes higher female mortality in childhood. Infant mortality rate per 100 live births among male children is higher than females. But child death rate (1-4) among female is higher.

According to UNICEF, about 23000 women die in pregnancy and childbirth every year, while 600000 others suffer from various neo-natal complications in Bangladesh. Malnutrition, environmental insanitation and shortage of medical services and above all a negative attitude towards female health have been the main causes of poor health of Bangladeshi women.

From (W.H.O, 1962) study it has been observed that the nutritional status of the women before conception may be of as great importance in determining the success of her pregnancy as is the food consumed while she is pregnant. The well nourished women is much better able to meet the demands which pregnancy makes her body than is a woman whose body stores of needed nutrients are inadequate either because of poor nutrition and an unbalanced dietary pattern or a succession of unspaced pregnancies or because her own body has not attained its full maturity as in the case of early marriage.

From EDHS study among Egyptian women it has been found that maternal height is an outcome of nutrition during childhood and adolescence. It is useful in predicting the risk of difficult delivery, since small stature is frequently associated with small pelvis size. The risk of low birth weight babies is also higher for short women. The cutoff point, i.e., the height below which a woman is considered to be at nutritional risk, is defined as 145 centimeters. Pregnant women who provide the developing fetus with iron are at greater risk of anemia than non pregnant women. Anemia during pregnancy increases the risks of maternal and infant death, premature delivery, and low birth weight (EDHS, 2005).

An analysis of the situation of the India by UNICEF states that cultural traditions of intra-family distribution of food rooted in rural areas compel women to eat least both in quality and in quantity. This inadequate diet cannot meet the demands of the baby during pregnancy and lactation and thereby depletes her health leading to entrenched deficiencies and ill health. This is the root cause of nutritional deficiency of infant and their deaths in several contexts are resulting out of the nutritional deficiency of the mother (Vankatacharya, 1985).

From the study, it has been found that the poor care that is afforded to girls and women by their elders and husbands is the first major reason for higher levels of child malnutrition (Raalingaswami, 1996). It is also observed from a study that gender disparities in nutrition are evident from infancy to adulthood. In fact gender has been the most statistically significant determinant of malnutrition among young children and

malnutrition is a frequent direct or underlying cause of death among girls below age five (Coonrod, 1998).

It has been found that infant mortality tends to be relatively higher for children born to younger mothers particularly those under twenty and above thirty years of age, and lower for children born to mothers aged between 20 and 29 (Population Report, 1984). Several studies on infant mortality conducted in different parts of the world showed a U or a shallow U or a reverse J shaped curve in its relationship with birth order (Wyon and Gorden, 1962). Another study found that the level of infant mortality is quite high at first and second orders of birth and lower for third order of birth and again high for fourth and higher order of births (Mahadevan et al., 1981). It has been found that birth interval is also a factor, which is negatively associated with infant mortality (Park, 1985; Kabir, 1984). A recent analysis by Huffman (1984) using data from 25 developing countries illustrates the substantial impact of spacing on child mortality. It states that " if all births were spaced at least 2 years apart, infant mortality can be reduced by 10 percent and child mortality (ages <5 years) by 16 percent"

According to Bhatia (1981) ecological factors like house conditions, sanitation, water supply, and excreta disposal are differentially important in influencing the mortality of infants in a given population. One study found that inadequate knowledge on proper hygiene and sanitation makes both mother and child extremely vulnerable to infection. It has been found that children living in overcrowded dwellings with poor light, ventilation and sanitation results in high infant deaths (Ghai, 1980). Recent studies have shown the high general level of environmental contamination in poor households and its effect on levels of contaminants on women's hands and breasts (Brunser et al., 1983).

Another study found that occupation of father shows significant influence on infant mortality (Hobcraft et al., 1981). It has found that female labour participation in the non-agricultural sector has greater influence on the infant mortality rate than in the agricultural sector (UN, 1982). Higher infant mortality rate was reported among working mothers than among non-working mothers both in rural and urban areas (Registrar

General of India, 1970). Another study found that mother's educational level has taken to reflect the level of her understanding about personal hygiene, better nutrition and increased awareness regarding preventive and curative health services like antenatal, post-natal care and care of the body resulting in reduction of infant mortality and morbidity (Srivastav et al., 1980). A study in Peru and Malaysia found that infant mortality rates of the lowest educational group can be three times greater than those of the highest (UN-DIESA, 1983). It has been found that the household income is one of the major factors influencing infant mortality (Nelson, 1984). It has been observed that the poor have consistently higher probabilities of death than the rich even if both groups have equal access to publicly owned health services (Antonovsky, 1967).

Studies in Europe and North America noted that every disease category analyzed, breast-fed babies had lower morbidity rate than bottle-fed babies (Wray, 1978). Another study found that infant mortality which is more widespread among children, who are not breast-fed, is a major cause of a short inter-birth interval (Mondot, 1981). It has been found that breast-feeding is negatively associated with infant mortality (Mahadevan et al., 1981). According to several studies conducted reveal that breast-fed infants are less likely to develop gastrointestinal disease and viral respiratory infections (Cunningham, 1979). It has been found that the weight of the mother during pregnancy has a relationship with birth weight of the baby. Similarly, the height of the mother also has a relationship with the birth weight of the infants (NINDS, 1972).

California researchers have concluded after seven years of study that babies born during the early night had a 12% higher rate of neonatal death and babies born during the late night period had a 16% higher rate. They believe that fatigue could play a role in certain hospitals where staffing patterns include long shifts. The researchers also proposed that factors like availability and quality of physicians and nurses may influence the death rate (Times of India, 2005).

Infant mortality of rural Orissa is higher than urban Orissa, because in rural Orissa the influence of cultural factors on infant mortality is found to be significant. Traditions, customs, beliefs, religious ideas also have a significant bearing on the survival chances of infants. Culture is embedded in the life style of people and reflected in their activities. Hence, cultural factors also have an influence on infant mortality. "Culture is that complex whole which includes the knowledge, belief, moral, law, customs and other habits, acquired by man as member of society" (Taylor, 1971).

It has been found that after the age of one month (post-neonatal0 period female deaths are invariably higher than male deaths (Park, 1995). According to several studies, neonatal mortality is substantially higher among deliveries attended by untrained personnel than those attended by trained persons and the risk of infant mortality is lower for mothers of all age groups if they received proper antenatal care (UNICEF, 1984; Mahadevan, 1986). Some studies found that customs and beliefs are transmitted from one generation to the next. Therefore, these are very important factors to be considered from the viewpoint of determinants of infant mortality (Lewis, 1985). Studies in different parts of India have indicated mortality differentials among different castes and religious groups in the country. In general Christians and Muslims have a lower mortality than Hindus and among the Hindus upper caste groups have generally lower mortality than the lower one (Vaidyanathan, 1972). A study found that the growing evidence that 'value of children', commonly manifest in fertility behaviour is also important for infant and child survival (Mahadevan, 1986). The study found that the neglect of female children, particularly of later birth orders and in large families, was very common in South Central India, and this has increased their mortality level (Mahadevan *et al.*, 1981).

According to several recent studies, improvement in status of women can control infant mortality (Mare, 1982). A study in India found that dysentery, broncho-pneumonia and pneumonia appear to be endogenous causes such as congenital malformation, birth injuries and pre-maturity (Registrar General, 1971). It has been found that Tetanus is a major cause of death in several developing countries of Asia, Africa and Latin America. It is primarily due to the unscientific procedure adopted by untrained persons while

cutting the umbilical cord using an unsterilised pair of scissors, unclean razor blades and knives (Chowdhury, 1982). Similarly, most studies on perinatal child mortality found that mortality rate among the twins are between 2 and 6 times as high as those among single births (Bhatia *et al.*, 1984)

It has been found that owing to certain beliefs and customs, women observe fasting during pregnancy. By doing so, they believe that child born will be in good health and sex of the child will be of their choice. Fasting during pregnancy will be in a good health and sex of the child will be of their choice. Fasting during pregnancy will increase the morbidity conditions of pregnant women due to under nourishment, which in turn affects the survival chances of new born. Generally, people believe that certain food items are harmful to the mother and the foetus and thereby, they avoid eating them during pregnancy (Bajkhaif, 1993).

Many more studies have done by researchers on influence of women malnutrition on infant mortality. But to describe conceptual framework for our present study we have taken some selected literature review.

Conceptual Framework

and

Methodology

CHAPTER-III

CONCEPTUAL FRAMEWORK

"Women's deprivation in terms of nutrition and health care rebounds on society in the form of ill-health of their offspring — males and females alike."

Siddiq Osmani and Amartya Sen

This chapter describes the influence of women Malnutrition on infant mortality through conceptual framework. This chapter has been divided into seven sections. The first section of this chapter deals with the causes of malnutrition among women. The second section shows the causes of infant mortality. Third section contains conceptual framework for influence of women malnutrition on infant mortality. Nutritional Anthropometry is used for measurement of nutritional status among women in fourth section. Source of data is mentioned in section fifth. The sixth section contains selection of dependent and independent variables and seventh section explains the methodology used for analyzing the influence of women malnutrition on infant mortality.

3.1 CAUSES OF MALNUTRITION

Malnutrition comprises four forms - under nutrition, over nutrition, imbalance and the specific deficiency. (1) Under nutrition: This is the condition, which creates when insufficient food is taken over a long period of time. In extreme cases, it is called starvation. (2) Over nutrition: This is the pathological state resulting from the consumption of excessive quantity of food over an extended period of time. (3) Imbalance: It is the pathological state resulting from a disproportion among essential nutrients with or without the absolute deficiency of any nutrient. (4) Specific deficiency: It is the pathological state resulting from a relative or absolute lack of an individual nutrient (Leathers, 2005).

Jelliffe (1966) listed the ecological factors which affect malnutrition is cultural influences, socioeconomic factors, conditioning influences, food production and health and other services.

Cultural Influences:

Lack of food is not the only cause of malnutrition. There is also starvation in the midst of plenty. People choose poor diets when good ones are available because of cultural influences, which vary widely from country to country and from region to region. These may be stated as follows: (a) Food habits, customs, beliefs, traditions and attitudes: The family plays an important role in shaping the food habits and these habits are passed from one generation to another. Rice is the staple cereal in the eastern and southern States of India and wheat is the staple cereal in the northern States. The major problem in our society is that in many customs and beliefs apply most often to vulnerable groups, i.e. infants, toddlers, expectant and lactating women. Papaya is avoided during pregnancy because it is believed to create abortion. In Gujarat, valuable foods such as dhals, leaf greens, rice and fruits are avoided by the nursing mother. There is a widespread belief that if a pregnant woman eats more, her baby will be big and delivery difficult. Certain foods are "forbidden" as being harmful for the child. (b) Food fads: Personal likes and dislikes play an important role for choice of food. These are called food-fads. The food fad is the main factor for nutritional deficiencies. (c) Religion: Religion has a powerful influence on the food habits of the people. Hindus do not eat beef and Muslims pork. Some orthodox Hindus do not eat meat, fish, eggs and certain vegetables like onion. These are known as food taboos, which prevent people from consuming nutritious foods even when these are easily available. (d) Cooking practices: Draining away the rice water at the end of cooking, prolonged boiling in open pans, peeling of vegetables, all influence the nutritive value of foods. (e) Child rearing practices: These vary widely from region to region and influence the nutritional status of infants and children. Examples of this situation are premature curtailment of breast-feeding, the adoption of bottle-feeding and adoption of commercially produced refined foods. (f) Miscellaneous: In some communities, men eat first and women eat last and poorly. Consequently, the health of

women in these societies may be adversely affected. Chronic alcoholism is another factor, which may lead to serious malnutrition.

Socio-Economic Factors:

Malnutrition is mainly the by product of poverty, ignorance, insufficient education, lack of knowledge regarding the nutritive value of foods, inadequate sanitary environment, large family size, etc. These factors directly affect the quality of life and are the true causes of malnutrition in society. The speed with which populations are growing in many developing countries is another important factor. It has made the solution of the malnutrition problem more difficult.

Conditioning Influences:

Infectious diseases are important factors responsible for malnutrition generally, in small children. Diarrhoea, intestinal parasites, measles, whooping cough, malaria, tuberculosis all contribute to malnutrition. In fact it is a vicious circle: infection contributes to malnutrition and malnutrition causing an otherwise minor childhood ailments to become killers. It has been found that where environmental conditions are poor, small children may suffer from some infection or the other for almost half of their first three years of life. The interrelationship between malnutrition and infection has been well documented.
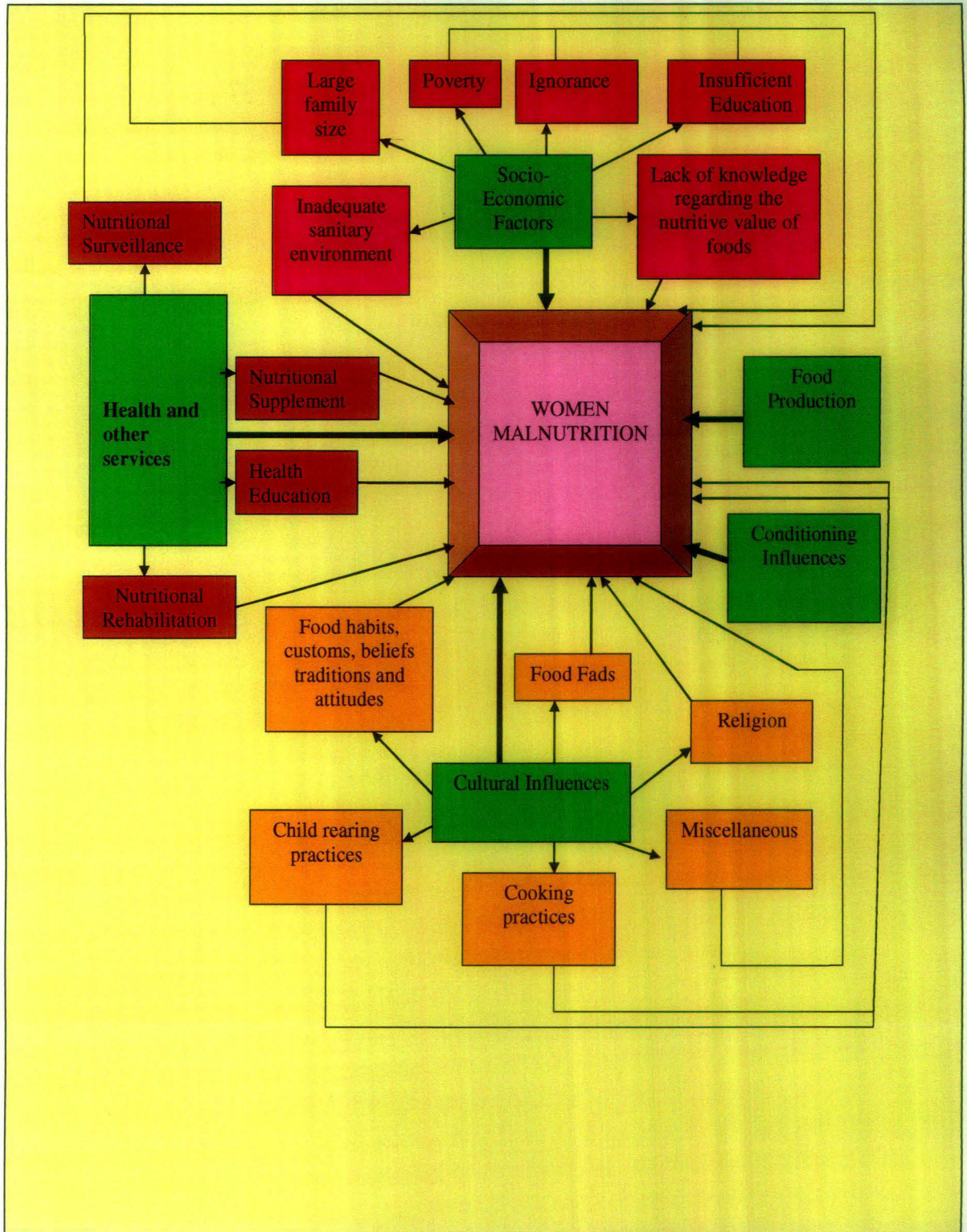
Figure-3.1 A Diagram for the analysis of the effects of the cultural and socio-economic factors on Women Malnutrition

Food Production: Increased food production should lead to increased food consumption. The average Indian has 0.6 hectare of land surface compared to 5.8 hectare per head in the developed countries. The per capita arable land for an average Indian is only 0.3 hectare. Increased food production is not solving the basic problem of hunger and malnutrition in much of the developing world. Scarcity of food, as a factor responsible for malnutrition, may be true at the family level; but it is not true on a global basis, nor is it true for most of the countries where malnutrition is still a serious problem. It is a problem of uneven distribution between the countries and within the countries.

Health and Other Services: If the health sector can be organized properly and given adequate resources then we can combat malnutrition. Some of the remedial actions that can be taken by the health sector are: (1) Nutritional surveillance: Nutritional surveillance indicates the continuous monitoring in a community or area of factor or conditions which indicate, relate to the nutritional status of individuals or groups of people (WHO, 1976). The first task is to identify the groups and individuals affected- through clinical examination and simple body measurements of persons attending health centers and hospitals. A further step is to carry out surveys in the villages. The data will give a more realistic picture of the nutritional status of the community. (2) Nutritional rehabilitation: Immediate measures are required as soon as the malnourished subjects are located. Children suffering from severe PEM (Protein Energy Malnutrition) with complications need urgent care may be in a hospital. Less severely affected children can be treated on a domiciliary basis or in special nutrition rehabilitation centers. These centers should be linked with health centers. (3) Nutrition supplementation: The target groups are mothers and children. Supplementary feeding is normally regarded as a stop-age measure for the rehabilitation of malnourished children. (4) Health education: It is opined that by appropriate educational action, about 50 percent of nutritional problems can be solved.

3. 2 CAUSES OF INFANT MORTALITY

A variety of factors affecting infant mortality are classified as biological and socio-economic or environmental factors, though these two categories should not be treated as watertight compartments, for there is a great deal of interaction between the two. At times, it is even possible to modify biological factors by introducing changes in socio-economic factors. The level of mortality is very high in the first few hours, days and weeks of life. The reasons for infant deaths at the earlier and later stages of infancy differ to a certain extent. Hence, in a study of infant mortality, infant deaths are carefully grouped into two categories according to the age at death. The first category consists of those infants who die before they complete four weeks of life. The other category consists of those infants who die between 28 days and 365 days of their life. The rate based on the first period is known as the neo-natal mortality rate. Factors, which affect foetal and neo-natal deaths, are primarily endogenous, while those which affect post-neo-natal deaths are primarily exogenous (Bhende, 2006).

Endogenous Factors:

The endogenous factors are related to the formation of the foetus in the womb and are, therefore, mainly biological in nature. Among the biological factors affecting foetal and neo-natal infant mortality rates, the important ones are the age of the mother, the birth order, the period of spacing between births, weights at birth, the fact of multiple births, family size and high fertility.

Age of the mother

There is a definite relationship between the age of the mother and the fate of the child. Infant mortality rates are greater when the mother is either very young (below the age of 19 years) or relatively older over 30 years). Very young mothers also tend to be poorer and less educated to take care of her child (Park, 2007).

Birth order

The live births are classified according to their order of rank. The highest mortality is found among first born and the lowest among those born second. The risk of infant mortality increases after the third birth. The fate of the 5th and later children is always worse than the fate of the 3rd child. Infant mortality from nutritional deficiencies is 3-4 times higher for infants born with fifth or higher birth order compared to the first three. These deaths occur mostly in post-neonatal period (Park, 2007).

Birth spacing

Repeated pregnancies have a greater influence on infant mortality. They create malnutrition and anemia in the mother, again predispose to low birth weight, which results in higher infant deaths. The mother who becomes pregnant again too early and whose youngest baby is displaced from the breast and prematurely weaned that baby is more prone to develop (1) protein energy malnutrition (2) diarrhea and dehydration, both of which cause an increased mortality in infants and young children. Evidence from the World Fertility Survey- the largest survey into human behaviour ever undertaken suggests that the risks to life for babies born within a year of each other is 2-4 times higher than for babies born more than 2 years apart. Wider spacing of births decrease infant mortality and is considered as important part of health care as immunization (Government of India, 1984).

Birth weight

Birth weight is a major determinant of infant and perinatal mortality and morbidity. Babies of low birth weight (under 2.5Kg) and high birth weight (over 4 Kg) are at special risk. One major cause of low birth weight is poor maternal nutrition not only during pregnancy, but even before that. It has been observed that the mother who was adequately nourished during her own growing up years has an excellent chance of delivering a normal size baby even if she has taken an inadequate diet during her pregnancy. An increase in birth weight would lower the perinatal and neonatal mortality (Park, 2007).

Multiple births

Infants born in multiple births face a greater risk of death than do those in single births due in large part to the greater frequency of low birth weight among the former (Park, 2007).

Family size

Studies show the infant mortality increases with family size. The numbers of episodes of infectious diarrhea, prevalence of malnutrition and severe respiratory infections have been found to increase with family size. Besides the frequency of disease, the duration of illness is also affected by the family size. It was found that the duration of illness is much longer in families with 3 or more children. Deprivation of maternal care is also found in large families. Fewer children would mean better maternal care, a better share of family resources, less morbidity and greatly decreased infant mortality (Park, 2007).

High fertility

Fertility is one of the most important factors that influence infant mortality. High fertility and high infant mortality go together (Park, 2007).

Exogenous Causes:

Social, cultural, economic and environmental factors are also found to affect infant mortality, specially during the post-neo-natal period. Post-neo-natal period deaths are therefore mainly due to various epidemics caused by communicable diseases.

Economic Factors

One of the most important variables affecting infant mortality rates, both directly and indirectly is socio-economic status. The availability and quality of health care and the nature of the child's environment are closely related to socio-economic status. Statistics reveal that infant mortality rates are highest in the slums and lowest in the richer residential localities. Major improvements in health status and a decrease in infant mortality require continuing socio-economic development, including provision of health services.

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Family Income

Income decides the nutritional level of the family, particularly of children, expectant and nursing mothers. In India more than any other income decides the kind of residential area and the nature of house one lives on (Preston, 1975).

Occupation of Mother

Occupation of mother is an important factor which influences infant mortality. It is a major indicator which determines the amount of care a mother can provide for the infant. In less developed societies where breast-feeding is the most satisfactory source of food for the young child, mothers going out to work may lower child health by disturbing breastfeeding practices more than it would be if mothers were confined to household duties (Sloan, 1971).

Cultural and Social Factors:

Breast feeding

Infant health is related to breast feeding because of the nutritional context and natural immunizing agents contained in breast milk, at least for fully breast-fed infants. Early weaning and bottle-fed infants living under poor hygienic conditions are more prone to die than the breast-fed infants living under similar conditions (Park, 2007).

Religion and caste

The difference are attributed to socio-cultural patterns of living, involving age-old habits, customs, traditions affecting cleanliness, eating, clothing, child care and almost every detail of daily living (Park, 2007).

Early marriages

The baby of teen-age mother has the highest risk for neonatal and post-neonatal mortality (Park, 2007).

Sex of the child

In most parts of India, female infants receive far less attention than males. This is especially the case, where there are already several female children. In many families, the birth of a female child is unwelcome. Statistics show that female infant mortality is higher than the male infant mortality. But when the total infant mortality is split into neonatal and post neonatal deaths, the picture gets reversed, i.e. neonatal death rate is higher for males than for female infants; post-neonatal death rate is higher for female infants than male infants (WHO, 1993).

Quality of mothering

The art of child care has to be learnt. Even in conditions of extreme poverty, children could reasonably survive if they had an efficient mother. It is the "quality of mothering' that helps to reduce infant mortality (Park, 2007).

Maternal education

Illiteracy is the greatest barrier to any improvement in the health conditions. Mother's education level, even within the same socio-economic class is a key determinant of their children's health. There is extensive evidence (e.g. Kerala experience) that maternal education plays a major role in the decline of infant and child mortality, presumably reflecting personal health behaviour, care and access to and use of health services. Women with schooling tend to marry later, delay child-bearing and are more likely to practice family planning. They generally have fewer children with wider spacing between births (Park, 2007).

Quality of Health care

Another likely factor affecting infant mortality in contemporary India is inadequate prenatal care and infrequent attendance at delivery. The percentage of deliveries attended by untrained persons or relatives is very high in rural India. Shortage of trained personnel like dais, midwives and health visitors is another determinant of high infant mortality in India. According to estimates only 43 percent of the deliveries are attended by trained birth attendants (Park, 2007).

Broken families

Infant mortality tends to be high where the mother or father has died or separated (Park, 2007).

Illegitimacy

Illegitimacy is also an important factor contributing to high infant mortality rate. A child born out of wedlock is generally unwanted both by the mother as well as society. Consequently such a child does not receive the care in terms of nutrition and medical care that it needs (Park, 2007).

Brutal habits and customs

Certain age-old customs and beliefs greatly influence infant mortality rate. These include depriving the baby of the first milk or colostrums, frequent purgation, branding the skin, application of crowding to the cut end of umbilical cord, faulty feeding practices and early weaning (Park, 2007).

The indigenous Dai

The untrained midwife is greatly responsible for the high infant mortality in India. She is usually an illiterate person devoid of all knowledge of rules of hygiene. Her unhygienic delivery practice is an important cause of high infant mortality (Park, 2007).

Bad environmental sanitation

Infants are highly susceptible to bad environmental sanitation. Lack of safe water supply, poor housing conditions, bad drainage, over crowding and insect breeding all increase the risk of infant mortality (Park, 2007).

Status of Women

Status of mother also affects infant mortality. Higher the status among women, greater the chances of survival of infants and lower the mortality, because women of higher status by virtue of their independent, modern attitudes and rational outlook can provide proper care to their infants (Mahadevan, 1993).

The development of a proximate determinants approach to the study of child survival presented in (Figure-3.2) is given by Mosley in 1983. The key to the model is the identification of a set of proximate determinants that directly influence the risk of morbidity and mortality. All social and economic determinants operate through these variables to affect child survival. The proximate determinants are grouped into five categories

- Maternal factors: age, parity and birth interval.
- Environmental contamination: air, food/water/fingers, skin/soil/inanimate objects and insect vectors.
- Nutrient deficiency: calories, protein, micronutrients (Vitamins and minerals).
- Injury: accidental and intentional.
- Personal illness control: personal preventive measures and medical treatment.
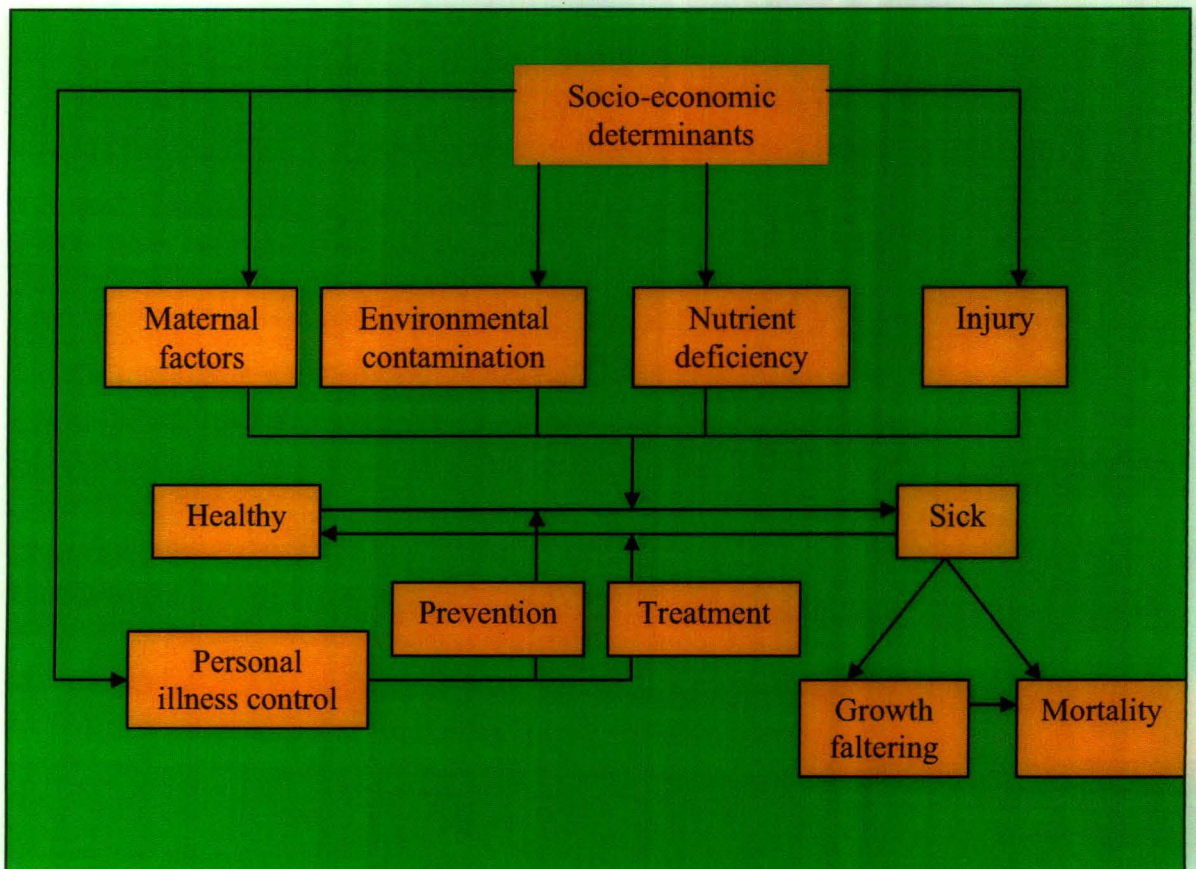
Figure-3.2 Operation of the five groups of proximate determinants on the health dynamics of a population

3.3 CONCEPTUAL FRAMEWORK

Conceptual framework is the heart of the study. There is internal link between the dependent and independent variables. So there is need of conceptual framework in research to outline possible courses of action or to present a preferred approach to a system analysis project. The framework is built from a set of concepts connected to a planned or existing system of methods, behaviors, functions, relationships, and objects. Conceptual frameworks are a type of intermediate theory that has the potential to link to all aspects of inquiry like problem definition, purpose, literature review, methodology, data collection and analysis. Conceptual frameworks act like maps that give coherence to empirical inquiry. Because conceptual frameworks are potentially so close to empirical inquiry, they take different forms depending upon the research question or problem (Tajalli, 2006).

A conceptual framework is explained as a set of broad ideas and principles taken from relevant fields of enquiry and used to structure a subsequent presentation (Reichel & Ramey, 1987). A conceptual framework has proper usefulness as a tool to link together research and a researcher to make meaning of subsequent findings. A framework is a reflection about the research and its context and to assist a researcher to develop awareness and understanding of the situation. "As with all investigation in the social world, the framework itself forms part of the *agenda for negotiation* to be scrutinized and tested, reviewed and reformed as a result of investigation" (Guba & Lincoln, 1989).

For the present study there is very essential to give a conceptual framework, which can connect women's malnutrition with infant mortality. The major factors which affect malnutrition among women are socio-economic and cultural factors. These are the direct factors which affect malnutrition. For infant mortality these are indirect factors. The conceptual framework is explaining the inter relationship between the different independent variables which has direct and indirect impact on both malnutrition and infant mortality.
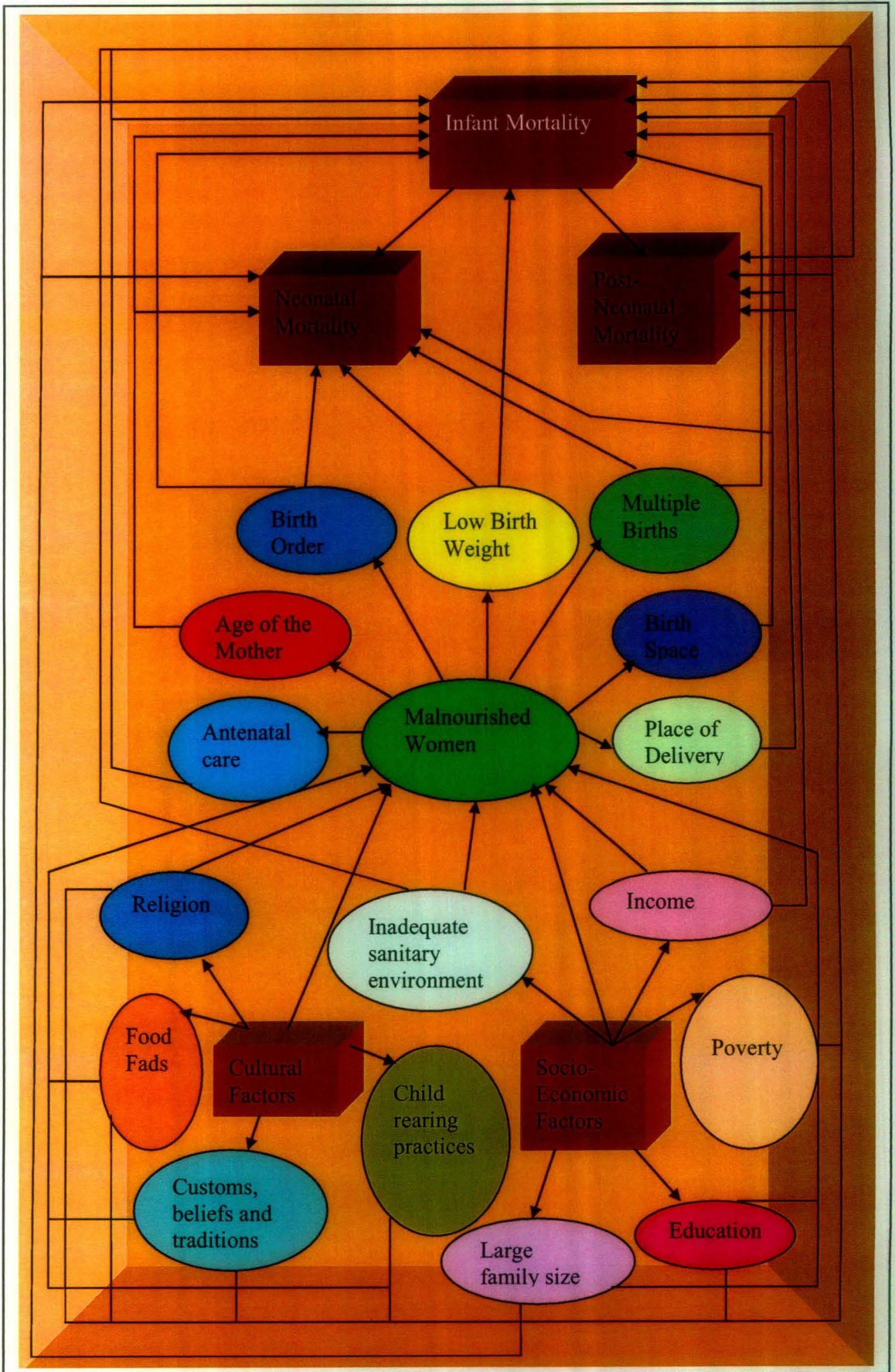
Figure-3.3 Conceptual Framework showing influence of women's malnutrition on infant Mortality

The conceptual framework as shown in (Figure-3.3) full fills the requirement of our study for explaining the influence of women's malnutrition on infant mortality in Orissa. Women are more malnourished in Orissa due to different socio-economic factors like poverty, large family size, less education, less income and inadequate sanitary environment. Cultural factors like religion, food fads, customs, beliefs and traditions and child rearing practices also affect malnutrition. Infant mortality is also indirectly affected by these socio-economic and cultural factors. The direct factors like age of the mother, birth order, multiple birth, birth space, birth weight and large family size are affecting infant mortality. Adequate nutrition, a fundamental cornerstone of any individual's health, is especially critical for women because inadequate nutrition wreaks havoc not only on women's own health but also on the health of their children. Children of malnourished women are more likely to face cognitive impairments; short stature, lower resistance to infections, and a higher risk of disease and death throughout their lives. Malnutrition poses a variety of threats to women. It weakens women's ability to survive childbirth, makes them more susceptible to infections, and leaves them with fewer reserves to recover from illness. A variety of nutritional deficits, including iron deficiency and insufficient caloric intake, can increase a woman's chances of having a low birth-weight infant. Low birth weight affects more infants in Orissa and is the strongest determinant of a child's survival. Infants with low birth weight account for the majority of infant deaths in the first week of life. Children born from malnourished women of lower age group have higher infant mortality. This is because of lower capacity to reproduce and more pregnancy complication at lower age. That creates still birth and mainly neonatal mortality. Like that if malnourished women take shorter period of birth space that will directly affect infant mortality. If malnourished women have higher number of children that also directly create infant mortality. Another direct factor of infant mortality is multiple births, when malnourished women delivered two or more child at a time it causes infant mortality this might be because of lower birth weight among the children and malnourished mother can not care both infants at a time in terms of breast feeding and health care. All these are also direct factors for neonatal mortality. The socio-economic factors and cultural factors directly affect post-neonatal mortality and indirectly affect infant mortality

3.4 NUTRITIONAL ANTHROPOMETRY

Nutritional status of women can be evaluated by anthropometric measures like Body mass index and anemia level.

Body Mass Index

The Body Mass Index (BMI) is calculated from weight and height measurements using the formula BMI= weight (in Kg) divided by height (in m2). The BMI was first introduced by Quetlet in order to eliminate the confounding effects of height on weight, which is also called the Quetlet Index. In normal adults, the ratio of the weight to the square of height is roughly constant and a person with a low BMI is underweight for their height. BMI reflects protein and fat reserves, which in turn reflect functional reserves including the ability to survive nutritional deficit and some diseases.

BMI may be appropriate for population-level assessments of chronic under nutrition. In 1988, researchers proposed the use of BMI to define and diagnose chronic under nutrition as a measure of under nutrition among adults, FAO and WHO now regard the Body Mass Index as the most suitable. According to the FAO (Sixth World Food Survey, 1996), a BMI below 18.5 is regarded as lower than normal thus indicative of under nutrition.

The need for a method of diagnosing chronic energy deficiency in adults was a major issue which emerged at the first meeting of the International Dietary Energy Consultancy Group (IDECG), held in Guatemala in 1987. Further efforts to examine this problem were recommended and a report representing the first attempts at the international level to devise an operational definition of chronic energy deficiency (CED) in adults was made (James et al, 1988). Soon after the IDECG's Working Party completed its work, FAO began to explore the possibility of using the Body Mass Index (BMI) of adults as an indicator of the food situation and nutritional well-being of a community. Initially, the functional significance and behaviour of various weight/height indices were explored in depth; later, the BMI became the focus of attention. In this text, evidence provided by FAO and others is assessed and the case for using the BMI as an indicator for chronic energy deficiency is presented.

The BMI is a simple but objective anthropometric indicator of the nutritional status of the adult population and seems to be closely related to their food consumption levels. It is relatively inexpensive, easy to collect and to analyze. Collection of data on weight and height from which BMI is easily derived can readily be incorporated into regional and national surveys that are presently being conducted. It could be used for the purpose of nutritional surveillance or for the purposes of monitoring since this allows for interregional or inter-country comparisons as well as longitudinal comparisons within the same region or country. The BMI is sensitive to socio-economic status and to seasonal fluctuations in food consumption relative to the level of physical activity. The BMI is a reasonably sensitive index of function and physical performance and may be useful if development projects depend on the physical activity of the community. The deleterious consequences of a low BMI status in an adult are only now being recognized; there is considerable need to evaluate immune function, proneness to illness, morbidity and mortality in low BMI adults. There is also scope for evaluation of intervention strategies in a community using the BMI as the parameter of choice to identify individual at risk. Further epidemiological research on anthropometric data and individual food consumption measurements are still necessary, especially in different socioeconomic contexts. The percentage of false positives and false negatives needs to be assessed. However, there is reason to believe the BMI is a simple responsive and useful index of nutritional status of the adult in a community and may indeed be the method of choice to assess the numbers of people who are undernourished world-wide.

Theoretical problems with BMI

Body shape- Many factors other than nutritional status determine BMI. Most important of these is body shape, in particular the ratio of leg-length to trunk-length, sometimes called the sitting-height to standing height ratio (SH/S) for Cormic index. This index varies both between populations and within populations.

Age- Adults body size; shape and composition vary with age, 25, 26, 27, 28, 29, 30, 31, 32, 33 and 34. Adults tend to loose fat free mass (FFM) and increase fat mass (FM) with age 35. These charges may alter the functional significance of BMI at different ages.

Practical problems with BMI

Difficulties in obtaining the component measures of BMI during famine- The height and weight measurements required to assess BMI are often difficult to obtain during famine. Chair or bed-scales are usually unavailable and thus patients must be able to stand in order to be weighed. Usually, many of the most severely undernourished adults requiring admission to therapeutic feeding canters can not stand at all and BMI can not be estimated.

Difficulties in the calculation of BMI – Even in non-famine situations the calculation of BMI and Cormic Index may be unfamiliar to filed workers and therefore difficult.

Difficulties in obtaining the component measures of BMI in elderly and handicapped people – As adults become older, spinal disease (predominantly osteoarthritis and osteoporosis) affects an increasing proportion of people. These conditions affect the ability to stand straight and make the accurate measurement of height impossible. BMI, based on height can not therefore be used in older adults.

Anemia Level

To determine the prevalence of malnutrition among women, it is necessary to estimate the number of women whose nutritional status is unsatisfactory. This is usually done by counting the number of women who fall below some agreed-upon cut-off point (a reference value) of an indicator of nutritional status.

Anemia is a condition characterized by a decrease in the concentration of hemoglobin in the blood. Hemoglobin is necessary for transporting oxygen to tissues and organs in the body. The reduction in oxygen available to organs and tissues when hemoglobin levels are low is responsible for many of the symptoms experienced by anemic persons. The consequences of anemia include general body weakness, frequent tiredness, and lowered resistance to disease. Anemia can be a particularly serious problem for pregnant women, leading to premature delivery and low birth weight. It is of concern in children since anemia is associated with impaired mental and physical development. Overall, morbidity and mortality risks increase for individuals suffering from anemia.

Anemia is classified as mild, moderate or severe based on the concentrations of hemoglobin in the blood. The cutoffs values used in defining each of these levels vary according to age and, for ever married women, pregnancy status. The following summarizes the cutoffs used in the analysis of the anemia data:

Table-3.1 Anemia level cutoff points for different age group population

Age	Mild (g/dl)	Moderate (g/dl)	Severe (g/dl)	Any (g/dl)
Children age 6-59 months	10.0-10.9	7.0-9.9	<7.0	<11.0
Ever-married women age 15-49				
Not pregnant	10.0-11.9	7.0-9.9	<7.0	<12.0
Pregnant	10.0-10.9	7.0-9.9	<7.0	<11.0
Never-married youth and young adults				
Girls				
Age 10-11	10.5-11.4	7.5-10.4	<7.5	<11.5
Age 12-19	10.0-11.9	7.0-9.9	<7.0	<12.0
Boys				
Age 10-11	10.5-11.4	7.5-10.4	<7.5	<11.5
Age 12-14	10.0-11.9	7.0-9.9	<7.0	<12.0
Age 15-19	12.0-12.9	9.0-11.9	<9.0	<13.0

Source: *EDHS (2005)*

3.5 SOURCE OF DATA

For the present study, data provided by the National Family Health Survey II and III, which were conducted during 1998-99, 2005-06 respectively, have been used. The National Family Health Surveys are the outcome of collaborative efforts of many organizations. The International Institute for Population Sciences (IIPS) was designated as the nodal agency for this project by the Ministry of Health and Family Welfare (MOHFW), Government of India, New Delhi. The project was funded by the United States Agency for International Development (USAID), with additional support from UNICEF. Technical guidance was provided by Macro International and the East-West Center, USA.

Responsibility for data collection was entrusted to 13 reputed organizations in India, including some Population Research Centres. The principal objective of NFHS-2 is to provide state and national estimates of fertility, the practice of family planning, infant and child mortality, maternal and child health and the utilization of health services provided to mothers and children. In addition, the survey includes information on the quality of health and family welfare services and provides indicators of the status of women.

Another feature of NFHS-2 is measurement of the nutritional status of women. The survey covers a representative sample of about 91,000 ever-married women age 15-49 from 26 states in India who were covered in two phases, the first starting in November 1998 and the second in March 1999. The survey provides state-level estimates of demographic and health parameters as well as data on various socioeconomic and programmatic dimensions, which are critical for bringing about the desired change in demographic and health parameters. One important feature of NFHS-2 is the data on the nutritional status of women and children collected by carrying out blood tests for hemoglobin levels in addition to the measurement of their height and weight.

The third National Family Health Survey (NFHS-3) was conducted in 2005-06. In addition to the indicators covered in NFHS-2, NFHS-3 provides information on several

new and emerging issues such as perinatal mortality, male involvement in the use of health and family welfare services, adolescent reproductive health, high risk sexual behaviour, family life education, safe injections, and knowledge about tuberculosis. A major new component of NFHS-3 is blood testing for HIV prevalence and behaviour-related information among adult men and women. In addition to interviewing ever-married women age 15-49, NFHS-3 included never married women age 15-49 and both ever-married and never married men age 15-54 as eligible respondents. Interviews were conducted with 124,385 women age 15-49 and 74,369 men age 15-54 from all 29 states. Throughout India, 102,946 women and men were tested for HIV in NFHS-3. NFHS-3 provides estimates of HIV prevalence for adult women and men at the national level, for Uttar Pradesh and for five high HIV prevalence states (Andhra Pradesh, Karnataka, Maharashtra, Manipur, and Tamil Nadu). NFHS-3 also provides estimates of population and health indicators for slum and non-slum populations for eight cities, namely Chennai, Delhi, Hyderabad, Indore, Kolkata, Meerut, Mumbai, and Nagpur. Fieldwork for NFHS-3 was conducted in two phases from November 2005 to August 2006. In the first phase, 12 states were covered and in the second phase the remaining 17 states were covered.

The overall target sample size for Orissa was 4,000 completed interviews with eligible women. The sample was designed to provide estimates for the state as a whole and for its rural and urban areas separately. The sample is not large enough to provide reliable estimates for individual districts. The required sampling rates for rural and urban areas were determined by allocating the sample proportionally to the population of the two areas and taking into account their expected urban and rural nonresponse rates. In NFHS-2 the survey was conducted from March to June 1999 for Orissa. Total 4689 households were interviewed among these 932 were urban household and 3757 were rural household. In NFHS-2 about 4425 women were interviewed among them 3757 were rural and 868 were urban women. Household response rate was 99.2 percent and women response rate was 98.4 percent. In NFHS-3, for Orissa the survey was conducted during the period (November 2005 to April 2006). Total 3910 households were interviewed. Total 4540 women and 1592 men were interviewed. The response rates were 98.9 percent, 96.1 percent and 92.7 percent for household, women and men respectively.

3.6 SELECTION OF VARIABLES

Identification of the causal relationship among the different variables of any study is an essential concern of an investigation. A causal relationship between the two variables exists only when one of them may logically be considered as the cause of the other. Thus for analyzing the data, two sets of variables are chosen. They are

- Dependent Variable
- Independent variable

The factor which is supposed to be the effect is known as the dependent variable and the factor which is supposed to be the cause is known as the independent variable. Thus the variations in dependent variable may be explained in terms of the variations in the independent variable.

Dependent Variables for women Malnutrition

Dependent variables of malnourished women are based on the two indices namely: Body Mass Index and Anemia level. These variables are dependent on the effects of demographic and socio-economic variables. In this study, the dependent variables selected from the NFHS-2, 3 data file are suitably categorized and their recorded forms are as follows:

Sl. no	Name of the variables	Categories of the variables
1	Body Mass Index of the Respondent	1. Under nutrition 2. Normal 3. Over nutrition
2	Anemia Level	1. Sever anemic 2. Moderate Anemic 3. Mild Anemic 4. Not Anemic

Independent Variables for women Malnutrition

The independent variables are the different demographic and socio-economic variables on which the indices of women malnutrition depend.

Sl. no	Name of the variables	Categories of the variables
1	Age of the women	1. 15-19 Years 2. 20-29 Years 3. 30+ Years
2	Children Ever Born	1. One child 2. 2-3 children 3. 4 and above
3	Type of place of residence	1. Urban 2. Rural
4	Religion	1 Hindu 2.Others
5	Education of Women	1.No education 2.Primary education 3.Secondary and higher education
6	Standard of living of women	1 low 2. Medium 3. High
7	Respondent's Occupation	1.Not working 2.Working
8	Caste	1. SC/ST 2. OBC 3. Others

Dependent Variables for Infant Mortality

Dependent variables of the infant mortality among malnourished women are based on the three indices namely: Infant deaths, neonatal deaths and post neonatal deaths. These variables are dependent on the effects of demographic and socio-economic variables. In this study, the dependent variables selected from the NFHS-2, 3 data file are suitably categorized and their recorded forms are as follows:

Sl. no	Name of the variables	Categories of the variables
1	Infant Deaths	1. Yes 0. No
2	Neonatal Deaths	1. Yes 0. No
3	Post-Neonatal deaths	1. Yes 0. No

Independent Variables for Infant Mortality

The independent variables or the causes of women nutritional status are the different demographic and socio-economic variables on which the indices of women malnutrition depend.

The maternal and bio-demographic variables considered in the analysis include: age of the mother, birth order, birth weight, preceding birth interval, multiple births and mother's education. The social variables include place of residence, religion and caste. The economic variables include standard of living and mother's work status. Health service utilization factors include place of delivery, ante-natal care, assistance during pregnancy and breast-feeding. The environmental factors like source of drinking water, toilet facility and electricity facility. The independent variables selected from the NFHS-2, 3 data file are suitably categorized and their recorded forms are as follows:

Sl. no	Name of the variables	Categories of the variables
1	Age of the mother at birth	1. <19 Years 2. 19-30 Years 3. >30 Years
2	Education of Mother	1.No education 2.Primary education 3.Secondary and higher education
3	Birth Order	1. 1 2. 2-3 3. >3
4	Birth Interval	1. <23 months 2. >24 months
5	Birth Weight	1. Large 2. Average 3. Small
6	Multiple Births	1.Single birth 2.Double births
7	Standard of living of mother	1 low 2. Medium 3. High
8	Mother's Occupation	1.Not working 2.Working
9	Place of Delivery	1.Home Delivery 2.Institutional Delivery
10	Sex of the child	1.Male 2. Female
11	Religion	1 Hindu 2.Others
12	Caste	1. SC/ST 2. OBC 3. Others

13	Place of Residence	1. Urban
		2. Rural
14	Ante-natal care	0. No ANC
		1. Any ANC
15	Assistance during delivery	I. Untrained
		2. Trained
16	Source of drinking water	1. Safe
		2. Unsafe
17	Electricity availability	0. No
		1. Yes
18	Toilet Facility	0. Without toilet
		1. With toilet
19	Exposure to mass media	1. Not exposed
		2. Fully exposed
20	Breast-feeding	1. Never breast feed
		2. less than 6 months
		3. more than 6 months

3.7 METHODOLOGY

Once the variables – dependent and independent – are chosen and suitably recorded to meet the need of the analysis, SPSS 13.0 (Software Package in Social Sciences) is used for the analysis of the research problem. The following methodologies are adopted for the analysis:

1. Cross tabulation
2. Binary logistics

Cross tabulation of the dependent and independent variables are prepared to find out the percentages of the demographic and socio-economic variables.

Binary logistic regression or simply logistic regression is applied to a dichotomous dependent variable, where the dependent variable is the odds of the event of interest occurring. Logistic regression determines the effect of a set of variables on the probability as well as the effect of the individual variables. In this case, all the two dependent variables namely; Body mass index and anemia level have dichotomous values and thus binary logistic is the model of choice.

The general logistic model expresses a qualitative dependent variable as a function of several independent variables, both qualitative and quantitative.

Le, $P=2$ (If ith malnourished are malnourished i.e. underweight or over weighted)

P-1 (normal)

Thus, malnutrition i.e. underweight (P) is a dichotomous dependent variable reflecting binary choices. Let us assume that underweight depends on a set of economic, socio-cultural and demographic characteristics to be represented by a vector. The basic form of a logistic function is:

$P-1/ (1+e^{-z})$

Or, $1-P = 1 / (1+e^{z})$

Or, $P/1-P = e^{z}$

Log $(P/1-P) = Z$

Where, P = estimated probability (the probability of underweight)

Z = independent variable

e = the base of natural logarithm ($e = 2.7183$)

The independent variable has the largest effect on P when $P = 0.5$ and P becomes smaller in absolute magnitude as P approaches 0 to 1.00

In case, if we use multivariate logistic function involving 'K' independent variables, like, $X_1, X_2, X_3....X_a$, the relationship can be written as :

Log $\{P/(1-P)\} = b_0 + b_1x_1 + b_2x_2 + b_3x_3...b_kx_k$

The coefficient b_1 represents the additive effect on one unit change in independent variable x_1 on the logistic odds of malnutrition i.e. underweight.

The quantity e^b is called the odds ratio that represents the multiplicative effect on one unit change in the independent variable x_1 on the odds of underweight. The odds ratio interpreted as e^b {Exp (B)} is more readily understandable as a measure of effect. This represents proportional increase for unit change in corresponding independent variable.

Chapter 4

Results and Discussion

CHAPTER-IV

IMPACT OF WOMEN MALNUTRITION ON INFANT MORTALITY

"You can tell the condition of a nation by looking at the status of its women".
-Jawaharlal Nehru

This chapter analyses and compares the impact of women malnutrition on Infant mortality in Orissa between NFHS-2 and NFHS-3. To obtain the objectives, this chapter has been divided into four sections. The first section of this chapter deals with the background of the study area and analyses the percentage distribution of the dependent variables. The second section shows the association between the dependent and the independent variables in Orissa. This analysis also attempts to bring out a comparative study of the association among the variables in between NFHS-2 and NFHS-3. The third section of this chapter analyses the impact of demographic and socio-economic variables with the help of binary logistic regression models. The fourth section summarizes the whole chapter.

4.1 BACKGROUND OF THE STUDY AREA

Before analyzing the nutritional status and infant mortality of the study area in this chapter there is need to present the demographic and socio-economic characteristics of Orissa as per the NFHS-2 and NFHS-3. For the analysis in NFHS-2 and NFHS-3 the schedule covering 1498 and 1781 kids of age ranging from 0-3 years and 0-5 years respectively in Orissa was considered.

In Table-4.1 it has shown the percentage distribution of demographic and socio-economic factors in Orissa for both NFHS-2 and NFHS-3. These independent variables are used for analyzing the nutritional status among women. The demographic factors are age of women and children ever born and socio-economic factors are education, caste, religion, occupation and standard of living of women.

Of the respondents in NFHS-2 and NFHS-3 in the state of Orissa, the highest number of women (69.8%) and (69.3%) respectively were from the age of above 20 or above. However, women above 30 years are slightly higher (25.1%) in NFHS-3 compared to NFHS-2 (20.3%). Although most of the women respondents were from the rural areas in both the surveys, but number of urban women (24.5%) were more in NFHS-3 against (18%) in NFHS-2 (Figure-4.1). Around half of women have 2 or 3 ever born children while a quarter of women have given birth three or more children and the same number of women became mother of one child in both the surveys. Over the years, literacy level had been improved significantly. Percentage of women passed secondary or higher secondary education is higher (36.9%) in NFHS-3 compared to 28.4% in NFHS-3. Like education, employment level had been increased. The percentage of non-working women had been reduced from (75.8%) in NFHS-2 to 68.8% in NFHS-3. In both the surveys, highest percentages of women (44% in NFHS-2 and 44.9% in NFHS-3) are from SC/ST strata followed by other backward caste (31.6% and 26.5% respectively) and the rest is from other caste. Most of the respondents were Hindu. Although majority of women were from lower income group but the number of higher income group were more in NFHS-3 (20.7%) against 9.7% in NFHS-2.
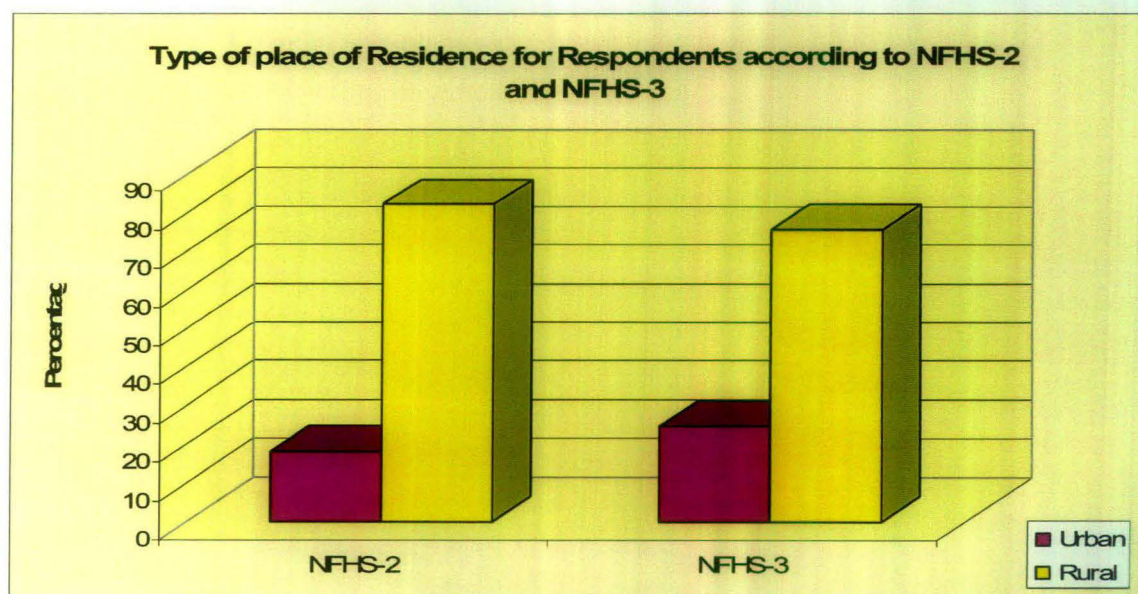
Figure-4.1
Source: *IIPS (2007)*

Table 4.1 Percentage distribution of independent variables for Nutritional status among women in Orissa, NFHS-2 (1998-99) and NFHS-3 (2005-06)

Independent Variables	NFHS-2 Percentage	NFHS-3 Percentage
Age of the Women		
15-19	9.9	5.6
20-29	69.8	69.3
30+	20.3	25.1
Place of Residence		
Urban	18	24.5
Rural	82	75.5
Children ever born		
One	25.4	23.7
2-3	49.3	51.0
3 and above	25.3	25.3
Education		
No education	53.7	44.3
Primary	18	18.8
Secondary and Higher	28.4	36.9
Occupation		
Not working	75.8	68.8
Working	24.2	31.2
Caste		
SC/ST	44	44.9
OBC	31.6	26.5
Other	24.4	28.6
Religion		
Hindu	95.7	95.5
Others	4.3	4.5
Standard of living		
Low	55.6	43.4
Medium	34.7	26.5
High	9.7	20.7
Not dejure resident	NA	9.4

Source: IIPS (2007)   NA –Not Available

In Table-4.2 it has given the percentage distribution of maternal and bio-demographic factors, in Orissa for both NFHS-2 and NFHS-3. These independent variables are used for analyzing infant mortality in Orissa. The maternal and bio-demographic variables are maternal education, age of the mother at birth, birth order of the child, birth interval, birth weight, mothers' body mass index and anemia level and multiple births.

The number of educated women with secondary or higher secondary is higher (36.9%) in NFHS-3 against 28.4% in NFHS-2. In both the surveys, two-third of women had reached the age of 19 or above at the time of child birth and 13.8% and 14.1% respectively in NFHS-2 and NFHS-3 had completed the age of 30 years. Majority of women had two to three children. Less number of women (20.9%) had three or more children in NFHS-3 compared to 24.5% in NFHS-2. However, birth spacing had been reduced in case of NFHS-3 than NFHS-2. In NFHS-2, 80.8% of women followed the 2 years birth space against 77.4% in NFHS-3. Undernourishment level among the women had been decreased in NFHS-3 (40.9%) from 47.5% in NFHS-2. However, the anemic level was slight declined in NFHS-3 among the respondents. It was found that during the time of birth, higher percentages of women were anemic in both the surveys. Sex ratio was remained same. Among the ever born children, majority of them were male child. Most of infant born were average in size and born single. In NFHS-2 fewer children were large in size comparison to NFHS-3. But in NFHS-3 higher percentage of children size was small at the time of birth. The percentage for average size of child at the time of birth was declined for NFHS-3 (Figure-4.2).

Birth weight of child for NFHS-2 and NFHS-3

	Large	Average	Small
NFHS-2	17.6	60.4	22
NFHS-3	23.2	51.4	25.4
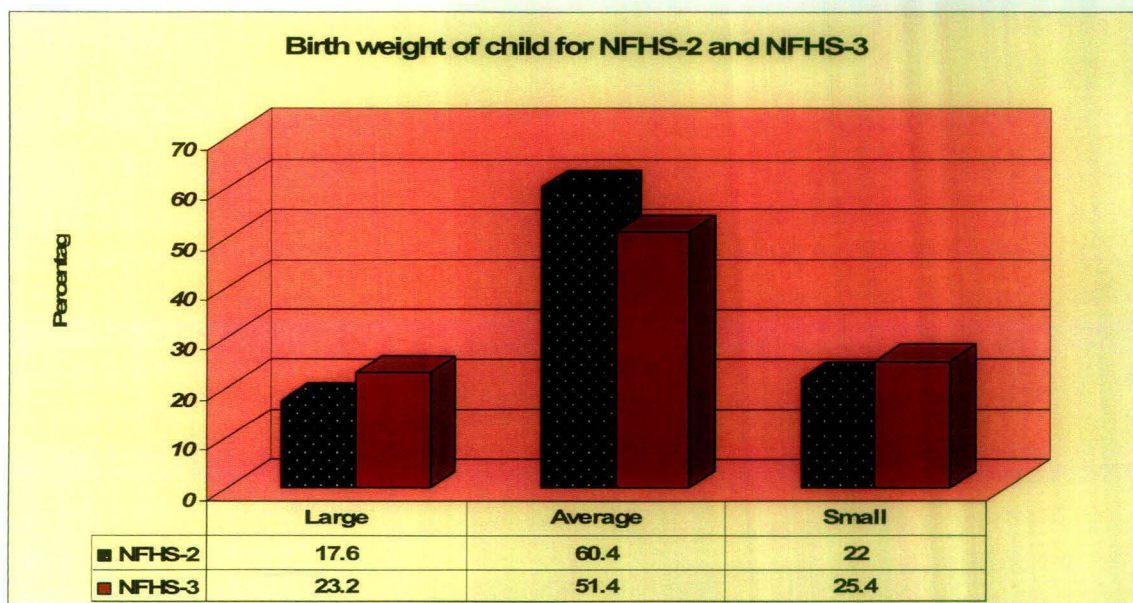
Figure-4.2

Source: *IIPS (2007)*

Table 4.2 Percentage distribution of maternal and bio-demographic variables for infant mortality in Orissa, NFHS-2 (1998-99) and NFHS-3 (2005-06)

Independent Variables	NFHS-2	NFHS-3
Maternal and bio-demographic factors		
Maternal education		
No education	53.7	44.3
Primary	18	18.8
Secondary and Higher	28.4	36.9
Age of the Mother at birth		
less than 19	12.4	13.4
19-30	73.8	72.5
>30 years	13.8	14.1
Birth order of the child		
1	29	35.3
2-3	46.5	43.7
>3	24.5	20.9
Birth Interval		
<23 months	19.2	22.6
>24 months	80.8	77.4
Mother's Body Mass Index		
Undernourished	47.5	40.9
Normal	48.8	52.9
Over nutrition	3.7	6.1
Mother's Anemia Level		
Any anemia	66.4	64.0
No anemia	33.6	36.0
Sex of the child		
Male	52.7	51.9
Female	47.3	48.1
Birth Weight of the child		
Large	17.6	23.2
Average	60.4	51.4
Small	22	25.4
Child is twin		
Single	98.5	97.8
Multiple	1.5	2.2

Source: IIPS (2007)   NA –Not Available

Table-4.3 shows health service utilization factors and household environmental factors for analyzing infant mortality in Orissa. The health service utilization factors are antenatal cares during pregnancy, place of delivery and assistance during delivery.

Household environmental factors like toilet facility, water facility, electricity, exposure to mass media and breast feeding.

NFHS data revealed that health services were largely available to the women during their pregnancy period. However, the coverage of ante natal care was higher during NFHS-3 compared to NFHS-2. In NFHS-3, 92.1% women had received ante natal care compared to 86.3% in NFHS-2. Institutional delivery was also quite higher (39.6%) in NFHS-3 against 21.8% in NFHS-2. This was may be due to the increased availability of institutional facilities across villages and small towns with increased trained assistance 46.9% in NFHS-3 compared to 35.9% in NFHS-2. Toilet facilities had been improved within the households. During NFHS-3, it was found that the percentage of households with toilet facilities was higher (19.2%) against 13.6% in NFHS-2. Availability of safe drinking water remains a problem for the vast masses living in rural and urban slums. However, the availability of safe drinking water was slightly improved during NFHS-3 at 19.0% compared to 15.8% during NFHS-2. But unlike safe drinking water, majority of the households had electricity facility. Exposure to mass media and awareness about general health and sanitation condition had been improved sharply among the women.
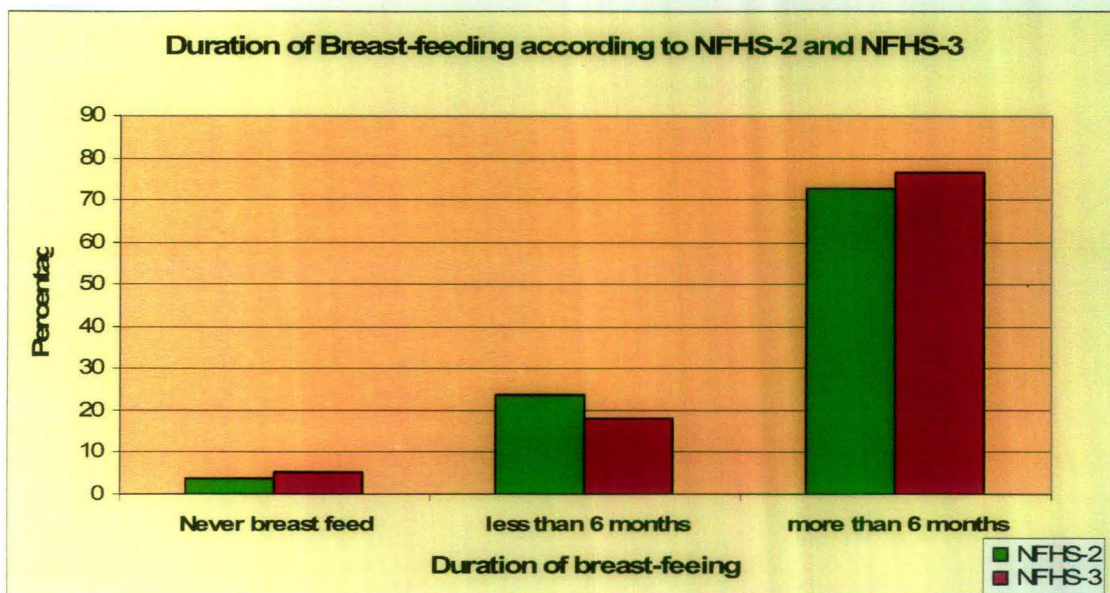
Figure-4.3
Source: *IIPS (2007)*

In NFHS-3, 72.8% women had been fully exposed to the mass media against 44% in NFHS-2. In NFHS-3, 76.6% women had more than 6 months breast feeding in comparison to 72.7% in NFHS-2. But there were more women (5.4%) in NFHS-3 who had never breast feed against 3.7% in NFHS-2 (Figure-4.3).

Table 4.3 Percentage distribution of health service utilization and household environmental variables for infant mortality in Orissa, NFHS-2 (1998-99) and NFHS-3 (2005-06)

Independent Variables	NFHS-2	NFHS-3
Health service utilization factors		
Antenatal care		
No ANC	13.7	7.9
Any ANC	86.3	92.1
Place of Delivery		
Home delivery	78.2	60.4
Institutional delivery	21.8	39.6
Assistance at Delivery		
Untrained	64.1	53.1
Trained	35.9	46.9
Household environmental factors		
Toilet facility		
Without toilet	86.4	71.9
With toilet	13.6	19.2
Not dejure residents		8.9
Water facility		
Safe	15.8	19.0
Unsafe	84.2	72.1
Not dejure residents	NA	8.9
Electricity		
Using	62.4	46.2
Not using	37.6	44.9
Not dejure residents		8.9
Exposure to Mass Media		
Not exposed	56	27.2
Fully exposed	44	72.8
Breast-feeding		
Never breast feed	3.7	5.4
less than 6 months	23.6	18.0
more than 6 months	72.7	76.6

Source: IIPS (2007)   NA –Not Available

Table-4.4 shows percentage distribution of socio-economic factors for analyzing infant mortality in Orissa. The socio-economic factors like education, occupation, standard of living, religion and caste.

In the era of globalization, income level of the families has been increasing sharply. Government of India's policy to eradicate poverty and the sponsorship of foreign governments have seen sharp rise in the income level of families over the past few years. In NFHS-2, majority women were from the lower income household but this percentage reduced to 43.4% in NFHS-3. In (Figure-4.4) the percentage of women in the higher income family had been doubled over the period (9.7% in NFHS-2 and 20.7% in NFHS-3). Nearly majority women belong to lower strata of society followed by other backward class (31percent) in NFHS-2 but the percentage of other women had been increased to 28.6% in NFHS-3 from 24.4% in NFHS-2. In search of better job, unemployed villagers had migrated to nearby small towns and big towns which led to the beginning of the urbanization process. In NFHS-2, 82% women were from rural areas against 75.5% in NFHS-3. With the boosting up economy, women's income level and employment opportunities had been increased. In NFHS-2, there were only a quarter of women found to be working while one-third women were working in NFHS-3 (Figure-4.5).
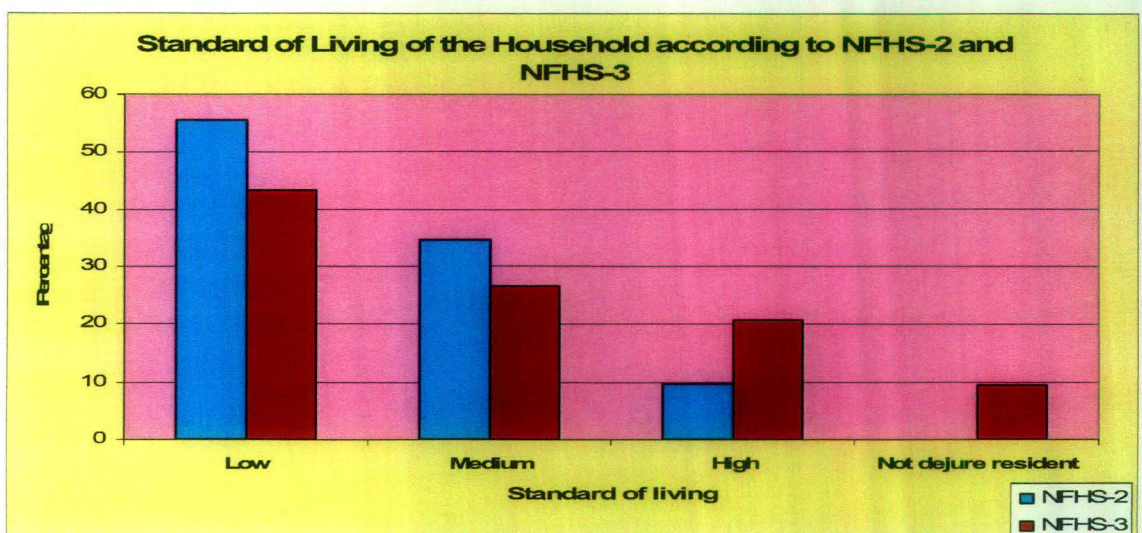
Figure-4.4

Source: *IIPS (2007)*

Table 4.4 Percentage distribution of socio-economic variables for infant mortality in Orissa, NFHS-2 (1998-99) and NFHS-3 (2005-06)

Independent Variables	NFHS-2	NFHS-3
Socio-economic variables		
Standard of living		
Low	55.6	43.4
Medium	34.7	26.5
High	9.7	20.7
Not dejure resident	NA	9.4
Caste		
SC/ST	44	44.9
OBC	31.6	26.5
Other	24.4	28.6
Place of Residence		
Urban	18	24.5
Rural	82	75.5
Occupation of Mother		
Not working	75.8	68.8
Working	24.2	31.2

Source: IIPS (2007)   NA –Not Available
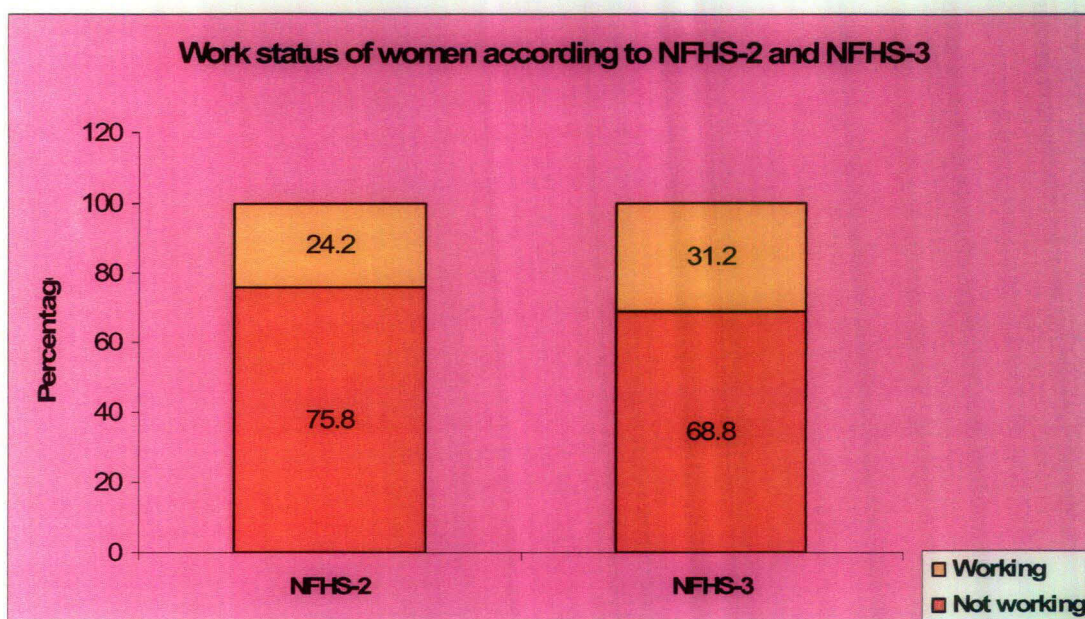
Figure-4.5

Source: *IIPS (2007)*

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Levels of Malnutrition among women in Orissa according to NFHS-2 and NFHS-3

The two major indicators used for measurement of women malnutrition are Body Mass Index and anemia level. Body mass index is classified into three categories like under nutrition; normal and over nutrition and anemia level is categorized into anemic and not anemic.
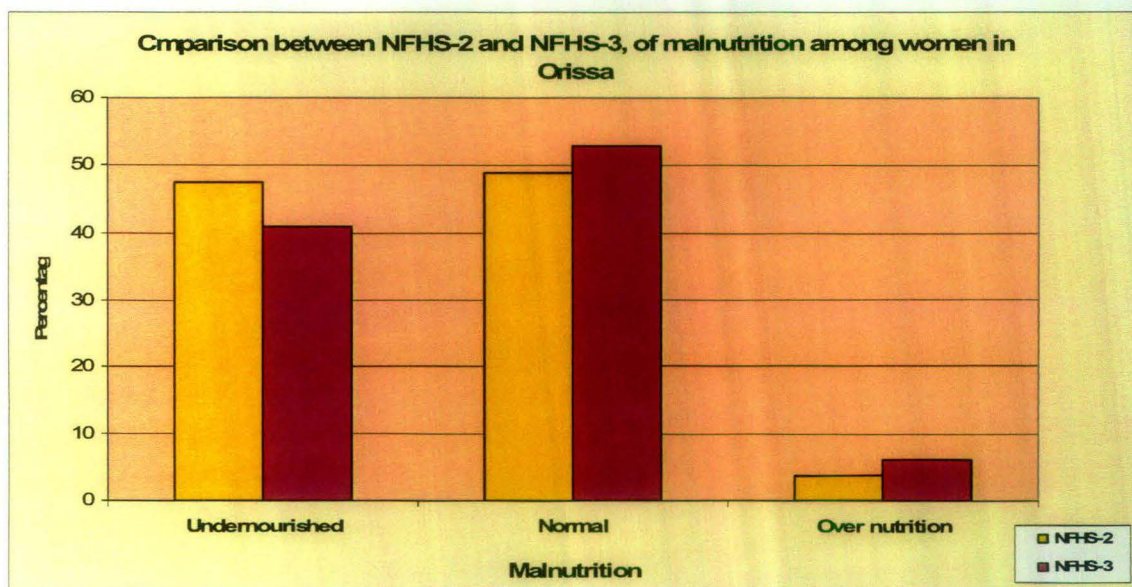
Figure-4.6
Source: *IIPS (2007)*

Figure-4.6 shows level of malnutrition among women in Orissa during National Family Health Survey 2 and 3. In NFHS-2 more women are malnourished in comparison to NFHS-3. In NFHS-3 normal women are higher percent than NFHS-2 and higher percent women have over nutrition in NFHS- 3 in comparison to NFHS-2. It was found that in comparison to NFHS-2 fewer women are malnourished in NFHS-3.

In Figure-4.7 it has shown the anemia level among women in comparison between NFHS-2 and 3. In NFHS-2 any anemia among women is higher in comparison to NFHS-3. In NFHS-3 the percentage of anemic women are decreased and percentage of not anemic are increased.
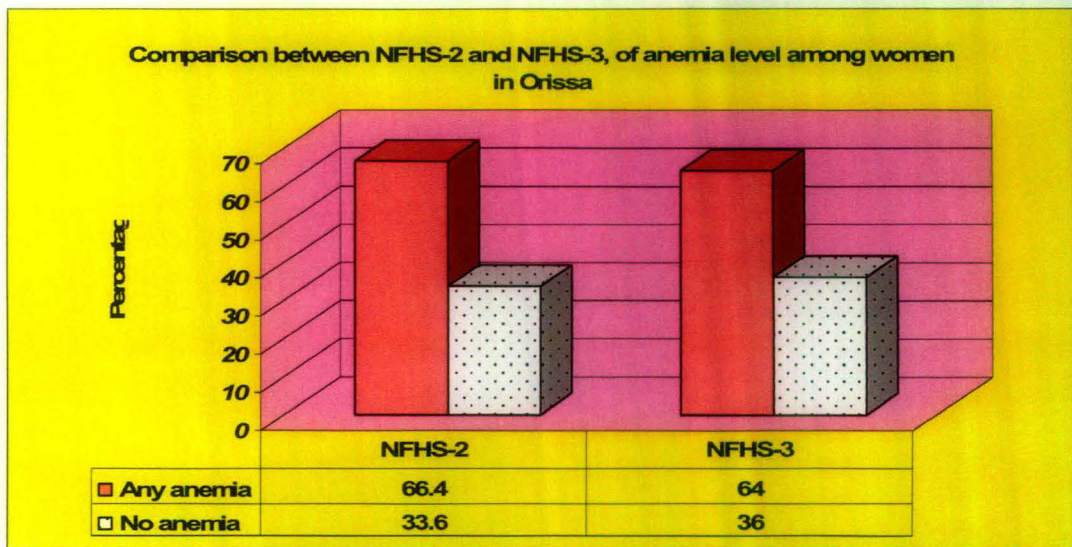
Figure-4.7

Source: *IIPS (2007)*

Levels of Infant Mortality in Orissa according to NFHS-2 and NFHS-3

Figure-4.8 shows infant mortality, post-neonatal mortality and neonatal mortality in Orissa between NFHS-2 and NFHS-3. In comparison to NFHS-2 infant mortality, neonatal mortality and post neonatal mortality are decreased in NFHS-3.
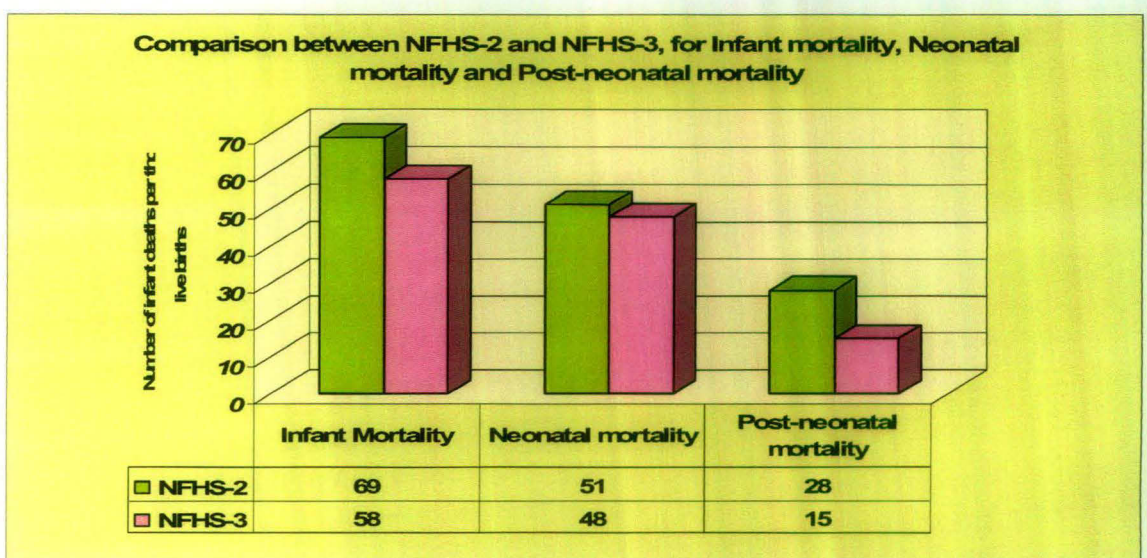
Figure-4.8

Source: *IIPS (2007)*

4.2 ASSOCIATION BETWEEN THE DEPENDENT AND THE INDEPENDENT VARIABLES: A COMPARATIVE STUDY OF NFHS-2 AND NFHS-3.

4.2.1 Association between malnutrition and independent variables

Table-4.5 shows association between Body mass index and demographic and socio-economic factors in Orissa. The socio-economic factors like education, occupation, standard of living, religion and caste.

Body Mass Index

In NFHS-2, majority of women were undernourished in the age group 15-19 while the percentage has been reduced to one-third in NFHS-3 in the same age group. Unlike in NFHS-2, where more number of under nourished women were from the age group of 15-19 than in 20-29 (48.6%), but in NFHS-3, percentage of women was higher in age group of 20-29 (41.7%) than age 15-19. In both the surveys, highest percentage of women was found undernourished from rural areas (48.9% in NFHS-2 and 42.4% in NFHS-3) compared to their urban counterpart (40.7% and 30.5% respectively). However, the percentage of undernourished women was marginally declined over the years. In both the studies, it was found that women having less than three or more children were more susceptible to be undernourished than the women ever gave birth to one child. In NFHS-2, 48.4% undernourished women have given ever birth to three or less than three child against 42.4% in NFHS-3. Education plays a vital role in women's health condition. In both the studies, around majority of women those who had not received any education were undernourished compared 39.5% and 31.2% percent women in NFHS-2 and NFHS-3 respectively those who have passed either secondary or higher secondary education. In both the studies, majority of working women were undernourished (although number is slightly lower in NFHS-3) than the non-working women. Majority of the malnourished women were from the lower strata of the society (SC/ST). In NFHS-2, 53.9% SC/ST women were undernourished compared to 48.7% in NFHS-3. Unlike NFHS-2, where 47.9% malnourished women were Hindu, in NFHS-3, 46.9% malnourished women were from other religion.

Table-4.5: Percentage distribution of Body Mass Index and background variables in Orissa, NFHS-2 (1998-99) and NFHS-3 (2005-06)

Background Variables	NFHS-2			NFHS-3		
	Body Mass Index			Body Mass Index		
	Under nourished	Normal	Over nutrition	Under nourished	Normal	Over nutrition
Age of women						
15-19	52.3	43.0	4.7	37.4	58.6	4.0
20-29	48.6	47.8	3.6	41.7	52.6	5.7
30+	41.1	55.3	3.6	39.6	52.8	7.6
Residence						
Urban	40.7	54.4	4.8	30.5	53.2	16.3
Rural	48.9	47.6	3.5	44.3	52.9	2.8
Children ever born						
One	47.4	48.9	3.7	34.1	57.8	8.1
Less than three	48.4	47.2	4.3	42.4	51.0	6.6
3 and above	45.6	51.7	2.6	44.3	52.3	3.3
Education						
No education	52.0	45.0	3.0	48.9	48.5	2.5
Primary	46.5	51.3	2.2	41.3	52.4	6.3
Secondary and Higher	39.5	54.4	6.1	31.2	58.5	10.3
Occupation						
Not working	46.6	49.4	4.0	38.4	54.6	7.0
Working	50.3	47.0	2.8	46.6	49.3	4.1
Caste						
SC/ST	53.9	43.4	2.7	48.7	47.4	3.9
OBC	45.0	51.6	3.4	41.7	55.1	3.2
Other	39.1	54.9	6.0	27.8	59.7	12.5
Religion						
Hindu	47.9	48.3	3.8	40.6	53.1	6.3
Others	37.5	59.4	3.1	46.9	50.6	2.5
Standard of living						
Low	50.9	46.3	2.8	47.4	49.9	2.8
Medium	47.9	48.7	3.5	37.0	59.1	3.8
High	26.2	63.4	10.3	28.0	57.9	14.1
Not dejure resident	NA	NA	NA	38.6	48.1	13.3

Source: IIPS (2007)   NA –Not Available

There is a direct coherence between the economic standard and the health status of women. In NFHS-3, 47.4% lower income back ground women were under nourished

compared to 50.9% in NFHS-2. But in the higher income group, under nourished condition has been increased in NFHS-3 (28.0%) against 26.2% in NFHS-2.

Table-4.6 shows association between anemia level and demographic and socio-economic factors in Orissa. The socio-economic factors like education, occupation, standard of living, religion, caste and place of residence. Demographic factors are age of the mother and children ever born.

Anemia Level

In both the surveys, it was found that women under age or lower age group had suffered more from anemia than their counterpart of higher age of 30 or above. However more women (74.2%) were suffered from anemia under the age group of 15-19 in NFHS-3 compared to 71.1% in NFHS-2 within the same age group. The number has also been increased (68.4%) in the women above 30 in NFHS-3 compared to 65.8% in NFHS-2. More number of women had been suffered from the disease in age of 30 or above. But the number was more in NFHS-3 as 72.5% women had been suffered in the age of 30 or above against the 70.7% in NFHS-2. In NFHS-2, 65% anemic were found among the women those have given birth to ever born one child compared to 55.2% in NFHS-3 study. Higher the education, lower the chances of anemic. 72.4% anemic women were found to be illiterate in NFHS-2 while 70.5% were anemic in NFHS-3. But the figure is contrast in case of higher education. 57.3% women were anemic those who had passed secondary or higher secondary education in NFHS-3 compared to 55.3% in NFHS-2. It was found from both the studies that working women were very often victimized of the disease than their non-working counter part. In NFHS-2, 70.2% working women were anemic compared to 67.3% in NFHS-3. In NFHS-2, higher numbers (66.9%) of Hindu women were anemic where as in NFHS-3 higher number (69.2%) of non-Hindu women were anemic. Income also coincides with the anemia level of women. Majority anemic women were found from the lower income group in both the studies. However, equal number (61.3%) of women in the middle income group had been suffered from the

anemia in both the studies. But a departure has been marked between the two studies that 53.2% women suffered from anemia in NFHS-3 than in NFHS-2 (44.1%).

Table -4.6: Percentage distribution of Anemia level and background variables in Orissa, NFHS-2 (1998-99) and NFHS-3 (2005-06)

Background Variables	NFHS-2		NFHS-3	
	No Anemia	Anemia	No Anemia	Anemia
Age				
15-19	28.9	71.1	25.8	74.2
20-29	34.2	65.8	38.3	61.7
30+	~34.2	65.8	31.6	68.4
Residence				
Urban	40.4	59.6	44.4	55.6
Rural	32.2	67.8	33.4	66.6
Children ever born				
One	35.0	65.0	44.8	55.2
Less than three	35.2	64.8	36.1	63.9
3 and above	29.3	70.7	27.5	72.5
Education				
No education	27.6	72.4	29.5	70.5
Primary	34.2	65.8	38.2	61.8
Secondary and Higher	44.7	55.3	42.7	57.3
Occupation				
Not working	34.9	65.1	37.5	62.5
Working	29.8	70.2	32.7	67.3
Caste				
SC/ST	26.1	73.9	28.8	71.2
OBC	37.2	62.8	40.3	59.7
Other	42.6	57.4	42.9	57.1
Religion				
Hindu	33.4	66.6	36.2	63.8
Others	39.1	60.9	30.8	69.2
Standard of living				
Low	26.7	73.3	30.2	69.8
Medium	38.7	61.3	38.7	61.3
High	55.9	44.1	46.8	53.2
Not dejure resident	NA	NA	34.5	65.5

Source: IIPS (2007)   NA –Not Available

4.2.2 Association between Infant Mortality and independent variables

Table-4.7.1 shows association between Infant mortality with independent variables. The independent variables are categorized according to maternal and bio-demographic factors like birth order, age of mother at the time of birth, birth space, birth weight, mother's nutritional status and anemia level.

Infant Mortality

Infant mortality is higher for first ever child born in both the studies. In NFHS-2, 78 out of 1000 infant dies compared to 65 in NFHS-3. However, the number is higher in NFHS-3 for the more than 4 or more child born in NFHS-3 (64) against 63 in NFHS-2. However, death rate is less (50) for two-three children born in comparison to 67 in NFHS-2. The mortality rate is higher among the younger women giving birth. 108 infant dies from the mother below 19 years in NFHS-2 while the number is sharply down to 76 in NFHS-3 followed by 19-30 years. However, 53 out of every thousand infant die from the mother in the age group of 30 or above in NFHS-2 while 44 in NFHS-3. Birth spacing also plays important role in infant mortality. Higher the spacing months, lower the chances of infant mortality. However, the number infant dies are more (108) in case of NFHS-3 compare to 93 in NFHS-2 in the birth spacing less than 23 months. The chances of infant mortality is higher among the twins (275 in NFHS-3) compared to (182 in NFHS-2). Mortality is higher among the infant having lower birth weight (108 in NFHS-3 and 101 in NFHS-2) compared to the infant of average weight (62 in NFHS-2 and 36 in NFHS-3). The chances of infant mortality were higher among the anemic women compared to normal women. However, the number of infant mortality is lower (66) in NFHS-3 compared to 79 in NFHS-2. More infant dies form the undernourished women compared to normal women. It was found from both the studies that chances of infant mortality is significantly less in the case of women those who had passed secondary or higher secondary education.

Table-4.7.1: Distribution of Infant Mortality and Maternal Factors in Orissa, NFHS-2 (1998-99) and NFHS-3 (2005-06)

Variables	NFHS-2	NFHS-3
Maternal and bio-demographic factor		
Birth order in three categories		
1	78	65
2-3	67	50
>4	63	64
Age at birth		
less than 19	108	76
19-30	66	58
>30 years	53	44
Birth interval		
<23 months	93	108
>24 months	59	38
Child is Twin		
Single	68	53
Multiple	182	275
Size of the child at birth		
Larger than average	46	36
Average	62	36
Smaller than average	101	108
Anemia level		
Any anemia	79	66
No anemia	50	44
Body Mass Index		
Undernourished	72	59
No undernourished	67	58
Education		
No education	82	67
Primary	67	66
Secondary and Higher	47	44

Source: IIPS (2007)   NA –Not Available

Table-4.7.2 shows correlation of Infant mortality with independent variables. The independent variables are categorized as health service utilization factors and household environmental factors. Health service utilization factors such as received ANC, type of place of residence and assistance during delivery. Household environmental variables are availability of electricity, source of drinking water, toilet facility, exposure to mass media and breast-feeding

Infant mortality is less in case of women received antenatal case (64) compared to women who had not received the care (93) in NFHS-2, but in NFHS-3, it was found that same number of infant mortality occurred in both categories of women. Infant mortality was higher in institutional delivery (80) in NFHS-2 while morality is higher home delivery (68) in NFHS-3. It was found that mortality rate was less in case of women those who had been attended by the trained assistant during delivery. Household toilet also plays a crucial rule in case of infant mortality. Both the studies showed that households having own toilet had less infant mortality than no toilet households and mortality is higher in the households which had no access to safe drinking water. The studies also found that infant mortality was less in the house holds having electricity connections compared to those who did not have electricity. NFHS-2 study revealed that the chances of infant mortality is higher (564 out of 1000) among the infant who had never been breast feed compared to 406 in NFHS-3. But mortality rate is significantly lower (10 out of 1000) in case of those who had been breast feed more than 6 months (both in NFHS-2 and NFHS-3). In NFHS-2, more infant mortality occurred among the women who had never been exposed to mass media against the women exposed to mass media but in NFHS-3, more numbers infant (60) dies from the mother exposed to mass media than the mothers not exposed to mass media (54). The study also found that infant mortality is higher among the rural areas compare to urban areas. The study also revealed that sex is not the criteria for infant mortality. In NFHS-2 study, it was found that 75 female infant dies compared to 65 male infant but in NFHS-3, the number of male mortality is higher (66) compared to 50 female infant.

Table-4.7.3 indicates correlation of Infant mortality with socio-economic variables such as work status, standard of living, caste and religion of mother.

More number of infant dies in the lower standard of living compared to higher standard of living women in both NFHS-2 and NFHS-3. More number of infant dies in SC/ST in NFHS-3 where as higher numbers of infant death among OBC women in NFHS-2. The data also shows that more number of infant dies in other religion compared to Hindu in NFHS-3 but all the infant death was occurred among Hindu in NFHS-2.

Table-4.7.2: Distribution of Infant Mortality and background variables in Orissa, NFHS-2 (1998-99) and NFHS-3 (2005-06)

Variables	NFHS-2	NFHS-3
Health service utilization factor		
Ante-natal care		
No ANC	93	37
Any ANC	64	36
Place of delivery		
Home delivery	67	68
Institutional delivery	80	44
Assistance during birth		
Untrained	74	72
Trained	61	43
Household environmental factor		
Toilet facility		
No	73	60
Yes	49	41
No dejure residents	NA	82
Source of drinking water		
Safe	51	51
Unsafe	73	77
Not dejue residents	NA	82
Has electricity		
No	79	58
Yes	53	54
Not dejure residents	NA	82
Breastfeeding		
Never breast feed	564	406
less than 6 months	175	162
more than 6 months	10	10
Exposure to mass media		
Not exposed	79	54
Fully exposed	58	60
Type of place of residence		
Urban	59	37
Rural	72	65
Sex of child		
Male	65	66
Female	75	50

Source: IIPS (2007)   NA –Not Available

Infant mortality is higher among not working women in NFHS-2 and in NFHS-3 infant mortality is higher among working women.

Table-4.7.3: Distribution of Infant Mortality and background variables in Orissa, NFHS-2 (1998-99) and NFHS-3 (2005-06)

Variables	NFHS-2	NFHS-3
Socio-economic factors		
Occupation		
Not working	70	55
Working	69	67
Caste		
SC/ST	59	66
OBC	87	64
Other	66	42
Religion		
Hindu	73	58
Others	00	62
Standard of living		
Low	80	62
Medium	62	59
High	34	46
Not dejure resident	NA	82

Source: IIPS (2007)   NA –Not Available

Table-4.8 shows association between Neonatal mortality with independent variables. The independent variables which affect neonatal mortality are age of mother at birth, birth order, birth interval, birth weight and multiple births.

Neonatal mortality

The data shows that, neonatal mortality is higher for the first born child compared to after third child or more children born in both surveys. The neonatal mortality is more among small birth weight 82 in NFHS-2 where as in NFHS-3 it is 108 which is very high compare to NFHS-2. Neo-natal mortality was more among the children born from below 19 year old women followed by 19-30 age groups for both NFHS-2 and NFHS-3. Higher

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the birth interval, the chances of neonatal survival is more. Child born less than the 23 months interval have more chances of mortality compared to spacing of more than two years in both NFHS-2 and NFHS-3. Neonatal mortality is higher among the child born twin or more compared to single.

Table-4.8: Distribution of Neonatal Mortality and background variables in Orissa, NFHS-2 (1998-99) and NFHS-3 (2005-06)

Variables	NFHS-2	NFHS-3
Birth order in three categories		
1	65	65
2-3	44	50
>4	46	64
Birth weight		
large	34	36
Average	41	36
Small	82	108
Age at birth		
less than 19	81	76
19-30	48	58
>30 years	39	44
Birth interval in two categories		
<23 months	78	108
>24 months	37	38
Child is Twin		
Single	50	53
Multiple	91	275

Source: IIPS (2007)

Table-4.9 shows association between Post-neonatal mortality with independent variables. The independent variables which affect Post-neonatal mortality are mainly economical and ecological factors. Economic factors like occupation and standard of living of the mother and ecological factors like place of residence, type of toilet facility, source of drinking water etc.

Post-neonatal mortality

The number of post-neonatal mortality is higher in the family without toilet compare to those who have toilets. In comparison to NFHS-2, in NFHS-3 the number of infant deaths among those who are not used toilet is less. Post neonatal mortality is higher among the working women in NFHS-2 against in NFHS-3 Post-neonatal mortality is higher among women those who do not work. Impure water is also a source of post neonatal mortality. Standard of living also responsible for post neonatal mortality as more number of Post-neonatal dies in the poor family compared to the high income group. Post neonatal mortality is higher among the SC/ST women. Post neonatal mortality is higher among the Hindu religion and the number is quite lower among the high educated. Number is also higher in rural areas as well as household without electricity. Mortality is higher among the girl children.

Table-4.9: Distribution of Post-neonatal Mortality and background variables in Orissa, NFHS-2 (1998-99) and NFHS-3 (2005-06)

Variable	NFHS-2	NFHS-3
Demographic factor		
Type of place of residence		
Urban	22	07
Rural	29	18
Sex of child		
Male	24	12
Female	32	19
Household environmental factor		
Toilet facility		
No	30	18
Yes	15	09
Not dejure residents	NA	06
Source of drinking water		
Safe	17	21
Unsafe	30	15
Not dejrue residents	NA	06
Has electricity		
No	34	19
Yes	18	13
Not dejure residents	NA	06
Socio-economic factor		
Occupation		
Not working	24	16
Working	41	14
Standard of living		
Low	38	19
Medium	19	16
High	00	09
Not dejure resident	NA	06
Caste		
SC/ST	32	21
OBC	25	11
Other	25	10
Religion		
Hindu	29	15
Others	00	12
Education		
No education	36	24
Primary	30	12
Secondary and Higher	12	06

Source: IIPS (2007)   NA –Not Available

Comparison between NFHS-2 and NFHS-3 for nutritional status among women and infant mortality

The major findings in between NFHS-2 and NFHS-3 are discussed in this section. The results are nearly same but the percentage varies in between these two.

In Figure-4.9 it has given the percentage of anemia among working women in NFHS-2 and NFHS-3. In NFHS-2 the percentage anemia among women is higher in comparison to NFHS-3. In both the cases anemia level is higher among working women then not working women. No anemia is higher among not working women than working women in both the cases but in NFHS-3 the percentage declines for anemia level among working and non working women.
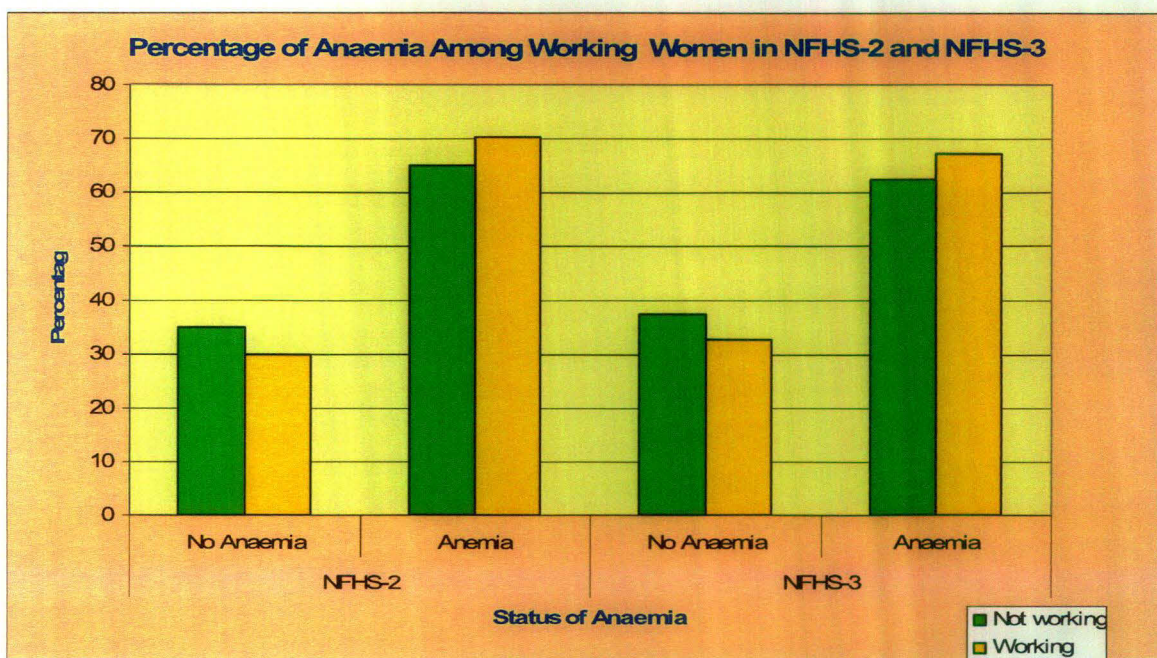
Figure-4.9

Source: *IIPS (2007)*

In Figure-4.10 it has given the percentage of anemia among rural and urban women in NFHS-2 and NFHS-3. In NFHS-2 the percentage anemia among women is higher in comparison to NFHS-3. In both the cases anemia level is higher among rural women then urban women. No anemia is higher among urban women than rural women.
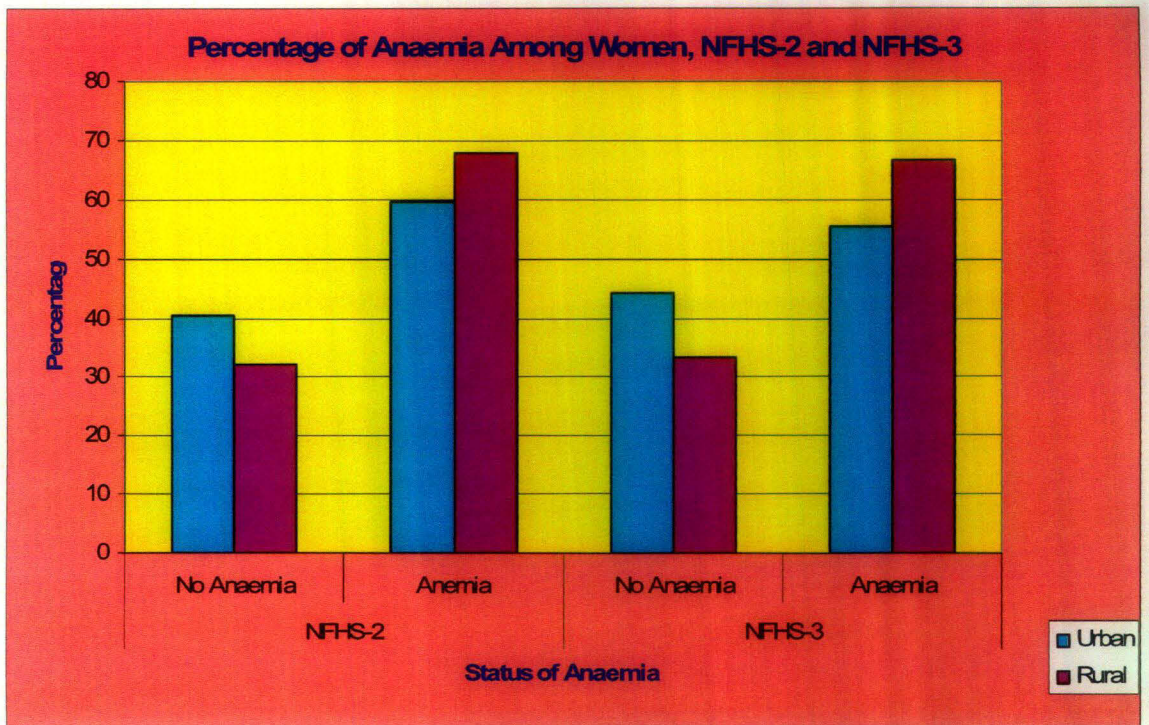
Figure-4.10

Source: *IIPS (2007)*

Figure-4.11 shows the relationship between anemia level among women and infant mortality in Orissa. Infant mortality is higher among anemic mother than not anemic mother in both NFHS-2 and 3. But the infant mortality among anemic mothers decline in NFHS-3 compare to NFHS-2.

Figure-4.12 shows the relationship between malnutrition among women and infant mortality in Orissa. Infant mortality is higher among malnourished mother than normal mother in both NFHS-2 and 3. But the infant mortality among malnourished mothers decline in NFHS-3 compare to NFHS-2.

Comparison between NFHS-2 and NFHS-3, for Anemia level among women and infant mortality in Orissa

	NFHS-2	NFHS-3
■ Any anemia	79	66
□ No anemia	50	44
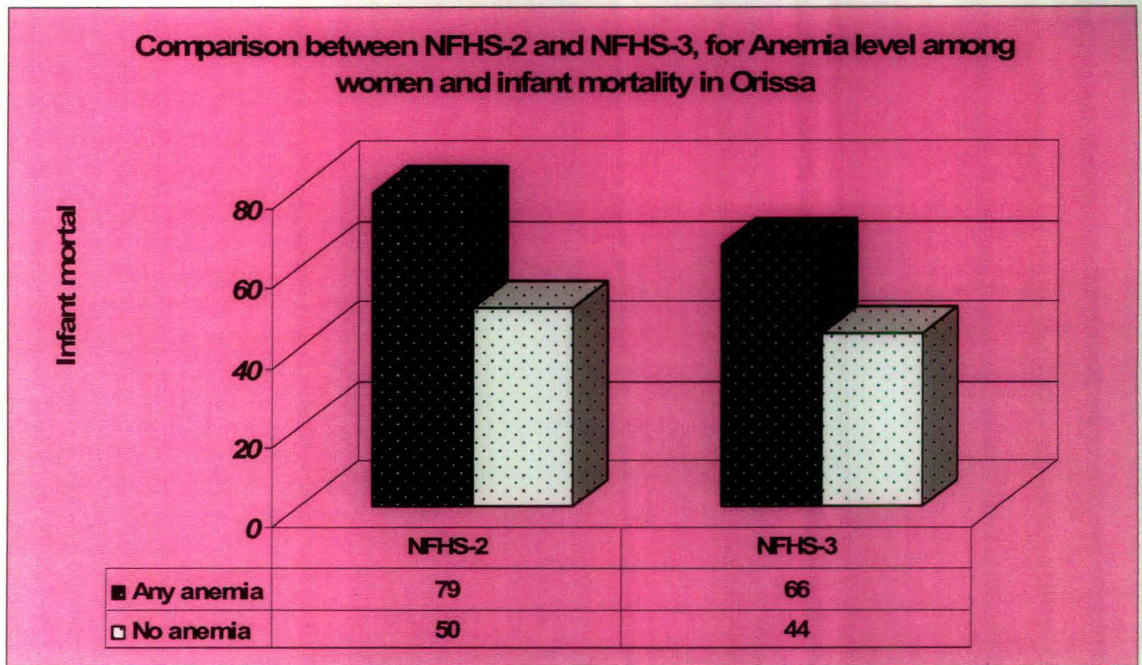
Figure-4.11

Source: *IIPS (2007)*

Comparison between NFHS-2 and NFHS-3, FOR Malnutrition among women and infant Mortality.

Level of malnutrition

■ No undernourished
□ Undernourished
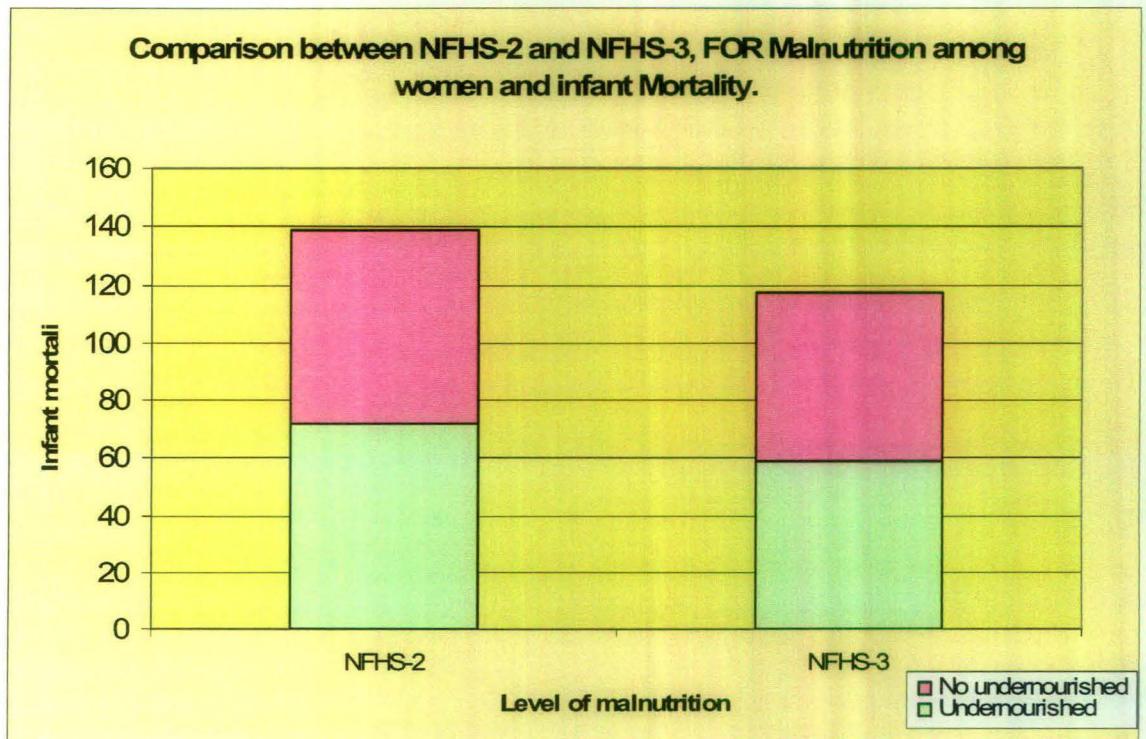
Figure-4.12

Source: *IIPS (2007)*

4.3 EFFECT OF THE DEMOGRAPHIC AND SOCIO-ECONOMIC VARIABLES ON WOMEN MALNUTRITION AND INFANT MORTALITY

In the previous section, the characteristics and the association between the dependent and independent variables are analyzed. The uni-variate analysis shows only gross effect, thus this relation does not control for the influence of other variables in the analysis and hence the net effects are ignored. Therefore an attempt has been made to examine the net effect of various socio-economic covariates on women malnutrition and infant mortality controlling other related socio-economic covariates. Since, the dependent variable is dicotomus in nature; binary logistic regression is being employed to examine the net effects.

4.3.1 Effect of the demographic and socio-economic variables on Body mass index

Results of binary logistic regression (Table-4.10) indicate that caste and standard of living of the household are significant predictors of women's malnutrition in NFHS-2. But in NFHS-3 religion, caste and type of place of residence plays a significant role in determining women's malnutrition.

In NFHS-2, women belong to general and OBC categories are less likely to affect by malnutrition in comparison to women belongs to SC/ST category. Women from high standard of living categories are 50 percent less likely to affect by malnutrition compared to women from lower standard of living.

In NFHS-3, rural women are more likely to affect by malnutrition compared to their counterparts. In comparison to SC/ST, women belong to OBC category and other castes are less likely to affect by malnutrition. But the trend is reverse in NFHS-2.

Table-4.10: Logistic regression for BMI

Variable	NFHS-2			NFHS-3		
	B	Sig.	Exp(B)	B	Sig.	Exp(B)
Age of women						
15-19	--	0.205	1.000	--	0.373	1.000
20-29	-0.007	0.972	0.993	0.316	0.193	1.372
30+	-0.267	0.254	0.766	0.237	0.383	1.267
Residence						
Urban	--	--	--	--	--	--
Rural	0.109	0.455	1.115	0.394	0.004	1.483
Children ever born						
One	--	0.671	1.000	--	0.195	1.000
Less than three	-0.008	0.956	0.992	0.168	0.230	1.183
3 and above	-0.130	0.461	0.878	-0.049	0.786	0.952
Education						
No education	--	0.309	1.000	--	0.087	1.000
Primary	-0.103	0.505	0.902	-0.162	0.276	0.851
Secondary and Higher	-0.241	0.125	0.786	-0.348	0.027	0.706
Occupation						
Not working	--	--	--	--	--	--
Working	-0.006	0.966	0.994	-0.044	0.714	0.957
Caste						
SC/ST	--	0.052	1.000	--	0.000	1.000
OBC	-0.246	0.061	0.782	-0.041	0.757	0.959
Other	-0.347	0.025	0.707	-0.539	0.000	0.583
Religion						
Hindu	--	--	--	--	--	--
Others	-0.286	0.301	0.751	0.551	0.028	1.735
Standard of living						
Low	--	0.002	1.000	--	.184	1.000
Medium	-0.046	0.721	1.047	-0.235	0.090	0.791
High	-0.716	0.002	0.489	-0.368	0.044	0.692
Not dejure resident	NA	NA	NA	-.131	.503	.877
Constant	0.211	0.352	1.235	-0.626	0.018	0.535

Source: IIPS (2007)   NA –Not Available

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4.3.2 Effect of the demographic and socio-economic variables on Anemia level.

Results of binary logistic regressions in table 4.11 shows that age of women, place of residence, children ever born and caste plays a significant role in determining the level of anemia among women in NFHS-3. However, in NFHS-2 Caste and standard of living are the significant predictors of anemia level among women in Orissa.

In NFHS-3, it is evident that the prevalence of anemia among women in the age group of 20-29 years and 30-49 years are lower compared to the women belong to the younger age group of 15-19 years. Result also shows that higher parities women are more likely to be affected by anemia compared to women with lower parities. As expected, prevalence of anemia is significantly higher for rural women (1.38 times) compared to the urban women. Women belong to SC/ST categories are more likely to affect by anemia compared to their counterpart.

Similarly, in NFHS-2, women belong to OBC and other caste is less likely to be affected by anemia. This indicates that there is a systematic dynamics of high prevalence of anemia among SC/ST women. As compared to women with low standard of living, moderate and high standard of living women are (0.69) and (0.42) times less likely to affected by anemia level.

Table-4.11: Logistic regression for Anemia level

Variable	NFHS-2			NFHS-3		
	B	Sig.	Exp(B)	B	Sig.	Exp(B)
Age of women						
15-19®	--	0.877	1.000	--	0.019	1.000
20-29	-0.028	0.895	0.973	-0.733	0.007	0.480
30+	-0.102	0.685	0.903	-0.606	0.043	0.546
Residence						
Urban®	--	--	--	--	--	--
Rural	0.068	0.652	1.070	0.323	0.015	1.381
Children ever born						
One®	--	0.583	1.000	--	0.002	1.000
Less than three	-0.081	0.577	0.922	0.338	0.014	1.403
3 and above	0.068	0.718	1.071	0.667	0.000	1.948
Education						
No education®	--	0.273	1.000	--	0.279	1.000
Primary	-0.033	0.841	0.967	-0.248	0.112	0.780
Secondary and Higher	-0.249	0.128	0.779	-0.105	0.518	0.900
Occupation						
Not working®	--	--	--	--	--	--
Working	-0.096	0.510	0.909	-0.200	0.123	0.819
Caste						
SC/ST®	--	0.030	1.000	--	0.014	1.000
OBC	-0.307	0.030	0.736	-0.357	0.012	0.700
Other	-0.391	0.016	0.677	-0.371	0.011	0.690
Religion						
Hindu®	--	--	--	--	--	--
Others	-0.177	0.524	0.838	0.344	0.208	1.411
Standard of living						
Low	--	0.000	1.000	--	0.219	1.000
Medium	-0.367	0.008	0.693	-0.143	0.323	0.866
High	-0.852	0.000	0.427	-0.259	0.154	0.772
Not dejure resident	NA	NA	NA	.155	.463	1.167
Constant	1.225	0.000	3.404	1.079	0.000	2.941

Source: IIPS (2007)   NA –Not Available

4.3.3 Effect of the demographic and socio-economic variables on Infant mortality

Results of binary logistic regressions in Table-4.12 indicates that combination of birth order and interval, standard of living, educational level of women, caste, sex of the child, mothers age at birth of the child and anemia level are significant predictors of infant mortality in Orissa. Similarly, in NFHS-3 the significant determinants of infant mortality are combination of birth order and interval, education of mother, age at birth and anemia level.

Results shows that, by controlling for birth order, if birth interval is longer the relative risk of dying is less compared to the same birth order. This indicates that birth interval impact is stronger than birth order effect on infant mortality. This trend is consistent across NFHS-2 and NFHS-3.

The probability of survival is higher for children belong to medium and high standard of living compared to the children of low SSLI. It means those mothers who are from lower standard of living might have less education and income which affects their infant's probability of survival.

Chance of survival is higher among infant whose mother have completed primary, secondary and higher education compared to the children whose mother is illiterate. It shows that mother's education plays a crucial role in determining the survival status of the children even after controlling other confounding socio-economic covariates.

Children belonging to SC/ST category are less likely to survive compared to their counterparts. Odd of dying is lower for male child (0.85 times) compared to female child. Probability of survival is lower for the children who born to younger mother (less than 19 years) compared to higher age group. Age of mother at the time of birth has negative relationship with infant mortality. Odd of dying is higher (1.23 times) for the children whose mother is anemic compared to the children, whose mother is healthy. So infant mortality is directly affected by mothers' anemia level.

Table-4.12: Logistic Regression for Infant Mortality

Variable	NFHS-2			NFHS-3		
	B	Sig.	Exp(B)	B	Sig.	Exp(B)
Combination of birth order and interval						
1st order birth ®	--	0.000	1.000	--	0.000	1.000
2-3rd order less than 24 months	0.358	0.000	1.430	0.354	0.001	1.425
2-3rd order greater than 24 months	-0.412	0.000	0.662	-0.651	0.000	0.522
>3 order and less than 24 months	0.147	0.220	1.159	0.588	0.000	1.800
>3 order and greater than 24 months	-0.322	0.005	0.724	-0.423	0.006	0.655
Standard of living						
Low®	--	0.004	1.000	--	0.542	1.000
Medium	-0.126	0.081	0.882	-0.128	0.175	0.879
High	-0.472	0.001	0.624	-0.138	0.295	0.871
Not dejure resident	NA	NA	NA	-0.092	0.703	0.912
Education						
No education®	--	0.000	1.000	--	0.000	1.000
Primary education	-0.152	0.060	0.859	-0.225	0.029	0.798
Higher and secondary	-0.672	0.000	0.511	-0.603	0.000	0.547
Caste						
SC/ST®	--	0.019	1.000	--	0.754	1.000
OBC	0.192	0.010	1.211	-0.027	0.787	0.973
Other	0.190	0.023	1.209	-0.078	0.455	0.925
Sex of the Child						
Male®	--	--	--	--	--	--
Female	-.159	.009	.853	-.052	0.490	0.949
Age at birth						
less than 19 years®	--	0.014	1.000	--	0.000	1.000
19-30	-0.227	0.004	0.797	-0.392	0.000	0.675
>30 years	-0.28	0.056	0.756	-0.477	0.008	0.620
Anemia Level						
No Anemia®	--	--	--	--	--	--
Any Anemia	0.205	0.002	1.231	-0.2263	0.002	0.796
Place of Residence						
Urban®	--	--	--	--	--	--
Rural	0.046	0.582	1.074	0.309	0.002	1.362
Occupation						
Not Working®	--	--	--	--	--	--
Working	-0.011	0.880	0.990	-0.044	0.610	0.957
Constant	-1.900	0.000	0.50	-1.714	0.000	0.180

Source: IIPS (2007)   NA –Not Available

In NFHS-3, it is evident that chance of survival in higher among infant whose mother have completed primary, secondary and higher education compared to the children whose mother is illiterate. It shows that mother's education plays a crucial role in determining the survival status of the children even after controlling other confounding socio-economic covariates.

In comparison to age of mother at the time of birth less than 19 years, infants are (0.65) times more likely to survive in 19-30 age of mother at the time of birth. Like that in >30 age of the mother at the time of birth have less infant mortality. Age of mother at the time of birth has negative relationship with infant mortality. In comparison to not anemic mother infants are (0.76) times less likely to survive among anemic mother. So infant mortality is directly affected by mothers' anemia level. In comparison to mothers who are in urban areas, infant are less likely to survive among rural mothers.

4.4 SUMMARY OF THE FINDINGS

From the present study it has been found that in NFHS-2, malnutrition is higher among SC/ST women then OBC and others category women. This may because of less availability of food, poverty and hunger among SC/ST groups. They are less educated so they no capacity for production and income which creates starvation and malnutrition. Malnutrition is higher among women of lower standard of living. This may happens because of less income and poverty. In NFHS-3 the data form present study it has been found that women are more malnourished in rural areas than urban areas. This may occur due to less education and employment among rural women than urban women. In rural areas health care facilities are very negligible.

One of the major findings from the present study is that infant mortality is less among the mother who have completed secondary and higher education because this might be occur due to good knowledge of antenatal care during pregnancy among educated mother and they have also higher status for own health care and child care which reduces infant mortality.

Chapter 5

Conclusions

CHAPTER-V

CONCLUSION

"While mortality has declined by half and fertility by two-fifths, malnutrition has only come down by about one-fifth in the last 40 years. The inescapable conclusion is that further progress in human development in India will be difficult to achieve unless malnutrition is tackled with greater vigor and more rapid improvement in the future than in the past,"

Dr. Anthony Measham

Malnutrition varies across regions, states, age, gender, and social groups. It is worst in children under two, in the populous northern states, in rural areas, and among women, tribal populations, and scheduled castes. It occurs from a combination of three key factors: inadequate food intake; illness; and harmful caring practices. In India, household food insecurity creates from inadequate employment and incomes; seasonal migration, especially among tribal populations; relatively high food prices; geographic and seasonal misdistribution of food; poor social organization; and large family size.

Poverty is main factors for the high level of malnutrition among women and children in India. This is higher among low status of women in Indian society, which results in women and girls getting less than their fair share of household food and health care. Poor eating habits during pregnancy, such as "eating down" in fear of a difficult delivery caused by a large baby, and proscriptions against certain foods are widespread. The majority of women are not reached by education, or even nutrition and health information of practical relevance, which could help to rectify some of these problems.

Higher malnutrition among children and mothers is a major barrier to further reduction in mortality rates, including those among pregnant women. A large proportion of adult Indian women are at high risk of maternal mortality because their low pre-pregnancy height or weight may cause obstetrical difficulties. Moreover, a vicious intergenerational cycle creates when a malnourished or ill mother gives birth to a low birth-weight female

child: she remains small in stature and pelvic size due to further malnourishment, and produces malnourished children in the next generation (Chopra, 1999).

Infants (0-1 year) constitute 2.92 percent of the total population in India. Of the 136 million children born each year in the world, 90 percent are in the third world. Although the chances of survival among these children have improved by 50 percent in last 20 years, the first few hours, days and months of their lives are still puzzle. At the time of birth 20-30 percent of infants are under weighted. That makes them vulnerable to infection and diseases. About 40 percent of total infant mortality occurs in the first month of life. One out of four children receives neither the quality nor the quantity of food needed to replace the substances provided by mother's milk (Park, 2007).

Pregnancy is a period of great anabolic activity takes place with most rapid rate of growth. For that both mother and infant are likely to suffer if the prenatal diet has been poor. Nutritional needs during pregnancy those of the developing foetus and building up of the reserves for both labour and lactation. Nutritional status of women before conception may be of as a great importance in determining the success of her pregnancy as is the food consumed while she is pregnant. The well nourished women is much better able to meet the demands which pregnancy makes on her body than is a woman whose body stores of needed nutrients are inadequate either because of poor nutrition and an unbalanced dietary pattern or a succession of unspaced pregnancies, or because her own body has not attained its full maturity as in the case of early marriage (W.H.O, 1962).

From the present study it has been concluded that majority of women were undernourished in the age group 15-19. Higher percent of undernourished women were from the rural areas. Majority of malnourished women had two to three children. Most of the malnourished women were illiterate. Majority of the malnourished women were working women. Majority of malnourished women were from the lower economic back ground.

From the current study it has been found that women under age or lower age group had suffered more from anemia. Similarly majority rural women were the worst sufferer. Most of the illiterate women were affected by anemia. Working women were more anemic. SC/ST and other backward class women were the worst suffer. Women with higher income group had fewer anemias.

It has been concluded from the present study that the number of infant mortality is higher among the women age group of below 19 than their counterpart of 30 or above age group women. Birth interval also plays a significant rule in infant mortality. The mortality is higher in the birth spacing less than two years. Mortality is higher among the twin or multiple cases compared to single child. Infant mortality is higher among the mother who had suffered from anemia during the pregnancy period than the normal women. Infant mortality is higher among the children who born underweight compared to overweight. Infant mortality is higher among the first born children compared to born after four or more children. More number of infant dies in other backward class. It is also shows that more number of infant dies in Hindu religion.

Major findings from the present study is that Orissa has high rate of poverty, hunger and malnutrition among women and these are the main cause of infant, neonatal and post-neonatal mortality. But the relatively high level of coverage of antenatal care and lower fertility rates might suggest that infant mortality should be expected to be low. But may be due to less education and occupation among women and malnutrition among women are main cause of infant mortality. So there is need of policy to reduce malnutrition and infant mortality in Orissa.

Policies and Recommendations

India entered the 21st century with a supportive policy framework to tackle its immense malnutrition problem and several active programmes that could succeed in reducing malnutrition significantly. These include the Public Distribution System (PDS), the Integrated Child Development Services (ICDS) programme, the National Mid-day Meals Programme (NMMP), and several employment schemes providing food for work.

However, these programmes fall short in meeting the needs of the poorest segments of the population, and their quality and coverage are inadequate.

If India is to succeed in dealing with malnutrition, the first essential requirement is a higher level of sustained political commitment. This will require a policy and implementation structure that will actively lead, monitor, and sustain national, state, and local action in many sectors, including agriculture, industry, and water and sanitation, in addition to implementing ongoing programs. Success will also require a major effort to better target nutritional programs and substantially increase their quality and impact (Robboy, 1999).

Preventive and Social measures for Infant mortality

There is no single specific health programme that can reduce infant mortality rate. Under ideal conditions of social welfare, no baby should die, except possibly the few who are born with serious handicaps such as congenital abnormalities or disorders. The measures required to achieve reduction of infant mortality are

Prenatal Nutrition

The risk of infant deaths begins even before birth if the mother is malnourished. Therefore, the very urgent need is to increase the state of maternal nutrition. In a study in India, poor women were fed an additional 500 kcals and 10 g of protein during the last 4 weeks of pregnancy. Their infants' birth weights were on an average 300g above those infants born to the control group (Lyangar, 1972).

Prevention of Infection

The major factors for death of infant in India are infectious diseases, many of which are preventable by immunization as for example, neonatal tetanus. The Universal Immunization Programme launched in 1985 aims at providing protection to all the expectant mothers and children against 6 vaccine preventable diseases, and thereby ensures greater survival among children.

Table-5.1 Priority areas to improve new born health

Before and during Pregnancy
- Delayed child-bearing.
- Well-timed, well spaced and wanted pregnancies
- Well-nourished and healthy mother
- Pregnancy free of drug abuse, tobacco and alcohol
- Tetanus and rubella immunization
- Prevention of mother-to-child transmission of HIV
- Female education

During pregnancy
- Early contact with health systems including:
  - Birth and emergency preparedness
  - Early detection and treatment of maternal complications
  - Monitoring of foetal well-being and timely interventions for foetal complications
  - Tetanus immunization
  - Prevention and treatment of anemia
  - Prevention and treatment of infections (malaria, hookworm)
  - Voluntary HIV counseling and testing and prevention of mother to child transmission of HIV.
- Good diet
- Prevention of violence against women

During and soon after delivery
- Safe and clean delivery by skilled attendant
- Early detection and prompt management of delivery and foetal complications
- Emergency obstetric care for maternal and foetal conditions
- New born care ensuring warmth and cleanliness
- New born cord, eye and skin care
- Early initiation of exclusive breast-feeding
- Early detection and treatment of complications of the new born
- Special care for infants born to early or too small
- Prevention and control of infections

During the first month of life
- Early post-natal contact
- Immunization
- Protection of girl child
- Prompt detection and management of diseases in newborn infant
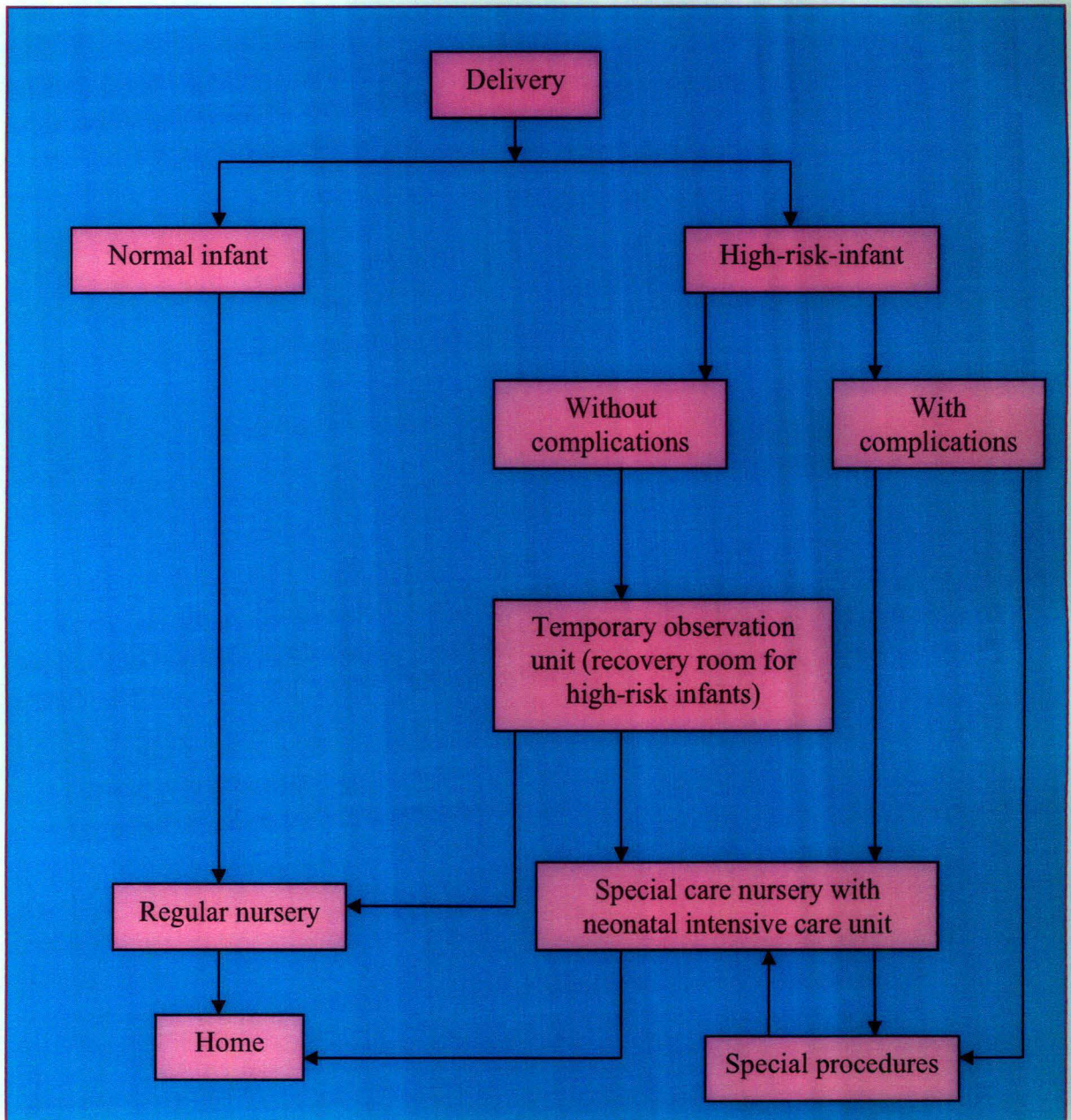
Source: *WHO (2004)*

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Figure-5.1
Flow chart of Optimum new born care

Growth monitoring

It is a less cost technology available for reducing infant mortality. All infants should be weighted periodically and maintained their growth charts. These charts help to identify of children at risk of early malnutrition.

Family planning

Family limitation and spacing of births has greater role for lowering infant mortality rate. Longer spacing between pregnancies is associated in all section of societies with improved infant and child survival.

Sanitation

For infants the risk of death is very closely related to the environment in which they live. Exposure to infections through contaminated food and polluted water, lack of elementary hygiene which affects young health. For this reason infant mortality is universally recognized not only as a most important indicator of the health status of the children, but also of the level of social development.

Provision of primary health care

All those involved in maternity care, from the doctor down to the local dai should collaborate and work together as a team.

Prenatal care must be improved with a view to detecting mothers with high risk factors and those with prenatal conditions associated with high risk are hospitalized and treated.

Special care baby units must be provided all the babies weighing less than 2000g and proper referral services.

Socio-economic development

The causes of infant mortality are mainly by socio-economic factors. So to reduce infant mortality there is need to spread of education mainly among women, improvement of nutrition and also increase the income level of women.

Breast feeding

The very effective measure for lowering infant mortality is to promote breast feeding, which is a good measure against gastro-intestinal and respiratory infections and Protein Energy Malnutrition.

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