SOCIO-ECONOMIC DETERMINANTS OF DIARRHOEAL MORBIDITY AND ITS TREATMENT AMONG THE YOUNG CHILDREN IN NORTH-EAST INDIA

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DECLARATION

I declare that the dissertation entitled "**Socio-Economic Determinants of Diarrhoeal Morbidity and Its Treatment among Young Children in North-East India**" submitted by me for the award of the degree of **Master of Philosophy** of Jawaharlal Nehru University is my own work. The dissertation has not been submitted for any other degree of this University or any other university.

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CERTIFICATE

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

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Abbreviations

ANM	Auxiliary Nurse Midwife
ARI	Acute Respiratory Infection
CDD	Control of Diarrhoeal Disease
CHC	Community Health Centre
CRS	Civil Registration System
DDC	Diarrhoeal Diseases Control Programme
ICD	International Classification of cause of Death
ICDS	Integrated Child Development Services
MCD	Medically certified cause of death
NFHS	National Family Health Survey
NHDR	National Human Development Report
NSDP	Net State Domestic Product
OBC	Other Backward Class or Other Backward Cast
ORS	Oral Rehydration Salt
ORT	Oral Rehydration Therapy
PHC	Primary Health Centre
RCH	Reproductive and Child Health Programme
SRS	Sample Registration System
SC	Schedule Cast
ST	Schedule Tribe
UNDP	United Nation Development Programme
UNICEP	United Nation International Children's Fund
WHO	World Health Organisation

Chapter One

Introduction

Introduction

"More than 10 million of the world's children die each year before reaching the age of five. Sadly two of every three of these children die from easily preventable, treatable diseases such as diarrhoea, pneumonia, malaria, measles, and tetanus, and from the conditions like malnutrition."(CORE group, a NGO, 2007).

Children represent the future, and ensuring their healthy growth and development ought to be a prime concern of all societies. Every three seconds a young child dies, in most of cases from an infectious disease (WHO, 2007). Newborns are particularly vulnerable and children are vulnerable to malnutrition and infectious diseases, many of which can be effectively prevented or treated (WHO, 2007), but sadly children under 5 age-group are still dying due to such preventable disease. Thus, all the treatment or medical facilities still needs to reach their aim of reducing child mortality from infectious disease.

Preventable *communicable diseases* (pneumonia, diarrhoea, malaria, measles and HIV infection) account for over 60% of childhood deaths. The fact that over 99 per cent of these deaths in year 2000 occurred in low-income countries demonstrates that they can and should be prevented (WHO, 2000). Communicable diseases also lead to considerable morbidity and in some cases long-term disability. Among all infectious diseases or preventable communicable diseases, 'Diarrhoea' is one of them; which is still responsible for a large number of child deaths especially in developing countries. Diarrhoeal diseases claim nearly two million lives a year among children under five. They are so widespread in developing countries that parents often fail to recognize the danger signs.

Diarrhoeal diseases impose a heavy burden on developing countries - accounting for 1.5 billion bouts of illness a year in children under five (WHO, 2007). The burden is highest in deprived areas where there is poor sanitation, inadequate hygiene and unsafe drinking water. In certain developing countries, epidemics of diarrhoeal

diseases such as cholera[1] and dysentery strike down adults and children alike. Other major diarrhoeal diseases include typhoid fever and rotavirus which is the main cause of severe dehydrating diarrhoea among children. Although, here some argued that diarrhoea is not a disease, infact, it is a symptom of several infectious diseases like cholera, malnutrition, measles etc., but some researchers introduce it as disease and inter-related it with other illness. Whether it is a disease or symptom of other illness, it responds to large number of death among young children less than five year of age group. So, various biomedical scientists and other researcher agreed that it is one of the important parasitic infectious disease or preventable communicable disease. Detail of Biomedical definition of diarrhoeal morbidity and it type, cause and agent of transmission is given below

Diarrhoea and it Type, Symptom, Causes and Transmission Agents

Definition of Diarrhoea

Diarrhoea is defined as loose, watery, unformed stools occurring more than three times in one day. It is common cause of illness and death in children worldwide, and often associated with poor sanitation and contaminated water or food sources.

Diarrhoea causes dehydration, which means that the body lacks enough fluid to function properly. Dehydration is particularly dangerous in children, and it must be treated promptly to avoid serious health problems. Most of the death of children occur in diarrhoea is due to dehydration.

Types of Diarrhoea

Generally, two type of diarrhoea has been is identified as Acute and Chronic diarrhoea.

[1] Cholera is an acute diarrhoeal disease of the gastrointestinal tract cause by the indigestion of Vibrio cholerae bacteria. The incubation period range from a few hours to 5 days after the bacteria is ingested. If cholera is left untreated, the victim's chances of survival are only 40%, but in cases where patients receive immediate proper treatment, the chance of survival is greatly increased. http://hubpages.com/hub/Prevention-and-Treatment-for-Cholera

- *Acute diarrhoea* is a common problem that usually last for less than 2 week and goes away on its own without special treatment.

- *Chronic diarrhoea* long last for 6 week or more, it creates serious illness among the children or patient.

World Health Organisation and other medical scientist identified at least four type of diarrhoea: -

- *Secretory diarrhoea* - Secretory diarrhoea means that there is an increase in the active secretion, or there is an inhibition of absorption. There is little to no structural damage. The most common cause of this type of diarrhoea is a cholera toxin that stimulates the secretion of anions, especially chloride ions. Therefore, to maintain a charge balance in the lumen, sodium is carried with it, along with water.
- *Osmotic diarrhoea* - Osmotic diarrhoea occurs when too much water is drawn into the bowels. This can be the result of maldigestion (e.g., pancreatic disease or Coeliac disease), in which the nutrients are left in the lumen to pull in water. Osmotic diarrhoea can also be caused by osmotic laxatives (which work to alleviate constipation by drawing water into the bowels). In healthy individuals, too much magnesium or vitamin C or undigested lactose can produce osmotic diarrhoea and distention of the bowel. A person who does not have lactose intolerance can have difficulty absorbing lactose after an extraordinarily high intake of dairy products. In persons who do not have fructose malabsorption, excess fructose intake can still cause diarrhoea. High-fructose foods that also have a high glucose content are more absorbable and less likely to cause diarrhoea. Sugar alcohols such as sorbitol (often found in sugar-free foods) are difficult for the body to absorb and, in large amounts, may lead to osmotic diarrhoea.
- *Motility-related diarrhoea* - Motility-related diarrhoea is caused by the rapid movement of food through the intestines (hypermotility). If the food moves too quickly through the GI tract, there is not enough time for sufficient nutrients and water to be absorbed. This can be due to a vagotomy or diabetic neuropathy, or a complication of menstruation. Hyperthyroidism can produce

hypermotility and lead to pseudodiarrhoea and occasionally real diarrhoea. Diarrhoea can be treated with antimotility agents (such as loperamide).

- *Inflammatory diarrhoea* - Inflammatory diarrhoea occurs when there is damage to the mucosal lining or brush border, which leads to a passive loss of protein-rich fluids, and a decreased ability to absorb these lost fluids. Features of all three of the other types of diarrhoea can be found in this type of diarrhoea. It can be caused by bacterial infections, viral infections, parasitic infections, or autoimmune problems such as inflammatory bowel diseases. It can also be caused by tuberculosis, colon cancer, and enteritis.
- *Dysentery* - Generally, if there is blood visible in the stools, it is not diarrhoea, but dysentery. The blood is trace of an invasion of bowel tissue. Dysentery is caused by an excess of water by a release of antidiuretic hormone from the posterior pituitary gland. Dysentery is a symptom of, among others, *Shigella*, *Entamoeba histolytica*, and *Salmonella*.

Symptom of Diarrhoea

Diarrhoea is characterized by frequent loose stools. The consistency of the stool can be anything from soft and pasty to completely watery. The color can range from brown to clear. Symptoms related to any diarrhoeal illness are often those associated with any injury to the gastrointestinal tract, such as fever, nausea, vomiting, and abdominal pain. All or none of these may be present depending on the disease causing the diarrhoea. The number of bowel movements can vary up to 20 or more per day. In some patients, blood or pus is present in the stool. Bowel movements may be difficult to flush (float) or contain undigested food material.

Patients with diarrhoea present with various clinical features depending on the underlying cause. Diarrhoea due to small-intestinal disease is typically high-volume, watery, and often associated with malabsorption, and dehydration is frequent. Diarrhoea due to colonic involvement is more often associated with frequent small-volume stools, with the presence of blood and a sensation of urgency. Patients with acute infectious diarrhoea typically present with nausea, vomiting, abdominal pain, fever, and frequent stools, which may be watery, malabsorptive, or bloody depending on the specific pathogen. In general, small-intestinal pathogens are noninvasive, and

ileocolonic pathogens are more likely to be invasive. Patients ingesting toxins or those with toxigenic infection typically have nausea and vomiting as prominent symptoms along with watery diarrhoea but rarely have a high fever. Vomiting that begins within several hours of ingesting a food should suggest food poisoning due to preformed toxin. Parasites that do not invade the intestinal mucosa, such as Giardia lamblia and Cryptosporidium, usually cause only mild abdominal discomfort. Giardiasis may be associated with mild steatorrhea, gaseousness, and bloating. Dehydration can occur if diarrhoea is severe and oral intake is limited due to nausea and vomiting, particularly in very young and elderly patients. It is manifested as increased thirst, decreased urinary output with dark urine, inability to sweat, and orthostatic changes. In severe cases, it may lead to acute renal failure and mental status changes like confusion and drowsiness.

Causes of Diarrhoeal Disease

Acute diarrhoea is usually related to a bacterial, viral, or parasitic infection. Chronic diarrhoea is usually related to functional disorders such as irritable bowel syndrome or inflammatory bowel disease. A few of the more common causes of diarrhoea include the following:

- *Bacterial infections*. Several types of bacteria consumed through contaminated food or water can cause diarrhoea. Common culprits include *Campylobacter, Salmonella, Shigella,* and *Escherichia coli (E. Coli) and Vibro cholera.* E. coli is most common bacteria in developing countries which primarily come from contaminated food and water, while Shigella bacteria are spread mostly by person to person transmission. Salmonella are an unusual cause of diarrhoea in most developing countries, but may be important in communities where commercially processed foods are widely used, it may causes dysentery. Campylobacter, it mainly effect on infant and it spread by contact with their faeces or consumption of contaminated food, milk or water. It can cause watery diarrhoea as well as dysentery. Vibro cholera bacteria is associated with Cholera, it is originated from contaminated water.
- *Viral infections*. Many viruses cause diarrhoea, including rotavirus, Norwalk virus, cytomegalovirus, herpes simplex virus, and viral hepatitis. Rotavirus is

more prominent then other viral infection. It is the most important cause of severe life threatening diarrhoea in children under 2 year of age worldwide. Rotavirus is probably spread by person to person transmission.

- *Food intolerances.* Some people are unable to digest food components such as artificial sweeteners and lactose— the sugar found in milk.
- *Parasites.* Parasites can enter the body through food or water and settle in the digestive system. Parasites that cause diarrhoea include *Giardia lamblia, Entamoeba histolytica,* and *Cryptosporidium.*
- *Reaction to medicines.* Antibiotics, blood pressure medications, cancer drugs, and antacids containing magnesium can all cause diarrhoea.
- *Intestinal diseases.* Inflammatory bowel disease, colitis, Crohn's disease, and celiac disease often lead to diarrhoea.
- *Functional bowel disorders.* Diarrhoea can be a symptom of irritable bowel syndrome.

Transmission Agents of Diarrhoea

The infectious agents that cause diarrhoea are usually spread by the faecal-oral route, which includes the ingestion of faecal contaminated water or food, and direct contact with infected faeces. A number of specific behaviours promote the transmission of enteric pathogens and thus increase the risk of diarrhoea (WHO, Geneva 1992). These include:

- *Falling to breast-feed exclusively for the first four or six months of life.* The risk of developing severe diarrhoea is many times greater in infants who are not breast-fed than in those who are exclusively breast-fed; the risk of death from diarrhoea is also substantially greater.
- *Using infant feeding bottles.* These easily become contaminated with faecal bacteria and are difficult to clean. When milk is added to an unclean bottle it becomes contaminated; if it is not consumed immediately, bacterial growth occurs.
- *Storing cooked food at room temperature.* When food is cooked and then saved to be used later, it may easily be contaminated by contact with contaminated

surfaces or containers. If food is kept for several hours at room temperature, bacteria in it can multiply many times.

- *Using drinking water contaminated with faecal bacteria.* Water may be contaminated at its sources or during storage in the home. Contamination in the home may occur when the storage container is not covered, or when a contaminated hand comes into contact with the water while collecting it from the container.
- *Failing to wash hands after defecation, after disposing of faeces or before handling food.*
- *Failing to dispose of faeces hygienically.* It is often believed that infant faeces are harmless, whereas they may actually contain large numbers of infectious viruses or bacteria; animal faeces can also transmit enteric infections to humans.

Treatment and Prevention of Diarrhoea

Treatment of Diarrhoea

The treatment of patients with diarrhoea treated based on the major features of the disease and understanding of the underlying pathogenic mechanisms (WHO, 1992). According to WHO, the principles of treatment are as follows:

- Watery diarrhoea require replacement of fluids and electrolytes (ORS) – irrespective of its etiology
- Feeding should be continued during all types of diarrhoea to the greatest extent possible and should be increase during convalescence so as to avoid any adverse effect on nutritional status
- Antimicrobials and antiprasitic agents should not be used routinely; most episodes, including severe diarrhoea and diarrhoea with fever, do not benefit from such treatment. The exceptions are:

  - dysenteric, which should be reated with an antimicrobial effectives for *shigella;* the few patients who do not respond to this treatment should be further or treated for possible amoebiasis

  - suspected cholera with severe dehydration;

- persistent diarrhoea, when trophozoites or cysts of Giardia or trophozoites of E. Histolytica are seen in faeces or intestinal fluid, or when pathogenic enteric bacteria are identified by stool culture.

Prevention of Diarrhoea

Diarrhoea can be prevented through two ways viz. interrupted the transmission of pathogens and strengthen the host defences (WHO, 1992).

Measures that interrupted the transmission of pathogens: - Measure taken to to interrupt the transmission of the causative agents should focus on these pathways through where infectious agents that cause diarrhoea are transmitted are given below:

- Giving only breast milk for first 4 and 6 months of life;
- Avoiding the use of infant feeding bottles;
- Improving practices related to the preparation and storage of weaning food;
- Using clean water for drinking;
- Washing hand;
- Safe disposing of faeces, including those of infant.

Measures that strengthen host defences: - Measures that can be taken to improve host defences and diminish the risk of diarrhoea include:

- Continuing to breast-feed for at least the first 2 years of life;
- Improving nutritional status (by improving the nutritional value of weaning foods and giving children more food);
- Immunised against measles and give zinc supplement.

Some Important Issues and Policies on Diarrhoeal Morbidity

There are issues important facts about diarrhoeal diseases (Vani K. Borooah, 2004). First, they are responsible for about one in five deaths of children in the world. Indeed, such diseases are the second-biggest killers of children, ahead of malaria, tuberculosis and AIDS. Second, most of these 2.5 million deaths each year take place in developing countries, 80% of them in the first 2 years of their life. Third, the vast

majority of diarrhoea are caused by infectious pathogens which reside in faeces and which employ a variety of routes to reach new hosts: the pathogen may reach a new host by getting onto fingers and, thereby, into foods and fluids, or the pathogen may enter foods and fluids, without a human intermediary, for example by flies landing on excreta and carrying the pathogen to foods, or by excreta entering the water supply. Fourth, since many transmissions occur in the home, the incidence of such diseases can be reduced by changes in domestic hygiene. While improvements to infrastructure, such as safe drinking water and effective sanitation facilities, contribute to blocking transmission, they are effective only if they are employed in conjunction with good domestic hygiene practices.

Diarrhoeal disease also represents economic burden for the developing countries. Although diarrhoeal disease is usually less harmful to adults then to children, it can also affect a country's economy by reducing the health of its workforce. Since it effect on the children is critical it causes high infant mortality rate since it more effective in below 2 year of age. So, most of developing country have record high rate of infant and child mortality. Any reduction in diarrhoea is causes decreasing in rate of IMR and CMR in developing country. So, the world health organisation (WHO) is focus on infectious disease in general and diarrhoea in particular. First measurement on this ground was taken in 1960 when oral rehydration salt is promoted to reduce the diarrhoeal disease. Generally oral rehydration therapy was developed by research in India and International Centre for Diarrhoea Disease Research, Bangladesh, for treatment of cholera. Both the cholera and diarrhoea are water born disease, most of study is inter-related the both the disease any decreasing in any one of this disease has lead the further decline of another disease.

Although, since 1960 there have been slight decline in diarrhoea was record due to oral rehydration therapy (ORT) programme implement in worldwide[2], but diarrhoea remains one of the most common illnesses of children and one of the major causes of infant and childhood mortality in developing countries, where an estimate 1.3

[2] Oral rehydration salt (ORS) was implemented in 1960 in India and Bangladesh to treat the disease like cholera, but major step taking under this as global control of diarrhoeal diseases (CDD) programmed established in 1978 by WHO, in collaboration of the UNDP, the UNICEF, the world bank and bilateral organization. (UN, 1987 New York)

thousand million episodes and 3.2 million deaths occur each year in those under five of age (WHO, 1992). Overall, these children experience an average of 3.3 episodes of diarrhoea per year, but in some areas the average exceeds nine episodes per year. In the majority of the developing countries of the Americas, Asia and Africa, infantile mortality rates have always been associated with the frequency of diarrheic diseases. The main cause of death from acute diarrhoea is dehydration, which results from the loss of fluid and electrolytes in diarrhoeal stools.

In 1980, WHO has adopted major measure on this disease is began with establishment of Control of Diarrhoeal Diseases (CDD) programmed to reduce the diarrhoea in worldwide. From its start in 1980, the WHO Programme for the Control of Diarrhoeal Diseases (CDD) made a commitment to significantly reducing global childhood mortality. This mandate arose from a resolution of the thirty-first World Health Assembly in 1978, which requested the Director-General:

"To intensify involvement of Member States in the development of a plan of action for an expanded programme on diarrhoeal disease control...", and specifically, "to promote technical cooperation with and among Member States in programme formulation, implementation and evaluation, and in training health workers at different levels; (and) to accord high priority to research activities for the further development of simple, effective and inexpensive methods of treatment, prevention and control....".

In 1990, CDD and the WHO Programme on Acute Respiratory Infections (ARI), established in 1984, were combined to form the Division of Diarrhoeal and Acute Respiratory Disease Control (CDR). The shared goal of these programmes continued to be the maximum reduction in worldwide childhood mortality. Since, the global under-five mortality rate fell from around 100 per 1,000 in the early 1980s to 70 per 1,000 by the end of the 1990s (Ahmad, Lopez, and Inoue, 2000). A dramatic reduction in diarrhoea mortality was responsible for a substantial part of this decline. The estimated deaths due to diarrhoea among children under five years of age fell from 4.6 million in 1980, to 3.0 million in 1990, to 1.6 million in 2000 (Snyder and Merson, 1982; Bern et al., 1992; World Health Organization, 2001).

In India: Some Issues and Policies

Like other developing countries, India also experienced high prevalent of diarrhoea among young children. In India, Diarrhoea is one of the single most common causes of death among children under age five, following acute respiratory infection (ARI and Diarrhoea cause about one third of all death, NFHS-III). Overall, 9 percent of all children under age five had diarrhoea, with 1 percent having diarrhoea with blood (NFHS-III). Diarrhoea is one of the most common causes of death in under-5 children in India. Acute diarrhoeal disease is one of the major consequences not only of water pollution but also of the failure of proper management of sewage and poor environmental condition, in both cities and rural areas.

But some other factor, like Social and economic factor is also effect on the prevalence of diarrhoea among the young children since various research and medical examination is present evident for its. Although, in India diarrhoeal prevalent among young children is not much high as acute respiratory diseases and pregnant related death but it still significantly found among the young children and sometime respond for high mortality in under five year age group. So, any reduction in diarrhoeal disease is automatically reduced the child mortality rate.

The high rates of diarrhoea prevalence are unfortunate because diarrhoeal disease is largely preventable and prevention techniques are often relatively simple. So here need to completed reduction of diarrhoea, any death due to diarrhoea left question marked on our health facilities and government policy.

Poor health persists as a major problem in India, because of environmental and socio-economic causes. Among environmental causes lack of safe drinking water, lack of basic sanitation, crowded, unsanitary living conditions, and pollution of water, food, soil and air are prominent. And in case of socio-economic causes poverty, illiteracy, Ignorance, prejudicial customs & tradition, inadequate nutrition, lack of personal hygiene and rapid growth population has created obstacle in development of health. Inadequate primary health care and un-even development of health are added additional problem in improvement of health. And these all are created serious

problem for child health. So government of India have been focus on that all the possible cause which related to infectious disease and created other health problem.

The Government of India has t. taking steps to strengthen maternal and child health services in India since the Fi. Five Year Plan (1951-56). The Ministry of Health and Family Welfare has sponsored special projects under the Maternal and Child Health Programme, including the Oral Rehydration Therapy (ORT) programme, the establishment of Regional Institutes of Maternal and Child Health in states with high infant mortality rates, the Universal Immunization Programme, and the Maternal and Child Health Supplemental Programme within the Postpartum Programme (Ministry of Health and Family Welfare, 1992). All these programmes are now integrated into the Reproductive and Child Health Programme that was launched in 1996. The Department of Women and Child Development within the Ministry of Human Resource Development initiated the Integrated Child Development Services (ICDS) in 1976. Under the ICDS programme, *Anganwadi* centres provide children with health, nutrition, and education services from birth to six years of age and a nutritional and health services to pregnant and breastfeeding mothers.

But major programme on diarrhoeal disease as a 'The Diarrhoeal Diseases Control Programme (DDC)' was started in 1978, with objective of prevent death due to dehydration[3] caused by diarrhoeal disease among children less than five year of age group due to dehydration. The best treatment for dehydration is Oral Rehydration Therapy by Oral Rehydration Salt (ORS) solution[4]. Under the RCH programme ORS is supplied in the kits to all sub-centres in the country every year. ORS packets are available with Anganwadi Workers in the villages as well as with the ANM. The community is oriented to use ORS solution and resort to other measures in case the

[3] The main cause of death from acute diarrhoea is dehydration, which results from the loss of fluid and electrolytes in diarrhoea stools. Other important causes of death are dysentery, malnutrition and serious infections, such as pneumonia (WHO, Geneva 1992)

[4] The definition of oral rehydration therapy (ORT) has changed over time. The earliest definition referred to the use of oral rehydration salts (ORS) alone; soon after, it was expanded to include the use of recommended home fluids (RHF). Later, continued feeding and increase fluids became components of ORT (Narayan Sastry and Sarah Burgard, 2002).

child has diarrhoea (National Health Programmes of India by J. Kishore). However, the use of treatment of diarrhoea remains particularly limited in several states.

Oral Rehydration Therapy started in 1986-87 is being implemented through RCH programme. Supplies of ORS packets to the states are being organized by central Government. Twice a year 150 packet of drugs are provided as part of drug kit supplied to all sub-centres in the country. The programme emphasises the rational use of drugs for the management of diarrhoea. Adequate nutritional care of the child with diarrhoea and proper advice to mothers on feeding are two important areas of this programme.

Since, India is very large and vast country effect of diarrhoea is seen highly unequal and disparity some have very high diarrhoea and some have little less and it treatment is also not reach in some state, where most of them adopted traditional method to treat it but some are unaware of it danger. In this paper I would like to focus on the north east state of India.

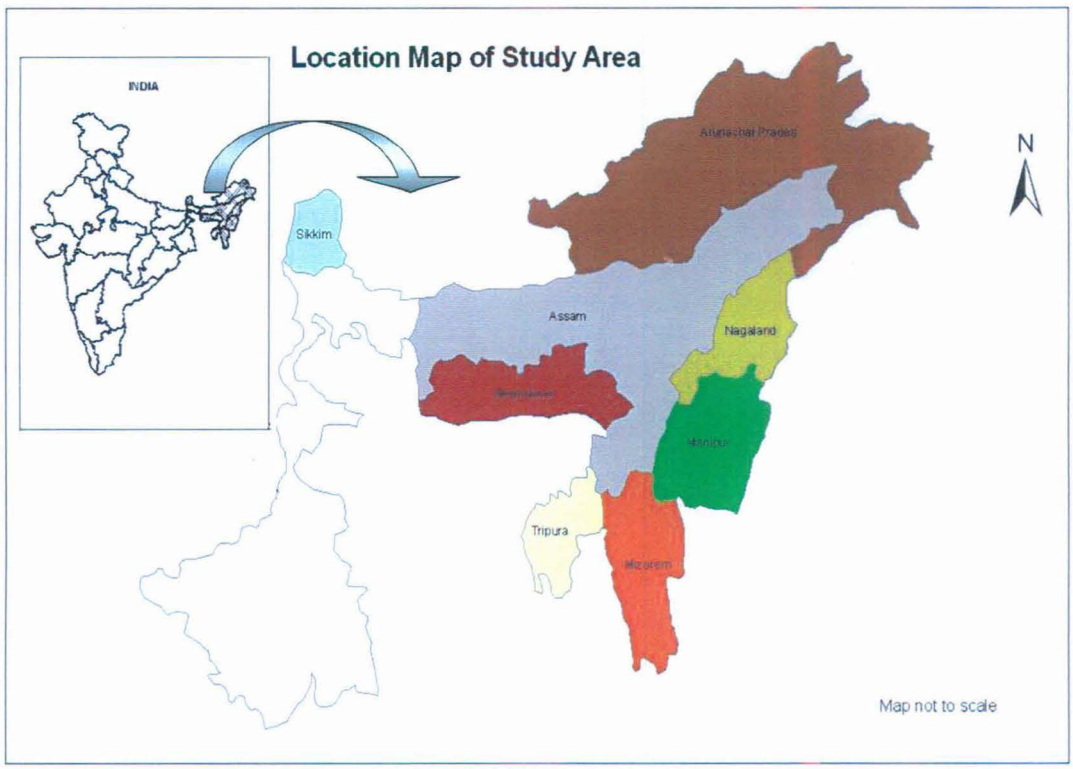
Study Area: North-East India

Since no rigorous studies have been undertaken to separately on north east India and it socio-economic and environmental determinants of diarrhoeal disease I would be like to focus on this region. According to NFHS-III, this region have experience high prevalent of diarrhoeal disease and also reported that very small percentage of the children with diarrhoea has seek medical treatment as compare to rest of India's state, so, here need to give especial attention on this region.

The north east India, in earlier, consist of 'seven sister' states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura. And recently Indian constitution was introduced the Sikkim as a part of north east India. Earlier Sikkim was enjoying own unique status in Indian constitution, since it was separated north east states by Bhutan and west Bengal. First bill propose on Sikkim as a part of north east India was introduced in 1998 in Rajya Sabha. And later it bill again introduce and approved in 2002, which is better known as amendment of North Eastern Council act

2002[5]. Since Sikkim is included in north eastern council, she became a part of north east India. Today north east India well know as 'eight sister", earlier it was known as seven sister. Although politically Sikkim is recently join with the north east India, but historically as well as culturally or socially or geographically it fondly bound with north east India.

Map-1



North east India is mostly hilly; it has plain on both side of the river Brahmaputra and the Himalayan range around it, around 70 percent of it land is hilly. The flora and fauna of this region is numerous and varied. The region accounts for 7.8% of the total land space of the country and having a population of 39.04 million (3.5%). The region is of strategic importance for the country on account of the fact that nearly 90% of its borders form India's international boundaries. The region bordered the Nepal, Bhutan,

[5] North eastern council is a nodal agency for the economic and social development of north eastern region which consist of eight states. It was constituted in 1971 by an Act of parliament and start functioning in the year of 1972. Earlier it was only seven states but now with the including of Sikkim under amendment act of north eastern council 2002 it have eight states.

China, Myanmar and Bangladesh. However they share only a 21 km common border with the rest of India via the Siliguri Corridor which also know as Chicken's Neck.

These regions are well known for its raw greenery and multiple tribal cultures, often of a historically egalitarian nature. She is a home to more than 70 major population groups speaking nearly 400 different languages and dialects. Most native people of the region have strong cultural and social similarities with the people of East and Southeast Asia. The term "Northeast India" itself is very much a post-colonial construct, coming into existence only after Indian Independence in 1947. While the region is extremely rich in terms of mineral and natural resources, including tea, oil, limestone, coal as well as bamboo for papermaking.

Although, this region has rich in natural vegetation and mineral, like India, region has also experience disparity and inequality in social, economic and health development, because of this diarrhoeal morbidity among young children are also unequal. One of the nation's most educated states is situated in region like Mizoram but on the other hand one of the lowest educated state also situated in this region like Arunachal Pradesh. Highest growth rate of population is also situated in this region like Nagaland and Arunachal stand as lowest density state of the India. In this case, demographically as well as socially this region is very interesting for study. Like India, overall prevalence of diarrhoea in north east state is also not much high as compare to prevalence of other disease, but unequal prevalent of diarrhoeal disease also occur in this region. Some time their custom or tradition and type of house are affecting on the child health but some time their social behaviour. And generally their economic condition is effective in the case of child health.

Despite, rich in mineral and natural vegetation, North East India have remained relatively backward even after 50 years of independence. The reasons for this backwardness or the lack of development are many. First, it's located in the north eastern corner of India, joined to mainland India through only a narrow corridor, hardly 80 km wide. Secondly, tribal had been encouraged to pursue their tribal lifestyle and culture undisturbed. Thirdly, the continued political unrest and ethnic violence there, and the difficult terrain make essential health and development services inaccessible.

On the other hand rapid growth of population is also effect the economic and social development of the region. The real cause of the lack of development is the alienation of the North-East India and failure to develop proper relationship between tribal and the rest of India.

Socio-Economic Status of North-East India

North-East India is the homeland of a large number of ethnic groups who came from different directions at different historical times. These groups belong to different racial stocks, speak different languages and have varied socio-cultural traditions. There are 145 tribal communities living in this region (A.N.M. Irshad Ali et al.). According to census 2001, around 27 percent of total population of North-East India is Scheduled Tribe.

Table-1.1, Social-Profile, North-East India, 2001

State	Percent of ST Pop from total pop. of state	Percent of SC pop.	Sex ratio	Literacy rate		
				Person	Male	Female
Sikkim	20.6	5.0	875	68.8	76	60.4
Arunachal Pradesh	64.2	0.6	893	54.3	63.8	43.5
Nagaland	89.1	0.0	900	66.6	71.2	61.5
Manipur	34.2	2.8	978	70.5	80.3	60.5
Mizoram	94.5	0.0	935	88.8	90.7	86.7
Tripura	31.1	17.4	948	73.2	81	64.9
Meghalaya	85.9	0.5	972	62.6	65.4	59.6
Assam	12.4	6.9	935	63.3	71.3	54.6
North-East	**26.9**	**6.4**	**937**	**65.1**	**72.6**	**57.0**
India	**8.2**	**16.2**	**933**	**64.8**	**75.3**	**53.7**

Source: - Census of India 2001, Registrar general of India

In the eight states of North-East India, the percentage of tribal population varies significantly. In the states of Assam, Sikkim, Manipur and Tripura, the percentage of tribal population to the total population of the respective states are 12.4%, 20.6%, 34.2 % and 31%. In Arunachal Pradesh, Meghalaya, Mizoram and Nagaland the percentage of tribal population to the total population of the respective states is quite high. In Mizoram, the tribal constitute 94.5 per cent of the total state's population. Table-1.1 shows the tribal population in the seven states of North-East India.

The region had a literacy rate of 65.1 percent, according to census 2001, as against the all India average of 64.8 percent. However, literacy rate varied from state to state in the region from a lowest figure of 54.3 percent (Arunachal Pradesh) to the highest figure of 88.8 percent (Mizoram). As per as sex-ratio is concerned region has better than national sex-ratio status with 937 female per thousand male. Among states Meghalaya has shown high sex-ratio with 972 female per thousand male while lowest is record in Sikkim (875).

Table-1.2, Economic-Profile, North-East India, 2001

State / UT	Percentage of male worker	Percentage of female worker	Percentage of Agriculture worker	Percentage non agriculture worker	Per capita NSDP, Rs (1997-98)
Sikkim	63	37	56.36	43.64	N.A.
Arunachal Pradesh	61	39	61.74	38.26	3,571
Nagaland	58	42	68.38	31.62	N.A
Manipur	56	44	52.19	47.81	1,948
Mizoram	56	44	60.60	39.40	N.A
Tripura	72	28	50.83	49.17	2,117
Meghalaya	59	41	65.84	34.16	1,804
Assam	72	28	52.36	47.64	1,675
North-East	**68**	**32**	**54.69**	**45.31**	**2223**
India	**68**	**32**	**58.20**	**41.80**	**2840**

Source: - 1. Census of India 2001, Registrar general of India
2. Per capita income is taken from National Human Development Report (NHDR), 2001

As per as economic status of the region is concerned, large percentage of the work force participate in agriculture activity as compare to non-agriculture activity. Around 54.69 percent of worker is agriculture worker (census, 2001). Like other states of India, male worker is high than his female counterpart.

According to National Human Development (NHD), 2001, per capita net State Domestic Product in the states varied from lowest figure of Rs. 1675 in Assam to highest figure of Rs. 3571 in Arunachal Pradesh and average of Rs. 2223 in the region in the year 1997-98 at 1980-81 prices, while country's average is Rs. 2840 in the year 1997-98 at 1980-81 price (table-1.2).

Regional Variation in Prevalence of Diarrhoeal Morbidity in India

Diarrhoea is one of the single most common causes of death among children under age five worldwide, following acute respiratory infection. Deaths from acute diarrhoea are most often caused by dehydration due to loss of water and electrolytes. NFHS-3 asked mothers of children born during the five years preceding the survey a series of questions about episodes of diarrhoea suffered by their children in the two weeks before the survey, including questions on feeding practices during diarrhoea, the treatment of diarrhoea, and their knowledge and use of ORS.

Prevalence of Diarrhoea

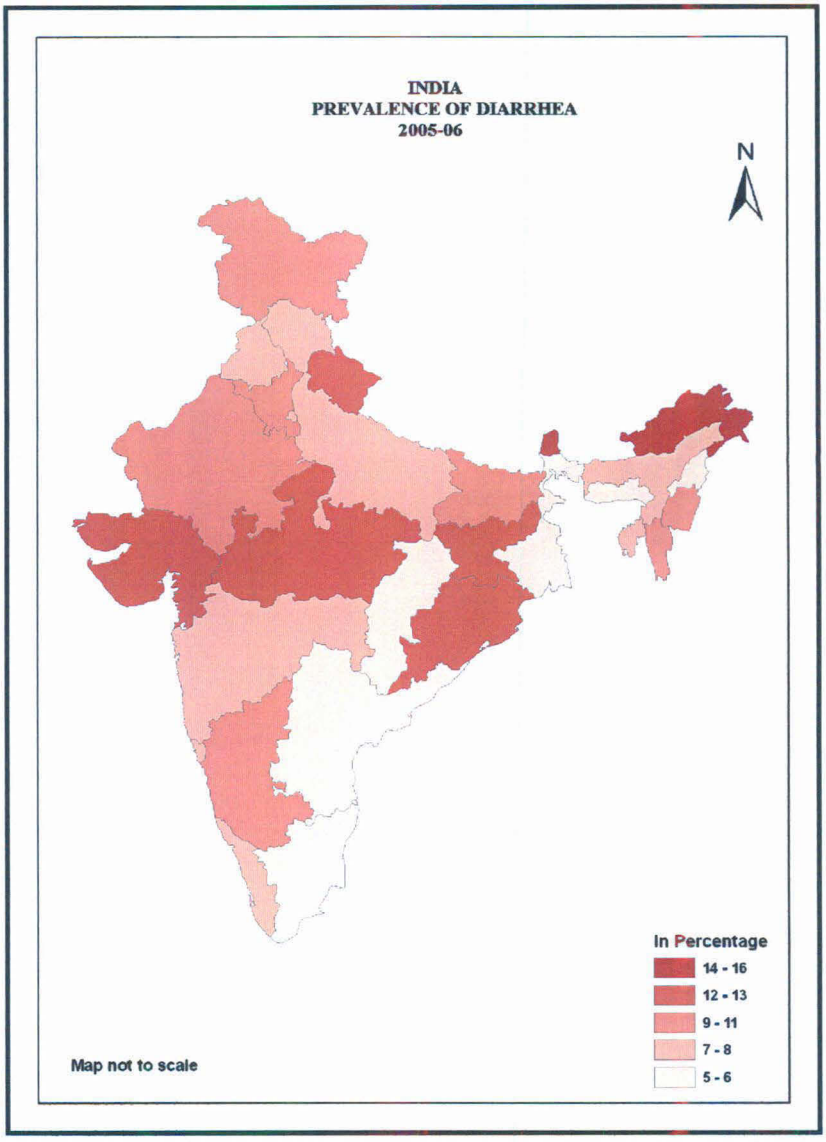
According to NFHS-3, 9 percent of Indian children suffer by diarrhoeal disease. As per as study areas is concerned, 8.3 percent of children under five years age-group are suffering by diarrhoeal disease in North-East India, it is almost near to national level.

Among states, two states of North-East India have recorded high prevalence of diarrhoea among young children viz. Sikkim (16.4%) and Arunachal Pradesh (15%) (Look at the map-2). And followed by Uttarakhand, Gujarat, Madhya Pradesh, Jharkhand, Orissa, etc which come under second highest range of 12 to 13 percent group. States like Jammu and Kashmir, Rajasthan, Haryana, Bihar, Karnataka, Manipur and Mizoram came under the third highest group of range between 9 to 11 percent of prevalence of diarrhoea among children.

Lowest percent of prevalence of diarrhoea is found in Chhattisgarh (5.2%); and followed by Tamil Nadu (5.4%), Meghalaya (5.7%) and Andhra Pradesh (5.7%), look at the table-1.3.

In North-East India unequal distribution of diarrhoea among states seem high, as highest prevalence of diarrhoea recorded in Sikkim and Arunachal Pradesh with 16 and 15 percent respectively, while lowest is record in Meghalaya and Nagaland with 5.7 and 6.4 percent, it shows almost ten percent of difference in prevalence of diarrhoea.

Map-2



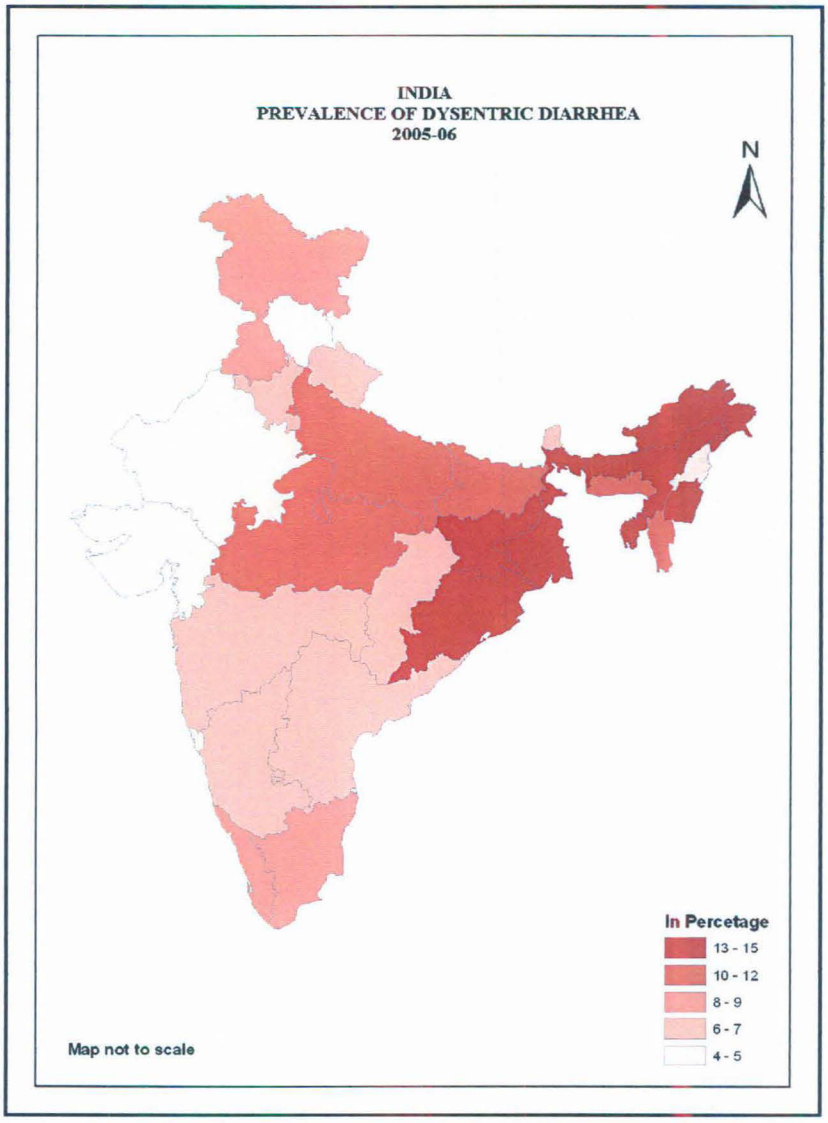
Prevalence of Diarrhoea with Blood in Stool

Bloody stool is symptom of chronic or dysenteric diarrhoea. Children having diarrhoea with blood is more vulnerable and risk for health, and probability of dying among these children is higher than children having normal diarrhoeal stool.

NFHS-3 has collect data on children having diarrhoea with blood in stool. Look at the table-1.3, where estimate the percentage of children having blood in stool out of total children suffer from diarrhoea. According to NFHS-3, around 10 percent of children who have diarrhoea have experience blood in stool. While North-Eastern region, as a

whole, is recorded slightly higher percentage of children who have blood is stool with around 13 percent.

Map-3



Among the states, most of the North-Eastern states are showing high percent of children having blood in stool as compared to rest of Indian states, except Sikkim and Nagaland which have lowest among the North-Eastern state. Among all states, highest percentage of children with dysenteric diarrhoea was record in West Bengal (15.1%) and followed by Manipur (14.8%), Assam (13.7%), Tripura (13.5%), Arunachal Pradesh (13.4%), Orissa (13.4%) and Jharkhand (13.1), look at the table-1.3. Lowest

is recorded in Goa (4.5%) and followed by Gujarat (4.7%), Nagaland (5%), Rajasthan (5.1%), and Himachal Pradesh (5.3%).

Most of the high prevalence of dysenteric diarrhoea among children is in North-Eastern part of India, except Nagaland and Sikkim. But Sikkim is the state where high rate of diarrhoea, include both normal and dysenteric, has been prevalent.

Interestingly, if we compare both the maps on diarrhoea and blood in stool with diarrhoea, we can find that although western part of the Indian state has shown large percentage of children having diarrhoea as compared to Eastern and North-Eastern part of India, but Eastern and North-Eastern part of Indian state is more vulnerable than Western India because large percentage of children having diarrhoea are suffering more from diarrhoea with blood in stool (dysenteric diarrhoea), is indicated that probability of dying due to diarrhoea is more in Eastern India as compared to Western India and rest of the India.

As a most vulnerable state, among all Indian states, Arunachal Pradesh is more vulnerable than rest of India, which is second highest in case of prevalence of diarrhoea and fifth highest state having children with dysenteric diarrhoea (blood in stool).

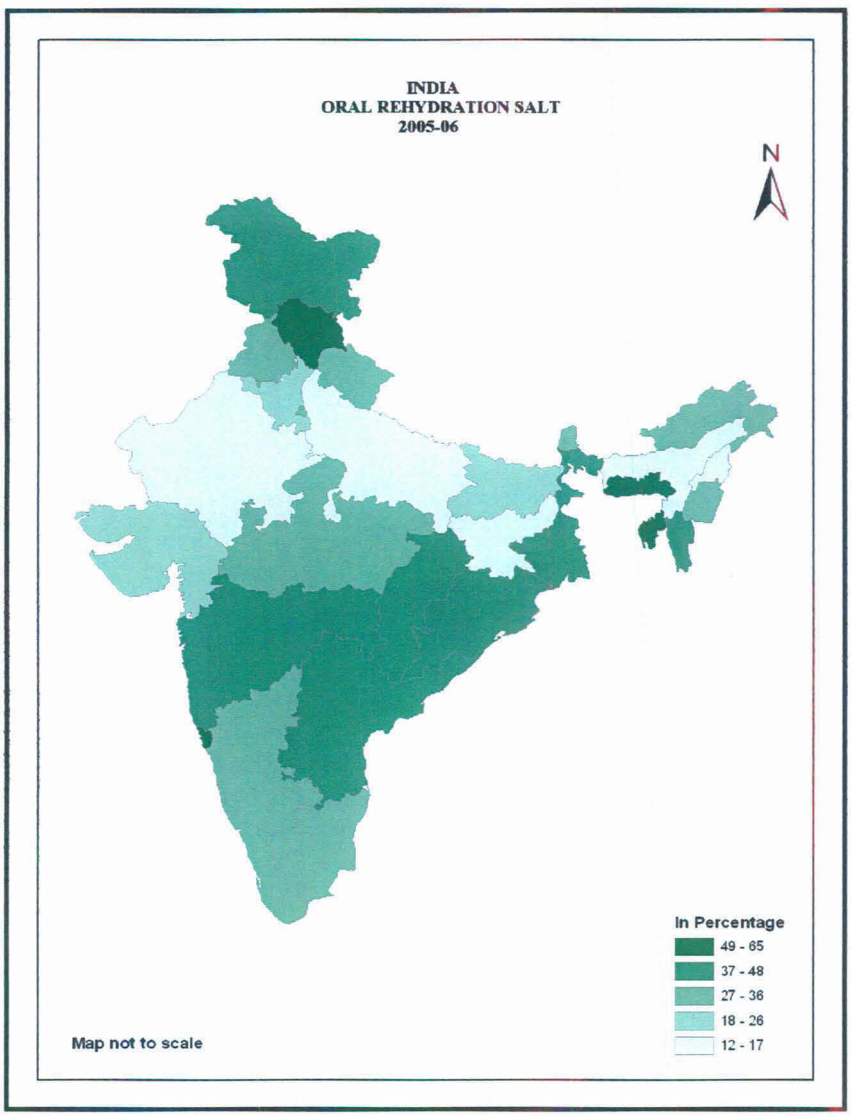
Regional Variation in Treatment of Diarrhoeal Morbidity in India

One of the best ways to cure or prevent diarrhoea is good hygiene and facilities of sufficient and good infrastructure to society as well as household. There are various measures identified to treat and prevent diarrhoea by medical experts, among them oral rehydration therapy is adopted worldwide to treat diarrhoea, because it is best and simplest way to preventing prevalence of diarrhoea, but the goal of availing ORS scheme for children worldwide especially in developing countries is a far dream yet. And also most of the developing countries' people still believe in traditional way of treating disease and so they have been avoiding any medical care. Some of important treatment of diarrhoeal disease, whose data is available in NFHS-3, is given below:-

a) Given Oral Rehydration

Table-1.3 also shows the percentage of children with diarrhoea who received Oral Rehydration salt, medical treatment and any treatment for diarrhoea. Twenty-six percent of children, who suffer from diarrhoea, treated with oral rehydration in India while around 25 percent of children of north-eastern region who suffer from diarrhoea treated with oral rehydration salt, only one percent of difference is seem between India and North-East India.

Map-4



Among the states, Meghalaya has shown high percentage of children who suffer from diarrhoea, has been treated by oral rehydration with 64.6 percent and followed by Tripura (58.8%), Himachal Pradesh (56.6%), Goa (50.7%) and Mizoram (48.3%).

Lowest is record in Utter Pradesh where only 12.5 percent of children with diarrhoea were given oral rehydration and remaining were not given ORS, and followed by Assam, Nagaland and Rajasthan.

Almost all of the Indian state including North-Eastern states have shown below 50 percent of the children have been treated by ORS who suffer from diarrhoea, except Meghalaya, Himachal Pradesh and Goa. If we carefully look over the map on ORS, we can find that most of the Indian great Ganga plain states were given very low rate of ORS to their children while states of peninsular India and hilly states have given more ORS treatment to their children.

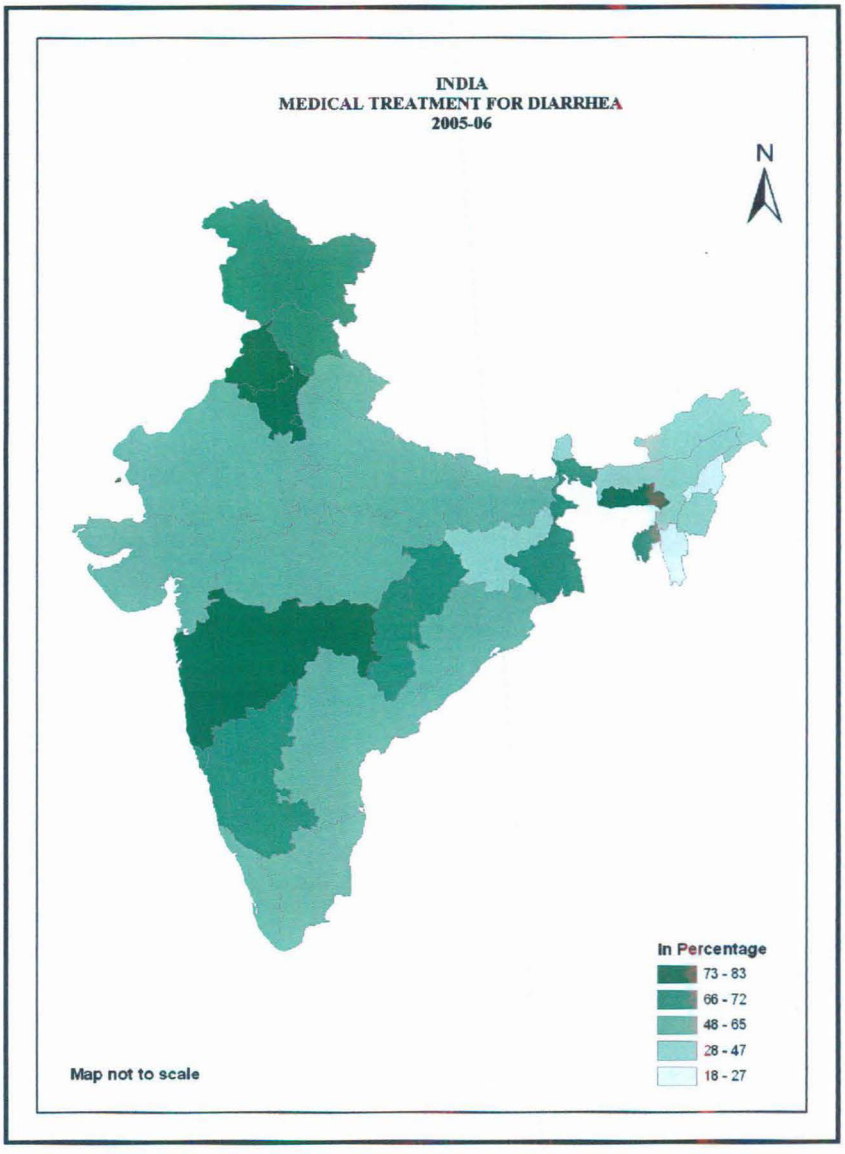
b) Medical Treatment

According to NFHS-3, around 63 percent of the children have received medical treatment in India while in North-Eastern region only 38 percent of children with diarrhoea received medical treatment for diarrhoea which is shows a very critical health condition for children under 5 year age-group, since dysenteric diarrhoea is highly prevalent in North-East India as compared to the rest of India and needs urgent medical attention.

At the state level large percentage of the children of rest of Indian states are more likely to visit hospitals and receive medical treatment for diarrhoeal morbidity as compared to North-Eastern region, look at the Map-5. Haryana has shown that almost 83 percent of children have received medical treatment for diarrhoea, followed by Maharashtra (80%), Punjab (76.3%), etc.

Among North-Eastern states only in Meghalaya record large percent of children have received medical treatment for diarrhoea, around 76.9 percent of children have received medical treatment for diarrhoea, and followed by Tripura (66.7), rest of North-Eastern states have shown extremely low percent of children seeking for medical treatment who have diarrhoea.

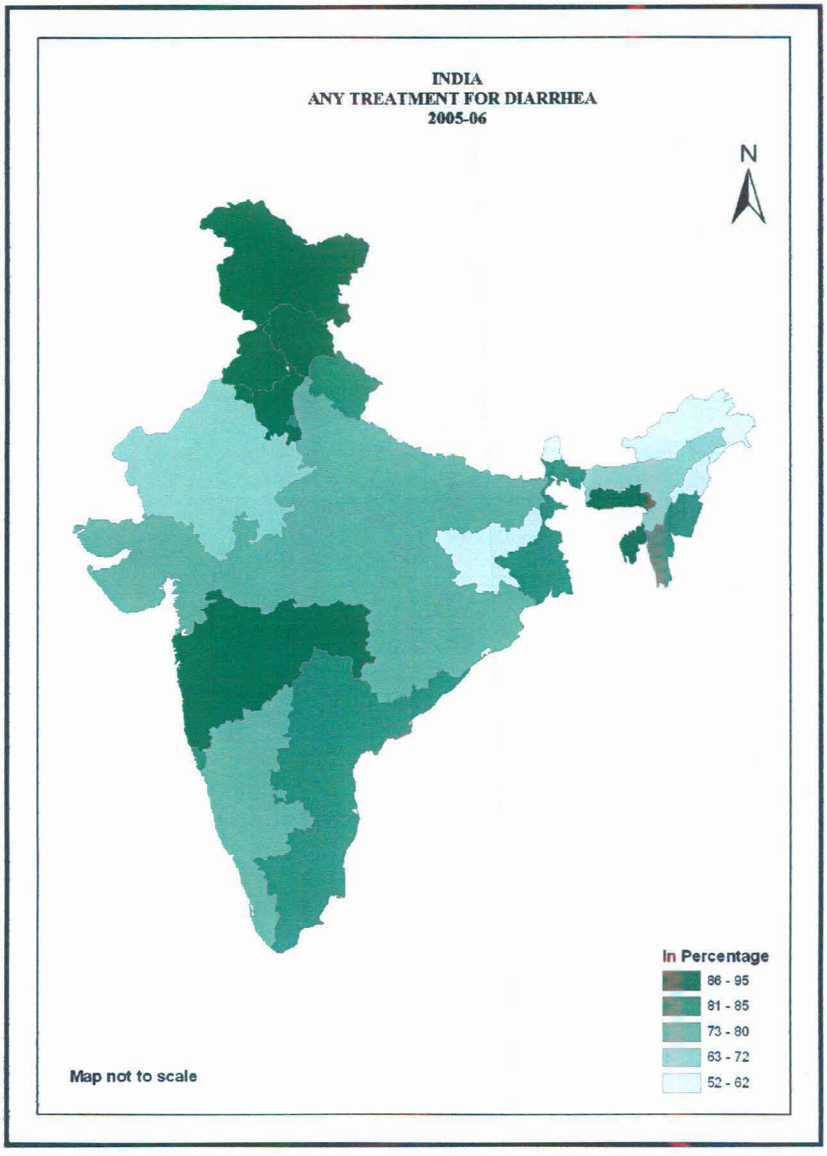
Map-5



c) Received Any Treatment for Diarrhoea

Diarrhoea is a disease which can be treated in several way, many of the household adopted some other treatment with oral rehydration and medical treatment to treated diarrhoea. If the children were given any treatment for diarrhoea then it good indicate for people aware on diarrhoeal disease, but if children were not given any treatment it mean poor awareness of people on this disease, children should be treated with other method to include medical and ORS treatment.

Map-6



NFHS-3 has collected data on whether a child with diarrhoea has received any treatment or not from mother. According to NFHS-3, around 78 percent of children have received some treatment for diarrhoea in India while only 70 percent of children with diarrhoea in North-Eastern region have received some treatment for diarrhoea; remaining 30 percent of children have not received any treatment for diarrhoea.

At the state level, almost all of the states have shown more than 70 percent of children with diarrhoea have received some treatment for diarrhoea except some of North-Eastern states viz., Sikkim, Arunachal Pradesh, Nagaland and Assam; and other states like Jharkhand, look at the table-1.3.

Table-1.3, Regional Variation of Prevalence and Treatment of Diarrhoea in India

State	Had Diarrhoea	Blood in stool	Given ORS	Medical treatment	Received any treatment
India	**9.0**	**9.6**	**26.1**	**62.6**	**78.1**
Jammu and Kashmir	10.0	9.2	40.7	67.2	87.3
Himachal Pradesh	7.7	5.3	56.6	72.4	86.8
Punjab	7.8	9.3	34.0	76.3	88.7
Uttaranchal	12.9	6.0	33.3	62.9	82.8
Haryana	10.3	5.7	24.6	82.6	86.9
Delhi	8.4	10.6	29.8	76.8	81.9
Rajasthan	10.3	5.1	16.7	58.1	72.1
Uttar Pradesh	8.1	12.0	12.5	62.6	79.2
Bihar	10.7	10.1	20.9	57.2	75.0
West Bengal	6.4	15.1	42.2	67.5	80.7
Jharkhand	13.3	13.1	17.3	46.7	61.8
Orissa	11.7	13.4	39.8	63.2	79.4
Chhattisgarh	5.2	6.3	40.0	67.1	79.7
Madhya Pradesh	12.1	10.7	29.8	61.3	78.5
Gujarat	13.1	4.7	26.3	62.4	75.1
Maharashtra	8.1	7.4	38.5	80.1	88.7
Andhra Pradesh	5.7	5.6	36.8	65.1	81.7
Karnataka	8.7	6.7	31.8	67.8	79.9
Goa	6.8	4.5	50.7	71.6	84.8
Kerala	6.8	7.6	32.8	63.2	79.4
Tamil Nadu	5.4	8.9	32.2	63.3	81.1
North-East India	**8.3**	**12.9**	**24.8**	**38.2**	**70.4**
Sikkim	16.4	7.2	33.3	34.2	60.4
Arunachal Pradesh	14.9	13.4	31.4	35.5	51.7
Nagaland	6.4	5.0	16.4	17.9	56.8
Manipur	9.9	14.8	36.3	39.5	82.5
Mizoram	11.0	11.2	48.3	27.3	84.3
Tripura	8.3	13.5	58.8	66.7	92.2
Meghalaya	5.7	10.8	64.6	76.9	95.3
Assam	8.1	13.7	14.5	33.3	66.4

Source: - Calculate from NFHS-3Children file, 2005-06

Discussion

All overall analysis on prevalence of diarrhoea and dysenteric diarrhoea shows that, although prevalence of diarrhoea is lower than national level in North-Eastern states still high percentage of prevalence of diarrhoea is recorded in few North-Eastern

states like Sikkim and Arunachal Pradesh. But more critical is that dysenteric diarrhoea is high among the most of the North-Eastern states as compared to other states of India and also sought for medical treatment is also very low in this region, it shows more probability of deaths due to diarrhoea.

On the other hand, in case of other treatments also, very small percent of children with diarrhoea get treated in the North-Eastern states. Adoption of oral rehydration treatment is very low among North-Eastern states; not only this, most of the children with diarrhoea have even not received any other treatment as compared to rest of the India.

Region needs immediate medical attention, effective health policy, strengthening the use of oral rehydration salt and the need to study this region as particular.

Objectives

Main objective of this paper is given below:-

- One of the specific aim of the study is identification of risk factor associated with diarrhoea
- To assess the impact of socioeconomic factor on diarrhoeal morbidity
- To assess the impact of socio-economic factor on treatment of diarrhoea

Chapter Two

Literature Review

Literature Review

Diarrhoea is one of the major causes of morbidity and death among the young children especially under five year age group. Many scholar and medical expertise has focus on this field. About 80% of death due to diarrhoea is found in developing countries (WHO, 1992). According to World Health Organization, diarrhoea is second most communicable disease, which affects the health of child especially in developing countries. Here, is a brief review of some of the work done by various authors and expertise.

The literature available on North -East India is scarce. Most of the work focuses on the country level and other area, specially on developing countries and also various literature deals with the factor which determined the diarrhoeal morbidity among the young children and it effects on child mortality, literature also deals with the assessment and treatment of the Diarrhoeal disease. And this literature survey helps us to understanding the prevalence of Diarrhoeal morbidity among young children and factors which control over the Diarrhoeal morbidity, its effect on the child mortality and their health.

Survey of literature brings various issues on diarrhoea which is responsible for increasing and decreasing of diarrhoeal morbidity. Many of the authors and scholars have amply demonstrated different variables like some have given supreme importance to proximate or intermediate variable but others have given importance to independent or explanatory variables. And at the same time, some scholars or authors have doubts about the inter-relationship between diarrhoea and nutrition level. And also they have argued on the approaches to the study the diarrhoeal morbidity because medical scientists believe it as biomedical study, but on the other hand, recently social scientist also involve in this ground of study of diarrhoea as a social problem since it mostly affects children and positively related to the social condition of society and household.

Keeping in mind this issue and theme of this paper, I would like to survey the work of some prominent author, whose contribution in this ground is unforgettable and which can help us in further progress of this paper.

Since, diarrhoea is directly related to human health, it is purely a medical study ground but today social scientists are actively keen to know about this disease since it affects the children and the society, and here it is believed that prevention of diarrhoeal morbidity is directly and indirectly related by the social, economic and health infrastructure. As per as child is concerned, here also the focus on the factors which determined the survival of child from any disease outcome, it will be help us to further understanding of socio-economic determinant of diarrhoeal disease outcome.

Diarrhoea can be studied from two dimensions viz. biomedical perspective and social perspective (W. Henry Mosley, 1984). Biomedical scientists focus on the disease agent and host interaction. The biomedical literatures provide the richest sources of information and disease outcomes but relatively little to say about social interaction. But the importance of considering the social dimensions of the problem is being recognized by other scholars and agencies like World Health Organization. Some of the authors have also focused on the survival of child from any disease outcome under the impact of socio-economic factor.

Biomedical Perspective

In the case of biomedical perspective, many of medical authorities and organizations are engaged in this field of study. They have identified many causes of diarrhoea and treatment or prevention of this disease. But, with identification of cause of bacteria, virus and parasitic infection, they also identified main sources of these pathogenic organism through which they concluded that diarrhoea is closely relate to hygiene condition of the household and most of the bacteria or parasitic pathogenic is found in developing countries.

J.M. Hunter, L. Rey, K.Y. Chu, E.O. Adekolu John and K.E Motte (1993) had emphasized given on water born pathogen which not only causes diarrhoea it also cause several infectious disease, like cholera etc., Similarly, Kathy Pond (2005) says that diarrhoea is caused by water borne pathogen. She identified Campylobacter,

Salmonella typhi, Shigella dysenteriae, Leptospira, Giardia, E. coli, Cryptosporidium and Leionella as important water borne pathogens which cause normal to sever diarrhoea among the people. Some authors or medical expertise argued that diarrhoea is not a disease but it is a symptom of other infectious diseases like cholera, fever etc, A. Mondal and R.B. Sack has stated that diarrhoea is symptom of onset of Cholera since it is caused by water borne pathogen and other hygiene condition. Most important thing is that diarrhoea is also caused by one of the bacteria which causes cholera like 'Vibro cholera', it why medical expertise state that diarrhoea is onset of cholera, but many of diarrhoeal bacteria are not related to cholera, so, some of medical scientist separated it as a independent disease.

World Health Organization (1993) has also identified various pathogens which not only come from water but origin from surrounding environment where victim of diarrhoeal disease live. It can provide very helpful information on diarrhoeal disease to medical student in general and non-medical student in particular.

One of the most important contributions is made in this ground by Robert E. Black (1982), in his article "Diarrhoeal Diseases and Child Morbidity and Mortality" he states that diarrhoea is caused by a variety of bacterial, viral, and parasitic enteropathogens. In developing country settings, Escherichia coli and Shigella are the bacterial pathogens most often responsible for the disease. E. coli are an important cause of epidemic and sporadic cases of diarrhoea among infants. Shigellosis is most common among children two to four years of age (Black et al., 1984) and is usually mild, with treatment requiring only rehydration. Viral diarrhoeas are acute, self-limiting illnesses and the most common group, the rotaviruses, appears to be responsible for many of the serious sporadic diarrhoeas in young children. Diarrhoea can also be caused by a variety of parasites, of which Entamoeba histolytica and Giardia lamblia may be the most common (Black, 1984). Transmission of the bacteria, viruses, and parasites that cause diarrhoea occurs through the fecal-oral route as a result of direct person-to-person contact (such as hand-to-mouth contact) and exposure to contaminated food, water, and objects. Avoidance of contaminated water and attention to hygienic practices, such as sanitary waste disposal, correct food handling techniques, and hand washing, can help prevent illness. In addition, infants may derive some protection from breastfeeding, since breast milk contains specific

rotavirus-neutralizing antibodies. Children more than two years of age and adults have substantial resistance to rotavirus diarrhoea (Black et al., 1982).

Black, in his work with identification of important virus, bacteria and parasitic, he identified the agents of diarrhoea through which bacteria, virus and parasitic infections are transferred to human body and developed the disease. This agent can play as covariate factor since it is directly related to the diarrhoea formation in human body and play as intermediate variable between dependent variable and independent variable. But, magnitude of this covariate factor depends on the behavior of human which is controlled by socio-economic factor.

As diarrhoea occurs through the fecal-oral rout as a result of Transmission of the bacteria, viruses, and parasites as a result of direct person-to-person contact (such as hand-to-mouth contact) and exposure to contaminated food, water, and objects, proximate determination is playing important role to determine the diarrhoea.

Ann Ashworth (1998) in his well work "Nutrition interventions to reduce diarrhoeal morbidity and mortality" has said that breast-feeding; improved weaning practices; prevention of low birth weight (LBW), improved food hygiene, vitamin A supplementation; enhanced lactation, supplementary feeding programmes is essential to reduce diarrhoea. Breast feeding is only effective on children of below two years of age group so in this case age of children is also considered as important factor. One of the important causes of diarrhoea like E. coli are commonly transmitted via weaning food to young children and other pathogens like shigella, rotavirus, and G. lamblia, are infectious in small doses and can be spread via contaminated hands or household object (Blake, et.al). As per as household object is concerned Gebremariam Woldemicael, 2001, has emphasized that given the type of floor material, which depends on the household economic status and place of residence, are significant predictors of diarrhoea. With this he also discovers an important relationship between diarrhoeal morbidity and age of child and number of children living in the house with particularly high prevalence of diarrhoea at the age of weaning and in households with large number of living children.

The biomedical literature provides the richest source of information and disease outcomes but has relatively little to say about social interactions, but they can't deny

the relation of pathogen agent of diarrhoea with social and economic character of household.

Socio-Economic Perspective

Developing countries has experienced poor social and economic development, here widely recognized that exposure to diarrhoea pathogens in developing countries is conditioned by such factors as age of the child, quality and quantity of water, availability of toilet facilities, housing conditions, level of education, household's economic status, place of residence, feeding practices, and the general sanitary conditions (personal or domestic hygiene) around the house. So, with this identification we cannot separate the effect of that all socio-economic and covariate or intermediate variable because that all are interrelated to each other. But some of the authors have separated it in their own way of study.

According to W. Henry Mosley (1983) any technique's effectiveness and performance of health facility depends on use or participation of population, and population, in turn, is affected by its own socio-economic factors, for example, a mother may be introduced to a technique, but her decision to use it and her ability to use it effectively are powerfully dependent upon the social support system. And further, he also argued that studies of use and impact of oral rehydration therapy have been done, but the results have often been ambiguous because of inadequate consideration of socio-economic factors.

Similarly, Issaka Kanton Osumanu (2007), in his well-know work "Household environmental and behavioral determinants of childhood diarrhoea morbidity in the Tamale Metropolitan Area (TMA), Ghana", argued that diarrhoeal morbidity is strongly dependent on the mother's understanding of the links between various risk factors and childhood diarrhoea, and advocates the need for well-planned, intensive health education programmes to change incorrect beliefs and to educate the mothers about the role of infection in causing diarrhoea. Natalya Bilenko, Drora Fraser, Lechaim Naggan (1999) has emphasized on the maternal knowledge and behavior, but at the same time he argued that maternal age and education did not appear to be important risk factors for diarrhoeal experience in the study of children and it may be possible to intervene in the community to reduce infant diarrhoea morbidity by

improving maternal knowledge and awareness of causes of diarrhoea, and by emphasizing maintenance of breastfeeding during illness. An education intervention program of this type may help lower the rates of diarrhoea in the population, and possibly contribute to lowering the high rates of hospitalizations.

Hygiene and literacy may be closely related. Although the evidence is inconclusive, some studies conducted primarily in Africa did show diarrhoeal morbidity rates were the highest in families with the lowest levels of educational attainment but argued that such observations themselves are not useful because families with lower educational attainment may be those with the lowest income, poorest housing, most crowded and worst sanitary facilities. These confounding variables can promote the transmission of enteric pathogens. If we control these confounding variables, education attainment shows a significant impact on the incidence of diarrhoea (Arif and Ibrahim, 1998).

Jean-Christophe Fotso & Barthelemy Kuate-Defo, stated that the socio-economic factors that influence child health include family-level variables such as education and employment, income and ownership of consumer durable goods, type of drinking water, sanitation and housing; as well as community-level covariates captured by the availability of health-related services and relevant socio-economic infrastructures. Same time he also pointed out that diarrhoeal morbidity causes the severe malnutrition which further leads to death of children. Another authors like Narayan Sastry (RAND) and Sarah Burgard (UCLA and RAND), and David M. Janicke, Jack W. Finney, Anne W, where former have given emphasis on mother education and latter have given emphasis on the mother perception of child health and maternal emotional functioning influence the decision-making process involved in seeking health care on behalf of children whether she is educated or not.

Ulysses Fagundes-Neto and Jacy A.B.de Andrade argued that association of some factors, such as age less than six months, severe malnutrition, food intolerance and the identification of EPEC strains in the stool culture, and indicate a high risk of death among infants hospitalized due to severe acute diarrhoea. So age is also crucial factor which determined not only the diarrhoea but also determined the sever effect of diarrhoea on children which causes death of children. In the case of malnutrition many of authors are not agreeing that diarrhoea causes the severe malnutrition. K.

Anand, K.R. Sundaram, J. Lobo and S.K. Kapoor argued that nutritional status may not play an important role in increasing the susceptible of children to diarrhoea. According to them, diarrhoeal disease is highly spread in the mid of August but level of nutrition is also high in same month because it is a harvesting session of wheat, so, probability of improving the nutrition level is very high in this month. But many of study is show that occurrence of diarrhoea in children further increases the malnutrition among young children. Lincoln C. Chen argued that although disease incidence may not be influenced by nutritional status, but improved nutrition would be expected to result in reduced disease duration, severity, prevalence and most importantly, lowered case-fatality rates. Similar argument is presented by S. Sahni, R.K. Chandra, A.M. Molla, Ayesha Molla, S.A. Sarker, M. Mujibur Rahaman that food intake during the time of diarrhoea can reduce the incident of diarrhoea.

In the case of India, there is no such study done on a large scale, Vani K. Borooah has attempted to make socio-economic determination and other proximate determination in his work of "On the incidence of Diarrhoeal morbidity among the young children", where he has given emphasis on good hygiene practices and awareness of mother on diarrhoea. According to him "good hygiene practices within the home can reduced the incidence of diarrhoeal among young children. Furthermore, children born to undernourished, i.e., anaemic, mothers may be more susceptible to infection than children whose mothers are well nourished".

Jyotsna Jalan and Martin Ravallion, have studies the effect of infrastructure in rural India. They argued that the prevalence and duration of diarrhoea among young children under five in rural India are significantly low on average for families with piped water than for observationally identical household without piped water, but this is again controlled by the education and income of household. According to them, health gains from piped water tend to be lower for children with less well educated women in the household. Irrespective of the socio-economic factors, quality of water, increase water availability and quantity associated with better hygiene practices are important to control the diarrhoea (S.A. Esrey, R.G. Feachem, & J.M.Hughes; WHO, 1985).

They have identified many determinants to diarrhoea by various author or scholar such as proximate determinants or factors, socio-economic factors, behavioral factors and environmental factors. Most of the proximate factors reflected back the environment risk factor and behavioral factor is often associated with the socio-economic factor. As many authors argued that differentiation of behavior factor is dependent on the social and economic condition of the household. Below is separate literature survey made on some of socio-economic and other variables:-

Literature Review on Socio-Economic and Other Variables

a) Household Income

Household income is one of the most important socio-economic indicators, which can determine the accessibility of good hygiene, sanitation and other requirements to prevent the incident of diarrhoeal morbidity. It why most of the scholars have estimated that Children living in poor households have higher rates of diarrhoea than their wealthy counterparts, probably due to inadequate access to environmental facilities, unsanitary environments in the home and poor child hygiene.

Robert E. Black (1983), in his study of Bangladesh, estimated that several specific type of diarrhoea had higher incident and longer duration in children from low income household. Similarly, G.M. Arif and Sabiha Ibrahim (1998), Narayan Sastry and Sarah Burgard (2002) etc. have emphasised on the household income to determine the diarrhoeal morbidity among young children on basis of their respective field studies. Well, some scholar has argued that effect of household income on diarrhoea is insignificant since mother education is more effective then household income. But household income strongly affects the intervention variable like accessibility of pipe water in dwell or safe drinking water and other facility of good sanitation.

b) Mother's Education

Literature on the welfare of children in developing countries is highlighting importance of having literate parents, particularly having a literate mother. There is evidence that children's health, nutritional status and educational attainments are enhanced by having better educate parents, particularly the mother (Vani K. Borooah, 2004).

Father's education level usually correlates strongly with his occupation; and therefore with the household income. Father education is a strong determinant of the household's assets and marketable commodities the household consumes. But mother's education is more and more viable then father since mother is directly or biologically related to infant. Her educational level can affect child's survival by influencing her choices and increasing her skills in health care practices related to nutrition, hygiene, preventive care, and disease treatment. In fact, according to Moseley and Lincoln, many proximate determinants may be directly influenced by mother's education. So, many of the agents of diarrhoeal disease are directly or indirectly effect by the mother education, like safe drinking water through access of piped within the home, hygiene sanitation etc.

Level of mother education also plays an important role in the child health care. Lower levels of maternal education are associated with high incidence of diarrhoea. The incidence of diarrhoea reduces with basic and secondary or higher levels of maternal education. The findings confirm earlier studies which found lower incidence of childhood diarrhoea among children of educated mothers than among children of mothers with no formal education (Tagoe, 1995). Educated mothers practice good hygiene and better child feeding, all of which increases a child's resistance against infectious diseases. Education enables caregivers to avoid health threats and deal with illness more easily (World Resources Institute, 1998). Education enhances the opportunities for wage employment and income and increases access to household amenities and facilities including those related to better hygiene and environmental health (Togunde, 1999; Cerrutti, 2000; Ehiri, 1993; Kwasi Owusu Boadi and Markku Kuitunen, 2005).

c) Age of the Child

Age has been considered a controversial risk factor for death from acute diarrhoea. Interestingly, Ulysses Fagundes and Jacy A.B. de Andrade, in their literature survey found that the report of 22 longitudinal studies in 12 countries found median global values for mortality highest among infants less than one year of age and risk factor of death was four times higher for infants under six months and another interesting

aspect that EPEC[1] serogroups in the stool culture was significantly more frequent in infants under six months of age. But this age of six month is that age group of children when most of the children come under the breastfeed group but after six month of age the breast feeding practise is found irregular and probability of death due to diarrhoea and higher prevalent or incident of diarrhoeal morbidity is very high. So, the incidence of diarrhoea was found to be higher in the second half of the infant life, when inborn immunity is weaker and exposure to contaminated weaning foods is increased.

Kwasi Owusu Boadi and Markku Kuitunen (2005), has concluded from their study of Ghana that children under the age of five years bear a major burden of the morbidity, but it is the children under two years on whom the impact of diarrhoea and associated malnutrition is greatest. One of the study made on Njorbo watershed, in Kenya, by 26th IUSSP International Population Conference (2009 issues), stated that the prevalence rates for age one year are relatively lower. After one year, it increases sharply at two years and then increases slightly at three and four years of age. In the other words, children in the age categories 2-4 years have higher diarrhoeal morbidity than the one year olds. It is because the most children at age of one year are still breastfeeding.

Breast milk provides some form of immunity to the child's body (UNICEF, 2003). Also in this age category, the children are less independent so they are given more care than the other age brackets. Most likely at age one there is no other younger child in the family to shift the mother's or caretaker's attention from them. The age bracket of two years shows the highest prevalence. The children in this bracket are more independent and are exploring their environment. This is the period when most children are weaned off breastfeeding.

[1] EPEC, enteropathogenic Escherichia coli, is a bacteria which commonly associated with diarrhoeal morbidity especially among young children. EPEC are defined as *E. coli* belonging to serogroups epidemiologically implicated as pathogens but whose virulence mechanism is unrelated to the excretion of typical *E. coli* enterotoxins. *E. coli* are Gram-negative, rod-shaped bacteria belonging the family Enterobacteriaceae. EPEC cause either a watery or bloody diarrhoea, the former associated with the attachment to, and physical alteration of, the integrity of the intestine. (http://www.cfsan.fda.gov/~mow/chap14.html)

d) Sex of the Child

The sex of the child plays an important role in the probability of its survival in most of the societies or countries, especially in patriarchal society. Trends in India show that female mortality is higher (Report of Registrar General, 2003), especially at the post-neonatal and childhood ages.

Biologically, the female of the species has a greater advantage in terms of chance of survival and based on this fact alone, male mortality tends to be higher than female mortality during the neonatal period. However, a distinct preference for a male child may reverse the natural order and result in greater female mortality during early childhood, through the mechanism of differential treatment of sons and daughters in terms of allocation of food, prevention and treatment of diseases and accidents, etc. Thus, in states with strong son preference male mortality tends to be higher than female mortality during the neonatal stage, while female mortality is higher at later ages. India, with its pervasive preference for sons also shows excess female mortality in the age group 1-4.

So, here it is believed that female child is more likely to be sick than male child and probability of incident of diarrhoea is also more than her male counterpart.

Sanitary and Child Care Related or Intervention Variables

a) Sources of Drinking Water

Both quantity and quality of water supply are important determinant of exposure to disease. Adequate quantity is essential to permit bathing, washing and cleaning; quality[2] for drinking and food preparation (W. Henry Moseley, Lincoln C. Chen, 1984).

Since water is related to various kind of waterborne disease, here need to improve the water quality and quantity. In case of diarrhoea there are various scholar and expertise, which work on interrelationship between water and diarrhoea, since diarrhoea is also counted as water borne disease, because contaminated water highly

[2] Quality of water is not only depending on the sources of water but it also depends on the household level care.

contains E.coli[3] bacteria. E.coli is most common bacteria which is causes diarrhoeal morbidity among young children especially in developing countries. Other water born pathogen viz. campylobacter, salmonella, shigella, rotavirus, parasites infection, etc. are prominent which commonly cause diarrhoea among the young children especially in developing countries.

Access to improved drinking water is widely advocated as an effective way to reduce diarrhoea-related morbidity and mortality, particularly in poorest areas of the world and in most vulnerable population segments like children (Kwasi Owusu Boadi and Markku Kuitunen, 2005).

Here it is difficult to obtain data on the quality of water and quantities of water use by the household, some scholars had been working on their own personal sample of water. But, some authors or organisations have estimated quality of water on the basis of sources of water which is used by the household. Organisations like CIET[4] , in summary report of Burkina Faso, estimated that own or community taps, hand pumps, were recognized as safer or easier to protect. On the other hand, well, canal, springs, stream, river, lake, or pond were classified as unsafe or more risky.

NFHS, National Family Health Survey, of India also published the sources of water which provided help to further analysis of this paper. NFHS-III, classified improved and non-improved sources water in following way-

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[3] E.coli (Escherichia coli) has had a central place in water microbiology for decades as an indicator of faecal pollution. It is only relatively recently that the role of E. Coli as pathogen, rather than indicator, in drinking water has begun to be stressed. Interest in the role of E. Coli as a cause of diarrhoeal disease has increase because of the emergence of E. Coli O157:H7 and other enterohaemorrhagic E. Coli, due to the severity of the related disease. There are enterotoxigenic, enteropathogenic, enterohaemorrhagic, enteroinvasive, enteroaggregative and diffusely adherent strains of *E. coli*. Each type of *E. coli* causes diarrhoeal disease through different mechanisms and each causes a different clinical presentation. Several of the types cause diarrhoea by the elaboration of one or more toxins, others by some other form of direct damage to epithelial cells. http://www.iwaponline.com/jwh/001/0065/0010065.pdf

[4] CIET, *Centro de Investigación de Enfermedades Tropicales* (Tropical Disease Research Centre), CIET is an international group of epidemiologists and social scientists who bring scientific research methods to local government and community levels. It came to existing in 1985 in Maxico. Later in 1994 it name is change as "Community Information and Epidemiology Technologies" and more recently in South Africa and Europe CIET has come to stand for "Community Information, Empowerment and Transparency".

Improved sources of water: - Piped water into Dwelling/yard/plot, Public tap/standpipe, Tube well or borehole, Protect dug well, Protect spring and Rainwater.

Un-improved sources of water: - Unprotect dug well, Unprotect spring, Tanker truck/cart with small tank, Surface water and Bottle water.

b) Toilet Facilities and Disposal of Child's Stool

Children living in households with some kind of toilet facilities are less likely to be sick than children in households which do not have toilet facilities. The risk of having diarrhoea was found to be significantly associated with toilet facility, where children living in houses with toilet facilities are about 50% less likely to contract diarrhoea then children living in houses with no such facilities (Gebremariam Woldemicael).

All the major infectious agents of diarrhoea are transmitted by the faecal-oral route, and all can be transmitted via contaminated water. According to S.A. Esrey et al. (1985), the traditional water sources are often highly contaminated with faecal matter, therefore, hygienic disposal of human excreta plays a role in controlling the disease. Use of toilet by all member of community should reduce faecal contamination of houses, yards and gardens, and neighbourhood. In addition, proper treatment and disposal of human excreta would prevent faecal contamination of fields, crops and receiving water bodies, which would in turn further reduce the transmission of faecal pathogens.

The hygienic disposal of the faeces of children too young to use the toilet is of utmost importance, because such children constitute an important reservoir of several agent of diarrhoea (S.A. Esrey et al., 1985).

c) Breast-feeding

Appropriate breastfeeding practices have a beneficial impact on mothers and their babies. Immediate initiation of breastfeeding helps the release of oxytocin hormone, resulting in uterine contractions that expel the placenta, thereby reducing the chances of postpartum hemorrhage. The first breast milk, colostrum, provides natural immunity to the child since it is enriched with anti-infective proteins (immunoglobins) and Vitamin A, enabling the newborn to help fight infections.

Breast milk is considered to be best immunisation practice for the children. There are various evidence which proved that breast milk is best for children and it protects children from various diseases like communicable disease and provides some form of immunity to the child's body (UNICEF, 2003). The benefit of breastfeeding in the prevention and treatment of diarrhoea has been well documented in both developing and developed countries and continued breastfeeding during illness has been recommended by the World Health Organization [Natalya Bilenko, Drora Fraser, Lechaim Naggan (1999)].

Natalya Bilenko, Drora Fraser, Lechaim Naggan (1999), et.al, report that the cessation of breastfeeding was associated with high rates of morbidity from diarrhoea. Mother's milk is likely to reduce both the prevalence and the impact of diarrhoea in infant. In terms of protection against diarrhoea, breast-feeding probably has an important direct role for up to six months and an indirect effect, by its contribution to the nutrition of young children, into the second year of life[5]. But most of the scholars have argued that breast milk is only effective if it is exclusive breastfeeding.

Generally, children under six month of age have exclusive breastfeeding and after six months children slowly cease breast milk and are fed on another food and drink, but sometimes mother's practice weaning before six month of age, which further causes high risk of infant mortality due to diarrhoea. According to Shams Arifeen, Robert E. Black, Gretchen Antelman, Abdullah Baqui, Laura Caulfield, and Stan Becker (2001), compared with exclusive breastfeeding in the first few months of life, partial or no breastfeeding was associated with a higher risk of infant deaths resulting from all causes and higher risk of deaths attributable to diarrhoea. Exclusive breastfeeding is the recommended practice as it minimizes the baby's exposure to pathogens from any source, thus reducing diarrhoea, respiratory tract infections, and other risks. Breastfeeding provided a greater degree of protection against diarrhoea death in first six month of life. Similar contribution made by various authors who estimated that

[5] http://www.unu.edu/Unupress/food/8F041e/8F041E04.htm given information is got from this website under the heading of "The prevention and control of diarrhoeal diseases"

most of the children suffering from diarrhoea are above six months or one year, because most of children under six months or one year are fed by mother's milk.

With exclusive breast feeding, initiation of breast milk to child is also considered as important to reduce diarrhoea. Mother first milk contains colostrums – the sticky, yellow-white in colour – should be new born first test, it can protected infant from several infectious disease. C. John, A. E. Remon et. al., in their work, have found that infants in whom breastfeeding was initiated early had lower rate of diarrhoea than those initiated late.

Chapter Three

Conceptual Framework, Data and Methodology

Conceptual Framework, Data and Methodology

To complete and organise the theme of this study, this chapter looks into the conceptual framework of the paper, main sources of data and suitable methodology. The chapter discusses the conceptual framework with the help of existing literature; available data and suitable methodology.

Conceptual Framework

The review of literature gives a clear picture of the issue at hand and helps to identify the significance of socio-economic determinants of diarrhoeal morbidity. The theme of this chapter is conceptualising with the help of a "framework" in order to understand how various socio-economic factors have chance of affecting the prevalence of diarrhoeal morbidity among young children in North-East India. And also create separate framework for discussing the available treatments of diarrhoea or its prevention.

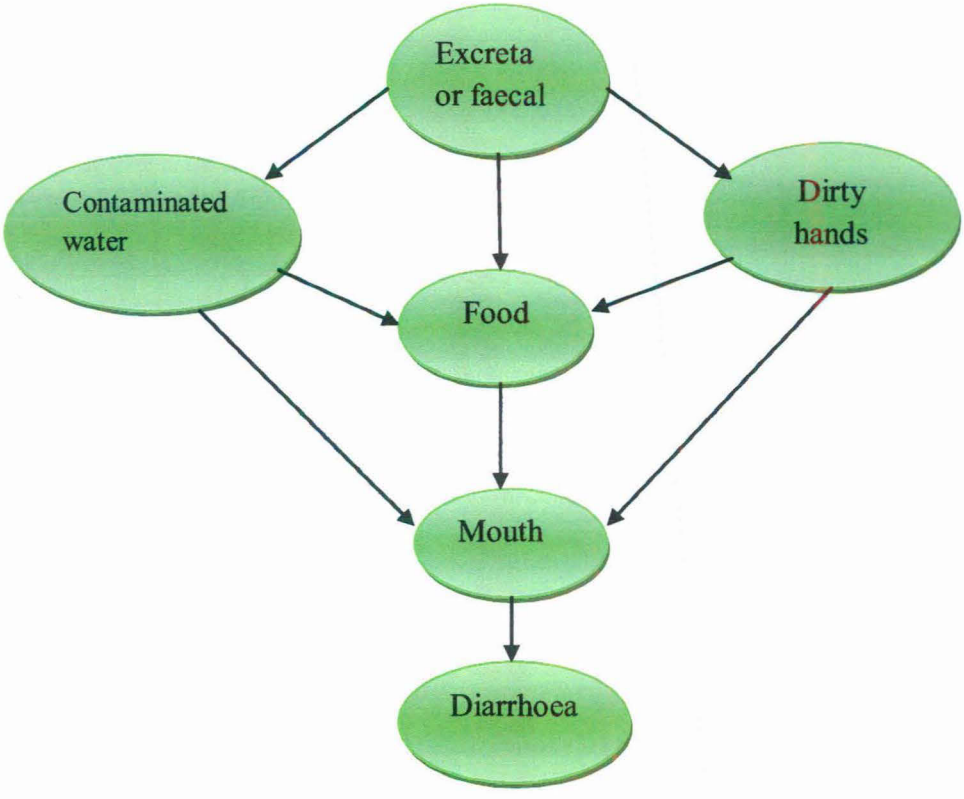
Conceptual Framework for Socio-economic Determinants of Diarrhoeal Morbidity:-

The relationship between the household's socio-economic characteristics and childhood diarrhoea has been amply demonstrated in the literature (David M. Janicke, Jack W. Finney and Anne W. Riley: 2008; Gebremariam Woldemicael: 2001; G. M. Arif and Sabiha Ibrahim: 1998). Vani K. Borooah (2004) found a strong association between the socio-economic status of the household and the incidence of childhood diarrhoea in India.

From the previous chapter we get two dimension of study of diarrhoeal morbidity viz. one biomedical perspective and other socio-economic perspective. Most of the studies done in developing countries are based on the social and economic perspective but some studies also focused on the bio-medical perspective especially by bio-medical scientists and some institutes like World Health Organisation, etc.

As per biomedical study is concerned, most of the literature survey and physician have stated that Diarrhoeal pathogenic organism is mainly originating from excreta or faecal, which is transmitted through various agent, like contaminated water, dirty hand, and contaminated food, human to human contact in overcrowded area, flies and insect etc. These all are immediate factors which essentially cause the diarrhoea among children. Contaminated water is most common source of prevalence of diarrhoea among the children who lived in household which did not have any pure source of water; Contaminated water contains E. coli, Vibro cholera etc. Many literatures also show that sources of water are not statistically significant with prevalence of diarrhoea. Since cleanliness or quality of water is more important than sources of water whether it came from safe source or unsafe. After studying various literatures I have attempted to construct a framework for evaluation of diarrhoeal morbidity among the children with the help of immediate factor:

Figure.3.1, Evaluation of Diarrhoea through immediate factors



The biomedical literature provides the richest source of information and disease outcomes but has relatively little to say about social interactions. Although, immediate or environmental factors have mainly caused diarrhoea among the

children, but maintenance of water quality and sanitation facilities depends on mother's understanding and awareness of hygiene that can be increased by mother's education, household's income, active participation of society and community, etc. According to W. Henry Mosley (1984), effectiveness of any technique and performance of health facility depends on use or participation of population and population, in turn, is affected by its own socio-economic factors. For example, a mother may be introduced to a technique, but her decision to use it and her ability to use it effectively, strongly depends upon the social support system. And further, he also argued that studies of use and impact of oral rehydration therapy have been done, but the results have often been ambiguous because of inadequate consideration of socio-economic factors.

W. Henry Mosley and Lincoln C. Chen (1984) have identified various social and biological or biomedical variables for the study of child survival and also constructed a framework for the same. According to them, a social researcher studies the direct effect or correlation of dependent variables and independent variables; on the other hand, a biomedical researcher primarily focuses on the biological process of disease, intervention or proximate variables like, environmental contamination and dietary intake[1] and its effect on the disease like diarrhoea.

Authors like Robert E. Black, a well know biomedical scientist, stated that most common bacteria of diarrhoea (E. coli, Shigella, etc) is frequently found in developing nations and directly affects the children, particularly between the age group 0 to 5, but it is rarely found in developed nations. Through this statement we can say that in developing countries socio-economic conditions are poorer than developed countries, The bacteria (like E. coli and Shigella) prevails frequently in developing countries are mainly of pathogenic origin and depend on the hygiene conditions. This further depends on the socio-economic condition of the household.

Although, biomedical scientist recognised that agents of diarrhoea and immediate factors of causing the spread of diarrhoea, they also agree that all immediate and

[1] Environmental contamination is related to polluted drinking water; and dietary intake is related to nutrition status, food availability and breastfeeding etc, Biomedical researcher tried to correlated these with the disease (W. Henry Mosley and Lincoln C. Chen)

intermediate factors are controlled by the socio-economic conditions. So, we should be focusing on the social and economic perspective of the study of the diarrhoeal disease among young children, since it controlled the most of the agents of disease transmission.

Moseley has identified two possible frameworks to study the relationship between socio-economic factors and diarrhoeal disease (See fig.3.2 and fig.3.3). First figure shows the direct relationship between socio-economic conditions (independent variable) and diarrhoea (dependent variable). And second figure depicts that dependent variables get influenced by intervening variables (intermediate variables).

Fig.3.2, Direct Relationship

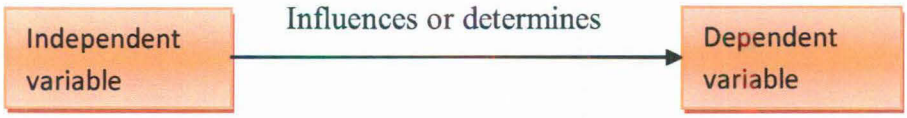
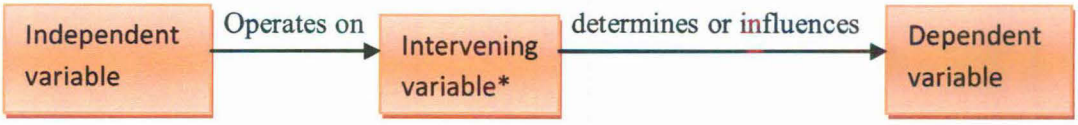


Fig. 3.3, Indirect Relationship



*intermediate or proximate variables

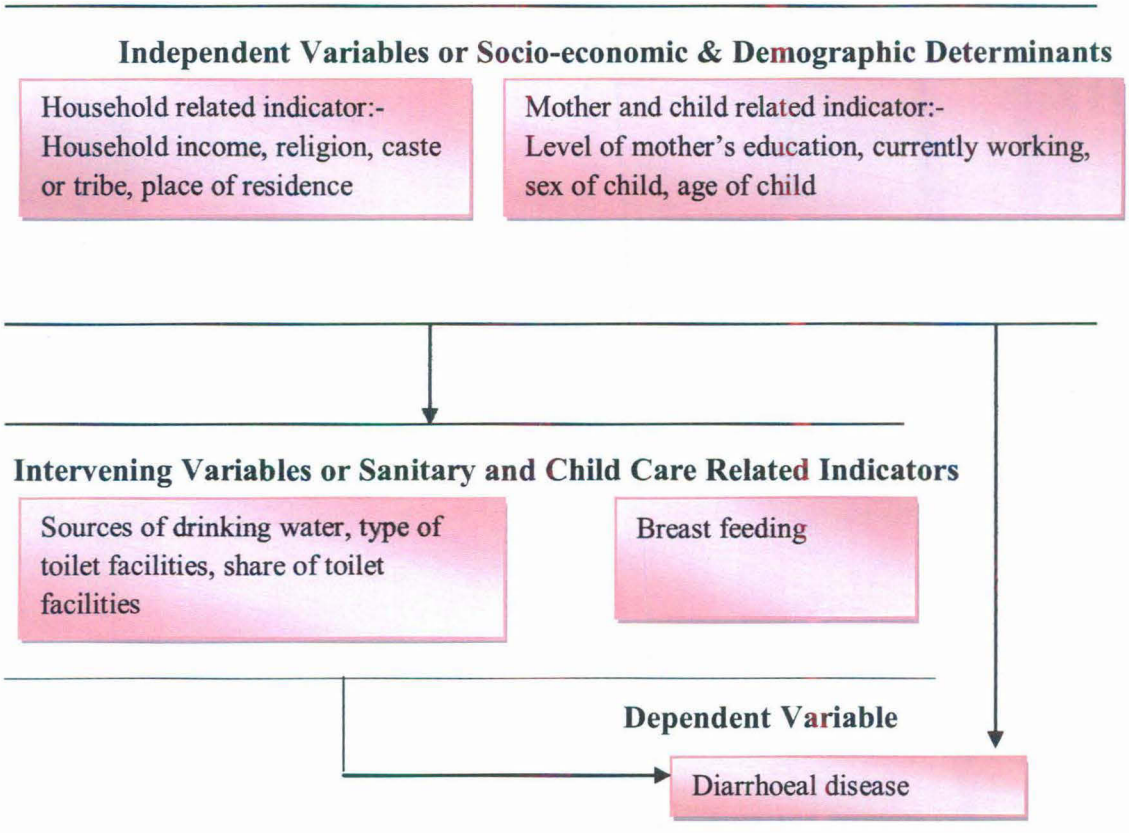
With the help of above framework given by Mosley and keeping in mind the nature of the paper, a conceptual framework has been drawn for socio-economic determinants of diarrhoeal morbidity among young children (See fig. 3.4). It also shows the hierarchical effects on diarrhoea by independent variable via intervention or intermediated variable.

Socio-economic variables as independent variables control the other variables which directly or indirectly affects the diarrhoeal morbidity among the young children. A section of literature has estimated that the effect of socio-economic variables on the health and mortality of children in developing countries is high. Children's age and gender; mother's level of education and working status; condition of the household like, household income, religion, ethnicity, type of place of residence have been

included in socio-economic and demographic determinants as independent variables in the framework.

Intermediate or proximate factor is also included, because child health is determined directly by a set of biological, behavioural and environment factors that reflect a child's exposure to the risk of disease and protection from these diseases. For example, better household sanitation and water supply play a protective role, since enteric pathogenic of diarrhoea originated from contaminated water and food. One reason to include the intermediate factors in model is to examine how the effects of socio-economic factors have changed by inclusion of intermediate factors. This provides insights into the ways in which the background factors operate to affect child's diarrhoeal outcome.

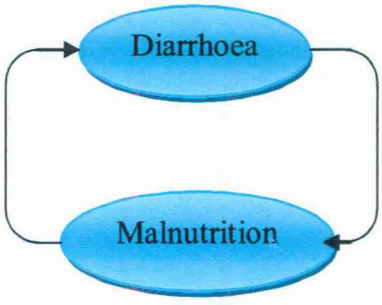
Fig. 3.4, Conceptual Framework for Diarrhoea



Breast feeding, good sanitation and nutritional status of children have played two roles. It can determine the diarrhoeal morbidity among the children and it also can be adopted as effective factor to prevent the further expansion of disease. Malnutrition

has vicious effects on diarrhoeal disease outcome, children with malnutrition are more prone to suffer from diarrhoea, but some of the authors have argued that children who had diarrhoea will lead malnutrition and further it leads sever diarrhoea. It seems malnutrition and diarrhoea are related to each other through vicious circle, look at the figure 5.

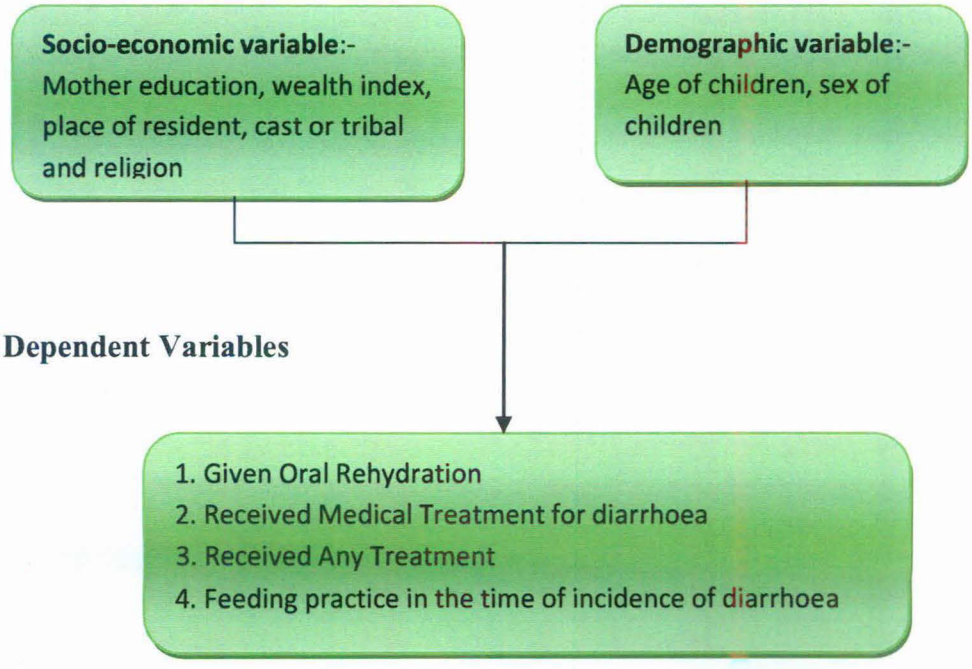
Fig. 3.5, Vicious Cycle of Diarrhoea-Malnutrition



No doubt, socio-economic factors effectively impinge on both disease outcome and behaviour or environmental factors, and also affect the treatment and prevention of diarrhoea. (See fig. 3.6).

Fig. 3.6: Framework for Treatment and Prevention of Diarrhoea

Independent Variables



Feeding practice in the time of incidence of diarrhoea is good indicator of preventing malnutrition and further expansion of diarrhoea as a dysenteric. Both the quantity and quality of food given to child who had diarrhoea is affected by the mother's awareness on diarrhoea and child's health. Infact, all the dependent variables like oral rehydration, medical treatment and any other treatment given to children depend on mother's active participation vis-à-vis her socio-economic background.

Hypotheses

After reviewing the literature and conceptualising the theme, the following hypotheses have been framed-

- Child's age and gender is significantly associated with diarrhoea, lower age group of children are more prone to get exposed to risk outcomes. Risk outcome decreases with older age. Female has more probability to get exposed to risk outcome.

- Mother's education and working status is significantly affects child's exposure to risk outcome. And also determines the types of treatment given to child during diarrhoea.

- Prevalence and treatment of diarrhoea can be determined with the help of household income. A child of rich family is less likely to get exposed to risk and more likely to receive better treatment in the case of risk.

- Other social conditions like Religion and ethnicity of the children is also determined the prevalence of diarrhoea among children.

- Child who received breast milk as soon as after birth is less likely to expose infectious disease like diarrhoea as compare to those who received breast milk after a long time of gap.

- Access to improved drinking water and toilet facilities is widely advocated as an effective way to reduce diarrhoea-related morbidity and mortality

Data Sources and Limitations of Data

In this paper, most of the work depends on the availability of data. There are number of sources which publish data on mortality and morbidity, in India Registration General of India publishes data on mortality and morbidity through 'Medically Certified Cause Of Death (MCD)' based on International classification of cause of death (ICD), vital statistic, civil registration system (CRS), sample registration system (SRS) etc. Among these publications only medically certified cause of death has published mortality base on the morbidity and remained publication are only published country death and birth rate. MCD has also been facing many problems in evaluation of data as well as its coverage area. It is unable to cover whole of the North-East India except Assam. But Assam also comes under the poor coverage area.

So the data taken for the proposed study is from the 3rd National Family Health Survey (NFHS-3), 2005-06. NFHS-3 covered all 29 states of India, which comprise more than 99 percent of India's population. It mainly targets the women as respondents, so most of information on child is collected from the women or say mother. Men have also been interviewed. It covers more than 90 percent though it is less in number as compare to women respondent because it has given priority to women and child health.

In the case of North-East India, it covers more than 98 percent of the household respondents and more than 95 percent of the women respondents. NFHS data on demographical background as well on social and economical background of the household or respondents is very helpful in the evolution of this research work.

Since, this research paper is concerned with the affect of social and economic factors on morbidity like, diarrhoea and it is prevalent among the young children, which should be low in rate but unfortunately it still very common and highly prevalent feature in the developing countries like India. NFHS data for analysing the degree of determination of all background factors on diarrhoea provides appropriate variables for evolution of this paper.

The study was carried out in the North-Eastern region by using data from NFHS-3 2005-06. For this paper, children data was selected, where respondents are women or say mother. So, all the process of this work is concerned only with the respondent's (mother) socio-economic background, instead of state's total respondents. Its sample size is less than state's total women respondents and individual or household respondents. Most of the work and result is my own estimation since this is not available in any report or article based on North-East India.

Coding of Variables

Most of the variables in this study are nominal type, proper categorization of variables is important for statistical analysis of the variable. Each category of variable is represented by unique code, but the codes do not bear any numerical values. NFHS-3, collected data from mother who has five year old child during the five years preceding the survey a series of questions about episode of diarrhoea suffered by their children in two weeks before the survey, including question of feeding practice, treatment of diarrhoea and use of ORS. NFHS also collected data on mothers' or children's background characteristics. With the help of available data from NFHS, some variables are carefully selected and recoded as the need of method processing. Detailed of selected variable and coding process has given below:-

Response variable (dichotomy)

1. Had a diarrhoea – 0 = No, 1 = Yes
2. Blood in stool – 0 = No, 1 = Yes
3. Given ORS therapy – 0 = No, 1 = Yes
4. Received medical treatment for diarrhoea – 0 = No, 1 = Yes
5. Received Any Treatment for Diarrhoea – 0 = No, 1 = Yes

Other Response variable (more than two response variable)

1. Feeding Practice During Diarrhoea – 1 = Nothing
   2 = Offer less
   3 = As usual
   4 = More than usual

Independent or predictor variables

1. Age of the children – 1 = < 6

2 = 6 – 11

3 = 12 – 23

4 = 24 – 35

5 = 36 – 47

6 = 48 – 59

2. Sex of child – 1 = Male, 2 = Female
3. Wealth index – 1 = poor, 2 = middle, 3 = rich
4. Place of resident – 1 = Urban, 2 = rural
5. Religion – 1= Hindu, 2 = Muslim, 3 = Christian, 4 = Other
6. Cast – 1 = SC, 2 = ST, 3 = OBC, 4 = other
7. Mother level of education – 0 = No education
   1 = Complete primary
   2 = Complete secondary
   3 = higher
8. Mother currently work – 0 = No, 1 = Yes
9. Type of toilet – 1 = Unimproved, 2 = Improve
10. Sources of drinking water – 1 = Unimproved, 2 = Improve
11. Initiation of Breastfeeding – 1 = within half an hour of birth,
    2 = within one hour of birth
    3 = within one day of birth

Methodology

After coding of variables and keeping in mind the main objective of this paper some of appropriate research method is adopted. But before discussing the method the study would light to highlight some of data problem which created hinder to adopt some of method to use in this paper.

Although, NFHS provides rich information on social, economic and demographic conditions of the region, in household, individual, women and children level. But in the case of North-East India, very small sample has been measured in some variable which created hindrance in adopting appropriate method in this paper. Some methods like chi square test and multinomial regression has been not used in this paper because of small sample size (standard sample size should be at least 30). If any of sample size

variables is found less than 30 it will not give correct or good result. So these two methods have been avoided in this paper, although it is appropriate method for analysis the relation or statistical association between some dependent and independent variable. In this paper two other appropriate methods have been used based on data available and sample size, that is, univariate and multivariate regression analysis, beside it also uses number of charts and maps. Details of these two methods have given below:-

Univariate analysis – It has been carried out in order to study the percentage distribution of diarrhoea among the young children age group of under 5 year who is suffering from diarrhoeal morbidity. This analysis provides the descriptive statistic on the demographic and socio-economic variables. Univariate analyses will be helpful in construction of charts.

Multivariate analysis – It is based on the statistical principle of multivariate statistics, which involves observation and analysis of more than one statistical variable at a time. There are number of method which use multivariate statistic depends on type of data like nominal, ordinal, continuous or interval etc. Methods which have been used under multivariate analysis are multinomial regression, logistic regression, multinomial logistic regression, ordinal regression, etc. Multivariate logistic regression has been used for analyzing statistical association of predicted variable and respond variable in this paper.

Logistic regression: it has been used in order to measure the net affect of predicted variables on the respond variables. It is more commonly known as logistic regression. It is used when the response variables are dichotomy or binary, like if children had diarrhoea, $Y_i = 1$ if Yes or $Y_i = 0$, if No. Y is respond variable, i = n, number of children. The diarrhoea model for treatments of diarrhoea is estimated only for children who were reported to have had diarrhoea. Predictor variable is categorical, ordinal, but sometime mixture of both categorical and ordinal.

The basic form of logistic regression is: -

$$P = \frac{1}{1 + e^{-z}} \quad \text{----------equation (1)}$$

Where P is estimated probability, z is the predictor variable and e is the base of natural logarithm. The variable z is a measure of the total contribution of all the risk factors used in the model known as the logit. The variable z is usually defined as

$$z = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + \ldots\ldots\ldots\ldots\ldots\ldots + b_nx_n$$

The multivariate logistic function involving n predictor variable is representing by:

$$P = \frac{1}{1 + e^{-(b_0 + b_1x_1 + b_2x_2 + b_3x_3 + \ldots\ldots\ldots\ldots\ldots\ldots + b_nx_n)}}$$

Or

$$\text{Logit } P = b_0 + b_1x_1 + b_2x_2 + b_3x_3\ldots\ldots\ldots\ldots\ldots + b_nx_n$$

where, b_0 is called the "intercept" and b_1, b_2, b_3 and so on are called the "regression co-efficient" of x_1, x_2, x_3 respectively. The intercept is the value of *z* when the value of all risk factors is zero (i.e., the value of *z* in someone with no risk factors). Each of the regression co-efficient describes the size of the contribution of that risk factor. A positive regression coefficient means that that risk factor increases the probability of the outcome, while a negative regression coefficient means that risk factor decreases the probability of that outcome; a large regression coefficient means that the risk factor strongly influences the probability of that outcome; while a near-zero regression coefficient means that that risk factor has little influence on the probability of that outcome.

Chapter Four

Socio-Economic Determinants of Diarrhoeal Morbidity and Its Treatment among Young Children in North-East India

Socio-Economic Determinants of Diarrhoeal Morbidity and Its Treatments among Young Children in North-East India

In developing countries around the world, diarrhoea is an important cause of morbidity as well as mortality (WHO, 1996). If frequent or prolonged, diarrhoea can lead to poor nutritional status. Repeated episodes of diarrhoeal illness can also leave children susceptible to other infections (N. Sastry et al., 2002). The high rates of diarrhoea prevalence are unfortunate because diarrhoeal disease is largely preventable and prevention techniques are relatively simple.

In the past few years, there has been growing focus on policies and research in socio-economic inequalities in health related matters among the poor in less-developed countries. Reducing health inequalities by socio-economic status and improving the health of the disadvantaged have become the main goal of the World Bank, the World Health Organization, and other international organizations (N. Sastry, 2004). The policy makers and researchers often want to know the prevalence or incidence of the disease by socio-economic background or its association with environmental factors.

Research on impact of socio-economic factors on diarrhoeal disease incidence mostly focuses on less developing countries and some states of India. No attention has been paid to examine the effects of socio-economic factors on prevalence of diarrhoeal morbidity among young children in North-East India. Primarily the literature available on this area is in the form of Reports like NHR, NFHS, SHR, Statistical abstract, etc.

No rigorous studies have been undertaken to separate the effect of socio-economic variables on diarrhoeal morbidity. Although number of studies conducted mainly on other developing nations and other states of India reveal that the socio-economic variables and other households' access to infrastructure play a crucial role to determine the diarrhoeal morbidity among young children. But in the case of North-Eastern states it is still unknown. This chapter attempts to examine the prevalence and

treatment of diarrhoea in North-East India in 2005-06 based on the data published by NFHS-3. One of the basic goals of this paper is to investigate whether the prevalence of diarrhoea apparent over this period was accompanied by socio-economic variables.

In North-East India after fever and malaria, diarrhoea is the second most infectious disease which is highly prevalent among the young children. According to NFHS-3, in 2005-06 the prevalence of diarrhoea in North-Eastern states is higher than the rest of India. In India as a whole, 9 percent of children suffer from diarrhoea while around 8.3 percent of children have been suffering from diarrhoea in the North-East India. Not only this, every state has shown a high prevalence of diarrhoea as compared to national level except Meghalaya and Nagaland, while Tripura and Assam showed almost equal to national average.

Sample Character

Table-4.1 shows that along with the information on age and gender of children, their mothers' level of education and working status. It also shows the household income, religion, ethnicity, source of drinking water and type of toilet facilities and child breast feeding status.

According to NFHS-3, during the time of proceeding survey, 13 percent of children were less than 6 months old and 7.7 percent of children aging between 7 to 11 month of age, it means more than 15 percent of children were less than one years old. 19 percent of the children had completed their first birthday. 53.8 percent of respondents are poor out of total respondents while only 22.4 percent of respondents are rich and 23.8 percent are middle class population (refer table-4.1). Entire North-East is rural as per the census, 2001, which states that almost 85 percent of north-eastern population lived in rural areas and only 15 percent of the population is urban. Similar result has been shown by NFHS-3, 2005-06. Percentage of both male and female children is almost equal; it clearly indicates that there is no sign of gender discrimination among the children. But this type of conclusion on the basis of mere data is invalid, because in North Eastern state, like Assam and among few tribes in the region, gender discrimination is common.

Table-4.1, Percentage distribution of under-five Children by Selected Characteristics

Age in month	Number of children	In Percent
<6	264	13.4
7 - 11	153	7.7
12 - 23	373	18.9
24 - 35	400	20.2
36 - 47	396	20.0
48 - 59	393	19.8
Gender		
Male	993	49.7
Female	1006	50.3
Wealth index		
Poor	1075	53.8
Middle	475	23.8
Rich	447	22.4
Type of place of residence		
Urban	298	14.9
Rural	1701	85.1
Religion		
Hindu	1009	51
Muslim	509	26
Christian	396	20
Other	78	4
Ethnic group		
Other	1054	66.4
ST	533	33.6
Mothers' educations		
No education	1029	52
Complete primary	832	42
Complete secondary	62	3
Higher	75	4
Mother currently working		
No	1510	75.8
Yes	483	24.2
Source of drinking water		
Unimproved	679	34.0
Improve	1319	66.0
Type of toilet facilities		
Unimproved	1091	54.7
Improve	905	45.3
When child put to breast		
within half an hour of birth	1001	71.8
within one hour of birth	285	20.4
within one day of birth	108	7.8

Source: - Calculated from NFHS-3 Children file, 2005-06

Percent of working women is very low in North-East India; only 24 percent of women are working and remaining 76 percent are currently non-working women. In the case of level of education, overall percentage of mothers with higher and secondary education is almost negligible since it comprises a small percent of the total respondents. While 42 percent is primary educated and 52 percent is illiterate.

Among the respondents, 34 percent are Scheduled Tribes and the remaining is shared by Scheduled Caste, OBC and others. According to the census, generally, North-Eastern states are highly dominated by tribal population. As far as religion is concerned, large proportion of respondents are Hindus at 51 percent. Followed by Muslims and Christians, other religions share is only 4 percent. Hindu and Muslim is generally high in states like Assam and Tripura. Sikkim also shows a high percent of population of followers of Hinduism while Buddhism also prevails in this region. Remaining states mostly follow Christianity. But the over all percentage of Hindus and Muslims in the region far exceeds that of Christians even though they occupy a larger area.

In North-East India source of water is better than rest of India; here 66 percent of children live in households where better access to safe drinking water is available, but 34 percent of children live without safe drinking water. While sanitation facilities are poorer than water facilities in North East India, 55 percent of children live without safe toilet facilities. Only 45 percent of children live with safe sanitation facilities.

Breast feeding status was better in North-East India, where 72 percent of children were initiated within half an hour of birth and 20 percent were initiated within one hour of birth, but only 8 percent of children were given breast milk within one day of birth.

Prevalence of Diarrhoea and Selected Background Characteristics

NFHS-3 collected data from mothers whether their children had diarrhoea or not, if children had diarrhoea then whether there was any sign of blood in stool or not. Diarrhoea without blood is considered as normal diarrhoea and diarrhoea with blood in stool will be dysenteric diarrhoea, because according to physicians and

international organisations like world Health Organisation (WHO), diarrhoea with visible blood in stool is indicator of dysenteric or chronic diarrhoea.

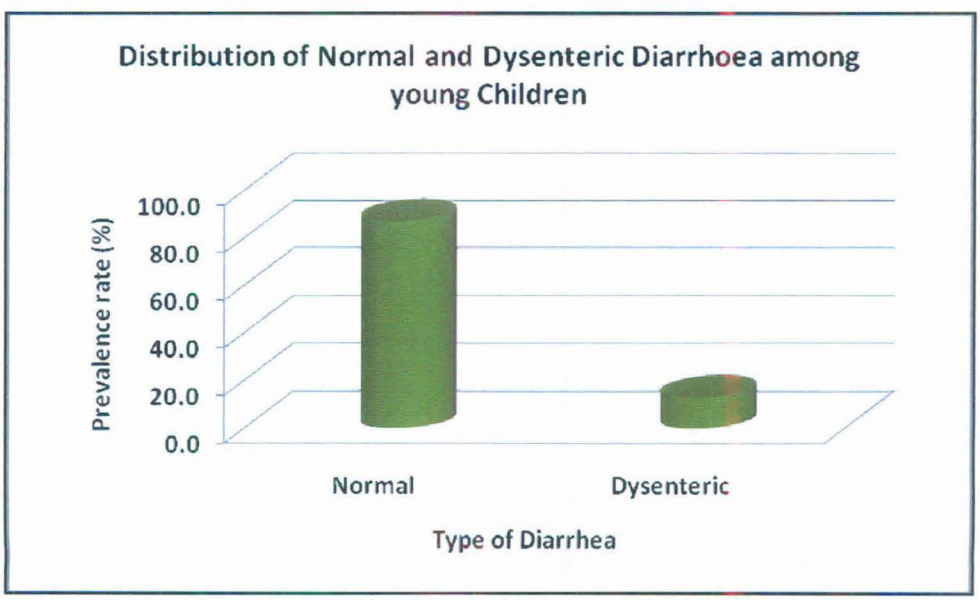
Table-4.2, Prevalence of Diarrhoea in North-East India, 2005-06

Categories	In Percent	Number of children
	Had diarrhoea recently	
no	91.7	1832
yes	8.3	167
Total	100	1998
	Blood in stool	
no	87.1	145
yes	12.9	22
Total	100	167

Sources: - Calculated from NFHS-3 Children file, 2005-06

In North-East India, out of 1998 children only 167 children (8.3%) were suffering from diarrhoea. Although, it did not show high prevalence of diarrhoea but any occurrence of diarrhoeal incident is question mark on region's health system and child's health status since it is a preventable disease and its treatment is easy and available and also it can be prevented at home too. And also any occurrence of dysenteric diarrhoea among children also creates serious issue in health system and socio-economic conditions of the region.

Chart-4.1



Out of 167 children, who had diarrhoea, 22 children (around 13%) had suffered from dysenteric diarrhoea in North-East India. 145 children (87%) had normal diarrhoea. Normal diarrhoea is common among the children as compared to dysenteric diarrhoea (refer chart-4.1), but we can't ignore dysenteric diarrhoea which targeted almost 13 percent of children who had diarrhoea.

This paper further discusses the distribution and association of diarrhoea with socio-economic, demographic and environmental background of children and mothers. Note that all the analysis evaluated is based on total prevalence of diarrhoea, there are not any separate analysis for dysenteric and normal diarrhoea since sample size for dysenteric diarrhoea is too small to analysis any statistical association with background characters. For analysis of statistical significance association between dependent and independent variables, sample size should be at least more than 30; if any sample size is estimated less than 30 it does not show any correct result.

A Univariate Analysis

Prevalence of Diarrhoeal Morbidity and Child's Age and Gender

Generally, less than five-years of age group of children is considered as more vulnerable for diarrhoea than adult. Look at the chart-4.2 which shows trends on prevalence of diarrhoea among the children (under five years of age) according to age specific group. Trends show that with increasing age in months prevalence of diarrhoea gradually decreases among young children.

Table-4.3, Prevalence of Diarrhoeal morbidity by Age and Gender, North-East India

	Prevalence of diarrhea		
Age in month	Total	male	female
<6	8.7	9.8	7.6
7 - 11	13.7	14.3	12.2
12 - 23	12.3	11.6	12.6
24 - 35	8.0	8.5	7.5
36 - 47	5.8	5.2	6.4
48 - 59	5.1	8.5	2.0
Total	8.3	9.1	7.4

Source: - Calculate from NFHS-3 Children file, 2005-06

Among all age group children under five, high prevalence of diarrhoea is found among the age group between 7 to 11 months and followed by the 12 to 23 months; it seems that less than 1 year child is more vulnerable to diarrhoea disease. 13.7 percent of children in the age group 7-11 months had diarrhoea and followed by 12.3 percent of children in the age group 12 to 23 months, as shown in table-4.3.

Chart-4.2

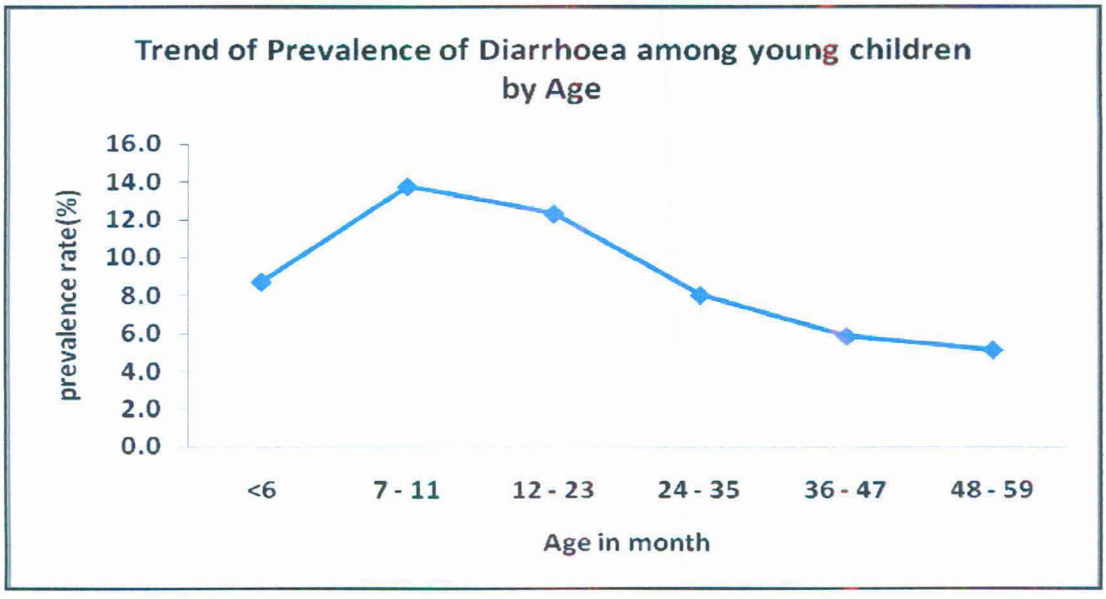
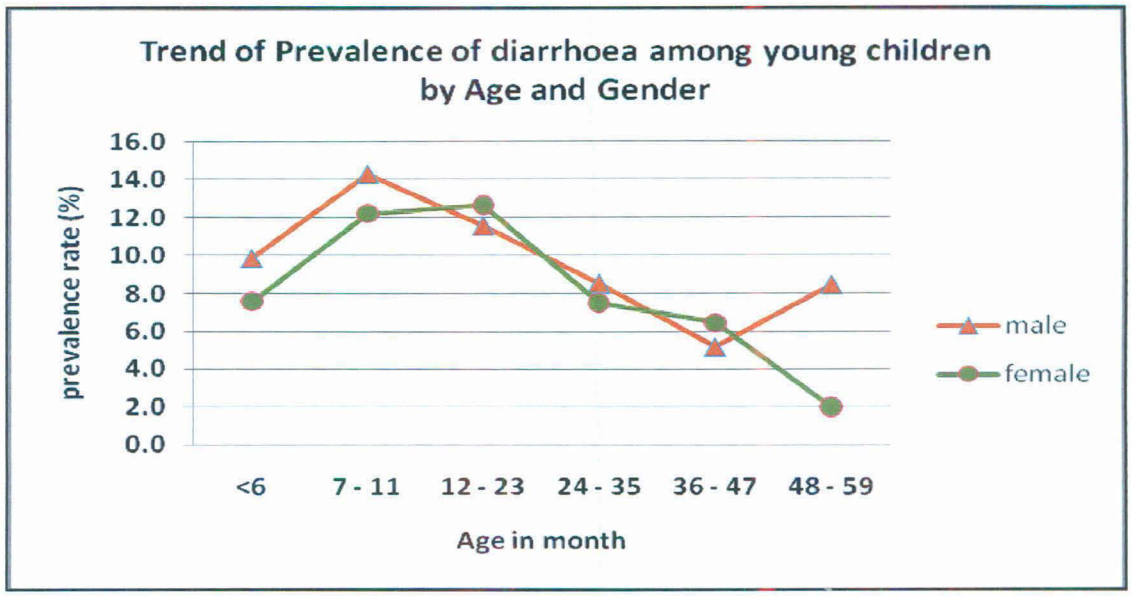


Chart-4.2 clearly shows that after six months of age incident of diarrhoea suddenly increases till 7 to 11 months (1 year of age), but after 1 year of age, we can see slow decline in the prevalence of diarrhoea.

The age-specific diarrhoeal morbidity among young children by gender is shown in table-4.2. Overall trend for diarrhoea via age is almost similar for both sexes (chart-4.3). For both, the male and females diarrhoea morbidity rate peaked at 7-11 and 12-23 months of age (one and two year of age). After 12-23 month of age it declines steadily for both sexes. But after 47 months of age, prevalence of diarrhoea among male children suddenly increases with increase in the age but prevalence of diarrhoea among female children is shows continuous decline with increasing age, it may be the effect of other confounding variables, which control the prevalence of diarrhoea among male children. In gender terms, in North-East India prevalence of diarrhoea among female children is less than male children.

Chart-4.3



Overall trend of diarrhoeal morbidity by age shows a gradual decline with increase in age in months. Similarly, in case of gender-age specific trend, trend is showing decline in prevalence of diarrhoea with increase in age. It seems that diarrhoea is more effectively affects younger age especially age group between 7 to 23 months of age.

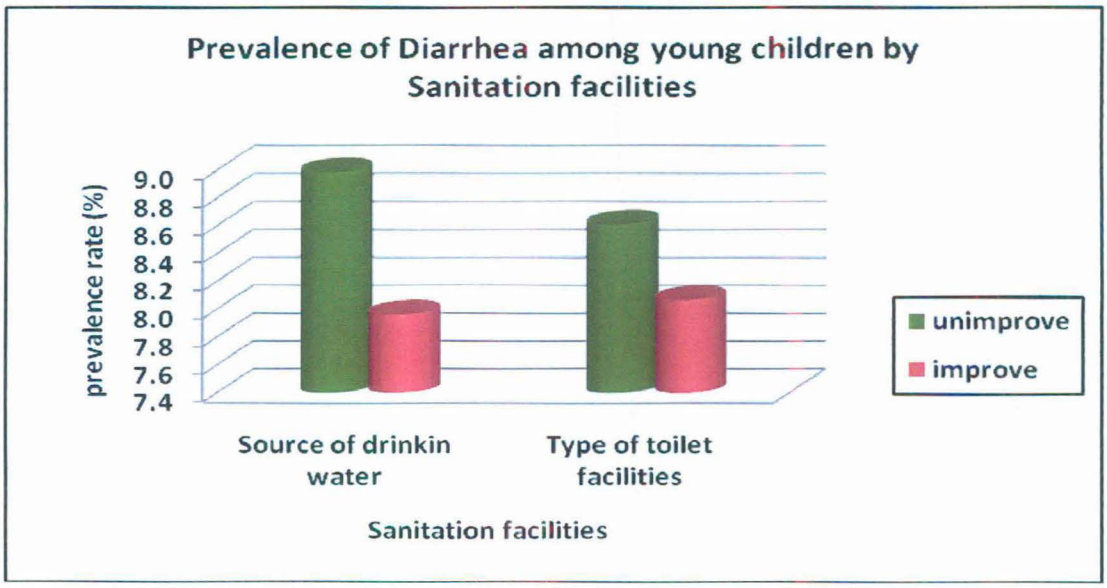
These findings regarding the age pattern of diarrhoeal morbidity are consistent with studies conducted in other developing countries, which show relatively higher diarrhoeal disease in the first two year of life. This pattern could be due to exogenous factors such as an increased exposure to contaminate weaning food in the second year of child's life, at an age when the immune system is weak in younger children than in older children.

Prevalence of Diarrhoeal morbidity among young children and sanitation facilities

Sanitation of household is good determinant of incidence of childhood infectious disease. Unhygienic condition of sanitation of household is considered as main source of infectious disease. Infact, sanitation is also a good indicator of socio-economic development of society as well as environmental factor. Of the several interventions that may reduce diarrhoeal morbidity and mortality rates, the improvement of water supply and excreta disposal facilities has attracted particular interest (S.A. Esrey et.al.,

1985). Use of safe toilet by all members of the community should reduce faecal contamination in surrounding environment of children. Both the water and toilet is also an immediate factor which causes diarrhoea.

Chart-4.4



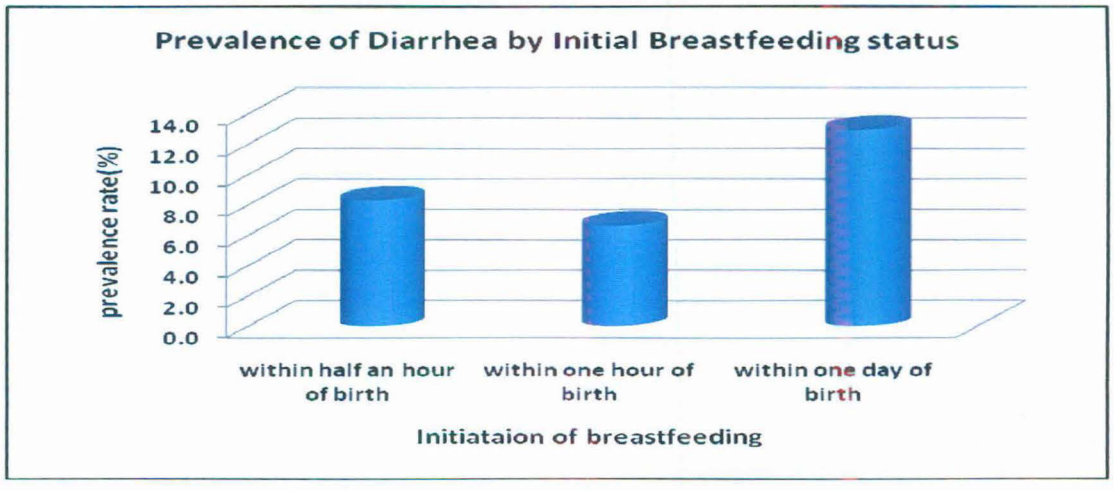
In North-East India, children living in households having safe drinking water sources and toilet facilities were less likely to be sick than children in households having unsafe water and toilet facilities (see chart-4.4).

Out of the total children who do not have access to safe drinking water, around 9 percent of children had diarrhoea while in households with access to safe drinking water the prevalence of diarrhoea is 8 percent, as shown in table-4.4. Similarly, respondents having unimproved type of toilet facilities have experienced high prevalence of diarrhoea among thier children; in such cases around around 8.6 percent of children had diarrhoea, while 8.1 percent of children of respondents had diarrhoea who have improved or safe type of toilet facilities are accessible.

Prevalence of Diarrhoeal morbidity among young children and initiation of breastfeeding

Breast feeding status of children is also an important factor which determined the prevalence of diarrhoea among young children. Infact, it play important role in preventing diarrhoeal infection.

Chart-4.5



Breastfeeding is behavioural as well as biological factor of mothers; there is general notion that if children are exclusively breastfeed till six month of age then probability of children to get exposed to risk is less, as compared to children who are not exclusively breastfeed. Similarly, initiation of breastfeeding also affects child's expose to risk. Generally, children to whom breastfeeding is initiated within half an hour of birth have less chance to get exposed to childhood illnesses like diarrhoea. The first breast milk (colostrums) is highly nutritious and has antibodies that protect the newborn from disease. Late initiation of breastfeeding not only deprives the child of valuable colostrums, but becomes a reason for introduction of prelacteal feeds (other than milk), that are potentially harmful and contribute to diarrhoea in the newborn (NFHS-3).

Data on North-East India reveals that children who were initiated breastfeeding within one hour of birth are less attacked by diarrhoea as compared to children who were initiated within half an hour of birth. Although highest percentage of prevalence of diarrhoea is found among those children who were initiated breastfeeding within one day of birth. As expected, children who are breastfeed within half an hour should be less likely to expose risk. But result shows that children who breastfed within one hour are less likely to be exposed to risk. There may be possibility that, children breastfed within half an hour may be those with poor housing facilities, worse sanitation facilities, poor dietary intake of mother during pregnancy and affects of some biological reasons etc. These confounding variables can promote the transmission of enteric pathogens. Thus, to see the independent effect of breastfeeding

and other variables on the occurrence of diarrhoea in children, the confounding variable must be controlled.

Table-4.4, Prevalence of Diarrhoeal morbidity among young children and socio-economic background

Background characteristic	Diarrhoea (%)
Wealth index	
Poor	8.3
Middle	8.8
Rich	7.8
Type of place of residence	
Urban	9.1
Rural	8.2
Religion	
Hindu	6.9
Muslim	11.8
Christian	7.1
Other	10.3
Ethnic group	
other	7.7
ST	9.2
Mothers' Educational	
no education	8.2
Complete primary	8.8
Complete secondary	9.7
higher	5.3
Mothers' Currently working	
No	7.9
Yes	9.7
Source of drinking water	
Unimproved	9.0
Improve	8.0
Type of toilet facilities	
Unimproved	8.6
Improve	8.1
Initiation of breast feeding	
within half an hour of birth	8.3
within one hour of birth	6.7
within one day of birth	13.0

Source: - Calculate from NFHS-3 Children file, 2005-06

Prevalence of diarrhoeal morbidity and socio-economic background of child's mother

It is widely recognized that exposure to diarrhoea pathogens in developing countries is conditioned by such factors as quality and quantity of water, availability of toilet facilities, housing condition, level of education, household economic status, place of residence, and the general sanitary conditions (personal and domestic hygiene) around the house (W. Gebremariam, 2001). In case of North-East India following socio-economic variables are adopted viz. sex of the child, wealth index, type of place of resident, level of education, mother currently working or not, religion and cast or tribe.

North-Eastern region is generally dominated by Christian religion, and followed by Hindu. Prevalence of diarrhoea among Christian and Hindu children is lower than other religions. Highest percentage of diarrhoeal incident is recorded in those who follow Muslim religion. Second highest is recorded among the other religions that includes Buddhist, Donyi Polo (local religion of Arunachal Pradesh) etc.

Prevalence of diarrhoea among tribal children is more than other castes that includes Schedule Caste, Other Backward Class and General. Among STs, 9.2 percent children alone are suffering from diarrhoea; while 7.7 percent of children of other castes are suffering from diarrhoea. As per the economic status of respondents is concerned, as compared to rural area urban areas have shown a high prevalence of diarrhoea among young children in North-East India.

In urban areas 9.1 percent of children have diarrhoea while 8.2 percent of rural children have diarrhoea. In the case of wealth index of respondents, children of middle class have experienced more diarrhoea than other classes with 8.8 percent and followed by poor class where 8.3 percent of children have diarrhoea, look at table-4.3. While among the rich, 7.8 percent of the children have diarrhoea out of the total rich children.

Various study conducted by many authors have strongly emphasized on the given mother related factors. Since, child under 5 years of age is directly related mother's social and economic status, mother's level of education and working status is directly affecting the children. In North-East India, out of the total children of non-educated

mother around 8.2 percent of children have diarrhoea, but highest prevalence of diarrhoea is found in among the children whose mothers have completed primary and secondary education, but prevalence of diarrhoea is significantly low with higher level of education. It seems that educational differences because behavioural differences affects the transmission of enteric pathogens. But there is also possible that mother with low educational attainments like secondary and primary education is associated with poor household and low sanitation and many other confounding factors, in to see independent effect of mother education these confound variables should be controlled.

In the case of working status of mother, in North-East India children of currently working mothers show high prevalence diarrhoea as compared to those children whose mothers are currently not working. There is possibility that type of work, time and sanitation facilities are associated with the high incidence of diarrhoeal morbidity among the children whose mothers are currently working.

A Logistic Regression Analysis

The relative influence of different socio-economic and intervention variables on the probability of a child having diarrhoeal morbidity is assessed in this section by binary logistic regression technique. A logit model is estimated on data for 9165 mother who had children below the age of 5 years. The dependent variable, diarrhoeal morbidity, of this equation (y) was coded as taking the value 1 for women *i* (Yi=1) if any of her under five age children had ever suffered an episode of diarrhoea in two weeks before the survey conducted by NFHS, and 0 (Yi=0) otherwise. And eleven explanatary variables viz., child age and gender, mother educational attainment and working status, household income, place of resident, ethnic group, sources of drinking water, type of toilet and breastfeeding; discussed in earlier chapter also used in analysis. Note that for logistic regression there is no need to normalise the data with women sample weight. All the processes of logistic regression are procceded without giving any weight.

Results present in table-4.5 show that the child's age is strongly associated with diarrhoeal morbidity and shows 1 percent of statistical significance, except two age group viz. 24-35 and 36-47 month of child. There was steady decline in the

probability of diarrhoeal morbidity with child's age; 36-47 month of children were 76 percent less likely than infant to become sick and this percentage declined further to 58 percent for 48-59 month old children, both this age groups are negatively correlated with incidence of diarrhoea (-0.270 and -0.541 respectively).

The gender variable had a negetive effect on probability of incidence of diarrhoea among female child. It is suggesting that female under five is less likely than male to get diarrhoea. It may primarily be attributed to biological differences, generally, female is biologically stronger than male, but it is statistically not significant nor it is stronly associated with the incidence of diarrhoea. The incidence of diarrhoea is positvely corelated with wealth index of mother or respondent but statistically insignificant for diarrhoeal incidence, but it also shows that with high income the probability of incidence of diarrhoea is less than with low income level. Interestingly, as per as he various studies are concerned it should be negative relation with the incidence of diarrhoea.

Interestingly, rural areas also show negativel correlaion with incidence of diarrhoea among young children which suggests that rural child is less likely to suffer from diarrhoea as compared to urban child, it is statistically significant (0.032 or 5 percent of significant level, 95% CI). Generally, we expect that rural child will be more prone to the risk of being exposed to diarrhoea as compared to the urban area. These responses and differences may be important for geographical targeting by policy makers. Rural-urban has their own background character which determines the diarrhoea among young children.

Incidence of diarrhoea is not showing any significant association with respondent's religion. Both the Muslim and Christian religion show negative relation with diarrhoea in North-East India, while other religions show positive relation with prevalence of diarrhoea among children. It suggests that children of other religions are more likely to suffer from diarrhoea as compared to children of Christians, Muslims and Hindus. 95 percent of Muslim children are more probable to suffer from diarrhoea than Hindu children. As per as ethnic group is concerned, ST children shows a negative relation with the diarrhoeal incidence among young children, but it is

statistically insignificant. Ethnic groups are not showing any association with diarrhoea.

As expected, mothers' level of education shows a negative effect on the diarrhoeal morbidity among young children in North-East region, where probability of children having diarrhoea is declining with increased higher education. After holding other variables, children whose mother have higher education (odd ratio = 0.659, 95 % CI) are less likely to get exposed to diarrhoea than children of lower educated mothers. Higher education shows a significant association with prevalence of diarrhoea among children, but other level of mothers' education like 'no education', 'primary' and 'secondary' education do not show any significant association with prevalence of diarrhoea among children. Mother's current working status also shows a significant association (odd ratio = 1.246, 95% CI) with diarrhoeal incidence among young children, but it bring forth a positive relation with incidence of diarrhoea among young children, it suggests that children whose mothers are currently working are more prone to suffer from diarrhoea then children whose mothers are currently not working.

It is little surprising that a relatively safe source of drinking water did not show significant association with the incidence of diarrhoea among young children, although this is considered to have negative relation with diarrhoeal incidence (look at the table-4.5). It may be that the ways of water-use in homes are more important than source of safe water. Even water that is pure at its source may become polluted as it passes through the damage pipelines (Arif and Ibrahim, 1998). Similarly, if unclean or polluted water is properly treated at home (by methods like boiling) then it becomes completely safe to drink.

As expected, toilet facilities reveals a negative correlation with the incidence of diarrhoea, children living in household with safe toilet facilities are less likely to be suffering from diarrhoea as compared to children who are living at household having unsafe toilet facilities. But like source of drinking water, it also does not show any statistically significant association with diarrhoea. Apparently, in terms of controlled diarrhoea toilet facilities seem to be more important than water supply in North-East India.

Table-4.5, Logistic Regression Effect of Predictors on Diarrhoeal Morbidity Among Children Under-Five, NFHS-3 2005-06

Background character	B	Exp(B)	Sig.
Age in Month			
< 6 [R]			0.000
7 - 11	0.564	1.757	0.003
12 - 23	0.468	1.596	0.003
24 - 35	0.233	1.262	0.154
36 - 47	-0.270	0.763	0.123
48 - 59	-0.541	0.582	0.004
Sex of Child			
Male [R]			
Female	-0.114	0.893	0.199
Wealth Index			
Poor [R]			0.583
Middle	0.117	1.124	0.334
Rich	0.125	1.133	0.388
Type of Place of residence			
Urban [R]			
Rural	-0.228	0.796	0.032
Religion			
Hindu [R]			0.087
Muslim	-0.044	0.957	0.804
Christian	-0.181	0.834	0.227
Other	0.193	1.213	0.292
Cast or Tribe			
Other [R]			
ST	0.009	1.009	0.948
Mothers' educations			
No education [R]			0.180
Complete Primary	-0.043	0.958	0.680
Complate Secondary	-0.305	0.737	0.181
Higher	-0.419	0.658	0.054
Mother Currently working			
No [R]			
Yes	0.220	1.246	0.020
Sources of drinking water			
Unimproved [R]			
Improve	0.109	1.115	0.258
Type of toilet facilities			
Unimproved [R]			
Improve	-0.116	0.890	0.268
When child put to breast			
Within half an hour of birth [R]			0.029
Within one hour of birth	0.250	1.284	0.022
Within one day of birth	0.272	1.313	0.089

R – is show the reference variable

Initiation of breast milk demonstrates a significant association with diarrhoeal incidence among young children. It shows more and more positive correlation with late initiation of breast feeding after the birth of child. After holding other confounding variables, independent effects of initiation of breastfeeding is strongly associated with diarrhoea, children who are feed within one hour (odd ratio = 1.284, 95% CI) of birth are more likely to be suffering from diarrhoea as compared to children who are fed within half an hour of birth. And children who fed with one day of birth but not within an hour of birth (odd ratio = 1.313, 90% CI) are more likely to be suffering with diarrhoea as compared to children who are fed within one hour of birth.

Treatment and Prevention of Diarrhoeal Morbidity among Young Children and Socio-Economic Factors

Since diarrhoea is the main childhood illness worldwide, its treatment and prevention is found worldwide especially in less developed countries. There are various treatments and prevention suggested by policy makers, physicians and other health worker. Many of the treatments on diarrhoea can be practiced at home; just the need is to train mothers about how to treat diarrhoeal disease at home.

Pathogenic organism of diarrhoea is directly related to good hygiene and safe sanitation practices at home. Many of the studies reveals that safe drinking water, safe toilet facilities, washing hands (after defecation or disposing of faeces and before preparing food or eating), feeding clean food (weaning food) and also feeding child plenty of food at the time of diarrhoea to prevent dehydration and malnutrition, safe disposal of faeces etc. are important hygiene practices at home that can prevent incidence of diarrhoea among children.

Recently many policy makers and health workers or physicians strongly emphasized the use of Oral Rehydration Therapy with Oral Rehydration salt at home. They also advice mothers that if children have any diarrhoea then mothers should visit physician or other health workers to treat diarrhoea before it becomes dysenteric diarrhoea, which causes severe diarrhoea and also causes mortality among young children. Other treatments for diarrhoea is advised by physicians or health workers or world health organizations are giving child zinc supplement, Anti-diarrhoeal drug, Antiemetics and

antimicrobials for dysenteric diarrhoea (it should be used only after visiting physicians and health workers).

NFHS-3 published data covering- feeding practices during diarrhoea, medical treatments, received any treatment for diarrhoea, given oral rehydration salt and other therapies for diarrhoea, disposal of child's stool, zinc supplement, Antibiotic pill and injection, Antimotility, herbal medicine, etc. Uses of antibiotic, antimotility and herbal medicines need consultation from doctor. In North-East India it is found that zinc supplement was not given to children who had diarrhoea. So, in this paper only few variables have been selected for further analysis; they are feeding practice during diarrhoea, availability of medical treatment to child, whether received any treatment for diarrhoea and given Oral rehydration.

This section discusses the association between socio-economic background of child's mother and selected treatment or prevention used by mother. Before, discussing on treatment or prevention of diarrhoea and the background characteristics, I would like to highlight the mother's alertness on immediate sought to treatment for diarrhoea after her child is found suffering from diarrhoea in North-East India and place where she first sought for treatment of Diarrhoea.

A Univariate Analysis

Mother's Awareness on Immediate Treatment for Diarrhoea Day after Child had Diarrhoea

Mothers play an important role which determines the incidence of diarrhoea and treatment or prevention of diarrhoea among young children. Although many treatments and preventions of diarrhoea are available and it can easily be obtained from physicians, health workers and drug store, but mothers' awareness is more important for treatment of infected children from diarrhoea, not only that, infact, awareness of mother about child health determines the incidence and treatment of all diseases. So, technique's effectiveness and performance of health facilities largely depends on use or participation of mothers (H. Mosley, 1982).

NFHS-3 collected data from 92 children (in weight cases) whether mothers sought for advice or treatment day after diarrhoea was detected in their children. Table-4.6

shows the number of children whose mother sought advice or treatment for diarrhoea day after diarrhoea occurred in their children. Out of 92 children 71.7 percent of children's mother sought treatment for diarrhoea on 1 or 2 days after child had diarrhoea, while only 12 percent of children's mothers sought advice on same day. Overall, in North-East India, mothers are well aware about diarrhoea. As per as rural-urban is concerned, both rural and urban mothers are well aware about diarrhoea, because maximum number of mothers whose children had diarrhoea sought treatment for diarrhoea within 2 days.

Table-4.6, Day After Diarrhoea Sought Advice or Treatment, North-Eastern Region of India

Place of resident	Day after diarrhea sought advice or treatment				
	Same day	1-2 day	3-4 day	After 5 day	Total
Urban	17.6	64.7	11.8	5.9	100
Rural	10.7	73.3	12.0	4.0	100
Total	12.0	71.7	12.0	4.3	100

Sources: self calculate from NFHS-3 Children file, 2005-06

At the state level also, we see almost in all states of North-East India, mothers sought treatment at first and second day of occurrence of diarrhoea, although very small percent of mothers sought treatment for diarrhoea on the same day of occurrence of diarrhoea in their children. Very small percent of mothers sought after treatment after 5 days, except Arunachal Pradesh where 13 percent of mothers report that they sought treatment for diarrhoea after 5 days of occurrence of diarrhoea; in this case Arunachal is followed by Sikkim where 7.5 percent of mothers have sought treatment for diarrhoea five day after its occurrence.

This shows poor alertness of mother son diarrhoeal disease as compared to other states, may be it the reason these two states have shown a high prevalence of diarrhoeal morbidity among young children.

Among all states, Meghalaya and Nagaland is showing better awareness among mothers on diarrhoea and its treatment, where 28 and 30 percent of mothers sought treatment or advice for diarrhoea on same day of occurrence of diarrhoea in their children respectively, look at the table-4.7.

Table-4.7, Day After Diarrhoea Sought Advice or Treatment by State-wise

State	Day after diarrhea sought advice or treatment (%)			
	Same day	1-2 day	3-4 day	After 5 day
Sikkim	25.0	42.5	25.0	7.5
Arunachal Pradesh	17.8	60.0	8.9	13.3
Nagaland	30.3	51.5	15.2	3.0
Manipur	19.7	66.7	11.1	2.6
Mizoram	3.3	63.3	30.0	3.3
Tripura	23.1	66.7	10.3	0.0
Meghalaya	28.1	66.7	0.0	5.3
Assam	5.9	75.0	14.7	4.4

Sources: self calculate from NFHS-3 Children file, 2005-06

First place to seek treatment for Diarrhoea

NFHS-3 (2005-06) collected data on mothers' response to health system, where mothers whose children had suffered from diarrhoea first sought for treatment of diarrhoea. This type of data is useful to know how much and which health system mothers are trusting more for treatment of diarrhoea. This type of analysis helps to understand the response of people to the health system and further helps in policy implemention.

In public sector all the government or municipal hospitals, government dispensaries, community health centers, primary health centers, sub-centers, camps, mobile hospitals and other public medical sector are included; and on the other hand, in private sector all private hospitals, pharmacies, drugstores, private doctors, clinics, private peramedics, hakims, homeopethics, etc are included; and in the case of other places sought are shops, traditional healers, friends and relatives, etc.

Table-4.8, Place First Sought for Treatment of Diarrhoea, North-East India, 2005-06

Place of residence	Place first sought treatment for diarrhoea			
	Public sector	Private sector	Other	Total
Urban	23.5	70.6	5.9	100
Rural	36.0	58.7	5.3	100
Total	33.7	60.9	5.4	100

Sources: - Calculated from NFHS-3 children file, 2005-06

Taken together- the Public, Private and other places- irrespective of place of residence, around 61 perecnt of mothers of diarrhoea infected by children first sought treatment in private sector and only about 34 perecnt sought treatment in public sector, but the share of other places is only 5.4 percent (look at the table-4.8 and chart-6).

Chart-4.6

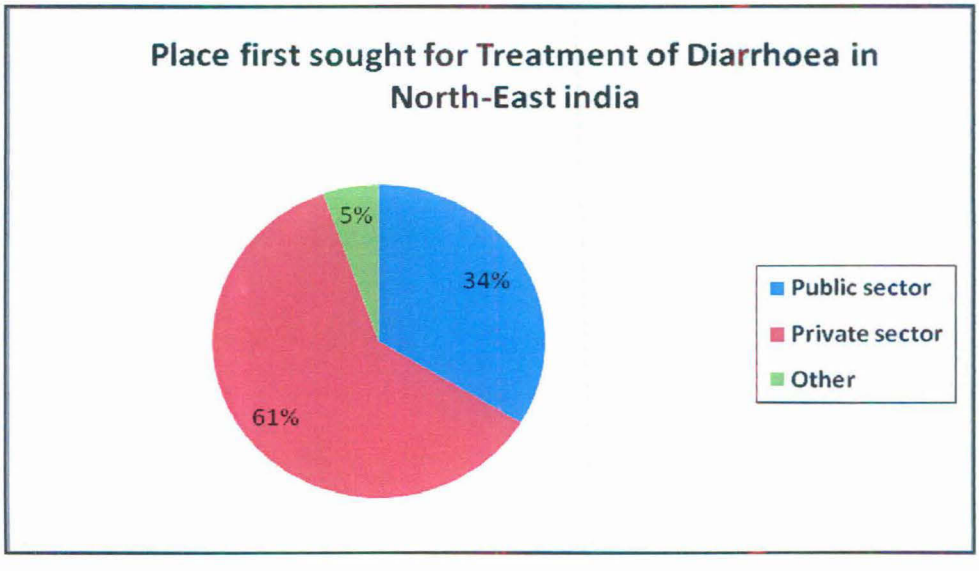


Chart-4.7 and chart-4.8 show that the percentage share of all places sought for treatment of diarrhoea by infected children's mothers in rural and urban respectively.

Chart- 4.7

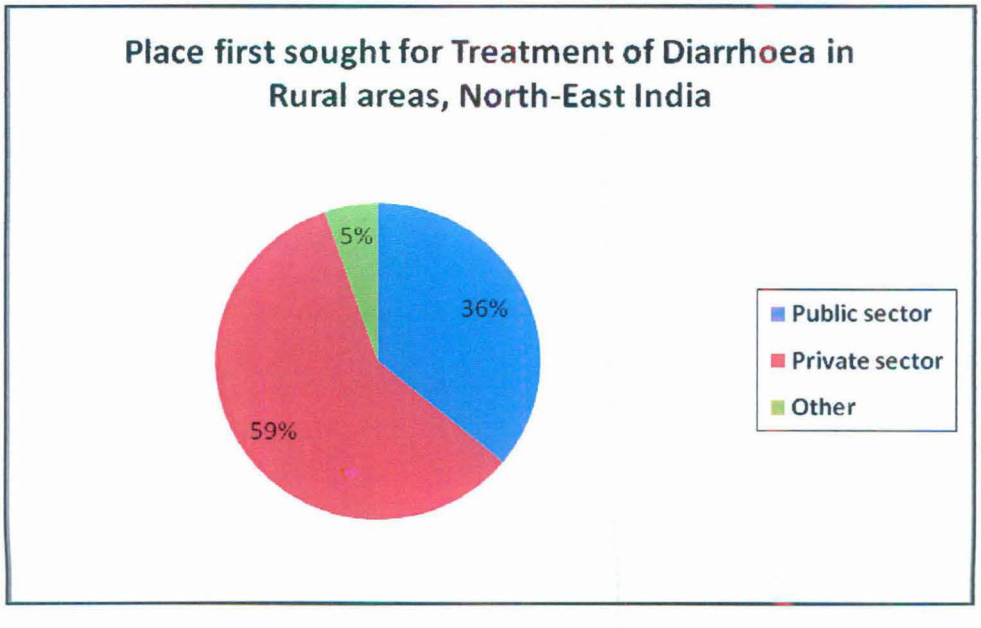
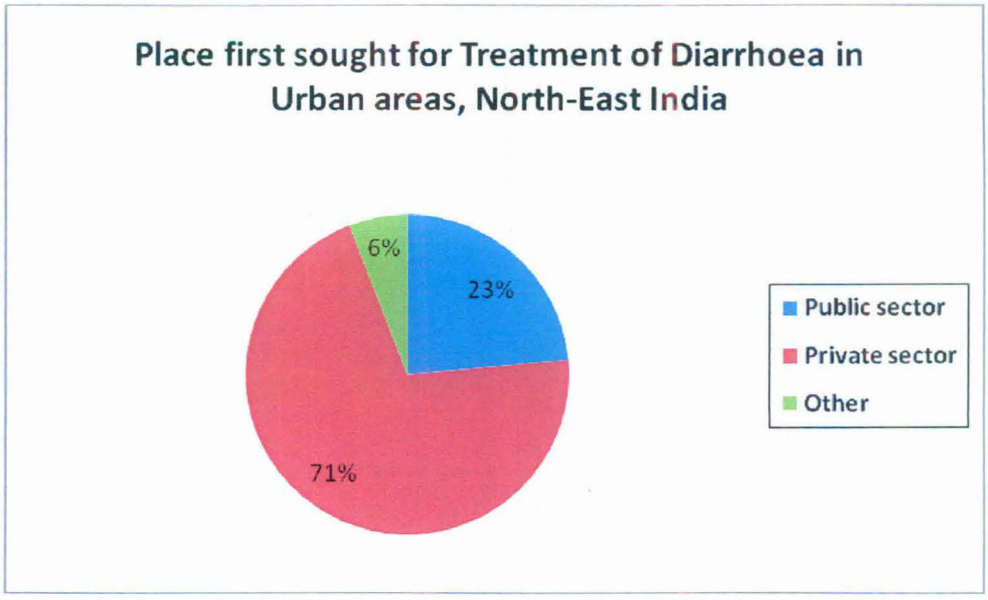
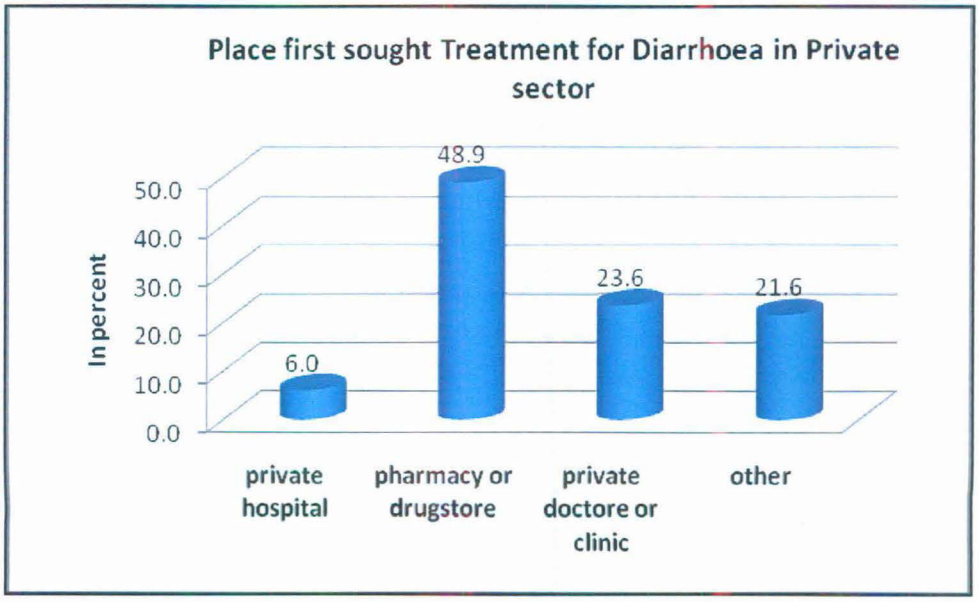


Chart 4.8



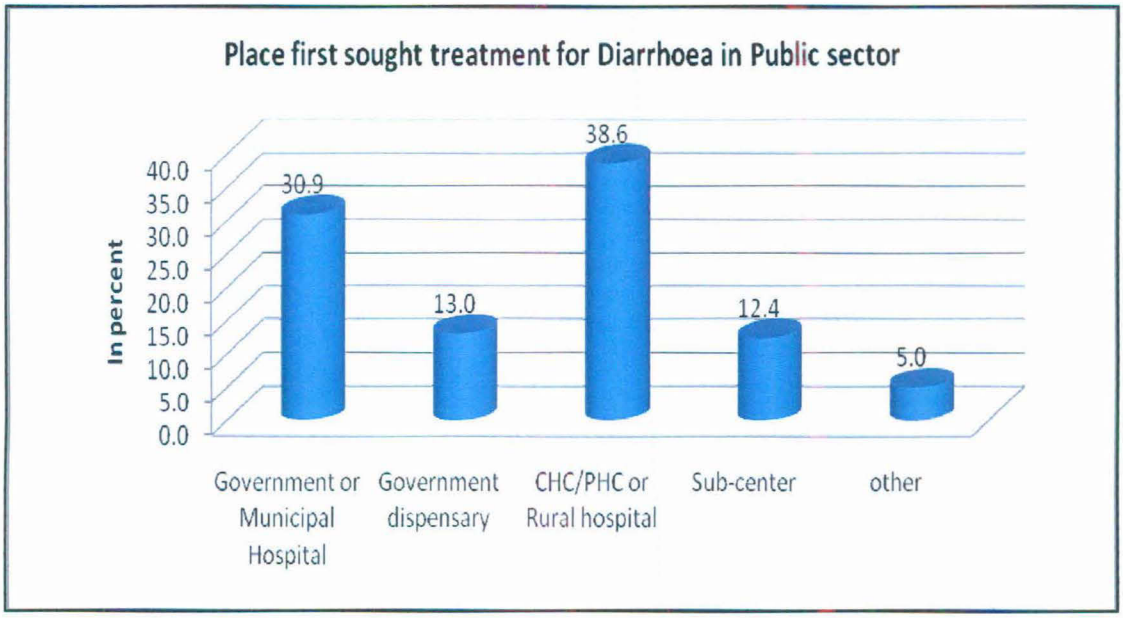
In rural areas 59 percent of infected children's mothers sought treatment for diarrhoea in private sector whereas in urban areas 71 percent of infected children's mothers first sought treatment for diarrhoea in private sector. It seems in both rural and urban areas, private sector is performing well than public sector in North-East India and thus, has gained people's confidence. Besides the public and private sectors, there are also mothers seeking treatment for diarrhoea in other places but it shares a very small percentage.

Chart-4.9



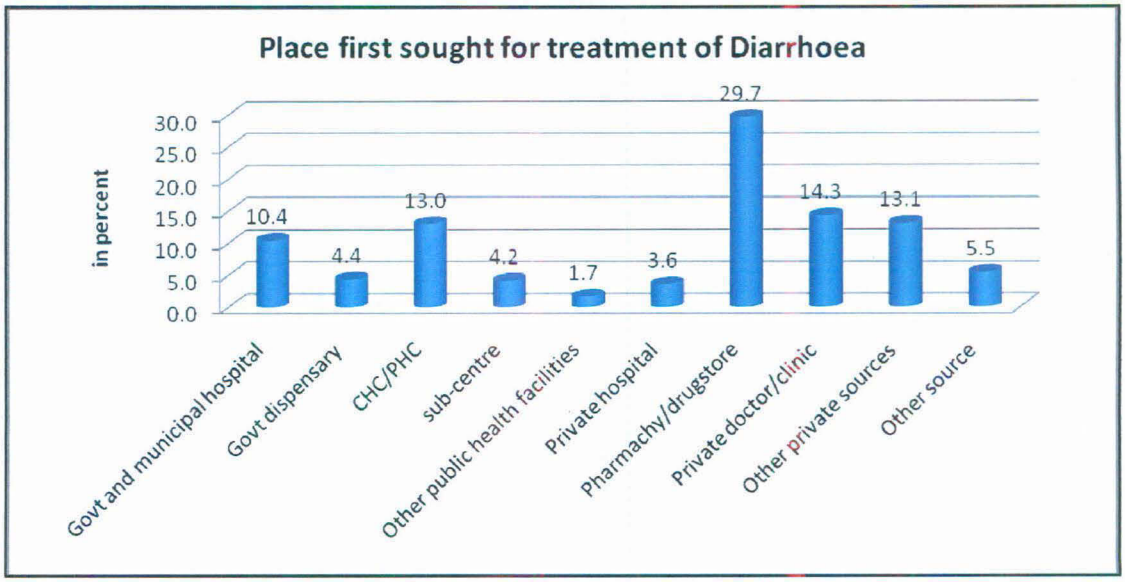
In both rural and urban more percent of infected children's mothers sought treatment for diarrhoea in private sector as compared to public sector. In the private sector, mothers prefer drug store or pharmacy the most. According to NFHS-3, around 49 percent of sick children mothers have first sought treatment in private pharmacy or drug store. While only 6 percent of children were taken to private hospitals, 24 percent of children were taken to private doctors or clinics and remaining were taken to other sources, look at chart-4.9. Interestingly, mothers have not preferred to go health advisors like doctors for the treatment of their children for diarrhoea.

Chart-4.10



In the public sector, 31 percent of children were taken to government or municipal hospitals. Generally, in municipal hospitals only urban children were taken since they are situated in urban places, whereas in the case of rural areas, there are community health centres, primary health centres, sub-centres, etc. on the basis on population. According to NFHS-3, out of total public sector approximately 39 percent of children were taken to CHC/PHC or rural hospitals, remaining 13 percent were taken to government dispensaries, around 12 percent to sub-centres and only 5 percent in other sources, please chart-4.10.

Chart -4.11



When we club all private and public places of treatment together to compare them on the criteria of 'first place of preference for treatment by mother for diarrhoea', we find that pharmacy and drug store (29.7 %) are the most seek after place by diarrhoea suffering child's mother in the North-Eastern region. After that it is private doctors and clinics (14.3 %); followed by other private sources (13.1 %) in private sector and CHC/PHC (13.0 %) in public sector. The least preferred place for treatment by mothers is 'other public health facilities' (1.7 %) as shown in the chart 4.11.

Feeding Practices during Diarrhoea

The quantity of food given to child has a strong impact on the duration of diarrhoea. A child who is given less food during an episode of diarrhoea is three times more likely to suffer from long diarrhoea compared with a child who is given the same or more food (CIET org.). So, mothers have always been encouraged to treat their child who suffering from diarrhoea by increasing their fluid intake and continuing to feed them normally. This practice prevents malnutrition among children which can further lead to severe diarrhoea (dysenteric diarrhoea with blood in stool) among children.

In NFHS-3 to assess knowledge of proper treatment practices, mothers whose child is suffering from diarrhoea within the two weeks preceding the survey were asked about the relative amounts of fluids and foods given to the child during the diarrhoea episode. Specifically, these mothers were asked whether the amount of food and

fluids given to the child when he/she was sick with diarrhoea were more than usual or same as usual or somewhat less than usual or much less than usual or fluid and food was stopped. In this paper, it is categorised in four parts viz. Stop food, less than usual, same as usual and more than usual, as already mentioned in earlier chapter.

Table-4.9 shows the percentage distribution of children in the age group of 0 to 59 months who had diarrhoea and their feeding practices according to background characteristics of children and mothers. As overall, in North-East India, only 7 percent of children who had diarrhoea were given more fluid than the usual amount of fluid to drink and only 0.9 percent, ignorable percent, of children who had diarrhoea were given more food than usual amount of food to eat. Well, half of children who had diarrhoea were given same amount of fluid and food as they usually consume, as 59.1 percent of children were given fluid as usual and 51.7 percent of children were given food as usual. In North-East India mothers emphasized more on fluid to drink than on solid food to eat.

But critical issue is that more than 30 percent of children who had diarrhoea were given fluid to drink less than usual, but more gloomy findings is in the case of amount of food offered to child. More than 40 percent of children who had diarrhoea were given less than usual food intake, which in turn might affect the nutrition status of the child and can further lead to dysenteric diarrhoea among children. Almost 3 (2.7%) and 4 (3.5%) percent of children who had diarrhoea were not given anything to drink and eat respectively.

As per the background characteristics are concerned, differentials in the proportion of children receiving increased fluid and food with respect to background characters is very limited, such as among various age groups almost 50 percent of children of each age group were given fluid and food as usual to consume, but there are no children who were given food more than usual and few children were given fluid more than usual. And as far as gender differential is concerned in North-East India, gender discrepancy is almost ignorable, both male and female were fed almost with similar amount. Infact, data is showing that females were fed better than males.

Table-4.9, Percentage Distribution of Children who had Diarrhoea by Amount of Fluid and Food taken according to Background Characteristics

Background character	Amount offer to drink (in %)				Amount offer to eat (in %)			
Age in month	nothing	offer less	as usual	offer more	nothing	offer less	as usual	offer more
<6	4.2	16.7	75.0	4.2	13.0	39.1	47.8	0.0
7 - 11	0.0	35.0	60.0	5.0	0.0	45.0	55.0	0.0
12 - 23	4.3	41.3	47.8	6.5	2.2	45.7	52.2	0.0
24 - 35	0.0	21.9	65.6	12.5	6.1	42.4	51.5	0.0
36 - 47	4.3	30.4	56.5	8.7	0.0	39.1	60.9	0.0
48 - 59	0.0	40.0	55.0	5.0	0.0	52.4	47.6	0.0
Gender								
Male	1.1	35.2	57.1	6.6	3.3	46.7	48.9	1.1
Female	4.0	26.7	62.7	6.7	4.0	40.0	54.7	1.3
Wealth index								
Poor	2.2	32.6	60.7	4.5	2.2	49.4	48.3	0.0
Middle	4.8	28.6	59.5	7.1	4.8	38.1	57.1	0.0
Rich	2.9	31.4	54.3	11.4	5.7	37.1	54.3	2.9
Type of place of residence								
Urban	3.7	37.0	48.1	11.1	3.7	48.1	48.1	0.0
Rural	2.9	30.0	61.4	5.7	3.6	42.9	52.9	0.7
Religion								
Hindu	2.8	35.2	54.9	7.0	4.2	40.8	53.5	1.4
Muslim	0.0	30.5	67.8	1.7	1.7	48.3	50.0	0.0
Christian	7.1	25.0	50.0	17.9	6.9	48.3	44.8	0.0
Other	11.1	22.2	55.6	11.1	1.0	2.0	5.0	0.0
Ethnic group								
Other	2.4	31.7	57.3	8.5	3.7	43.2	51.9	1.2
ST	4.2	29.2	58.3	8.3	4.2	37.5	58.3	0.0
Mothers' education								
No education	1.2	32.9	61.2	4.7	2.4	45.9	51.8	0.0
Complete primary	5.5	31.5	53.4	9.6	5.5	43.8	49.3	1.4
Complete secondary	0.0	14.3	71.4	14.3	0.0	16.7	83.3	0.0
Higher	0.0	25.0	50.0	25.0	0.0	33.3	66.7	0.0
Currently working								
No	3.4	30.3	60.5	5.9	4.2	44.2	50.8	0.8
Yes	2.2	32.6	56.5	8.7	2.2	41.3	54.3	2.2
Total	2.7	31.2	59.1	7.0	3.5	43.9	51.7	0.9

Sources: - Calculate from NFHS-3 Children file, 2005-06

All other background characters show similar results, there are not any major differences coming out because of the background characters, except '*level of mother's education*' where 25 percent of children whose mothers have received higher education have given fluid more than usual for consumption. But, in the case of amount of food offered, level of mother's education is also not showing any effective variations in feeding practices. May be this all is affected by confounding factors which affects the child's feeding practices. To see the independent effect of mother's education, confounding factors must be controlled.

Percentage Distribution of children who had received Medical Treatment, Any Treatment and Oral Rehydration Salt (ORS) for Diarrhoea according to Socio-economic Background

As it's already mentioned in earlier chapter that very small percent of children who had diarrhoea received medical treatment for diarrhoea in North-East India, while some or the other treatment for diarrhoea is universally given in whole of North-Eastern region, but it is lower than the rest of India in terms of percentage. Almost 70 percent of children have been treated by some available source of treatment for diarrhoea, while remaining 30 percent of children who suffered from diarrhoea did not receive any treatment at all, it show a very critical health conditions among children. On the other hand, only 38 percent of children have received medical treatment and only 25 percent were given ORS.

Table-4.10, Treatment of Diarrhoea in North-East India, 2005-06

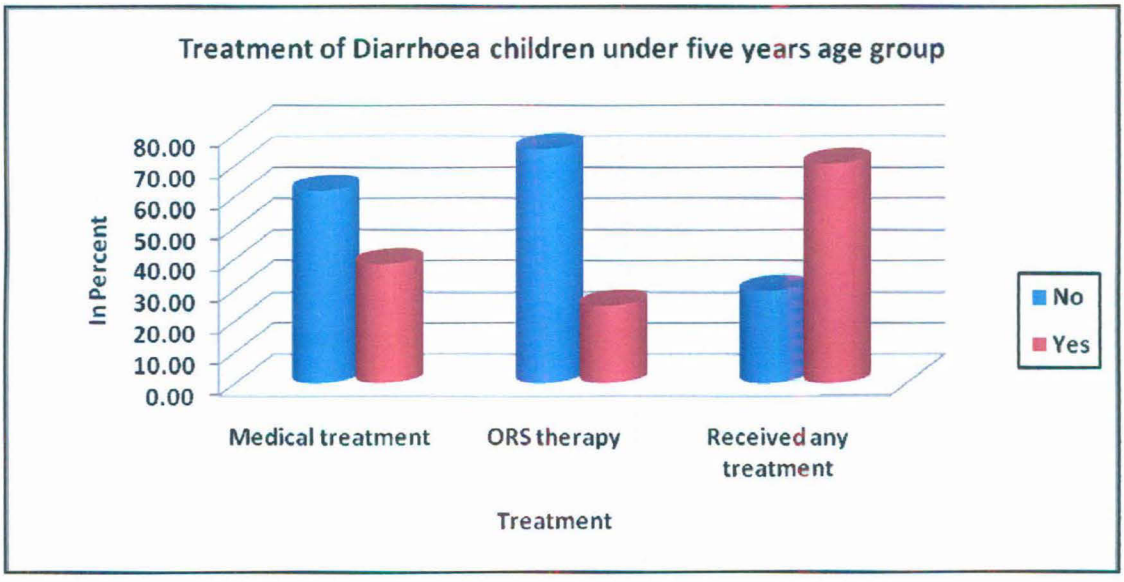
Medical treatment	In Percent	Number of children
No	61.76	103
Yes	38.24	64
Total	100	167
ORS therapy		
No	75.2	125
yes	24.8	41
Total	100	167
Received any treatment		
No	29.6	49
Yes	70.4	117
Total	100	167

Source: - Calculated from NFHS-3 Children file, 2005-06

Table-4.10 shows the number of children who have received or not received treatment medical treatment or ORS therapy or any treatment for diarrhoea. And also look at the chart-4.12. All results suggest that in North-East India large percent of children have received one or the other treatment for diarrhoea whether it was medical or homemade medicines. Around 70 percent of children received treatment for diarrhoea but 30 percent of children remain deprived of any treatment for diarrhoea. But medical and ORS treatment remained less among the children.

Table-4.11 show the percentage of children who had diarrhoea and received any treatment or medical treatment or oral rehydration salt (ORS), according to background socio-economic and demographic characters.

Chart-4.12



- ***Medical treatment***

Advice or treatment was sought from health providers or medical sources for only 38 percent of children who had diarrhoea. Among background characters of children, 50 percent in the age group of 7 to 11 months were taken for medical treatment, it may be because this age group is highly affected by diarrhoeal incidence. In the case of gender, male has received more medical attention than his female counterpart. Household income is showing significant affect on medical treatment, where good wealth status is showing better treatment from medical sources.

Table-4.11, Distribution of Treatment for Diarrhoea by Medical Treatment, ORS and Any Treatment

Background characteristics	Treatment of Diarrhea		
Age in month	**Medical treatment**	**ORS**	**Any treatment**
<6	39.1	13.0	60.9
7 - 11	50.0	23.8	70.0
12 - 23	34.8	22.2	72.7
24 - 35	34.4	34.4	78.1
36 - 47	41.7	30.4	65.2
48 - 59	33.3	20.0	75.0
Sex of child			
Male	40.7	28.3	75.6
Female	35.5	21.1	63.2
Wealth index			
Poor	32.6	16.9	61.4
Middle	42.9	32.6	78.6
Rich	45.7	37.1	82.9
Type of place of residence			
Urban	48.1	40.7	80.8
Rural	36.4	22.1	68.3
Religion			
Hindu	41.4	25.7	72.5
Muslim	35.0	18.3	68.3
Christian	32.1	34.5	69.0
Other	55.6	37.5	75.0
Ethnic group			
Other	38.3	21.0	65.4
ST	34.7	34.7	68.8
Mothers' educations			
No education	33.3	18.8	62.7
Complete primary	41.7	28.8	76.4
Complete secondary	50.0	50.0	100.0
Higher	75.0	50.0	100.0
Currently working			
No	39.5	21.7	71.4
Yes	34.0	31.9	67.4
Total	38.2	24.8	70.0

Source: - Calculated from NFHS-3 Children file, 2005-06

Similarly, children who live at urban areas received more medical treatment than their rural counterpart. Mother's level of education is also showing significant affect on medical treatment of diarrhoea. The table 4.11 shows medical treatment of diarrhoea

for children increase with mothers' level of education. But, mothers' working status is showing interesting features that mothers who are currently working, there 34 percent of children were given medical attention, while mothers who are not working currently show slightly higher percentage of children receiving medical attention with 39.5 percent. It may be confounding variable which affects the mothers' working status and medical treatment of diarrhoea.

- ***Knowledge and use Oral rehydration Salt (ORS)***

Diarrhoea leads to death through dehydration. ORT is a potential effective treatment that has been promoted widely for children with diarrhoea throughout the developing world, beginning in the late 1970. Since then oral rehydration therapy became corner stone of programme for control of diarrhoeal disease worldwide. Under the RCH programme ORS is supplied in the kits to all sub-centres in the country every year. Oral Rehydration Therapy (ORT) involves the replacement of fluids and electrolytes lost during an episode of diarrhoeal illness. Under oral rehydration therapy programme Oral Rehydration Salt (ORS) packets are made widely available and mothers are taught how to use them. ORS packets are available with Anganwadi Workers in the villages as well as with the ANM.

Table-4.12, Mother's Knowledge and Use of ORS

Categories	Total children under 5 age group whose mother heard of ORS	Total number of children who had diarrhea, whose mother heard of ORS	Given ORS to child who had diarrhea, whose mother heard of ORS	Total children who had diarrhea were given ORS irrespective of mother heard of ORS
in number				
No	487	30	95	125
Yes	1506	136	41	41
total	1993	167	136	167
in percent				
No	24.4	18.2	69.7	75.2
Yes	75.6	81.8	30.3	24.8
total	100	100	100	100

Sources: self calculate from NFHS-3 Children file, 2005-06

NFHS-3 asked mothers of children born during the five years preceding the survey a series of questions about their knowledge and use of ORS. See the table-4.12, out of total children whose mothers were interviewed whether she heard of ORS or not irrespective of diarrhoeal incidence, around 76 percent of children's mother have heard of ORS, on the other hand, among the children who had diarrhoea around 82 percent of children's mother have heard of ORS. Among these 82 percent of children who had diarrhoea and whose mother have heard of ORS only 30 percent of children were given ORS, this shows poor performance in use of ORS in North-East India. Among all children who had diarrhoea irrespective of whether mother knows about ORS or not around only 25 percent of children were given ORS in North-East India.

As far as background characteristics are concerned, see the table-4.8, it shows similar results as '*medical treatment*' and '*received any treatment*' for diarrhoea because diarrhoea infected children better and higher educated mothers, children belonging to households with highest wealth index, urban children, male children, sick children of women who are currently working, etc. are more likely to receive ORS.

Among ethnic groups, interestingly ST Children are more likely to receive ORS than other ethnic groups, including SC, OBC, and Generals, etc. Use of ORS packets is lower among the Hindus, Muslims, Christians and other religions, while 50 percent of children of Buddhist and Donyi polo religious were given ORS.

- ***Received any treatment***

'Receiving any treatment' for diarrhoea is universal in all background characteristics of children and mothers as compared to other treatments like medical treatment and ORS therapy. In other words, one or the other type of treatment was provided to all diarrhoea affected children irrespective of their backgrounds and their mothers' background. In case of secondary and higher educated of mothers, 100 percent of children have received some or the other treatment for diarrhoea.

Among all the religious groups, only 68.9 percent children suffering from diarrhoea from Muslim community have received any treatment. Religion plays a critical role among all background characteristics of children and mothers. On the criteria of sex

of the children, male children have received better attention than females. 82.9 percent of the rich children were given some or the other treatment for diarrhoea while only 61.4 percent of poor children receive any treatment for diarrhoea and remaining children who had diarrhoea did not receive any treatment for diarrhoea.

A Logistic Analysis

Here, we have used binary logistic regression to model the relationship between treatment of diarrhoea and socio-economic variables. For treatment of diarrhoea three seperated dependent variables viz 'any treatment', 'medical treatment' and 'ORS were taken' and three separate logit model are estimated for each dependent variable. Dependent variables were defined as dichotomous (received or not received). A model is calculated on sample size of 860 children who had diarrhoea were given 'any treatment', 'medical treatment' and 'ORS' with eight explanatory variables viz. child's age and sex, mother's education level and current working status, household's income, place of resident, ethnic group, religion, etc.

The dependent variable, 'any treatment' or 'medical treatment' or 'ORS', of this equation (y) is coded as taking the value 1 for children *i* (Yi=1) if he/she received 'any treatment' or 'medical treatment' or 'ORS' for diarrhoea during an episode of diarrhoea in two week before the survey was conducted by NFHS, and 0 (Yi=0) otherwise. Detail coding of all dependent and independent variables is already discussed in chapter three.

- ***Recieved Medical treatment for Diarrhoea***

In the case of *'received medical treatment'* only two variables show significant association with medical treatment for diarrhoea among children viz. level of mother's education and religion. Level of mother's education show positive and significant correlation with medical treatment for diarrhoea. It suggests that children of higher educated mothers (odd ratio = 2.789, 95% CI) are more likely to recieve medical treatment for diarrhoea, it shows that probability to recieve medical care for treatment increases with increase in the level of mother's education.

On the other hand,when it comes to religion, we see that some religions like Muslims and Christians negetively correlate with medical treatment for diarrhoea, while other religions (including Buddhist, Donyi Polo, Sikh, Jain, Parsi Zoroastrain etc.) show positive relation but not showing any significant association with medical treatment for diarrhoea. Only Christians show 5 percent of significant level (95% CI) with negetive relation and 53 percent less probability to go for medical treatment as compared to Muslim.

Among other socio-economic variables, currently working status of mothers show negetive relation but statistically not associated with medical treatment for diarrhoea among children. Gender of child and place of resident also show negetive correlation with medical treatment but did not show any statistically significant relation with medical treatment for children with diarrhoea. Similarly, wealth index and ethnicity of children show positive relation with medical treatment but it also did not show any significant association with medical treatment of children with diarrhoea.

After 2 year of age or 12 to 23 months of age, children probability of recieving medical treatment is gradually declining but this also shows positive relation with medical treatment. In the age group of 48-59 months, children are showing negative correlation. But any of these age-specific group is not showing any significant relation with medical treatment for children who had diarrhoea.

- ***Given ORS to Children***

The result shown in table-4.13 shows that the child's age is strongly associated with ORS treatment for diarrhoea. The age group of 12-23 and 24-35 months showa a high probability of recieving ORS for diarrhoea treatment (100% CI). After 35 months of age, probability of treatment by ORS shows steady decline. The gender variable shows negative effect on the treatment of diarrhoea by ORS, it suggests that 91 percent of female children are less likely to recieve ORS treatment for diarrhoea as compared to her male counterparts, but did not show any statistical relation with ORS treatment for diarrhoea.

Table-4.13, Logistic Regression on Treatment of Diarrhoeal Morbidity and Socio-Economic Variables, NFHS-3 (2005-06)

Background character	Medical treatment			ORS			Any Treatment		
	B	Exp(B)	Sig.	B	Exp(B)	Sig.	B	Exp(B)	Sig.
Age in Month									
< 6 [R]			0.569			0.001			0.000
7 - 11	0.205	1.227	0.506	0.420	1.522	0.238	0.620	1.859	0.052
12 - 23	0.280	1.322	0.293	1.118	3.058	0.000	1.230	3.421	0.000
24 - 35	0.215	1.239	0.439	1.223	3.396	0.000	1.301	3.675	0.000
36 - 47	0.033	1.033	0.914	0.887	2.428	0.009	0.808	2.244	0.009
48 - 59	-0.197	0.821	0.553	0.818	2.267	0.024	0.678	1.970	0.040
Gender									
Male [R]									
Female	-0.065	0.937	0.672	-0.098	0.907	0.540	-0.061	0.941	0.716
Wealth Index									
Poor [R]			0.632			0.004			0.000
Middle	0.189	1.208	0.355	0.456	1.578	0.038	0.635	1.888	0.002
Rich	0.157	1.170	0.482	0.784	2.191	0.001	0.876	2.402	0.000
Type of Place of residence									
Urban [R]									
Rural	-0.166	0.847	0.338	-0.031	0.969	0.862	-0.057	0.945	0.774
Religion									
Hindu [R]			0.002			0.118			0.342
Muslim	-0.045	0.956	0.874	0.005	1.005	0.986	0.321	1.379	0.303
Christian	-0.624	0.536	0.016	-0.665	0.514	0.016	-0.375	0.687	0.174
Other	0.295	1.343	0.326	-0.538	0.584	0.105	-0.263	0.769	0.426
Ethnic Group									
Other [R]									
ST	0.091	1.095	0.714	0.799	2.223	0.003	0.395	1.484	0.135
Mothers' educations									
No edu. [R]			0.027			0.006			0.003
Complete Pri.	0.334	1.397	0.065	0.415	1.514	0.029	0.417	1.517	0.030
Complete Sec.	0.556	1.743	0.135	0.453	1.573	0.239	1.441	4.224	0.011
Higher	1.026	2.789	0.004	1.278	3.591	0.001	1.434	4.194	0.007
Mother Currently working									
No [R]									
Yes	-0.110	0.896	0.499	-0.154	0.857	0.363	-0.226	0.798	0.204

R – is show the reference variable

Again mother's working status and place of resident show negative correlation and not any significant association with treatment for diarrhoea by ORS. While ethnic group and wealth index show positive and significant association with ORS treatment for children who had diarrhoea. Rich children are more likely to received ORS (odd ratio = 2.191, 99% CI) treatment for diarrhoea as compared to middle and poor household children. Thus, probability of receiving ORS for diarrhoea among children improves with better wealth status. Mothers who have completed primary education (odd ratio = 1.514, 95% CI) and higher education (odd ratio = 3.591, 99% CI) show statistical significant and positive corelation with ORS treatment for diarrhoea. But children's whose mothers have completed secondary education although show positive relation and more probability to received ORS therapy but it does not show any statistical significance.

In the case of religion, Christians and other religions show negetive corelation, while only Christian show statistically significant association with ORS treatment for diarrhoea. Muslims show positive relation with ORS therapy, Muslims are more likely to received ORS therapy for diarrhoea as compared to other religions.

- ***Received any Treatment for Dairrhoea***

Table-4.13 shows that among all variables, age of the children, wealth index and level of mother's education are significantly associated with *'any treatment'* which are given to children for diarrhoea.

Among age-goups, each age-group has shown positive co-efficient with 'any treatment' for diarrhoea, 12 to 23 months and 24 to 35 months of children have more probability to receive any treatment for diarrhoea as compared to other age-groups (100% CI). After 24 to 35 months of age probability of 'any treatment' gradualy decreases with increase in age, it is because diarrhoeal incidence decreases with increase in age of the children. Gender variables have shown negetive effect on the probability of receiving 'any treatment' for diarrhoea, it suggests that female under five years of age who had diarrhoea are less likely to receive 'any treatment' as compared to her male counterpart, but result on gender is not showing any significant association with receiving 'any treatment' for diarrhoea.

Working status of mother do not show any significant association with recieving 'any treatment' for diarrhoea, it shows negetive relation with 'any treatment'. It means that the probability of receiving 'any treatment' for diarrhoea among young children whose mothers are currently working is lower than those children whose mothers are not presently working, it may be primarily attributed to time-management problem among currently working women. But level of mother's education shows significant and positive relation with receiving 'any treatment' for diarrhoea. Probability of children to receive any treatment for diarrhoea has increased with high level of education of mothers.

Similarly, wealth status of mother also shows a significant and positive association with the children who had diarrhoea and received 'any treatment' for it. It demonstrate that rich children are more likely to receive any treatment for diarrhoea (100% CI) as compared to middle and poor children. Well, all income groups show 1 percent of significance level (99% CI). Rural children show negetive corelation with 'any treatment' for diarrhoea, it suggests that rural child are less likely to receive 'any treatment' as compared to urban children, but it not show any significant association with receiving 'any treatment' for diarrhoea.

Among religious groups, Christian and other religious groups are negatively correlated with recieving 'any treatment' for diarrhoea. This suggests that children of that religious group are less likely to receive 'any treatment' for diarrhoea as compared to other religions. But religion is not showing any significant relation with receiving 'any treatment' for diarrhoea. Similarly, ethnic background of respondents does not show any significant association with receiving 'any treatment', although it shows a positive correlation with recieving 'any treatment' for diarrhoea.

Summary

Univariate analysis provides the percentage distribution of diarrhoea among the children under-five age-group, it provides descriptive statistic on predictor variable. It only shows the gross effect or result and does not control the influence of other variables in the analysis and hence, the effects are ignored. On the other hand, logistic regression shows net effect of predictor variable on response variables and it shows

significant association between dependent variables and independent variables after controlling confound variables. It helps us to understand the independent effect of predictor variable on response variables.

Our study of logistic regression analysis on North-East India suggests that as in other developing countries, North-East India has also been affected by socio-economic background. Age of the children is significantly associted not only with incidence of diarrhoea among the children but also associated with treatment of diarrhoea, as it common in younger age-group. But in North-East India age of the children is not showing any significant association with medical treatment for diarrhoea, but it is significantly associated with other treatments like ORS and receiving 'any treatment' for diarrhoea.

But unlike, other backward regions, gender of children is not playing any significant association with both incidence and treatment of diarrhoea in North-East region of India. Although, it shows that female child is less likely than male child to get diarrhoea and are negatively correlated with diarrhoeal incident. But on the other hand, female child is less likely to get treatment than her male counterpart and but it again do not show any statistical significance in North-East India.

As far as other socio-economic factors are concerned, mother's level of education is showing significant association with both the incidence and treatment of diarrhoea among children, like in other developing countries. As Henry Mosley, Natalya Bilenko, Drora Fraser, Lechaim Naggan, Issaka Kanton Osumanu, etc, who have been researching child survival from morbidity and mortality in developing countries, concluded that mother's understanding of risk outcome plays an important role to determine the chances of child survival. They have strongly emphasized on mother's education which can help mother to mitigate risk outcome among diarrhoea children. Unlike mother's education, working status of mother is not showing any significant effect on diarrhoea, while it is positively associated with incidence of diarrhoea but negatively associated with treatment of diarrhoea.

In the case of other socio-economic variables, only place of residence indicates significant association with incidence of diarrhoea, with negative relation it suggests

that in North-East India urban areas' children have more probability to suffer from diarrhoea as compared to rural. But place of residence do not show any significant association with treatment of diarrhoea. Remaining factors like household income (wealth index), ethnicity and religion have not show significant association with incidence of diarrhoea. Wealth index and ethnicity of children show positive relation. Among religions, Muslims and Christians show negative while Hindus and others show a positive relation. Interestingly probability of suffering from diarrhoea is higher among rich children as compared to lower income children. In this study we found that wealth index, although it not significantly associated with incidence of diarrhoea but it is significantly associated with treatment of diarrhoea, especially, with ORS and 'any other treatment' except medical treatment.

In North-East India, as this study suggests, mothers are more likely to treat her child at home, very little percent of mothers seek medical treatment for diarrhoea and ORS treatment is also lower. Child breast feeding status shows better in North-East India where more than 70 percent of children were given breast milk within half an hour of birth, it is statistically significant for incidence of diarrhoea. As far as environmental factor is concerned source of drinking water do not show any significant association and also shows a positive relation with diarrhoea, that is why Arif and Ibrahim said that water storage condition is more important than source of water, water may come from safe water source but it can be contaminated if it not stored in proper way.

Limitations of the study

There are certain limitations in this paper; some of the important limitations are given below:

- Small sample size of data has created hindrance in adopting appropriated method.
- Small sample size on diarrhoea with blood in stool also handicapped us from analyzing the crucial disease like dysenteric diarrhoea which is highly prevalent in North-East India than rest of India.

- Lack of data on zinc supplement; although NFHS-3 has provided data on zinc supplement it use was totally ignorable, so, sample size is very small to analyze.
- Lack of data on hand-wash practice by mothers; it is literally as well as biomedically important to prevent the incidence of diarrhoea.
- Lack of data on quality of water use in household for drink; it is more important than source of water as predictor to determine the incidence of diarrhoea among the children.

Chapter Five

Conclusion

Conclusion

In this paper, we examined the socio-economic variables including some demographic and environmental factors and its effect on the prevalence of diarrhoea and the treatment for under-five year children in North-East India for year 2005-06 with the help of available data of NFHS-3. This study adds to our understanding on affects of socio-economic and environmental behaviour over prevalence and treatment of diarrhoea among children. However, our hypothesis could not be fully established; the overall picture drawn from this study has several implications for controlling the diarrhoea disease among children in North-East India.

This study finds that out of total children whose mothers were interviewed for diarrhoea whether their child had diarrhoea or not in last two weeks before the survey, 8.3 percent of children were found to have diarrhoea and 13 percent of them were suffering by dysenteric diarrhoea.

Although treatment for diarrhoea is universalise in North-East states with 70 percent of them receiving some treatment for diarrhoea, but 30 percent still have not received any treatment for diarrhoea, which is very crucial point of this study. Child with diarrhoea should be treated with some treatment, because it is easily available in many place like drug stores, pharmacy, health-worker, etc., infact, treatment of diarrhoea also can be initiated and practiced at home by the mothers.

Despite several policies been implemented on Oral Rehydration Therapy countrywide through RCH or NRHM in every district of India, still very small percent of children have actually received ORS solution in North-East India. Shockingly, only 25 percent of children who had suffered diarrhoea were given ORS solution in this region. Although 76 percent of mothers had heard about diarrhoea in the North-East states but more crucial is that out of 82 percent of children who had suffered from diarrhoea and whose mothers knew about ORS, only 30 percent were actually given ORS therapy. Performance of ORS scheme is very poor in this region. Similarly, very small percent

of children who had diarrhoea were taken for medical treatment in North-East India, within the options available for medical treatment mothers in this region generally prefer to go to public sector for treatment.

Since private sector has performed better than public sector in India, similar results have been recorded in North-East India as well, 61 percent of diarrhoea infected children's mothers had sought treatment in private sector, while only 34 percent has sought treatment in public sector and remaining were treated from other sources.

In private sector, people are more likely visit private drug store or pharmacy and very little percent of mothers prefer to go to doctors or health advisors, because of high fee demanded by private doctors, since majority of people in North-East India are poor. Although government of India has provided free health treatment for every person and even government has provided dispensary for people. But very small percent of children are taken to public health care and dispensaries. Problem is that despite implementation of National Health Policy in every state, since its first implementation in 1982 in North-East India, it is still far from the basic aim or objective. Shortfall of health workers other great lacuna and people often face scarcity of medicine in government dispensaries; thereby, indirectly forcing people buy medicine from private pharmacy.

As far as socio-economic, environmental, child-age and gender is concerned, the overall study on North-East India and existing literature on developing countries suggest that child's age and gender has significant effect on the prevalence and treatment of diarrhoea, but in North-East India, results show that only age of child has significant effect on prevalence of diarrhoea, not only that this is also significantly associated with treatment of diarrhoea. The risk of having diarrhoea reaches its peak between 7 to 11 and 12 to 23 months of age, it is the period when child is given weaning food, later it decrease with older age. More attention should be focussed on the children under 3 years of age and weaning food which is given to child during this period of time.

Low risk of diarrhoea among young children who were fed within half an hour after birth as compare to child who were fed within one hour after birth clearly indicates

the protective effect of breast-feeding practice of mother. Our results show significant association between prevalence of diarrhoea and initiation of breast-feeding. Although, immediate breast feeding after birth can help to reduce the prevalence of diarrhoea, but in North-East India high percent of prevalence of diarrhoea is recorded among children who were given breast-milk within half an hour after birth as compared to those children who were given milk within one hour after birth. The Government of India recommends that initiation of breastfeeding should begin immediately after child birth, but Government should also focus on the other confounding factors with initiation of breastfeeding, since prevalence of diarrhoea is very high among the children who were given breast milk immediate after birth.

Surprisingly, Sanitation facilities and source of drinking water did not show any significant association with prevalence of diarrhoea as expected, but sanitation facilities show negative relation with prevalence of diarrhoea. The children, who lived at household with better sanitation, are less likely to be exposed to diarrhoeal disease. Toilet facilities in North-Eastern states are far from the satisfactory where only 45 percent of children lived in household with access to safe toilets in their household and 66 percent of children lived in household with safe drinking water source. But, contrary to expectation, safe drinking water source did not show any significant association and also show positive correlation with prevalence of diarrhoea. It may due to the quality of water which is use in household and broken pipelines. Undoubtedly, North-East India accounts for more prevalence of diarrhoea among the children who lived in household with unsafe drinking water but more attention should be paid on water storage patterns within house.

Mother's level of education is another important determinant of diarrhoea among children under five-year age-group which significantly associates with both the prevalence of diarrhoea and its treatment. Probability of occurrence diarrhoea among children is decreasing with increase in the level of mother's education and probability of getting better treatment for diarrhoea is increasing with the increase in mother's level of education. The matter of concern is that in North-East India percentage of mothers with high education is very low, it is almost negligible. Also, the highest percentage of children with diarrhoea whose mothers completed secondary education

is even higher than primary and illiterate mothers; it may be confounding variables which bound the effect of mother education on diarrhoea.

Other socio-economic variables don't show any significant association with prevalence of diarrhoea. But some of it has statistically significant association with treatment of diarrhoea like wealth index, religion, and ethnicity etc.

Children who with live in rich households are more likely to get medical, ORS and any other treatment. As we already discussed above that mother are more likely to go to private sector for treatment, from here it clear that rich child has received better treatment for diarrhoea as they are able to buy medicine and pay for better treatment, while poor can't buy any medicine or unable to get better treatment from doctor, most of them are treated at home. In India, a huge infrastructure already exists for providing health care services. But facilities are not properly utilized because of various reasons. The primary reasons are the lack of community participation and poor quality of services leading to low utilization of health facilities and other reason is difficult geographical terrain and scattered population (Tekhre, Y.L. et al. 2004). On the other hand, the private sector demands very high fee which only rich people can afford.

Among religious groups, as our study suggest that only Christians are showing negative relation with all type of treatments viz. Medical, ORS and any other treatment. But none of all these religious groups viz. Hindu, Muslim, Christian and other religious, is strongly associated with the prevalence of diarrhoea as well as its treatment. Schedule tribe is showing positive relation with both the prevalence of diarrhoea and its treatment.

Unlike expectation, gender of the child does not show any significant association with diarrhoea, females are less likely to be exposed to diarrhoea but males get better treatment in comparison to his female counterparts. Biologically, female has more capability to fight infectious disease as compared to male, but main area of concern is treatment where female is less likely to taken for treatment; it is the factor which indicates the gender discrimination in North-East India.

On the other hand, as far as place of residence is concerned rural children is less likely to be exposed to diarrhoea as compared to urban areas but rural areas correlate with treatment of diarrhoea. Mother's working status also shows negative relation with treatment of diarrhoea but do not show any significant association.

All our study suggest that mother's level of education and child's age are the most important areas of concern since these two are significantly associated with both the prevalence of diarrhoea and its treatment. Immediate initiation of breast-feeding also displayed significant association with prevalent of diarrhoea, it can be vital in reducing the prevalence of diarrhoea. Other treatments or preventions of diarrhoea like feeding practices during diarrhoea, normal or usual feeding during diarrhoea is common vis-a-vis all the socio-economic backgrounds. But the main and critical point is that very less percentage of mothers feed or offer more fluid and food intake to their children during diarrhoea. Mother should be encouraged to feed more food and fluid during diarrhoea. There are no any major differentiates found among the all the socio-economic background. It is also seen that in North-East India mothers are offering more fluid during diarrhoea than solid food.

While it is widely recognised that diarrhoea is a major cause of child morbidity and mortality and it is affected by several socio-economic, environmental and behavioural factors, but there has rarely been conducted any study on North-East India by any scholar. There is a number of information available from documents and data, published by Government of India and some institutions or organisations. But this study only provides retrospective perspective. And also, since the sample size is small for analysis within state level, the research is incapable to highlight the proper behaviour of socio-economic, environmental factors over prevalence of diarrhoea among children within the states. This overall estimation of prevalence and treatment of diarrhoea on North-East India as whole only useful for adoption and implementation of health policies or programmes for North-Eastern state as a whole not for within the states, this type of study underpins the urgent need of socio-economic development and health care within states and overall.

Appendices

Appendix - I

Logistic Regression of Background Characteristic on Prevalence of Diarrhoeal Morbidity

Background characteristic	B	S.E.	Wald	df	Exp(B)	Sig.
Age in Month						
< 6 [R]			68.376	5		0.000
7 - 11	0.564	0.188	9.019	1	1.757	0.003
12 - 23	0.468	0.160	8.585	1	1.596	0.003
24 - 35	0.233	0.163	2.033	1	1.262	0.154
36 - 47	-0.270	0.175	2.383	1	0.763	0.123
48 - 59	-0.541	0.188	8.291	1	0.582	0.004
Sex of Child						
Male [R]						
Female	-0.114	0.088	1.648	1	0.893	0.199
Wealth Index						
Poor [R]			1.079	2		0.583
Middle	0.117	0.121	0.933	1	1.124	0.334
Rich	0.125	0.144	0.747	1	1.133	0.388
Type of Place of residence						
Urban [R]						
Rural	-0.228	0.106	4.574	1	0.796	0.032
Religion						
Hindu [R]			6.575	3		0.087
Muslim	-0.044	0.178	0.062	1	0.957	0.804
Christian	-0.181	0.150	1.460	1	0.834	0.227
Other	0.193	0.183	1.110	1	1.213	0.292
Cast or Tribe						
Other [R]						
ST	0.009	0.144	0.004	1	1.009	0.948
Mother level of education						
No education [R]			4.885	3		0.180
Complete Primary	-0.043	0.105	0.170	1	0.958	0.680
Complete Secondary	-0.305	0.228	1.790	1	0.737	0.181
Higher	-0.419	0.218	3.712	1	0.658	0.054
Mother Currently working						
No [R]						
Yes	0.220	0.095	5.375	1	1.246	0.020
Sources of drinking water						
Unimproved [R]						
improve	0.109	0.097	1.279	1	1.115	0.258
Type of toilet facilities						
Unimproved [R]						
improve	-0.116	0.105	1.228	1	0.890	0.268
When child put to breast						
Within half an hour of birth [R]			7.057	2		0.029
Within one hour of birth	0.250	0.109	5.261	1	1.284	0.022
Within one day of birth	0.272	0.160	2.900	1	1.313	0.089
Constant	-2.243	0.209	115.179	1	0.106	0

R – is show the reference variable

Appendix – II

Logistic Regression on Background Characteristics on Medical Treatment

Background characteristics	B	S.E.	Wald	df	Exp(B)	Sig.
Age in Month						
< 6 [R]			3.864	5		0.569
7 - 11	0.205	0.308	0.442	1	1.227	0.506
12 - 23	0.280	0.266	1.106	1	1.322	0.293
24 - 35	0.215	0.277	0.600	1	1.239	0.439
36 - 47	0.033	0.306	0.012	1	1.033	0.914
48 - 59	-0.197	0.332	0.352	1	0.821	0.553
Gender						
Male [R]						
Female	-0.065	0.153	0.179	1	0.937	0.672
Wealth Index						
Poor [R]			0.917	2		0.632
Middle	0.189	0.205	0.856	1	1.208	0.355
Rich	0.157	0.224	0.494	1	1.170	0.482
Type of Place of residence						
Urban [R]						
Rural	-0.166	0.173	0.918	1	0.847	0.338
Religion						
Hindu [R]			14.662	3		0.002
Muslim	-0.045	0.287	0.025	1	0.956	0.874
Christian	-0.624	0.259	5.783	1	0.536	0.016
Other	0.295	0.301	0.964	1	1.343	0.326
Ethnic Group						
Other [R]						
ST	0.091	0.247	0.134	1	1.095	0.714
Mothers' educations						
No education [R]			9.206	3		0.027
complete Primary	0.334	0.181	3.400	1	1.397	0.065
complate Secondary	0.556	0.372	2.234	1	1.743	0.135
Higher	1.026	0.359	8.173	1	2.789	0.004
Mother Currently working						
No [R]						
Yes	-0.110	0.163	0.456	1	0.896	0.499
Constant	-0.667	0.325	4.210	1	0.513	0.040

R – is show the reference variable

Appendix – III

Logistic Regression on Background Characteristics on Oral Rehydration Salt

Background characteristics	B	S.E.	Wald	df	Exp(B)	Sig.
Age in Month						
< 6 [R]			21.477	5		0.001
7 - 11	0.420	0.356	1.393	1	1.522	0.238
12 - 23	1.118	0.303	13.576	1	3.058	0.000
24 - 35	1.223	0.314	15.182	1	3.396	0.000
36 - 47	0.887	0.342	6.739	1	2.428	0.009
48 - 59	0.818	0.361	5.127	1	2.267	0.024
Gender						
Male [R]						
Female	-0.098	0.159	0.375	1	0.907	0.540
Wealth Index						
Poor [R]			11.077	2		0.004
Middle	0.456	0.220	4.307	1	1.578	0.038
Rich	0.784	0.236	11.031	1	2.191	0.001
Type of Place of residence						
Urban [R]						
Rural	-0.031	0.181	0.030	1	0.969	0.862
Religion						
Hindu [R]			5.863	3		0.118
Muslim	0.005	0.320	0.000	1	1.005	0.986
Christian	-0.665	0.277	5.768	1	0.514	0.016
Other	-0.538	0.332	2.631	1	0.584	0.105
Ethnic Group						
Other [R]						
ST	0.799	0.269	8.811	1	2.223	0.003
Mothers' educations						
No education [R]			12.337	3		0.006
complete Primary	0.415	0.190	4.775	1	1.514	0.029
complate Secondary	0.453	0.385	1.387	1	1.573	0.239
Higher	1.278	0.375	11.595	1	3.591	0.001
Mother Currently working						
No [R]						
Yes	-0.154	0.169	0.828	1	0.857	0.363
Constant	-2.243	0.373	36.065	1	0.106	0.000

R – is show the reference variable

Appendix - IV

Logistic Regression on Background Characteristics on 'Received any treatment'

Background characteristics	B	S.E.	Wald	df	Exp(B)	Sig.
Age in Month						
< 6 [R]			25.385	5		0.000
7 - 11	0.620	0.319	3.781	1	1.859	0.052
12 - 23	1.230	0.285	18.641	1	3.421	0.000
24 - 35	1.301	0.302	18.547	1	3.675	0.000
36 - 47	0.808	0.311	6.745	1	2.244	0.009
48 - 59	0.678	0.331	4.204	1	1.970	0.040
Gender						
Male [R]						
Female	-0.061	0.168	0.132	1	0.941	0.716
Wealth Index						
Poor [R]			15.343	2		0.000
Middle	0.635	0.210	9.175	1	1.888	0.002
Rich	0.876	0.245	12.826	1	2.402	0.000
Type of Place of residence						
Urban [R]						
Rural	-0.057	0.198	0.082	1	0.945	0.774
Religion						
Hindu [R]			3.339	3		0.342
Muslim	0.321	0.312	1.061	1	1.379	0.303
Christian	-0.375	0.276	1.849	1	0.687	0.174
Other	-0.263	0.330	0.635	1	0.769	0.426
Ethnic Group						
Other [R]						
ST	0.395	0.264	2.237	1	1.484	0.135
Mothers' educations						
No education [R]			13.714	3		0.003
Complete Primary	0.417	0.192	4.725	1	1.517	0.030
Complete Secondary	1.441	0.563	6.542	1	4.224	0.011
Higher	1.434	0.531	7.289	1	4.194	0.007
Mother Currently working						
No [R]						
Yes	-0.226	0.178	1.612	1	0.798	0.204
Constant	-0.658	0.341	3.716145	1	0.518	0.054

R – is show the reference variable

Appendix - V

Percentage Distribution of 'Place First Sought for Treatment of Diarrhea' by mothers' within Public and Private Sector, NFHS-3, 2005-06

Public sector	In Percent
Government or Municipal Hospital	30.9
Government dispensary	13.0
CHC/PHC or Rural hospital	38.6
Sub-centre	12.4
Other	5.0
Total	100
Private sector	
Private hospital	6.0
Pharmacy or drugstore	48.9
Private Doctor or clinic	23.6
other	21.6
Total	100

Appendix - VI

Percentage Distribution of 'Place First Sought for Treatment for Diarrhoea' by mothers' in among all Health Institution, NFHS-3, 2005-06

Health Institution	In Percent
Govt and municipal hospital	10.4
Govt dispensary	4.4
CHC/PHC	13.0
Sub-centre	4.2
Other public health facilities	1.7
Private hospital	3.6
Pharmacy/drugstore	29.7
Private doctor/clinic	14.3
Other private sources	13.1
Other source	5.5
Total	100

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