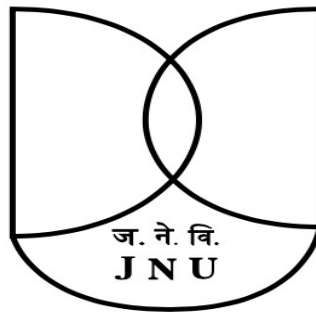


**SOCIAL HISTORY OF ORAL REHYDRATION SOLUTION  
(ORS) IN BANGLADESH, 1968-1998**

*Thesis submitted to the Jawaharlal Nehru University  
for the award of the degree of*

**DOCTOR OF PHILOSOPHY**

**MOHAMMAD BILAL HOSSAIN**



**CENTRE OF SOCIAL MEDICINE AND COMMUNITY HEALTH  
SCHOOL OF SOCIAL SCIENCES  
JAWAHARLAL NEHRU UNIVERSITY**

**New Delhi - 110067, INDIA**

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CENTRE OF SOCIAL MEDICINE & COMMUNITY HEALTH  
SCHOOL OF SOCIAL SCIENCES  
**JAWAHARLAL NEHRU UNIVERSITY**  
NEW DELHI - 110067

Dated: 2nd August, 2019

DECLARATION

I declare that the thesis entitled "SOCIAL HISTORY OF ORAL REHYDRATION SOLUTION (ORS) IN BANGLADESH, 1968-1998" is being submitted by me in partial fulfilment of the requirements of the award of the degree of DOCTOR of PHILOSOPHY of Jawaharlal Nehru University, New Delhi (India). This thesis has not been submitted for the award of any other degree of this University or any other University and is my original work.

*M. Bilal*

Mohammad Bilal Hossain

CERTIFICATE

We recommend that the thesis be placed before the examiners for evaluation and consideration of the award of Degree of Doctor of Philosophy.

*R. Dasgupta*  
Prof. Rajib Dasgupta

Supervisor  
PROF. RAJIB DASGUPTA  
Centre of Social Medicine & Community Health  
School of Social Sciences  
Jawaharlal Nehru University  
New Delhi - 110067

*S. Acharya*  
Prof. Sanghamitra S. Acharya

Chairperson  
CHAIRPERSON  
Centre of Social Medicine & Community Health  
School of Social Sciences  
Jawaharlal Nehru University  
New Delhi-110067

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Mohammad Bilal Hossain



## LIST OF ABBREVIATIONS

BARD	Bangladesh Academy for Rural Development
BDT	Bangladeshi Taka
BEIC	British East India Company
BRAC	Bangladesh Rehabilitation Assistance Committee
BRAC	Bangladesh Rural Advancement Committee
CBR	Crude Birth Rate
CC	Cubic Centimeter
CDC	Center for Disease Control
CDR	Crude Death Rate
CRL	Cholera Research Laboratory
CRP	Concentrated Reinforcement Program
DG	Director General
ECPP	Epidemic Control Preparedness Program
EIS	Epidemic Intelligence Service
ESP	Essential Service Package
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GoB	Government of Bangladesh
HDS	Health and Demographic Surveillance
HPI	Health Poverty Index
HPSP	Health and Population Sector Program
HPSS	Health and Population Sector Strategy
ICDDR,B	International Center for Diarrheal Disease Research, Bangladesh
ICMR	Indian Center for Medical Research
IMR	Infant Mortality Rate
IPRSP	Interim Poverty Reduction Strategy Paper
IRC	International Rescue Committee
IV	Intravenous
KCMG	Knight Commander Order of St. Michael and St. George
LBW	Low Birth Weight
LEB	Life Expectancy at Birth
LGS	Labon Gur Solution
MGDs	Millennium Development Goals
MMR	Maternal Mortality Rate
MoH&FW	Ministry of Health and Family Welfare
NGO	Non-Government Organization
NIH	National Institute of Health
NORP	National Oral Rehydration Program
NORP	National Oral Rehydration Project
ORS	Oral Rehydration Solution
ORSaline	Oral Rehydration Saline
ORT	Oral Rehydration Therapy

ORW	Oral Replacement Worker
OTEP	Oral Therapy Extension Program
PO	Program Organizer
PSCRL	Pakistan SEATO Cholera Research Laboratory
PSI	Population Services International
RED	Research and Evaluation Division
RHW	Rural Health Worker
SDC	Swiss Development Cooperation
SEATO	Southeast Asia Treaty Organization
SFCA	Swedish Free Church Aid
SIDA	Swedish International Development Agency
SMC	Social Marketing Company
TAC	Technical Advisory Committee
TEO	Thana Education Officer
TT	Tetanus Toxoid
TV	Television
UK	United Kingdom
UN	United Nations
UNDP	United Nations Development Program
UNFPA	United Nations Fund for Population Activities
UNICEF	United Nations Children's Fund
UNISDR	United Nations International Strategy for Disaster Reduction
USA	United States of America
USAID	United States Agency for International Development
USD	United States Dollar
WB	World Bank
WHO	World Health Organization

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## **Chapter One:**

### **Introduction**

#### **1.1. Overview of the Study**

The invention of Oral Rehydration Therapy (ORT) is one of the most significant triumphs of the history of twentieth-century medicine. The use of ORT in controlling mortality and morbidity associated with cholera and diarrheal diseases has been recognized as a success story in the sphere of public health. However, after the successful trial of Oral Rehydration Solution (ORS) in East Pakistan (now Bangladesh) in 1968, the mortality rate caused by cholera and diarrheal diseases did not reduce significantly. Significantly, it happened due to unawareness of population and lack of scaling up a program of ORS in Bangladesh. In this backdrop, various initiatives and programs were designed to overcome the unawareness of the health-related institutions, health specialists and population of Bangladesh.

As time went on, the Government of Bangladesh and non-government organizations (NGOs) significantly attempted to build awareness among the people of Bangladesh. The BRAC (leading NGO in Bangladesh) popularized the *Labon Gur* Solution (LGS) as a replacement of packet ORS. *Labon* and *Gur* are the Bengali words, and their English terms are salt and molasses or sugar. The ORS in the form of LGS was available in every household in the 1970s and 1980s in Bangladesh. Considering the availability of sugar and molasses in the rural households, the ICDDR,B (International Centre for Diarrheal Disease Research, Bangladesh) and BRAC decided to work with the LGS rather than packet ORS. The ICDDR,B and BRAC trained the rural people with different models how to prepare LGS at home. The mass training of how to prepare LGS, as well as the availability of *Labon* and *Gur* (salt and molasses), made the programs successful. In addition to the efforts of the NGOs, the Government of Bangladesh patronized the NGOs' initiatives as well as launched various scaling up programs. Consequently, the use of ORS and LGS increased, and mortality

declined. This study has focused on this entire narrative of the social history of ORS in Bangladesh.

The Bengal Delta was notably the home of *Vibrio cholerae* in the world. The US experts, supported by the US Government, established the Pakistan SEATO Cholera Research Laboratory (PSCRL) in Matlab area, located in the Delta, in 1960 to study cholera and diarrheal diseases. Experts of the PSCRL invented the Oral Rehydration Solution (ORS) and confirmed its successful trial in the PSCRL Mohakhali Hospital and the Matlab Hospital in 1968. The oral solution was invented but how to disseminate the knowledge of the ORS to people and ensure the use of ORS were the challenges; ICDDR,B and BRAC in collaboration with the Government of Bangladesh (GoB) and international organizations dealt with the problems through operations research and social science approaches. Finally, they got the triumph of reaching every household of the country with the messages of how to make oral rehydration solution at home and ensured the standard of modules by a regular laboratory test.

That is to say, the invention of the oral rehydration solution and its extraordinary contribution to controlling mortality and morbidity associated with diarrheal diseases produced a success story. The relatively simple technology of making ORS along with its common implementation technique was believed to be the key behind its success. However, the history of ORS reveals the new conflict between high and low technology, between clinical science and laboratory, and between medical research and public health (Ruxin, 1994). A detailed understanding of the social history of ORS thus might be beneficial to identify the critical components behind its success, and that will pave the way of exploring the new knowledge of public health.

Coupled with the literary evidence, diarrhea was one of the primary causes of mortality in Bangladesh in the 1980s. There was 22.5 percent diarrheal death of

all deaths in the Matlab area of Bangladesh from 1981 to 1985 (Shaikh, Wojtyniak, Mostafa, & Khan, 1990). The study found that diarrhea was the most frequent cause of death in the age group between 1-4 years. Before the development of ORT, intravenous therapy used for the treatment of diarrhea; however, this treatment method was quite expensive. For example, a severely dehydrated patient would require 5-10 bags of saline, each of that having a cost of around 100 (one hundred) BDT (Bangladeshi Taka) equivalent to 6.46 USD. According to the World Bank National Accounts Data, the GDP per capita in Bangladesh (1980) was 222.94 US dollar equivalent to 3450.87 BDT (World Bank, 2017).

Moreover, it also needed skilled professionals, and high technology medical apparatus [e.g., needles, tubing and sterile fluid (The World Bank Group Private Sector and Infrastructure Network, n.d.)]. In contrast to that, oral rehydration therapy (ORT) needs only the use of ORS (oral rehydration solution) along with nutritional therapy. ORS helps to balance the fluid loss due to dehydration, and the dietary treatment helps to minimize the damage of weight and lessen the duration of illness (Cash, 1987). The most persuasive thing is- the preparation of ORS requires only water, salt, and sugar mixed in proper proportion. This handy technology quickly replaced the previously complicated treatment processes and brought a revolution in the treatment of diarrhea. Due to the implementation of ORT, diarrheal mortality has fallen rapidly among the children under one year than aged 1-4 years (Kosek, Bern, & Guerrant, 2003). Considering all things, the success story of ORT in reducing childhood mortality on a global scale is comparable to the impact of pasteurization, immunization, and sanitation (Guerrant, Carneiro-Filho, & Dillingham, 2003).

Despite the convenient and low-cost technology of ORS, the success rooted in the contriving of the scaling up program and implementation procedure along with the socio-political and economic context. Provided that there were three

major issues thriving to the successful history of ORS in Bangladesh: development of science and technology, scaling up the public health program (Oral Therapy Extension Program) to put it in use on a mass level, and adopting the cultural dimension of people's use of the technology. All three mechanisms were interrelated to each other. History of the ORS had no linear progress, but there were starts and stops, serendipity and missed opportunities (Cash, 1987). The political mandate, along with the contributions of national and international NGOs, also played a significant role.

The Cholera Research Laboratory in Dhaka later on the ICDDR,B was a pivotal institute to invent the ORS. The Bangladesh Rural Advancement Committee (BRAC<sup>1</sup>), national-level NGO in Bangladesh, got ahead with the national level oral therapy extension program (OTEP) in Bangladesh to teach mothers how to prepare oral saline at home. Besides ICDDR,B and BRAC, international organizations like; WHO, the Oxfam, the Swiss Development Cooperation (SDC), the Swedish Free Church Aid (SFCA), Swedish International Development Agency (SIDA) and the UNICEF funded for the research and implementation of ORS program in Bangladesh.

However, the most extensive oral therapy program in the world was begun by the BRAC in Bangladesh (1979) with the collaboration of the Government of Bangladesh for teaching the mothers how to prepare ORS and LGS (*Labon Gur* Solution) at home. About 12 million mothers were shown the formula through the Oral Therapy Extension Program (OTEP). The women as trainers from nearby households in the carrying out of the OTEP was an effective policy for its success. Besides, Radio and Television were used to publicize the learning process of preparing oral saline. Educational institutions, markets, tea stalls, religious places were also used to educate the people on how to prepare LGS at

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<sup>1</sup> Now from 2009 BRAC has no elaboration, BRAC is name.



home.

Richard Weekes precisely identified Pakistan as a 'double country' due to its separate eastern and western wing with more than a thousand miles distance (Weekes, 1964). The west wing was geographically closer to the Middle East, and the east wing was nearer to Southeast Asia. Climatic, topographical, linguistic, cultural and historical differences of both East and West Pakistan ultimately shaped the nature of a double country. The disparity in economic policy between East and West Pakistan created the gap in the first decade after independence (1947). Per capita income in West Pakistan increased from Rs. 330 in 1949-50 to Rs. 373 in 1959-60; whereas it declined from Rs. 305 to Rs. 288 in East Pakistan in the same period (Jahan, 1973). According to the census report of 1961, the population was 50.8 million in East Pakistan and 42.9 million in West Pakistan, but health facilities were less in East Pakistan compared to West Pakistan. Statistics of 1957-58 shows that the number of hospital beds was 4,237 in East Pakistan and 21,021 in West Pakistan; the total number of nurses in East Pakistan 275 and West Pakistan 2,021; the total number of doctors in East Pakistan 4,580 and West Pakistan 5,034 (Jahan, 1973). Amid this discrepancy smallpox, cholera and other infectious diseases were rampant in East Pakistan compared to West Pakistan. In this situation, international organizations worked for the development of health as well as experimented the new medicines for testing interventions in East Pakistan.

## **1.2. Review of Literature**

There is plenty of literature published in journals, magazines, conference proceedings and books on ORT, and ORS. Major subject matters of the existing literature are historicity of ORS and cholera, scaling up the program, scientific basis, socio-political and economic aspects related to ORS program and different themes on ORS. However, a comprehensive study on the social history of ORS in Bangladesh not yet done. A social history of ORS in Bangladesh from

1968 to 1998 is unfolded in the literature of public health. For understanding the existing literature whole literature review is divided into three significant parts like; the historicity of cholera, ORS and public health along with socio-political context, mass scaling up program and promotion of ORS, and scientific basis of ORS.

#### **A. The Historicity of Cholera, ORS and Public Health:**

‘A History of Asiatic Cholera’ written by C. Macnamara was published by the Macmillan and Co. in 1876 from London. The concentration of this book is to narrate the historicity of cholera epidemics in Asia, especially the Bengal Delta is recognized as the home of cholera for a long time. How Asiatic cholera became a scourge for the world and shaped as pandemic after 1817 discussed in the book. It is identified as the menacing diseases for the human in the world, and it showed the trajectories of spreading the diseases from Asia to the rest of the world. It has attention to identify the epidemic situation of cholera before 1817 in out of Asia and to define the characteristics of cholera and its causes. However, the historicity of cholera up to 1870s is described in the book where Bengal has precedence in the related discussion (Macnamara, C, 1876a).

R. Pollitzer wrote the history of cholera, prevalence, bacteriology, pathology and epidemiological aspects in his book ‘Cholera’ as a monograph series of WHO in 1959. Six pandemics from 1817 to 1930s and the contemporary healing practices are precisely discussed in his book. The development of therapeutic medicine and history of intravenous saline are narrated in the book. The invention of cholera germ and its remedies are remarkably studied. Besides, the routes of spreading cholera germ from India to Europe, America and other continents are mentioned with the importance of antique prevalence of cholera in Bengal. However, the discussion mainly concentrated on the disease, not the social aspects of Bengal (Pollitzer, 1959).

The book 'Cholera' edited by Dhiman Barua and William B. Greenough III is another book which covers the historicity of cholera in the world. In the first chapter of this book, Dhiman Barua showed disagreement with the previous studies of the scholars regarding the identification of Bengal Delta as the home of cholera. He analyzed the historical perspective of cholera in the world from the ancient time to the contemporary period, where he indicates that the cholera is seen first in the works of Hippocrates and there are many writings on cholera in different parts of the world. Cholera in Bengal is accentuated by the western historians which concluded the point of the home of cholera. All seven pandemics of cholera are discussed in this book (Barua & Greenough, 1992a).

In the pioneering book, published in 1993 by David Arnold 'Colonizing the Body: State Medicine and Epidemic Disease in Nineteenth-Century India', discussed how Western medicine faced contestations and dilemmas in nineteenth-century India. After one and a half-century of British rule since 1757, Western medicine was still struggling to establish itself among the Indians. He mentioned Bengal delta as the home of cholera, and there was evidence of worshipping the cholera deity. *Ola Bibi* was cholera deity, but he suggested that it might be associated with not only cholera but dysentery and other diarrheal diseases. However, he looked at how cholera was connected to disorderly crowds. Arnold's book was dealt with broader Indian perspective where Bengal part was partially exemplified, but it did not discuss the therapeutic medicine of cholera, more specifically the oral rehydration therapy (Arnold, 1993b). This work is an attempt to study the curative medicine of cholera.

Rajib Dasgupta's book 'Urbanizing Cholera: The Social Determinants of its Re-emergence' discussed cholera in Delhi from 1965 to 2000 with social epidemiological accounts of cholera focusing on urban poor. It analyzed the eco-social approaches and spatial methodology, the transformation of cholera from an old world to the contemporary megacities. The attention was given to

the in-depth situational analysis of Delhi, concentrating on the vulnerability of urban poor by waterborne infections and the uncompleted program of water and sanitation (Dasgupta, 2012).

Sunil Amrith's book 'Decolonizing International Health, India and Southeast Asia, 1930-65' covers the history of post-colonial public health and medicine. In the middle of the twentieth century, Asia was the heart of international efforts to make the world free of disease. The main focus of the book is on India, but suggestions and debates on the intervention of public health are Pan-Asian even global. The revolutionary new technologies of disease control were invented in the mid-twentieth century. The most fundamental shifting of notion after the Second World War was that health would be the responsibility of government and the right of citizenship. The World Health Organization (WHO) was formed on the promise of a world without disease. The book also explores the institutional efforts for the development of health, which is relevant to the thesis (Amrith, 2006).

Another important book was written by Sharif Uddin Ahmed 'Mitford Hospital and Dhaka Medical School; History and Heritage 1858-1947' which is written in Bengali and describes the health service delivery of two hospitals along with the psychological, social and cultural life of the people of Bengal (S. U. Ahmed, 2007). He analyzed the origin and development of the Mitford Hospital and the Dhaka Medical School and the cultural heritage of the institutions. He argued that two medical institutions provided services to popularize western medicine in Bengal. He explained the contributions of the medical schools in the prevention of epidemic disease in colonial Bengal.

Projit Bihari Mukharji's 'Nationalizing the Body: The Medical Market, Print and *Daktari* Medicine' deals with the so-called *Daktari* medicine. *Daktar* prescribes the *Daktari* medicine referred to people who were practicing Western

medicine. It is vernacularization of English doctor into Bengali. Mukharji showed how the term *daktar* emerged as a socially relevant identity at least after two hundred years of the exposure of Western medicine in South Asia (Mukharji, 2009).

Ihtisam Kazi wrote a book on ‘A Historical Study of Malaria in Bengal 1860-1920’ (Kazi, 2004) covering sixty years of malarial situation in Bengal. The writer had chosen the time duration not only from the point of political and social context but from the health and sanitary point of view. Malaria is marked as one of the fatal diseases which has been described in the book. It also deals with the concept of disease and malaria, sanitary and malarial administration in Bengal, population and malaria, and ecological factors contributing to malaria. Moreover, the economic causes of malaria were also discussed in the book.

In the article of Chowdhury and Kabir published in 1991 discussed four folk terminologies of diarrhea in rural Bangladesh. The writers argued that the use of the word diarrhea from the epidemiological consideration seemed problematic in rural Bangladesh. People considered 5% of total diarrhea episodes as diarrhea. There are four folk terminologies; *dud haga* (due to ingestion of breast milk by infants), *ajirno* (due to overeating), *amasha* (mucoïd diarrhea), *daeria* (cholera) (A Mushtaque R Chowdhury & Kabir, 1991).

The prominent article ‘Magic Bullet: The History of Oral Rehydration Therapy’ published in 1994. Joshua Nalibow Ruxin discussed the historical development of the ORT and the development of ORS in Bangladesh in the article. He explained the epidemiological perspective of diarrhea in the developing countries mentioning diarrhea as the global killer. Pathophysiology of ORS also discussed in the paper (Ruxin, 1994).

The history of oral rehydration therapy and solution is discussed in the study of

Guerrant and others. It is entitled 'Cholera, Diarrhea, and Oral Rehydration Therapy: Triumph and Indictment' (Guerrant et al., 2003).

Rounaq Jahan's book 'Pakistan Failure in National Integration' discussed the gradual process of East Pakistan and West Pakistan disintegration and finally the emergence of new nation-state Bangladesh. There was a consensus among the Bengalis that policies and practices of Pakistan were suppressive to fundamental rights and cultural freedom, misuse of religion in politics, economic disparity, and the monopoly of state power by the small civil-military bureaucratic elite. However, this book articulated the historical facts, data, and analysis, which led to the separation and birth of Bangladesh (Jahan, 1973). Socio-political contexts were also discussed behind the disparity and suppression, which is relevant to the study.

Moudud Ahmed analyzed the challenges in post-independence Bangladesh in his book 'Democracy and the Challenge of Development: A Study of Politics and Military Interventions in Bangladesh.' According to the discussion of Moudud's book, there were two significant challenges to face immediately after the independence; institutionalization of democratic order and economic development. Two military rulers ruled Bangladesh fifteen year of first two decades after the liberation. On the other hand, Illiteracy, poverty, starvation, disease, and malnutrition prevailed around eighty percent population that was a challenge to the political governments to overcome (M. Ahmed, 1995). Notably the socio-political contexts as well as the economic dynamics of new country, Bangladesh, were discussed in the book.

### **B. Mass Scaling up Program and Promotion of ORS**

A. Mushtaque R. Chowdhury and Richard A. Cash describe the discovery and application of oral rehydration therapy (ORT) against cholera in their book 'A Simple Solution: Teaching Millions to Treat Diarrhea at Home'. They

mentioned it as the silent victory of the history of medicine in the 20<sup>th</sup> century. Richard A Cash, one of the inventors of the ORS (Oral Rehydration Solution), spent his professional life to perfect the ORT technology and spread it in the whole world. However, the book analyzed the origin of the rehydration problem, early development of the ORT program and the oral therapy extension program (OTEP) with its successes and failures. Moreover, the formation of BRAC as an organization and its development are also discussed (A. M. Raza Chowdhury & Cash, 1996).

The article 'The Status of ORT in Bangladesh: How Widely is it Used?' published in 1997. It articulated the convincing evidence of wide-scale promotion of ORS in the 1980s and 1990s in Bangladesh which led to the improved situation today. The study shows that over 70% of mothers can prepare a safe and effective solution at home. An educated mother can prepare a better quality solution (A. M. Chowdhury, Karim, Sarkar, Cash, & Bhuiya, 1997).

The book 'Oral Rehydration Therapy: A Revolution in Child Survival' was published in 1988 by the Agency for International Development. It narrated the history of Oral Rehydration Therapy (ORT), challenges, how to reach mothers, and significant breakthroughs of ORT. The first chapter explains the global problems in saving children through ORT; the second chapter covers the history and discoveries in the development of ORT. The third chapter provides information about the methodologies of different countries in reaching mothers, health workers, and traditional healers; the fourth chapter narrates the integration of ORT with other health-related activities. Finally, a new direction regarding ORT gives in the last chapter (the United States, 1988).

Dr. Robert Northrup discusses the global implementation of ORT in his research paper published in the Journal of Diarrheal Disease Research in 1987. He argued

that ORS and ORT are described as the simple solutions; it is not as simple as being defined, it might better to call it "not so simple solution." ORT program needs various things in the process of implementation; preparation of planning and policies, an arrangement of training, skilled communication, the supply of logistics and proper distribution, gathering information, expert management and regular research (Northrup, 1987).

'Bangladesh ORS Case Study' was done by the University of Washington Global Health Start Program, studied the involvement of multiple organizations in the promotion of ORS in Bangladesh. Supportive collaboration between the government of Bangladesh and the private sector, especially with the BRAC, was analyzed in the paper. Coupled with literary evidence the paper argued that the ORS gained momentum in the 1990s due to multi-level efforts and it is continuing (Mosites et al., 2012).

### **C. The Scientific Basis of ORS**

Richard A. Cash in his paper 'A History of the Development of Oral Rehydration Therapy (ORT)' analyzed three points; firstly, the significance of the scientific method in the development of ORT and creating support for its utilization. Secondly, the paper describes the importance of conducting the research where the problem of life-threatening diarrhea exists and thirdly, the process of developing new medical therapy. That is to say, it is his observational interpretation along with historical analysis, where he been engaged for more than fifty years (Cash, 1987).

In the article of Gregory P. Connors and Julius G.K. Goepf published in 1999, discussed the history and scientific background of oral rehydration solution. The paper provided the guidelines for the use of ORS and discussed the barriers of its adoption in the emergency department of hospitals. It also acknowledged the limitation of the use of ORS and suggested the areas of future research (Connors



& Goepp, 1999).

Pathophysiology, efficacy, and effectiveness of oral rehydration solution were discussed in the article of Desjeux and others. Four significant things were presented in the paper like; the pathophysiology of dehydration and rehydration, the composition of ORS, an evaluation of the efficacy of ORS, and the assessment of the discrepancies between recommendation and practices of the ORT (Desjeux, Briend, & Butzner, 1997)

In the study of A. M. Molla and others showed that rice-based oral rehydration solution decreases the stool volume in acute diarrhea than glucose base ORS in Bangladesh (A. M. Molla, Ahmed, & Greenough III, 1985). Impact of ORT on infant and child mortality in the community of Bangladesh was examined in the study of Vincent Fauveau (Fauveau, Yunus, Islam, Briend, & Bennish, 1992). Use and safety of homemade oral rehydration solution in Bangladesh were studied by Chowdhury and others (Mushtaque, Chowdhury, Vaughan, & Abed, 1988). The efficacy of commercial ORS was compared with the WHO standard ORS formula in the treatment of hospitalized infants with acute diarrhea in the study of Clifford B. David and others. It is examined that commercial ORS contains less sodium and more glucose than the standard formula (David, Pyles, & Pizzuti, 1986).

### **1.3. Rationale of the Study**

This study focuses on the social history of Oral Rehydration Solution (ORS) in Bangladesh from 1968 to 1998. The first successful trial of ORS was done in 1968 in the PSCRL (later on ICDDR,B) in East Pakistan (now Bangladesh). Then after 1971, Bangladesh adopted a door to door community health service approach to reach the family planning program and provide the services of health programs to the people. Likewise, the knowledge of ORS for the treatment of diarrhea patients was disseminated to the people of the country.

The PSCRL launched several programs to disseminate the knowledge of ORS among the people, for instances, training course for the health professionals, 'Bari Mother' for teaching mothers how to prepare ORS at home, 'Depo System' in Teknaf and others. In 1979, the BRAC along with the support of the Government of Bangladesh and international organizations launched the Oral Therapy Extension Program (OTEP) to promote the knowledge of ORS. In 1998, through the Health and Population Sector Program (HPSP), the door to door health service delivery policy was shifted to the static service-point oriented policy.

To give an illustration of shifting the policy, immediately after the independence (1971) of Bangladesh the health policy was guided by the five year plans of the Government of Bangladesh (GoB) and by this way it was run up to 2000. The cabinet adopted the National Health Policy of Bangladesh on 14<sup>th</sup> August, 2000 (Osman, 2008). In the meantime, infrastructural developments were accomplished under the guidance of the five year plans and the policy of health service delivery was shifted in 1998. So, after 1998, the government service of oral rehydration therapy was centered (shifted from door to door) to the community clinics or the union health centers or the referral hospitals.

In the OTEP program, primacy was given to the teaching of mother how to prepare ORS at home with *Labon-Gur* (salt and sugar) and water rather than technology and technic of the ORS (A. M. Chowdhury et al., 1997). Salient features of the OTEP were house to house teaching of diarrhea message called the 'Seven Points to Remember' which had all information to treat diarrhea at home, including the administration and preparation of ORS with home ingredients. Males were contacted as they are the decision-makers in Bangladeshi families through weekly markets and mosques; school teachers and students were taught the seven points through school meeting; village healer meeting of village doctors and quacks who were popular in the village. Posters,

leaflets, flip charts were used to teach the mothers by the ORWs; radio and TV were included as an instrument to popularize the program; and monitoring and incentive salary for the ORWs (A. M. Chowdhury et al., 1997). The primary target of the GoB, ICDDR,B, BRAC, national and international organizations was to remove the unawareness of Bangladeshi people related to diarrheal diseases and its oral treatment, so, all the programs were designed based on the target.

The successful implementation of ORT in the period of 1968-1998 significantly declined the child mortality causing cholera and diarrhea. The scaling up of ORS through oral therapy extension program and various activities gave momentum in result in the 1990s and after 2000. For the treatment of diarrhea in Bangladesh, the oral rehydration solution was used 1% in 1980 (Perry, 2000). Then, either in ORS form or natural form, it was increased to 67% in an urban area and 58% in a rural area in 1993; it was increased more than 80% both in a rural and urban area after 2000. Deaths from diarrhea, between 1993 and 2011, were decreased from 12 per 1000 LBs to 1 per 1000 (Organization & others, 2015). Historians have paid little attention to exploring the social history of ORS, so, a broader study of the social history of ORS is prospective to understand the different dimensions of society and its level of connectivity to modern medicine and its application.

#### **1.4. Objective of the Research**

The study explored the social history of ORS in Bangladesh from 1968 to 1998. The objective of the research is to ascertain the social history of the development of ORT and ORS in Bangladesh. Primary objectives of the research are: firstly, to explore the narratives of society and social history of health and medicine. Secondly, to identify the social history of cholera and the development of ORS in Bangladesh. Thirdly, to study the inventions after ORS to fulfil the needs and how ICDDR,B led the entire inventions based on social demands. Fourthly, to

search the home-based education of ORS and LGS and their application processes throughout the country. Finally, to find out the social science approaches and the social marketing process of ORS in Bangladesh. All things considered, the ultimate objective of the study is to understand the social history of ORS which encompasses the broader understanding of the socio-political and economic perspective of Bangladesh as well as the successful way of knowledge dissemination among the illiterate people of Bangladesh.

The social history of ORS is thus interesting on many different aspects. There are many complex phenomena playing important role even though it looks pseudo-simple as correctly pointing out by Dr. Robert Northrup. He argued that ORS program needs various things in the process of implementation like; preparation of planning and policies, arrangement of training, skilled communication, supply of logistics and proper distribution, gathering information, expert management and regular research (Northrup, 1987). Unfortunately, a thorough investigation of the social history of ORS in Bangladesh was not done. All things considered, a thorough study of the social history of ORS in Bangladesh is persuasive in the history of public health. The context and theme of ORS notably covered from a global perspective. Proper attention is not explicitly given to Bangladesh, where the most extensive oral therapy program was completed. This study aims to explore the social history of ORS in Bangladesh from 1968 to 1998. The focus of the research is to study the history of the development of ORT and ORS in Bangladesh, along with the discursive social views of cholera and diarrheal diseases. The study is also aiming to identify the distinctive features of the Oral Therapy Extension Program (OTEP) that had enabled Bangladesh to accelerate the oral rehydration solution in the years between 1979 and 1990.

### **1.5. Research Question**

The study is an attempt to fill up the gap of the social history of ORS in

Bangladesh. The research questions of this study are:

- How the historical and socio-political context of the late sixties onward in Bangladesh created a particular framework where the technology was developed, experimented and implemented?
- What was the role of political government? How did a country ravaged by war and facing some epidemics in the refugee camps and later the process of nation-building, provide a laboratory for testing interventions?
- What was the role and objective of the international agencies and NGOs that played a critical role in the development and application of ORS? How does the local professionals and NGOs (specially BRAC which was a recipient of a large number of funds from several agencies) coordinate with the international agencies?
- How did the individual's attempts to accelerate the pathway of the evolvement of ORS and experiment in the community level? Where interdisciplinary experts played a vital role like; Richard Cash, David R Nalin, Lincoln Chen, Abdul Majid Molla, Rafiqul Islam, Sir Fazle Hasan Abed, A Mostaque R Chowdhury and others.
- What was the methodology of educating women and removing the ignorance related to ORS from society?
- Why did the social groups impede or enhance the teaching of ORS to mother in the rural area of Bangladesh?
- How did ORS reduce the case fatality of diarrhea in Bangladesh?
- How does gender as social determinant influence the development of ORS? As a male-dominated society, in the family level, a maximum decision was taken by the male in a Bangladeshi family.
- What was the role of community leaders in promoting or halting health program like the OTEP?
- What was the religious tradition in the society regarding cholera and ORS? How religious specialist- *gurus*, *imams*, *qazis*, *pandits* played a

role in the promotion of the ORS?

### **1.6. Research Methodology and Research Design**

The qualitative research methodology is used in this study with key informant interviewing and data collection from primary and secondary sources. However, the study is the triangulation of the key informant interview, archival data and the secondary data sources. A. Key Informant Interviewing: It is an in-depth qualitative interview with twenty-four individuals who have firsthand knowledge about ORS and its application in the community. The primary purpose of the key informant interview was to collect information from different sections of society who were involved in the development of ORS including scientists, sociologists, senior/ retired clinicians, professionals, public health workers, organizers and the people who received the knowledge of ORS. Two standard techniques were used to conduct the key informant interviews: face to face interview and telephone interview. (List of interviewees is in Appendix-1).

B. Primary and Secondary Data Collection: Both primary and secondary data were collected and studied for the research. Archival data and documents were reviewed. The World Health Organization (WHO), UNICEF, the Oxfam, the Swiss Development Cooperation, the Swedish Free Church Aid, the Swedish International Development Agency assisted the oral rehydration program. The CDC of the USA and ICDDR,B had a significant role in this progress. So, reports and documents from the related organizations and countries were studied. There were many Bengali and English newspapers published locally and nationally from both East Pakistan and West Pakistan before 1971.

After the independence major national newspapers were printed from the capital city Dhaka, besides some local papers were published in divisional cities and district levels. Among them, some English and Bengali newspapers' information was studied. Mainly editorials, news of diarrheal diseases, statistics

related to conditions and the report of the oral therapy program were more emphasized — besides, Secondary data and documents, research articles, magazine, periodicals were also used for the study.

### **1.7. Theoretical Framework**

Theory helps historians to deal with the complex nature of the study and to explain the event that is being studied. In the last two centuries (19<sup>th</sup> and 20<sup>th</sup>), methods of social history were evolved. By the nineteenth century, the social and economic history was getting priority in the historical studies, and in the twentieth century, it was broadening and began to give results. In the twentieth century, first, the Annales School in France attempted to study the social history with the conception of ‘total history’, then, the expansion of social history in the post-war period (the Second World War) in Britain was significant. British social historians were influenced by both Marx and French scholars. However, “social history is characterized by a concern with describing the experience of various social groups. An initial focus on class has been followed by an attempt to integrate the experience of women, and also different ethnic groups into the writing of history” (MacRaild & Taylor, 2004a).

However, Methodologies and theoretical approaches of both history and social sciences are being adopted in Social History; indeed, it is an interdisciplinary nature of the historical analysis. History was mainly related to the ruling class of the society or state but the growth of ‘history from below’ was come forward from the broader social concern, that molded the theoretical perspective of social history. Provided that Marxist theory of Historical Materialism and the Total History of Annales School are closely related to the thinking of Fernand Braudel, leader of second-generation Annales School. His particular concentration of Social History was paid to demography, climate and geography. “The Mediterranean and the Mediterranean World in the Age of Philip II” of Fernand Braudel placed the biological and physical nature in the

center of the historical analysis. To give an illustration, he showed the relation of ecological crisis, population explosion and revenge of biology to the industrialism (Andrews, 1975). MacRail and Taylor evaluated The Mediterranean like;

The Mediterranean was Braudel's attempt to reverse the increasing fragmentation of history – which had been a feature of the 1920s and 1930s outside the Annales School – and to halt 'thematic specialization': that is, to depart from prefix (social, economic, political, etc.) history and to look at whole problems or society as a whole. Braudel's vision was to write an all-embracing history: '*histoire totale*' ('total history') (MacRaild & Taylor, 2004b).

For instance, due to various social factors, individuals could be discriminated or prevented from the particular rights among them, social class is significant. On the ground of gender and ethnicity or sexuality, an individual could be deprived, for example, a woman in a Muslim society can be underprivileged from the higher education and joining in a particular job. Here the social structure is being used as the tool to discriminate the individual based on gender. Notably it restricts the freedom of action and sets a mental structure that the woman has to get permission from a male guardian for going outside or doing any particular job. Thus, social structure functions at the individual level.

On the other hand, an individual cannot change the circumstances but slightly modifies for a particular time only. However, a human being makes history but cannot determine the under circumstances which are directly transmitted from the past. Marxist theory of Historical Materialism is the structuralist theory where the social relationship is structured by the collective organization of the production processes. In the capitalist society, the production processes are determined by the capitalist, not by the labor classes (MacRaild, 2004).

Michel Foucault's term 'archaeology' and 'genealogy' have substantial guidance for conceptualizing the social history of the ORS in Bangladesh.



Foucault's 'archaeology' differentiated the historical analysis from the mainstream structured historical study. However, mainstream history is longitudinal, and it works with the development of human activities or something over a certain period, but the 'archaeology' is cross-sectional, and it works with different things and issues at the same time. Archaeologists always try to work with the various artefacts at a time to make them fit together. Foucault studied various things of 18<sup>th</sup> century's European history like; European linguistics, economics and science then tried to assimilate all of them to figure out the senses together.

To put it another way, 'archaeology' works to assemble all the artefacts to fit together, whereas 'genealogy' works to figure out what kind of human would be fit for the gathered artefacts. His 'genealogy' is related to the archaeological study, for instance, first, he investigated a cross-section (archaeology) of objects then questioned like; what kind of people are living in such a way, or, how did people think about themselves? (Fendler, 2010). So, the explanation of both terms simultaneously encompass the bifurcated approach as well as inclusive approach.

Therefore, the whole theoretical framework of the study is constructed based on the thinking of total history, structuralist thoughts and Foucault's theory of archeology and genealogy. A social history of ORS is concerned to the thoughts of the total history of the Annales School; governmental structure and structural set up of the organizations are connected to the structuralist view of Marxism, and the application of scaling up program covered the cross-sectional thoughts of archeology and genealogy.

### **1.8. Chapters**

This study divided into five chapters, excluding the introduction and the conclusion. Significantly, each chapter has separate research questions along

with the general enquires of the study. The introduction focuses on the primary objectives of the study, research questions, methodology of research, the rationale behind the research, review of the literature and theoretical framing. The conclusion focuses on the findings of the study.

Chapter 1 deals with the geography, population, society and health system in Bangladesh. The core question: who were inhabitants and what was the socio-economic, political and geographical condition in Bangladesh during the experiment of the ORS and its aftermath. However, a brief political history is given to assess the socio-political development as well as a different dimension of political elites in dealing with the health system. Class and gender, as well as religious impact behind the backwardness of thinking regarding modern medicines, are also discussed in this chapter.

Chapter 2 provides the historicity of cholera and the nature of its spreading in the whole world. What was the healing system before the development of the modern treatment of cholera? How the knowledge was developed, and information was gathered to face the epidemic of cholera? Along with the answers to these questions, this chapter gives an overview of the development process of Oral Rehydration Therapy. Moreover, how Bangladesh was acknowledged as the foreground of the research of cholera and how the Pakistan SEATO Cholera Research Center (Now ICDDR,B) was established in East Pakistan (Now Bangladesh) are described in this chapter.

In chapter 3, it continues the description of the development of ORS after the invention in 1968. Also, there were many dimensions of ORS and its application based on the needs of people considering the availability of the ingredients. Innovative measures to face the local challenges are also discussed in the chapter. Government, national NGOs and international organizations had contributions to uphold the innovation.

Chapter 4 discusses the home-based education of ORS and LGS in Bangladesh with particular concentration on the Oral Therapy Extension Program (OTEP) of the BRAC. The BRAC accomplished the most extensive program based on action research where they had no prior knowledge of this type of mass scaling up program. Based on trial and error, they completed the teaching of mothers in Bangladesh how to prepare ORS at home. This chapter reflects the significance of the role of the individuals, teams and ICDDR,B and BRAC as organizations worked together to teach mothers. Removing unawareness about cholera and its treatment and empowerment of women against the long term existed social traditions are discussed here.

Chapter 5 offers the social science approaches and social marketing of the ORS in Bangladesh. However, this chapter aims to examine the present situation regarding the knowledge of ORS and its availability as well as the development of consciousness about cholera and diarrheal diseases. ORS and LGS are now the part of everyday culture in Bangladesh, so how the mentality of ordinary people was shaped is also discussed in this chapter.

## **Chapter Two:**

### **Society and Social History of Health and Medicine in Bangladesh**

#### **2.1. Introduction**

The social history of health and medicine has been recognized as the major field of historical research. Aspects of disease and health, application of medicine, medical care, public health program and its application attract the concentration of not only the health and social historians but also the researchers of social sciences in the broader spectrum (J. Barry & Jones, 2002). However, the Society for the Social History of Medicine was formed (1969) in Britain to make an interdisciplinary body of the researchers of medical science and social sciences. Its wide-ranging views are the history of medicine, biological aspects of life, well-being, illness and its experiences, medical treatment and its thoughts, and the system of medical care. This to say, the intention is not to promote the sub-specialism in History but to promote the standard and intelligibility of history in general. The Society has been publishing a journal, 'Social History of Medicine', to promote the social history of health and medicine. Furthermore, the social history of health and medicine creates a perspective of the application of medicine or innovation of medication through historical study, and it also shows the way of public health efforts in a particular area.

On the other hand, society is an association of human beings; people are living in a specific country or area having shared customs and laws. Social medicine might be considered as the practice of medicine in living group or community concerned with health and diseases. However, it works with individuals as a member of the family and takes care of the groups as the members of a community (Sidney & Kark, 2006). The main focus of this chapter is to explore the social aspects related to health and medicine in Bangladesh. Conceptualization of public health discourse, the notion of state medicine and public health, the socio-economic and political history of Bangladesh, the social history of health and medicine, health administration and health facilities in

Bangladesh are discussed in this chapter.

## **2.2. Development of Public Health Discourse in Bangladesh**

In the middle of the twentieth century, Asia was considered as the heart of international public health effort to make the world free from communicable diseases. Identification of germs and invention of new antibiotics and related medicines created the aspiration among the public health experts (Amrith, 2006). Moreover, the rapid increase of population was perceived as the crisis of human civilization, and so, the efforts for the disease-free world and family planning were in the center of maximum public health initiatives.

However, the socio-political and intellectual history of health-related institutions of the mid-20<sup>th</sup> century was encircled with the experiments of new medicines and promotion of medical facilities as well as sanitary equipment. By this time, people were gradually awakened by the efforts of government, national and international organizations. The most significant shift in the notion of public health occurred during the Second World War that ensuring the health of citizens is the responsibility of the government, and it is the right of the citizens. The constitution of the WHO (World Health Organization) declared health as the 'fundamental human right' (Amrith, 2006). In this circumstances, after 1947, both India and Pakistan took help of the WHO and other international agencies to develop the strategies for state-funded health service system in the countries.

Up to the 1960s, main focus of international health, especially in low and middle-income countries, was the implementation of disease programs, like; malaria eradication program and smallpox eradication program. These programs were termed as the vertical programs due to specific disease interventions with coordinated production, finance and delivery of healthcare. However, at the end of 1960s new movement emerged beyond the vertical

programs and in 1969 a seminal publication appeared with an idea of horizontal disease programs with referring to the integration of vertical programs to general health sector management (Smith & Hanson, 2011). Provided that vertical programs had their finance and system of service delivery, but the new horizontal programs with general health management had several health services from a single point through a general health structure.

On the contrary, the comprehensive model of health care immediately diluted through the idea of 'selective primary health' (1979) with the contention of the scarcity of resources, cost-effective interventions. In the name of selective primary health care, the concept of GOBI-FFF (GOBI & 3F) was proposed, and it was sanctioned by the UNICEF with the argument of giving specific focus on high priority diseases that would bring better output with limited resources (Banerji, 1984).

- G: Growth chart monitoring for child development
- O: Oral rehydration salts, widespread availability
- B: Breastfeeding promotion
- I: Immunization of all children against pertussis, diphtheria, measles, poliomyelitis, tetanus, and tuberculosis
- F: Female education
- F: Family spacing for birth control
- F: Food supplement for pregnant women and young children

Therefore, the public sectors were increasingly under challenge due to the neoliberal economy of the 1980s and 1990s. However, the theorists argued that government production and services intrinsically inefficient due to the pursuit of self-interest of the politicians. So, improvements could be achieved through greater competition by the privatization of government assets and institutions or by creating the internal markets of the government products and services (Hanson, 2011). At the end of the 1980s, the World Bank initiated the program

of health sector reforms with several publications, one of them; *Health Financing in Developing Countries: An Agenda for Reform* proposed the more significant role of market-based mechanism in healthcare (Smith & Hanson, 2011).

Significantly, ‘the 1993 World Development Report, investing in health’ drew the attention of the proposals of market-based approaches. Correspondingly, the 2000 World Health Report newly defined the health system (all the organizations, people, and actions whose primary purpose is to restore, promote or maintain health) and developed the framework of performance evaluation system of health through fairness of financing, health achievement and responsiveness (WHO, 2000). Thus, the health system was gradually privatized through the supervision of international health protector, and the motion of ‘health is a responsibility of government’ was shifted to out of the pocket expenditure. Bangladesh, as a low-income country, followed the instructions of international agencies and adopted the policies and strategies prescribed by them.

### **2.3. Public Health and State Medicine**

The word ‘Public Health’ defined in the preface of the Encyclopedia of Public Health;

Public health is one of the essential institutions of society. It exists to promote, protect, preserve, and restore the good health of all the people, and it achieves these ends largely through collective action (Breslow, 2002).

So, the health related institutions, organizations, programs and services of public health are concerned with the entire population, not individual. Health professionals work and engage themselves for the development of health by ensuring the pre-conditions of wellbeing. Thus, it differs from physicians, nurses, dentists and others who are working for the health of individuals. Public health emphasizes on prevention and early detection of diseases, promotion of

health and rehabilitation of disability and impairment. Multi-disciplinary professionals and experts are working for the development of public health, which is viewed as a social institution of combined efforts and practices.

However, two tendencies of the literature of public health brought it (public health) at the fore of historiography of medicine in South Asia (formerly British India). One is the colonial legacy of public health where the British made progress or not did anything for the native, secondly, in the Indian context, the term 'public health' was performed instead of 'state medicine'. Therefore, it was measured in the light of colonial power to control its subjects (Pati & Harrison, 2009). Partho Datta described the British experience in Calcutta;

In the first few decades of the nineteenth century, the British view of Calcutta changed dramatically for the worse, however. Far from the idyllic accounts of Calcutta, an oasis of Western calm surrounded by fierce tropical country, the city came increasingly to be imagined as a hotbed of tropical diseases, subject to the vagaries of tropical weather, a dangerous arena where precious English lives were lost (Datta, 2009).

S. W. Goode explained the progress of Calcutta municipality and heritage of good works from the 19<sup>th</sup> century. Water supply, sewerage system, slum clearance, electrification and road construction are narrated in details in his book (Goode, 1916). Partho Datta drew the theme of Mark Harrison as the public health was developed in British India through the introduction of Western medical practice. It refers to the reformist nature of the colonial state. The application of public health was limited, but it newly introduced the creation of the authority, the imperatives of rule, ruling ideology and its consensus. It can be marked as the colonial modernity (Datta, 2009). So, the notion of public health mingled with the objective of colonial rule and it worked as the reputation carrier among the elite of Bengal.

In the same way, the functions of public health were evolved over a long time. By mid-twentieth century six functions were considered as the fundamental



roles of public health; communicable disease control, vital statistics, maternal and child health services, laboratory service, sanitation and health education of the public. In 1997, based on the consensus of the 145 prominent public health leaders of 67 nations, the World Health Organization (WHO) specified nine essential functions of public health; a) monitoring the health situation, b) protecting the environment, c) health promotion, d) prevention, surveillance, and control of communicable diseases, e) public health legislation and regulation, f) occupational health, g) specific public health services, h) public health management, i) care of vulnerable and high-risk populations (Breslow, 2002).

On the other hand, state medicine is administered and controlled by the national government through medical and hospital services provided to the entire population of a country and paid for out of funds raised by taxation (Merriam-Webster, 1828). Promotional activities for health were operated by the British Government in British India due to a public health concern. However, the activities were considered as the state patronized medicine and people had the intention to avoid the Western medical facilities. David Arnold pointed out that the impact of Western medicines was notably confined in the European community in British India and the enclaves of the army; otherwise, it had minimal impression even in the 1940s and 1950s. Unlike other medicines, even homoeopathy, which is European origin, Western medicine became part of new cultural hegemony and developing political order (Arnold, 1993c). Consequently, it was just treated as the white man's medicine and state medicine. Anti-colonial movements scared the people of Bengal to the state medicine even the activities of public health.

#### **2.4. A Brief Socio-Political History of Bangladesh**

Sir Herbert Risley identified the physical types of the Mohammedans of Eastern Bengal and the Bengal Brahmans and Kayastha and other groups of lower

Bengal as the Mongolo-Dravidian type with a broad head, dark complexion, medium stature and medium size of the nose with a tendency to broad (Risley, 1915). Risley remarked that Aryan expansionists pushed out the 'Bang' tribe of the Dravidian stock from their original home thousand years before the birth of Christ. Therefore, the 'Bang' settled in the delta region of the Ganges and the Brahmaputra. The word 'Banga' is mentioned in the Jaina books and Vedas (Ahmad, 1975). Meaning of the suffix 'al' is raised mounds, and the word Bengal was used by the Aryans to identify the areas where Bang tribe was inhabited (Ahmad, 1975).

H. C. Raychaudhuri, likewise, demarcated Bengal as the territory where Bengali speaking people live though it was beyond the British provincial borderline. The districts of Goalpara, Sylhet in the East, and Cachar of Assam and the districts of Manbhumi in the West are included in the Bengal territory. The north boundary of Bengal is reached to the summit of the Himalaya. Purnea, Rajmahal and Teliagarhi were parts of Subah of Bengal formed by King Akbar (Raychaudhuri, 1943).

Correspondingly, in British India, the Bengal Province was the name of Eastern region stretches from the Himalaya to the Bay of Bengal. The Surma, the Brahmaputra, and the Kangsa rivers in the East to the lower reaches of the Suvarnarekha and the Barakar in the West. Majority of the Western districts were Hindus, and the majority of eastern districts were Muslim (Raychaudhuri, 1943). That is to say, two rivers and their numerous branches shaped and reshaped the physical feature of Bengal, the Ganges and the Brahmaputra. A vast deposit of silt taken from the uplands created the vast areas of lower Bengal; it is still an active delta. Consequently, river-beds are still transforming and shifting in Bangladesh.

Even so, the Brahmans and the Aryans tried to dominate the Bengali culture and

dialects and replace the Sanskrit language and their own culture, but it was resisted, and similarly, the people of other regions of India resisted them. However, in the shaping of real Bengali culture, the Pala Dynasty contributed a lot, especially by developing Bengali literature. The oldest scripts of Bengali literature were created in the Pala Dynasty where the Buddhist scholars composed the *Charya-Padas*. From the early thirteenth century, by conquering of Turko-Afghan ruler, Bengali literature adopted foreign words like; Persian, Arabic, Turkish, Portuguese, Dutch, French and English.

Hiuen Tsang (7<sup>th</sup> century), the Chinese traveler, identified some general nature of the people of Bengal were hardy by nature, hardy and brave, honest and amiable, quick and hasty, and fondness for learning. The Brahminical writing emphasized on the high moral standard of the people of ancient Bengal. Women were graceful, sweet-speaking, soft and timid. Rice, meat, vegetables, milk in different forms, fruits and fish were the leading food of Bengali people (Majumdar, Ganguly, & Hazra, 1943).

Ibn Battuta, the Moroccan Muslim traveler, visited Eastern Bengal in 1346 during the reign of Fakhruddin Mubarak Shah. He entered Bengal by the estuary of the Hooghly river and passing through Satgaon (Chittagong) and finally came to Sylhet, the eastern part of Bengal to visit the renowned Muslim saint Shaykh Jalaluddin (Hazrat Shahjalal) (S. J. Sarkar & Roy, 1943). Ibn Battuta described the geographical condition as well as the socio-economic condition of Bengal. Moreover, he mentioned three rivers; the Ganges, the Jamuna and the Surma and how it worked as the routes and contributed to the people of Bengal to cultivate the staple foods. He also mentioned that the Ganges was the sacred river to the Hindus (M. H. Khan, 2014). On the other hand, the abundance of food and daily commodities and their prices were cheap, which was not seen by him in the whole world where he visited. *Fakir* and religious people were favored by the people Bengal irrespective of religions. Sultan Fakhruddin

(contemporary ruler of Bengal when Ibn Battuta visited) had a great devotion to the religious people, travelling through boats was free for the *fakir*, and they were honored by gift if they appeared in the town (S. J. Sarkar & Roy, 1943).

Since the conquest of Bengal (16<sup>th</sup> century) by the Mughals created a significant impact on the socio-political life of the people of Bengal. Due to the establishment of the Mughal empire based on Delhi, the Afghan chiefs fled to Bengal and settled. The people of Bengal did not like the domination of Delhi in Bengal, so they supported Afghan chiefs. Sher Shah, a powerful Afghan chief, defeated emperor Humayun in Bengal and succeeded in capturing Delhi. Sher Shah made a plan to connect Sonargaon, the capital city of Bengal, to Delhi by the Grand Trunk Road through the introduction of the system of relaying the postage by the mounting posts. Horses were managed to be available by the Government. Finally, it was erected by King Akbar after the annexation of Bengal with the Mughal Empire in 1576 AD (Ahmad, 1975). Henceforth, Bengal was connected with Upper India, West and Central Asia. However, the Mughal conquest in Bengal is marked as the re-establishment of the connection which was cut off by the overthrow of the lordship of Delhi by the Muslim viceroys of Bengal at the beginning of 14<sup>th</sup> century. It also opened a new era of harmony and progress (S. J. Sarkar, 1943).

Therefore, Bengal was formed a Suba, a provincial administrative unit, of the Mughal Empire. Emperor Akbar appointed his revenue adviser Raja Tudormal for the establishment of a scientific revenue system, and military adviser, Munim Khan, was appointed for consolidation and proper annexation of Bengal with the Mughal Empire. However, the supremacy of the Mughal was resisted for half a century by the local chiefs and the Afghan chiefs. Dhaka was made capital by emperor Jahangir, son of Akbar, who appointed Islam Khan to consolidate the region with the Empire. The is to say, during the Mughal rule, the Bengal province was treated as the resourceful region due to agricultural

products, trade and local crafts. It was considered as the granary of the Mughal Empire. So, Princes and powerful Generals of the Mughal court were appointed to rule Bengal (Ahmad, 1975).

In comparison, the ancient and medieval invaders entered India through the passage of the Himalaya or the land way, but the Europeans arrived through the coastal areas of India. The Portuguese, the Dutch, the French and the English all kept footsteps in India based on their naval power. Unlikely, Europeans nations struggled against each other to establish their supremacy in India. Finally, the English won and established their colony in India for about 190 years. The British East India Company (BEIC) received the royal charter from Queen Elizabeth I on 31<sup>st</sup> December 1600 to conduct business in the regions of the Indian Ocean.

Along with business the Company slowly entered into the socio-political matters of India and made a position by the mid of 18<sup>th</sup> century. The Company was continuing business with primary concentration on Bombay, Madras and Calcutta (Bengal). British social scientists and experts studied the characteristics of the people of Indian states together with business activities. The British followed the triangular policies in the selected areas; business, intervention in socio-political issues and research. According to Charles Grants, real veracity and integrity are differing phenomenon in Bengal. Every person is interest for his own; deceptions, frauds, evasions, forgeries and procrastination are common in the society of Bengal. Principles of truth and justice are impracticable in the intercourses and dealings (Grant, 1813).

Significantly, the English took the opportunity of the characters of Bengali people and intervened first in the affairs of Bengal administration. Sirajuddaula, Nawab of Bengal, was defeated by the force of the East India Company under the leadership of Robert Clive in the Battle of Plassey in 1757. Chief of Nawab

force, Mir Jafar, betrayed, on the other hand, business magnets like Jagath Seth, Urmichand stood with Robert Clive due to their business interests. So, they could quickly intervene in the administration of Bengal. Mir Qasim reorganized the forces of Bengal against the BEIC after the Plassey, but he was defeated in the Battle of Boxer in 1764 through which the supremacy of the East India Company was embedded.

Therefore, the East India Company took charge of 'Diwani' to collect revenue of Bengal from the Mughal Emperor in 1765 where Bengal Nawab Mir Jafar had only power to administer. This dual system of governance (administration under the Nawab and revenue under the British) created inconsistency in the ruling system. That resulted in the Great Famine of 1769-70 in Bengal by which one-third of total inhabitants perished. After that, the BEIC took the charges of both administration and revenue collection, and started to study for the better formula to rule the Bengali people. Finally, through the Permanent Settlement (1793), they institutionalized the system of colonial rule in Bengal as well as in India.

After the Sepoy Mutiny of 1857, the British Government abolished the company rule and established the direct rule of the British Government in India. Although it was an unsuccessful rebellion, it had a significant impact on both Indian society and the ruling system of the English. It was notably the last combined efforts from the traditional society as well as the long-lasting ruling class of India; consequently, the hope of the exclusion of the West from India was diminished. By the initiatives of the British rulers, the traditional Indian society was broken down, and the new westernized middle class emerged (Augustyn, 2019). This new educated middle class intensified the sense of Indian nationalism, and finally, British India got independence in 1947 with commencing two countries; India and Pakistan. Present Bangladesh became part of Pakistan in the name of East Bengal later on East Pakistan.

Immediately after the independence of Pakistan, the tension was aggregated among the Bengali based on the greater recognition of Bengali political leaders in national politics and the fixation of the national language. The demand of the Bengali in East Bengal was- Bangla language along with Urdu would be the national languages of Pakistan, but Pakistani political elites did not accept it and resulted in language riots in East Pakistan (1952). Majority of the population of Pakistan were in East Bengal, so, East Bengal demanded to fix the representation of the National Assembly based on population. But it was fixed based on 'parity' and 'separate electorates' which was perceived as the sinister arrangement among the Bengali (Sisson & Rose, 1990). As time went on, the disparity between the two wings of Pakistan was increased. By the mid of the 1950s, number of recruitment in Pakistan Civil Services from East Pakistan was only 51 out of 741 top civil servants; in military there was 1 Bengali Brigadier, 1 colonel and 2 lieutenant colonels among 308 equivalent or higher rank (Sisson & Rose, 1990); per capita income in West Pakistan was increased whereas it was decreased in East Pakistan from 1949-50 to 1959-60 (Jahan, 1973).

Moreover, the democratic rights of East Pakistan were suppressed by the West Pakistani political elites. In this backdrop, East Pakistan started liberation struggle against West Pakistan under the leadership of Bangabandhu Sheikh Mujibur Rahman in March of 1971. After the nine-month of the liberation war, Bangladesh got independence on 16<sup>th</sup> December 1971.

Sheikh Mujibur Rahman got a release from Pakistan jail and returned to a new country, Bangladesh, on 10<sup>th</sup> January 1972. He faced internal socio-economic crisis and initiated the reconstruction activities as well as nation-building programs. He had to formulate many policies to reconstruct the governance system of a new country. Door to door health service providing policy was adopted to reach the people in the countryside of Bangladesh. Besides, some

unresolved issues needed to be settled with Pakistan. Amid these activities, he was murdered along with his family members on 15<sup>th</sup> August 1975 by a group of military officers. Then, after some ups and downs, chief of army, Ziaur Rahman, came forward and took the statesmanship. Establishment of ‘Upazila<sup>2</sup> Health Complex’ in the sub-district level, enactment of ICDDR,B Act, and the Oral Therapy Extension Program was launched in his reign. In the mid of 1981, he was assassinated by some of the army personnel.

Again chief of army, H. M. Ershad, took the opportunity and continued statesmanship up to 1990. President Ershad continued the programs that were launched by Ziaur Rahman, and he made the Expanded Program on Immunization (EPI) functional (1985) in Bangladesh (Banglapedia, 2015). After a long struggle, military rule ended, and the democratic regime started by the election of 1991. The Bangladesh Nationalist Party (BNP) under the leadership of Khaleda Zia, wife of Ziaur Rahman, won in the election (1991) and formed the government. After five years, in the election of 1996, the Awami League under the leadership of Sheikh Hasina, daughter of Sheikh Mujibur Rahman got a majority and formed the government. Sheikh Hasina changed the health policy of ‘sector-wide approach’ ‘door to door visits by community health workers’ to static service point approach by the Health and Population Sector Program (SPSP) in 1998. Under this policy on stop health services from the centers were provided; from sub-district level by Upazila Health Complex, from union level by Union Health and Family Welfare Centers (UHFWC), and village level by the community clinics (Osman, 2008).

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<sup>2</sup> Upazila is an administrative unit in Bangladesh, it is the Bengali term of sub-district. From the independence to till date the term upazila has been used either upazial or thana. To avoid the confusion, in whole dissertation, only upazila (sub-district) is used.





Figure 2.1: Political map of Bangladesh showing the international boundary, divisions boundaries, district boundaries and national capital (www.mapsoftworld.com, 2016).

### 2.5. Demography and Population Trends in Bangladesh:

Bangladesh is one of the densely populated countries in the world. Initially, the population was doubling within six decades (table-2.2), but last time, it was doubled within three decades (table-2.2). The present population size is 123 million (in 1998), and population density in per square km is 850 (Ministry of Health & Family Welfare, 1999). In the report of the Ministry of Health and

Family Welfare (1999), the demography and population trends of Bangladesh are studied up to 1998. The population growth rate is 1.75 percent per annum, and due to combined efforts of government and NGOs, the fertility rate was decreased from 6.4 live births in 1975 to 3.3 child per woman in 1996. Up to 1997, men and women were 63 million and 60 million, and the sex ratio was 105. Out of the total population, 63 percent is under age 25, the working-age population from 15 to 64 is growing faster, and it will be double from 1992 to 2020. In 1992 it was 66 million, and it will be 135 million in 2020 (Ministry of Health & Family Welfare, 1999). About 4 percent population was living in an urban area in 1950, and it was increased six times, 25 percent in 1995. It is estimated that the urban population will be increased rapidly in future.

From 1947 to 1970 the programs and activities about family planning were comparatively not as much of the programs and activities which were adopted after the Independence of Bangladesh in 1971. The first five-year plan of Pakistan (1955-1956 to 1959-1960) recommended the idea of family limitation and sanctioned one million rupees as grants to private associations and family planning clinics (Robinson, 1978). In 1953, private family planning association was founded then the government clinics started to provide the family planning services in 1958. Therefore, the National Comprehensive Family Planning Scheme was started in 1965 with a budget of 160 million rupees to provide services to 20 million couples in Pakistan, but the expected result was not acquired. However, after the independence of Bangladesh in 1971, the first five-year plan (1973-1978) gave priority on population control and production of food. Due to vigorous efforts both from government and non-government organizations, the growth of population was decreased in the 1980s and 1990s.

The first population policy was adopted in Bangladesh (1976) associated with some significant innovations: population control by slowing population growth, comprehensive health and family planning by hospitals and domiciliary

workers, and the encouragement of NGOs and private sectors for participation in family planning program (Osman, 2008). The population policy of 1976 was the incorporation of the social reformation programs and overall national development. It was adopted to ensure the improvement of the living standard of the people of Bangladesh by making the family size smaller, confirming the health of mother and child, strengthening the family planning program through monitoring and decentralization of financial and administrative powers.

The second population policy was adopted in Bangladesh (2004) with the objectives of improving the standard of family planning, maternal and child health, reproductive health services and the living standard of people through confirming the desirable balance between population and development (Ministry of Health & Family Welfare, 2004). The context of the Millennium Development Goals (MGDs) and Interim Poverty Reduction Strategy Paper (IPRSP) are followed in the second population policy.

**Table 2.1: Population characteristics by broad age groups: 1961-2010(Ministry of Health & Family Welfare, 1999)**

Age Groups	1961	1974	1981	1991	1995	2000	2010
Population in '000.'							
0 – 14	25461	36738	41914	50529	49570	46398	47135
15-59	26880	35324	42886	54881	62860	72893	85926
60+	2882	4336	5112	6045	7300	9952	13321
Total	55223	76398	89912	111455	119730	129243	146382
Intercensal Growth Rate (%)							
0 – 14	3.17	2.81	1.88	1.87	0.50	-1.32	0.16
15-59	1.31	2.08	2.77	2.46	2.44	2.96	1.64
60+	3.86	3.15	2.35	1.67	6.38	6.2	2.92
Total	2.25	2.48	2.32	2.15	1.87	1.53	1.25
Sex Ratios							
0 – 14	105.9	104.9	105.6	107.4	104.0	104.3	105.3
15-59	105.5	108.2	105.0	103.1	101.5	101.8	0.99
60+	122.9	129.9	122.1	129.1	129.0	115.3	114.7
Total	107.6	107.7	106.1	105.9	105.2	103.7	102.7
Percent of Total Population							
0 – 14	46.1	48.1	46.6	45.2	41.4	35.9	32.2
15-59	48.7	46.2	47.7	49.4	52.5	56.4	58.7
60+	5.2	5.7	5.07	5.4	6.1	7.7	9.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

There are two schools of thoughts about the determinants of the decline of fertility; the developmentalists and the family planning enthusiasts. The developmentalists think that demographic transition can be achieved through the development activities. They argued that developed countries have no official family planning program, but it was achieved due to fulfilling the prior demands of people to reduce the family size. If people have the resources and contraception methods are available, then they use the family planning methods from their own. On the other hand, family planning enthusiasts are more focusing on the services of government and other organizations for the reduction of family size. In Bangladesh, both thoughts were applied to decreased the fertility. The determinants of fertility decline were; utilization of government family planning services, utilization of agricultural extension services for the development of rural households, increasing educational level or literacy, increasing life expectancy, decreasing infant mortality, employment of female in outside the family, and various factors which contributed in improving the societal condition in Bangladesh after the independence in 1971 (Kalam, 2000).

**Table 2.2: Population, Size, Inter-census Growth Rate, Crude Birth Rate and Crude Death Rate (Kalam, 2000).**

(Population 000s)					
Year	Population	Natural Increase Rate	Crude Birth Rate	Crude Death Rate	
1911	31555	0.82	53.8	45.6	
1921	33254	0.56	52.9	47.3	
1931	35604	0.87	50.4	41.7	
1941	41997	1.49	52.7	37.8	
1951	41937	0.87	49.4	40.7	
1961	54531	2.16	51.3	29.7	
1974	76398	2.80	47.4	19.4	
1981	89912	2.57	41.7	16.0	
1991	109876	2.06	31.6	11.0	

## **2.6. Socio-Economic Condition and Health**

Some parameters show the socio-economic trends of a country, like; values, norms, beliefs, the fulfilment of basic societal needs and services, education, types of occupation, security, food, life expectancies, political attitude, leisure

activities, crime rate and others. The presence of polluted air increases the incidence of different diseases which changes lifestyle in the developing countries. From the 1950s to 1980s, there was a green revolution in the world, and Bangladesh also actively took part in the revolution. Like other countries of the third world, a good number of people are the sufferers of starvation and hunger each year in Bangladesh (M. S. Rahman, 2000). According to the human poverty index (HPI) of UNDP in 1998, HPI in Bangladesh is 46.5 percent with the rank of 65 among the 77 developing countries in the world (M. S. Rahman, 2000). ‘Education is the right of a human being’ is stated in the Declaration of Human Rights in 1948. Both the government and NGOs initiated various programs to confirm education for all. The results of combined efforts are appeared in the 1980s and 1990s (see table -2.3).

**Table 2.3: Trends in Educational Facilities and Percentage of Literacy Rates in Bangladesh from 1985-1996 (M. S. Rahman, 2000)**

Indicators (Number of)	Year		
	1985-86	1990-91	1995-96
Primary Schools	44488	48146	61583
Secondary Schools	8649	9731	12858
General Colleges	687	997	3032
Medical and Dental Colleges	10	10	20
Engineering Colleges	4	4	4
Universities	6	9	27
Polytechnic Institute	17	18	20
Percentage of Literacy (Both sexes of seven years and above)	23.8	24.8	32.4

A newspaper article reflects the health condition of Bangladesh (East Pakistan) in Pakistan period. Eighty-five percent people of Pakistan were living in a rural area without health facilities and treatment. There were *kabiraj* and *boidho* in every village and colony who served the people in any sickness, and prescribed the patient or assured by physical presence. In response to their work, they were paid minimal, or it was based on the capability of the patient. However, now the Western medicine limits the opportunities of local *kabiraj* or *boidho*. People go to the hospital or pharmacy, but they are not getting proper treatment. If they get the treatment, they have to pay to the doctors and the compounders of

government hospitals. On the contrary, doctors and compounders are not regular in the government hospital, but they are giving time in private practice where they earn extra money. Besides, both doctors and compounders are demanding money against services in government hospitals or pharmacies. By the liaison of doctors and compounders, they are selling the medicines of the hospital to the people. So, from all sides, the more impoverished rural people are sufferers of diseases and getting die without treatment (S. A. K. M. Islam, 1970).

Before the starting of the Liberation War of Bangladesh (1971), cholera and other communicable diseases were rampant in the whole province (East Pakistan); several reports of deaths from diseases were being published in the newspapers. Amid these crises, a devastating cyclone attacked the southern part of East Pakistan, which further aggravated the whole situation. Editorial in the Daily Ittefaq (Bengali national newspaper) on 19<sup>th</sup> November 1970 narrated the shocking condition of the province. Due to the devastating cyclone, the southern part of the province became debris. People who were alive were fighting for survival because of the severe crisis of food, clothes, drinking water, shelter and medical treatment. After cyclone communicable diseases, especially cholera, were rampant in the region. For instance, in Hatia island, seven people died from cholera; the smell of the dead human body is spreading out where government officials are not taking the responsibility to bury the dead body (The Daily Ittefaq, 1970). In remote places of the region, cholera became epidemic, community people could not rescue them, or no one could survive due to the cyclone. Besides, people of other areas of the province were suffering from cholera; government recognized that about one thousand people died from cholera in different parts of the province only in October 1970. Cholera epidemic and massive deaths were common phenomena in the province (The Daily Ittefaq, 1970).

In contrast to the above view, a government press note was released on 31<sup>st</sup>

October 1970 describing the East Pakistan government efforts and expenditures for the management of cholera patients and medicine. To protect the cholera epidemic government positioned 85 doctors and 5500 vaccinators in whole East Pakistan and a significant number of vaccines were provided from 1965 to 1970 (table-2.4). But government efforts only for vaccination could not protect the people from the cholera epidemic. A holistic approach to control the cholera epidemic was absent in Pakistan period. Statistics of the given cholera vaccines are (East Pakistan Government, 1970);

**Table 2.4: Statistics of cholera vaccines from 1965 to 1970**

Year	Number of Cholera Vaccines
1965	32373849
1966	42393120
1967	32725557
1968	43185299
1969	31579213
1970 (up to October)	56370523

After the independence of Bangladesh, the UNICEF funded for setting of thousands of tube-wells in rural and urban areas of Bangladesh, and so the crisis of drinking water was reduced. Within the first decade (the 1970s) after independence, most of the locality got the tube-wells. Moreover, awareness of pure drinking water was increasing through the promotional activities of government and the community people. However, construction of health centers, distribution of ORS, activities of community health workers both from government and NGOs were creating better ambience for health. Due to combined efforts of the Government of Bangladesh, NGOs and international agencies, the situation was gradually improved in the 1980s and 1990s.

Amid the holistic activities, outbreaks of communicable diseases like dysentery and cholera were observed in different parts of the country. An editorial was published on 14<sup>th</sup> May of 1976 with describing dysentery and cholera situations in Bangladesh. Three hundred deaths were reported in Narayangonj area, near to Dhaka, due to cholera, dysentery and measles. The editor argues that cholera,

dysentery and measles are not incurable diseases, but 300 children died within a few days due to the negligence of the workers of the public health department. In addition, pure drinking water should be ensured both by the efforts of government and the community people through boiling water or collecting water from tube-wells. The editor suggested that public health workers should encourage the people and utilize the community leaders to build the awareness of pure drinking water. By this way, water-borne diseases could be removed from the country (The Daily Ittefaq, 1976).

**Table 2.5: Basic Health Indicators of Bangladesh comparison between 1973 and 2001 (R. M. Rahman, 2006)**

Indicator	1973	2001
Infant Mortality Rate (IMR)	140/1000	51/1000
Maternal Mortality Rate (MMR)	30/1000	3.5/1000
Crude Birth Rate (CBR)	47/1000	19.9/1000
Crude Death Rate (CDR)	17/1000	4.8/1000
Life Expectancy at Birth (LEB)	45 Years	62 Years
Doctor/Population Ratio	1:6250	1:4105
Doctor/Nurse Ratio	--	2:1.7
Bed Population Ratio	--	1:3154
Immunization Coverage under One Year	--	80 percent
Total Population Covered by Essential Health Care	--	42 percent
Proportion of Diarrhoea Control	--	70 percent
Delivery Assisted by a trained person	--	14 percent
Prevalence of Low Birth Weight (LBW)	--	25 percent
Prevalence of Child Malnutrition	--	48 percent

### **2.7. Drinking-Water and Sanitation:**

Drinking of contaminated water is the leading source for water-borne diseases like; pneumonia, diarrhea, dysentery, measles and other communicable diseases in both rural and urban areas of Bangladesh. However, a good portion of diseases prevalence could be protected by access to adequate sanitation services, safe water supply and improved hygiene practices in the world (WHO, 2019). The World Health Organization (1977) noted that due to the lack of safe drinking water, 80 percent diseases appeared in the developing countries of the world. About 120 crores of people lived in the scarcity of pure drinking water in the world, and 140 crores of people of the world had no amenities of proper



sewerage system (The Daily Ittefaq, 1977). Up to 1977 total number of tube-wells in Bangladesh were two lacs eighty-five thousand and every year; it was supposed to set fifty thousand tube-wells by the public health engineering (The Daily Ittefaq, 1977).

A substantial change was appeared due to the availability of pure drinking water within 2000, but the burden of diseases not sufficiently reduced. Tube-well water is considered as safe water to the rural people, and other sources are treated as unsafe such as pond water, river water and ring wells. 92% of the rural population have access to tube-well water, ring-wells- 1.4%, river water- 0.5%, pond water- 0.9% (M. M. Rahman, Matsui, & Ikemoto, 2013). According to the document of the World Bank (2016), for many years Bangladesh has been enjoying the universal access to drinking water but facing a problem with 22 percent arsenic contamination (The World Bank, 2016).

Another key thing to remember that sanitary toilet facilities prevent environmental hazards as well as infectious diseases. The primary reason behind the diarrheal diseases is the inadequate and unhygienic management of toilet and disposal of excreta. Up to 2000, roughly two-fifths of the world population was out of access to sanitary toilet facilities (M. M. Rahman et al., 2013). According to the statistics of the World Bank (2015), Bangladesh achieved significant progress in the reduction of open defecation. In 1990, there was 34 percent open defecation in Bangladesh, and it was reduced to just one percent of the total population in 2015. Moreover, 61% is improved sanitation, and it is growing 1.1 percent every year (The World Bank, 2016).

## **2.8. Social History of Health and Medicine in Bangladesh**

The study on health and medicine expanded in recent years to understand the long history of public health and medication in Bengal. The fore of medical experiments in the 19<sup>th</sup> and 20<sup>th</sup> centuries was Bengal, and it became an essential

part of widening the theoretical and practical knowledge of medical history. However, the British colonial rulers faced tremendous challenges in Bengal due to tropical diseases. So, medical men and medicine were brought to Calcutta, as the capital city of British India to protect the British army, white civilians and the businessmen. Western medicine struggled almost the whole period of British colonial rule in Bengal to make Western medicine as the primary choice to the people of Bengal. David Arnold identified two points behind this failure; Western medicine could not be transmitted from state medicine to public health. Secondly, there were a lot of indigenous medical practitioners – the *hakims*, the *boidhos* and the *kabiraj* (Arnold, 1993c). He wrote about the status of Western medicine in Bengal like;

Despite the influential patronage of the colonial state, despite its own scientific claims and monopolistic aspirations, Western medicine had singularly failed to displace its indigenous rivals. Indeed, by 1914 the cohorts of a reformed and revitalized Ayurvedic and Yunani medicine were mounting a fresh assault on the privileged status of Western medicine in India, and even homeopathy, despite its European origins, seemed to be winning more adherents, especially in Bengal, than orthodox allopathic medicine (Arnold, 1993c).

Some themes need to be discussed to understand the social history of health and medicine in Bangladesh, like; the relation between health and environment, poverty and health, the interrelation between health behavior and religion.

### **2.8.1. Health and Environment**

The land of Bengal was formed in the estuary of the Ganges-Brahmaputra river. In 1947 it (Bengal) was divided into two parts: eastern half was part of Pakistan as East Pakistan (Muslim majority area), and western half was in India as West Bengal (Hindu majority area). During the partition, more than 95 percent of the people of East Pakistan were living in the village with their farming lands. River influenced the land and the social lives of the people of Bengal.

Coupled with the evidence, environment-related health hazards are common in

Bangladesh. Among the top 15 disaster-prone countries in the world, Bangladesh is fifth (Shaw, Mallick, & Islam, 2013b). Poverty, population density, poor hygiene and sanitation, flooding, landslides are making the environment-related health risks more aggravated. Bangladesh has the maximum number of the population exposed to flooding in the world (UNISDR, 2011), 20 percent population are covered by floodwater, and about 68% population are periodically affected by flooding (Shaw et al., 2013b). Naturally, the health crisis is begun after the flood. Waterlogging for months or years in some places in Bangladesh has a pervasive impact on livelihoods, shelter, access to food and water, sanitation and healthcare. Moreover, rapid unplanned urbanization increases environmental and health-related risks.

Significantly, Bangladesh is an agriculture-based country with 160 million (2011) of population. It ranks fifth in Asia and eighth in the world, almost 48 percent of the population is dependent on agriculture (Shaw, Mallick, & Islam, 2013a). It has tropical monsoon weather associated with heavy seasonal rainfall, high humidity and high temperature. There are six seasons in Bangladesh nonetheless three seasons are generally being recognized: hot and humid summer from March to June; hot, humid and monsoon season from July to November; winter season from December to February. April is the warmest month, and January is the coldest month in a year. Besides, the average temperature is 16-20 degree Celsius with the availability of humidity, which is the conducive temperature for the survival of germs, especially cholera germ in the ponds, rivers, and holes. So, round the year it can survive and attacks the humans in a feebleness situation.

More or less every year Bangladesh faces the natural calamities like- tropical cyclones, coastal erosion, storm surges, tornados, droughts, floods; these are the causes of health hazards. It causes the loss of lives as well as it jeopardizing the development activities of the country. During the natural calamities, people are not getting pure drinking water, and so they are using pond water which

accelerates the water-borne diseases like- dysentery, diarrhea, fever and others. Under high temperature with humidity, people are suffering from dehydration; mainly, it affects the older people and the children. At the time of droughts, people are not getting food and water, which aggravates chronic energy deficiency among agricultural labors and other low-level professionals.

On the other hand, Bangladesh is suffering from both communicable and non-communicable diseases due to an unhealthy environment. Rapid unplanned urbanization, unhealthy dietary and the social transition are the significant stimulus behind the non-communicable disease. Lack of pure drinking water and the inappropriate method of the disposal of excreta (from the 1960s to 1980s) made the situation worsen. Poor rural housing with inadequate ventilation facility and lighting, eating behavior, lack of proper management of garbage and animal waste, shoddy sanitation work as the causes of both communicable and non-communicable diseases. The situation was gradually improving from the 1990s due to the comprehensive efforts which were started after the independence of Bangladesh. As Bengal was the permanent focus of cholera, people had a concern about the remedy of the disease. The cultural phenomenon has an impact on the dominant forms of medical and health knowledge prescribed by the legitimate institution like ICDDR,B and BRAC. There was a culture of searching remedies to prevent cholera scourge in the society of Bangladesh, and so the invention of home-based ORS was welcomed by the people of Bangladesh.

### **2.8.2. Poverty and Health**

The Lancet published an article on 23<sup>rd</sup> November 2013 titled ‘the Bangladesh paradox: exceptional health achievement despite economic poverty’ with some key messages. It is narrated in the article that-

A) Bangladesh is an exceptional health performer, but it presents the paradox of pronounced reductions in mortality accompanied by

persistent malnutrition and low use of some basic health services. B) Bangladesh's success might be attributed to a pluralistic health system with many stakeholders, including government and non-governmental organizations, who pursue women-focused, equity-oriented, nationally targeted programs, such as those in family planning, immunization, oral rehydration therapy, maternal and child health, tuberculosis, vitamin A supplementation, and others. C) Especially noteworthy is Bangladesh's approach to equity, and its widespread deployment of (mostly female) community health workers to bring high-priority services to every household in the country. D) The Bangladesh paradox shows successful direct health action in the context of positive and negative social determinants of health—positives such as women's empowerment, widespread education, and mitigation of the effect of natural disasters, and negatives such as low gross domestic product, pervasive poverty, and the persistence of income inequality. E) Bangladesh offers many lessons, including how gender equity can improve health outcomes, how health innovations can be scaled up, and how direct health interventions can partly overcome socioeconomic constraints (A. Mushtaque R. Chowdhury et al., 2013).

Over the period, the social structure of Bangladesh has been changed, and the dimension of poverty, as well as the difficulties of daily life, has also been shaped based on contemporary phenomenon. The Statistical Digest of Bangladesh (1970-71) reported that 90% of Bangladeshi people live in rural areas, and agricultural production provides 55% of the gross national product.<sup>3</sup> The peasants constituted 70% of the total population who were self-employed population in the country; among them, 18% were landless workers (Gankovsky, 1974).

Up to 1971 non-agricultural sectors of Bangladesh economy was dominated by the non-Bengali businessmen, who came to East Pakistan from India after the separation of 1947. After independence, the government of Bangladesh acquired the enterprises, over 1.5 million rupees, under the control of the government, which were under non-Bengali people in the business. Besides, the

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<sup>3</sup> Statistical Digest of Bangladesh, 1970-71, Dhaka, 1972, p. 220.

decision was also made to sell out the small enterprises less than 1.5 million rupees of non-Bengali businesspeople to the Bengalis. Thus, a good number of Bengalis got the status of business persons as well as the national and international connection of business in the absence of the non-Bengali businesspeople (Gankovsky, 1974). Many policies and programs were launched to alleviate the poverty in Bangladesh; consequently, after 1992, poverty was decreased significantly from the society of Bangladesh. Declining poverty indicate the overall improvement of the purchasing power of the people of Bangladesh, which strengthened the access to essential foods and better diets (FAO & WHO, 2014).

**Table 2.6: Indicators of poverty and health in rural Bangladesh from 1963/64 to 2000 (A. Rahman, 1986) and (World Bank, 2018)**

Indicators	1962-1964	1976/77	2000	2010
% of people below poverty line	75.0 (FAO)	83.0 (FAO)	48.9 (WB)	31.5 (WB)
Calorie intake (K. cal)	2251 (Nutritional Survey)	2094 (Nutritional Survey)	--	2318 (WHO)

### 2.8.3. Health and Religion

Up to the nineteenth-century people of Bengal were predominantly and overwhelmingly living in rural surroundings, where human muscle and animal muscle performed the most work. Consequently, supernatural powers were mainly explained as the working force of the universe; traditional religious cultures shaped the thought process of the supernaturalism. In fact, life expectancy was low; disease was in fatal character, the belief system of diseases and their causes was frequently changing and varied one locality to another locality. So, in absence of scientific knowledge, people had only option to explain all the health-related experiences from the perspective of religion. Besides the religion, people had belief in local healing systems, magic and empirical remedies.

Islam, Hinduism and Buddhism are the major religions in Bangladesh. Muslims

believe in the religious practice for the significant healing role, and Allah (God) knows the etiology of the disease, so only he will give the remedy through prayers. Muslim priests (*Maulana or Mouluvi*) were considered as the healers, and people were used to going to the priests for *doa* (prayer) and *pani pora* (holy water). Hindus and Buddhists believed in the deities and some traditional religious ritual as the remedies of the diseases. Besides, folk healers and their empirical remedies were popular in Bengal for a long time (D. R. Nalin & Haque, 1977).

Pollitzer noted that due to the longstanding epidemic of cholera in Bengal Delta, the Hindu shrines were dedicated to the goddess of cholera, and fatality rate without treatment was 60-80% (Pollitzer, 1959). David Nalin searched the causes behind the religious amalgamation of cholera in Bangladesh, and he found that it was used to reduce the cholera-related apprehension, and whole theoretical perspective was built based on the rendering of threat and personification of supernatural beings (D. R. Nalin & Haque, 1977). The logic behind this correlation with deities or supernatural basis for the control of disease was the appeasement of deities or demons. If people exclude the evil activities or practices, then the disease or mortality would not exist, but people cannot exclude all the misdeeds, so, the demonstrable consequence of the deities is existed for a long time (D. R. Nalin & Haque, 1977).

David Nalin and Zahidul Haque studied on the two cultural groups of Chittagong District of Bangladesh; one was Bengali community (majority Muslim) and tribal group (Buddhists) in the Chittagong Hill Tracts in the winter season (October-December) of 1967. It was published in the Journal of Medical Anthropology in 1977 entitled “Folk Beliefs about Cholera among Bengali Muslims and Mogh Buddhists in Chittagong, Bangladesh”. It was based on in-depth interviews of local people when cholera was rampant in the locality in 1967.

The Bengali communities consist of a Muslim majority and Hindu and Buddhist minorities. Mogh tribespeople (Buddhist) are concentrated in specific localities along the coast. The different groups have different folklore regarding good and evil spirits, but they share the beliefs that illness may derive from malevolent glances or wishes and may be cured and prevented by prayers and the posting or wearing of talismans (tabez) to protect health. Strings are found around arms, necks and waists of children and adults of both sexes; these may bear rings, stones, sticks, medallions and (frequently) prayers in small, bullet-shaped silver or copper-colored metal containers. Copper rings and bangles are regarded as beneficial for arthritis. A knotted jute string, tied around the neck while cholera prayer is recited, is used by cholera patients for a cure (D. R. Nalin & Haque, 1977).

## **2.9. Health Administration and Health System in Bangladesh up to 1998**

There were three departments of the Ministry of Health in East Pakistan; a) department of medical care, b) department of public health engineering, and c) department of public health. The department of public health was in charge of taking care of the cholera epidemic, which was very small in size compared to the 46 million people of East Pakistan (T. A. Cockburn, 1960). According to the constitution of Pakistan, the Provincial Governments would deal with the health department of the province, only international health and specialized research institutions would be under the control of the Central Health Ministry. There were separate health programs in two states of Pakistan; medical services and public health services. The provincial government dealt with three programs; medical services, research program and public health program. Besides, control of medicine was kept under the provincial government. So, the Pakistan SEATO Cholera Research Laboratory was under the regulation of the Central Government of Pakistan (“Jatio Sastho Gobeshoragar Service (National Health Research Service),” 1969).

David Nalin shared an experience and some narratives about the health administration of East Pakistan. Director General (DG) of East Pakistan health



Doctor Fahim Uddin and head of Public Health Institute Dr Mansoor were cooperative to the PSCRL to prevent cholera and later on to disseminate the knowledge of ORS among the people of East Pakistan. Fahim Uddin played a crucial role in introducing David Nalin to the tenacity of cholera in the Chittagong Hill Tracts, he made a tour of the health Outposts. In some of the jungle areas of Chittagong Hill Tracts, patients were dying due to cholera. Moreover, when they went to the local health station, the offices when they found out who Fahim Uddin was as DG health, immediately claimed that there was no cholera in the area because they were afraid of getting exposed as doing nothing. So, there was tremendous support from the officials in the health ministry of East Pakistan, and also the central government of Pakistan was positively contributing by arranging PR-480 funds, which was the donation of US Government to the SEATO Cholera Research Laboratory (D. Nalin, 2018).

After the independence of Bangladesh (1971), the health system was guided by the Five Year Plans and the policies. Initially, the main target of health system development was associated with population control of the country. Along with the reduction of population growth, the health sector aimed to confirm minimum health facilities of the population with particular emphasis on the poor and disadvantaged section of the population (Osman, 2008). The Ministry of Health and Family Welfare (MOH&FW) is responsible for planning, policy formulation, and delivery of healthcare in Bangladesh. In the early 1970s, two separate directorates were responsible for two wings; health services and family planning (Vaughan, Karim, & Buse, 2000). Presently (2019) the activities of the MOH&FW are divided into four directorates: Director General of Health Services, Director General of Family Planning, Directorate of Nursing Services and Directorate of Drug Administration (MOH&FW, 2019).

First Five Year Plan (1973-1978) adopted to build health services throughout the country. The ultimate target was to provide reasonable health care to all

(Planning Commission, 1973). According to the plan, infectious diseases were the most important reason for the high prevalence of mortality and morbidity. Cholera was considered as one of the endemic diseases of the country. Safe water supply and hygienic disposal of human excreta were recommended as the permanent measures to prevent cholera endemic (Planning Commission, 1973). Therefore, construction of health complexes at the upazila level (sub-district level) and health centers at union level was started. By this time, the first population policy (1976) was adopted to reduce the population growth through hospitals and female health workers. Health workers would provide the health service at the doorsteps of people throughout the country (Osman, 2008).

The interim Two Year Plan (1978-1980) reflected the government's plan of the involvement of the private sector in the health service delivery. The Second Five Year Plan (1980-1985) encouraged the private sector and involved NGOs in the health sector. Some vertical programs were launched through public-private and NGO partnership; the Oral Therapy Extension Program was one of them. In the Third Five Year Plan (1985-1990), Maternal and Child health care was included as an effective way of population control. The EPI (Expanded Program on Immunization), distribution of Vitamin 'A' and the control of diarrheal diseases were intensified in the Third Five Year Plan (Osman, 2008).

The Fourth Five Year Plan (1990-1995) recognized the 'access to health is a fundamental right to a person'. It emphasized on Maternal and Child Health along with the primary health care of people (Planning Commission, 1995). The Fifth Five Year Plan (1997-2002) adopted the Health and Population Sector Strategy (HPSS). The Primary Health Care services would be provided through four tiers: (a) community level; (b) ward level; (c) union level; and (d) upazila level (Planning Commission, 1997). The HPSS gave specific strategic changes and reforms in the health sector. In 1998, the Health and Population Sector Program (HPSP) was launched following the strategies of SPSS. The major

reform programs of HPSP (1998-2002) were (Osman, 2008):

1. A transition from a project-based bifurcated approach to sector-wide approach (SWAp) of management through which all the sectoral projects were planned and managed in an integrated manner instead of running vertical projects.
2. Unification of the health and family planning wings of the Ministry of Health and Family Welfare (MoH&FW) to avoid duplication and overlapping of MCH services and to provide health and family planning services in a package to ensure efficiency gains.
3. To achieve the greatest health and impact per Taka spent and to serve the most vulnerable groups like women, children and poor, an Essential Service Package (ESP) containing five basic maternal, child and public health services was introduced which was delivered from one single service point, called 'one-stop shopping'. The objective of introducing this was to make access easier to multiple health services for clients (for multiple family members, i.e., a mother and her young child or children) during a single health facility visit. One-stop-services were provided in a three-tiered fixed facility, i.e., Upazila Health Complexes (UHCs) at the Upazila (sub-district) level, the Union Health and Family Welfare Centers (UHFWCs) at the union level and community clinics at the village level. Bangladesh is administratively divided (1998) into six divisions, 64 districts, 481 Upazilas (designated as *thana* till 1982) and 4,498 unions.
4. Construction of community clinics for every 6,000 populations, which was an effort to take the healthcare service structure closer to the people at the grassroots.

So, after 1998, the system of health care delivery based on Primary Health Care (PHC) was shaped with six tiers: (a) community level-through community health workers; (b) ward level through satellite clinics/health posts; (c) union level-through union health and family welfare centers (HFWC), it is the first health facility level; (d) Upazila level-through the Upazila Health Complex, it is the first referral level; (e) district hospital, it is the second referral level; (f) national level hospital, it the tertiary referral level (Planning Commission, 1997).

## 2.10. Health Facilities

According to the statistics of the Statistical Research and Training Institute of the University of Dhaka in 1975, there was one doctor and one hospital bed against ten thousand populations and one nurse against eighty thousand population in Bangladesh (Ittefaq Report, 1977). From 1975 to 1980 some changes in number appeared, hospital beds were doubled, and other facilities were increased, but the disparity between urban and rural health facilities became prominent over time. Out of eight thousand, only one thousand doctors were working in the rural area, out of 15 thousand hospital beds one-fourth were in rural areas. Statistics show (1980) that 2 percent population are living in Dhaka, but 20 percent hospital beds are available in the city. One hospital bed is against 4750 people in a rural area and 580 people in Dhaka city (Ittefaq Report, 1980). All the health facilities were increased within 1998 (Table-2.7).

**Table 2.7: Health Care Growth in Bangladesh from 1973 to 2003 (R. M. Rahman, 2006)**

Type of Facility	1973	1978	1983	1988	1993	1998	2003
<b>Total Hospitals</b>	<b>308</b>	<b>424</b>	<b>724</b>	<b>875</b>	<b>903</b>	<b>1273</b>	<b>1464</b>
Government Hospitals	--	388	560	608	611	647	654
Private Hospitals	--	36	164	267	292	626	810
District Hospitals	13	37	43	59	57	59	59
Upazila Health Complexes	160	253	319	352	372	402	417
<b>Number of Hospital Beds (Total)</b>	<b>12311</b>	<b>19538</b>	<b>25057</b>	<b>33334</b>	<b>35280</b>	<b>41514</b>	<b>44275</b>
Public Sectors	10449	16853	20286	26871	27637	30141	32615
Private Sectors	1862	2685	4771	6463	7643	11371	11660
<b>Total Medical Colleges</b>	<b>8</b>	<b>8</b>	<b>9</b>	<b>9</b>	<b>16</b>	<b>19</b>	<b>33</b>
Public Medical Colleges	8	8	9	9	13	13	13
Private Medical Colleges	NA	NA	NA	NA	3	6	20
<b>Post Graduate Institutes</b>	<b>1</b>	<b>3</b>	<b>6</b>	<b>6</b>	<b>6</b>	<b>6</b>	<b>6</b>
<b>Registered Doctors</b>	<b>5001</b>	<b>7035</b>	<b>11496</b>	<b>18030</b>	<b>21004</b>	<b>29613</b>	<b>36553</b>
<b>Registered Nurses</b>	<b>765</b>	<b>2011</b>	<b>5164</b>	<b>7390</b>	<b>9655</b>	<b>16104</b>	<b>19066</b>
<b>Registered Midwives</b>	<b>764</b>	<b>1041</b>	<b>3424</b>	<b>6556</b>	<b>7713</b>	<b>14312</b>	<b>16553</b>

### **2.11. Conclusion**

After the independence of Bangladesh (1971), the main target of public health activities was to control population growth. Initially, the health system was guided by five-year plans, programs and finally the draft of health policy was accepted by the cabinet on 14<sup>th</sup> August 2000. However, the entire health system was flourished based on public-private and NGOs partnerships. International agencies and organizations provided the technical and financial support to set a structure of the health system as well as donated in particular programs. Besides, NGOs worked to enhance the health structure in the country; they had a significant role in spreading the health-related knowledge to the people of Bangladesh. The health care delivery system is divided into six tiers from the community level to the national level. Health complexes were established in the sub-districts as the first referral level and health centers at the union level. Door to door community health care was the cornerstone of the health care service up to 1998. Then after 1998, community clinics were constructed (one clinic for 6000 people) to confirm the health facilities of the people of Bangladesh.

## **Chapter Three:**

### **Social History of Cholera and Development of ORS in Bangladesh**

#### **3.1. Introduction**

The term ‘cholera’ and ‘diarrhea’ have social interpretation and understanding in Bangladesh. The social understanding of cholera and diarrhea has been constructed based on the severity of disease and its fatality. Cholera has been defined as the most severe condition of loose bowels and vomiting with fatal and spreading nature of the disease. However, diarrhea has been described as the fluid loss through watery stools with different dimensions, even regular loose bowels also considered as diarrhea. Bangladeshi people are appalling to pronounce the word cholera due to a horrible experience in the past.

Moreover, cholera is recognized as the most lethal diseases in this region, and people’s idea is shaped as watery diarrhea with thirst, cramps, clammy skin and vomiting (D. R. Nalin & Haque, 1977). On this backdrop, to understand the perception of aged people, the researcher took interview of 15 elderly males and females from different districts of the country where they shared their experiences about cholera epidemics of the 1950s, 1960s, and 1970s. Even so, they were fearful of pronouncing the word cholera, and they identified it as the most shocking and fatal diseases in comparison to other communicable diseases like smallpox and TB. After the invention of ORS in 1968, the government and some organizations like ICDDR,B and BRAC initiated some programs to remove the unawareness regarding ORS from society.

Consequently, the epidemic situation was changed from the 1980s in the country. Due to the terrible experience of the cholera epidemic, people were more willing to accept the word diarrhea instead of cholera. Even the name of the Cholera Research Laboratory changed into the International Centre of Diarrheal Disease Research in Bangladesh (ICDDR,B) in 1978. Although there were several reasons behind the change of name even so people’s perception

was one of the reasons behind (Wahed, 2018).

To put it another way, it was 1992, fatal cholera was disappearing, but people perception regarding previous cholera episodes was present, cholera started in the village of South Raipur (home of the researcher) in Lakshmipur district of Bangladesh whenever the researcher observed the situation;

At first younger uncle of the researcher was affected by cholera in their family. His grandmother told him that *Ola Bibi* came to their house and she (grandmother) requested his (researcher) grandfather to call *azan* (prayer calling in Islam), and she started to pray to Allah for rescue. However, sounds of many untimed prayer callings (*azan*) were coming from different colonies of the village, and people were becoming more scared of *Ola Bibi*. Unlike others, father of the researcher was a knowledgeable man, and he had technical knowledge of pushing IV saline and had an understanding of the causes of cholera. He (father of researcher) went to the pharmacy and brought some ORS packets and some bags of IV saline at home. He pushed two IV saline in two hands of researcher's uncle and altered the drinking of pond water by boiling water from a tube well. Immediately mother of researcher arranged to send him (researcher, age was ten years) to his maternal grandfather house for safety. Four members of their family were affected, no fatal case appeared. However, three patients died of cholera in another colony of their village. That was the last large scale cholera in their village. He (researcher) observed that his grandparents were busy with prayer, and his father was occupied with treatment, and his mother was in between, and she sent him to another house far from their village. All reactions happened due to the level of understanding that means knowledge and ignorance. Older adults were scared of death records of previous cholera attacks, provided that they did not know the cause of cholera episodes. Once his (researcher) grandmother was telling her experience of the cholera attack of 1858 when 15 people died from the colony where she lived including 3 of her relatives. Every day one or two people died of cholera especially children. People were not coming to rescue even for burying.

Statistics show that 6684 people died of cholera in the first six months of 1958 in East Pakistan (Thomas A. Cockburn, 1960). However, the reporting system of death record was weak in the public health system of East Pakistan in 1958, so this number might not be the exact number.

It is well known that, cholera was one of the most dreadful diseases in Bangladesh for a thousand years, but the naming was different in a diverse situation. A healthy human can suddenly be affected by cholera and lose massive body fluid due to entering the germ of cholera in the stomach. David Arnold identified cholera as one of the epidemic diseases in 19<sup>th</sup> century British India as well as a highly political disease. Because, it was deemed a threat to British colonial power in mixing with the indigenous society and depressed the British immigrant community to work with the host society (Arnold, 1993a). Present Bangladesh was the part of British Colonial India, and so, there are social dimensions in the history of cholera and the development of ORS in Bangladesh. In this chapter, the social history of cholera and the development of ORS in Bangladesh are discussed chronologically.

### **3.2. Cholera and Social Belief**

The epidemic and pandemic natures of cholera in Bengal are well written for more than two hundred years. During the colonial period and pre-colonial period, Western experts and Indian experts made a bulk of literature on the cholera epidemic and its pandemic characteristics. The flow of writing is continuing. Medical historian Macnamara identified cholera as the ‘Asiatic Cholera’, and he explained cholera-like;

I mean a disease which is capable of being communicated to persons otherwise in sound health, through the dejecta of patients suffering from this malady; these forms are most commonly disseminated through a community, and taken into the system by means of drinking water—the dejecta finding their way by percolation through the soil or ill constituted drains into wells, or, it may be, being directly emptied into rivers from which drinking water is supplied. The disease can likewise be propagated by various articles of diet, such as milk, or in fact by anything swallowed which has been contaminated by the organic matter passed by cholera patients. In badly ventilated rooms the atmosphere may be so fully charged with the exhalation from the choleraic forms that people employed in nursing the sick may become poisoned. Fluids, and probably solids, exposed to air of this description absorb the organic matter, and may thus become the medium for



transmitting the disease. In the same way, persons engaged in carrying the bodies of those who have died from cholera for burial, or in washing their soiled linen, may contract the malady (Macnamara, C, 1876a).

Dejecta is a term to describe any solid and liquid wastes to emanate from the body. Understanding of Macnamara in the second half of the 19<sup>th</sup> century regarding the causation of cholera was the mixture of both science and social belief of contemporary society. He stated that nurse could be attacked by cholera due to inhalation of lousy air, persons who carried the dead bodies of cholera patients and washed the clothes also susceptible to cholera. These are the social beliefs, but the experts were not out of society, the main thing was that he could not accurately identify what the main reason for cholera was. That is why the spectrum of disease causation was so broad and owing to the lack of the development of medical science and technology. Causation of cholera was not specific to Macnamara.

WHO defines “Cholera is an acute diarrheal infection caused by ingestion of food or water contaminated with the bacterium *Vibrio cholerae*” (WHO, 2018). From an etiological point of view, cholera is a disease-causing of infection with the cholera microbe (up to 1993, *Vibrio cholerae O1*, in either its “classical” or its “*El Tor*” biotype) (Hamlin, 2009). The Lancet defines cholera as acute secretory diarrhea caused by the Gram-negative Bacterium *Vibrio cholerae* (Harris, LaRocque, Qadri, Ryan, & Calderwood, 2012). Besides, cholera is defined as an acute watery diarrheal disease (Clemens, Nair, Ahmed, Qadri, & Holmgren, 2017). Cholera was derived from the Greek words *chole* (bile) and *rein* (to flow), so the meaning of cholera is a flow of bile. There are two major serogroups of *Vibrio cholerae*; *O1* and *O139*. The *O1* serogroup has two biotypes; *Classical* and *El Tor*. Each biotype has two major serotypes: *Ogawa* and *Inaba* (Longini et al., 2002). Normally, anyone of two serotypes is responsible for the majority cases of a particular geographical area.

Cockburn identified Bengal as the home of cholera where infection can exist over the year and decade after decade.

Bengal has the unenviable distinction of being the home of cholera and quite possibly is the only place on earth where the infection can exist all year round decade after decade (Thomas A. Cockburn, 1960).

Clemens and others mentioned that before the first pandemic in 1817, the cholera was the Asiatic origin and especially the disease of the Ganges Delta (Clemens et al., 2017). However, Dhiman Barua, renowned scholar on cholera, showed disagreement with the argument of home place of cholera. He pointed out that worldwide there is lack of literature on the local history of cholera and Western writers identified Bengal as the home place, so it is recognized, but in the whole world, cholera-like disease existed for thousand years. He agreed on that, Bengal was the most susceptible to cholera in the world, however, it was not the only home of classical cholera (Barua & Greenough, 1992a).

Correspondingly, the researcher tried to understand the observation of older adults regarding the causations of cholera, symptoms of cholera and its remedy. They responded to the queries with awful expression, and nervousness even though they tried to avoid the questions. It was constructed due to their unpleasant experiences in the past. Conversely, the contemporary view of Bangladeshi people is; cholera is a deadly disease affected by having unpleasant foods and contaminated water, using unhygienic sanitation and lack of cleanliness. Meanwhile, education spread and people educated; they became aware of the causation of cholera and treatment. However, what were the views of senior generations in the 1960s or 1970s even 1980s? It was mainly superstitious and full of fear.

So, cholera considered as *kharap batash* (polluted air), *gorm batash* (hot air), *bala mosiboth* (curse and danger), causations were fraudulent activities in the society and disobeying to the rules of God as well as lack of cleanliness. Primary medicines were *jhaar fukh* (bouncing the thicket), *tabij* (so-called sacred thing

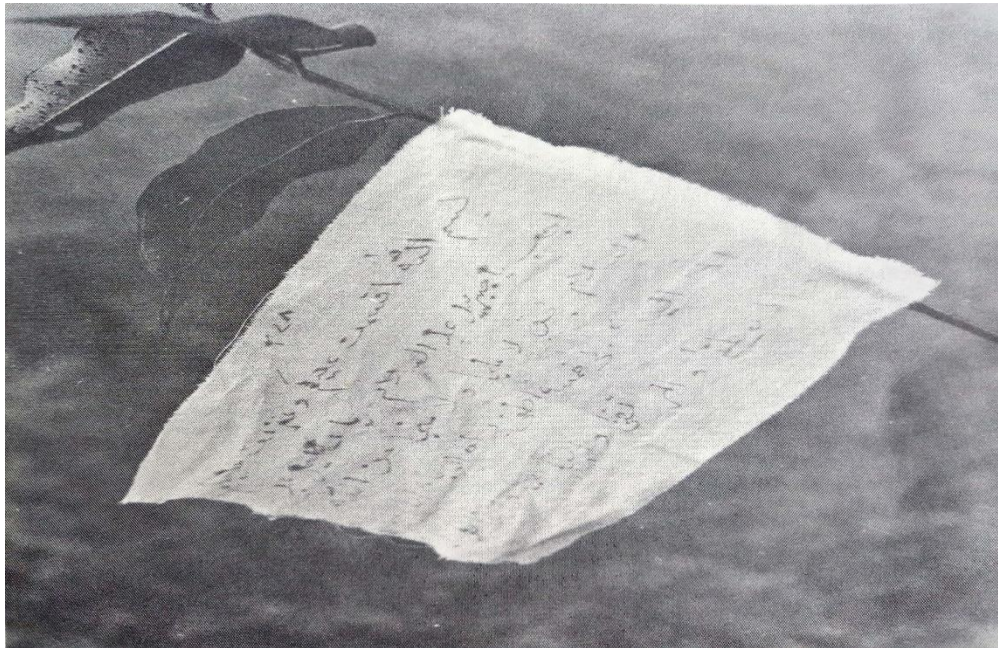
fitting on neck or hand), *pani pora* (holy water), *bori* (made by herbal materials) prayer to Allah for the Muslims and worshipping to deities for Hindus and other religions. Besides, calling Allah's name, watching guard, firing at home, staying awake at night and avoiding some habits and manners. *Kabiraj*<sup>4</sup> (local doctor), *Fakir* (Muslim Saint), *Mullah* (Muslim learned man) and the religious persons were believed as the guardians for recovery. For example, Ajit Fakir was renowned *fakir* in Bashgari union of Kalkini sub-district in Madaripur district of Bangladesh, his pronounced *mantra* (incantation) to remove cholera from humans. That was “*alir hate jol hukka, fatemar hate teer, jei pothe aichos bala, shei pothe fir*” (M. Khan, 2018), means of this lyric was- water bottle is in the hand of Ali (fourth caliph of Mohammad s.), arrow bows in the hand of Fatema (daughter of Mohammad s.), curse go back to that way by which you came. It has no meaning, however, people had theoretical knowledge about Ali and Fatema and their power. So, by any mean, *fakir* tried to sooth the patients and their relatives. Ultimately, it did not work.

In general, Bengali people considered cholera as the retribution of sins. Muslim religious leaders described that due to illicit sexuality, cholera appears and children are attacked due to parents' sin (D. R. Nalin & Haque, 1977). There were some rituals to protect the houses from cholera, among them the most familiar in all over Bengal was *Bondhokora* (closing off) by which the house would be protected, and cholera would not be able to enter. *Bondhokora* was confirmed through the hanging of cholera flags and fixing the clay pot lids in a particular position which would be exposed to all. Some Arabic words or numbers were written in the cholera flags and clay pot lids which were inscribed from Quran or Hadith or Books or traditional prayers. More importantly, during the time of *Bondhokora*, the religious leader (*Mouluvi*) recited from the holy

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<sup>4</sup> *Kabiraj* is a medical practitioner who follows the Ayurvedic system of treatment (Bengali to English Dictionary, Bangla Academy, Dhaka, 2015 print)

Quran or traditional prayers, in some cases, more than one *Moulavi* were involved to confirm the *Bondhokora*. After the *Bondhokora* ceremony, the closed ground was prohibited for visitors, and any slaughtering was prohibited for three to seven days according to the judgement of *Moulavi*. If it was violated the *bondhokora* would be broken. Ritual was to confirm *bondhokora* in every year in a specific time.



**Figure 3.1: Cholera Flag with the inscription of anti-cholera verses (D. R. Nalin & Haque, 1977)**

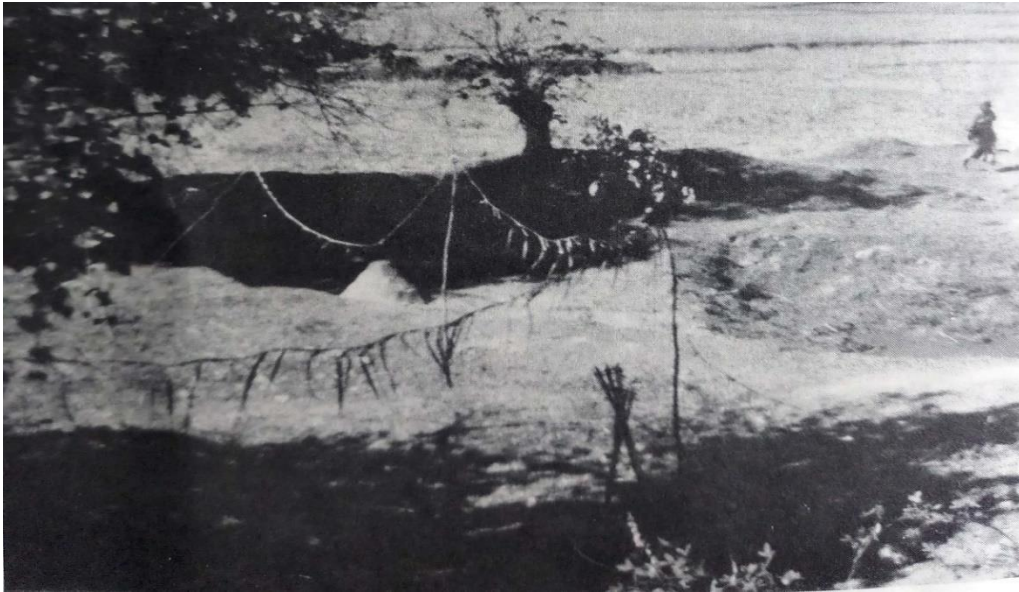


**Figure 3.2: Clay pot lid with inscribing the number (D. R. Nalin & Haque, 1977)**

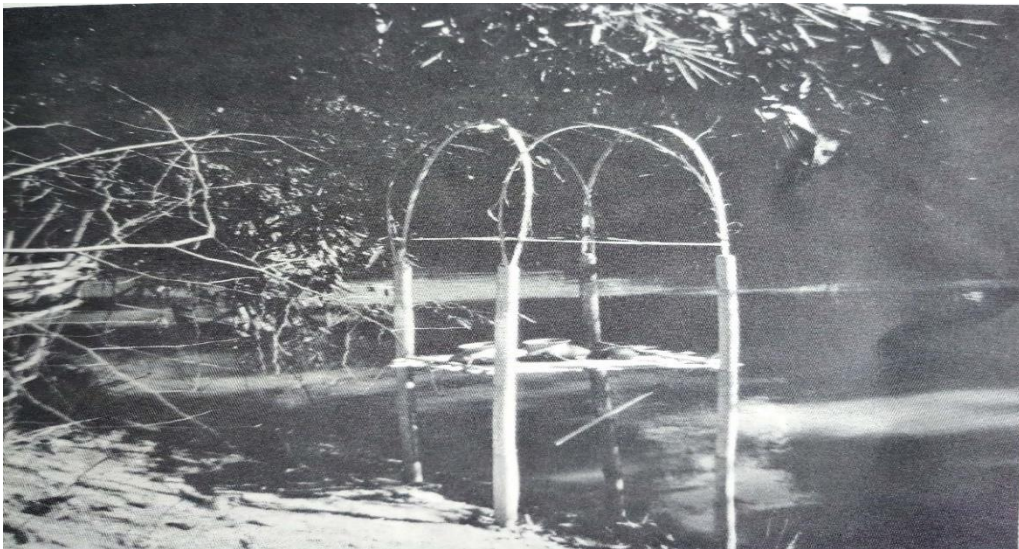
David Nalin discussed the protecting method of Buddhists people in

Bangladesh;

In Mogh village such as Harbung, cholera (*kalana*) was believed to be sent by a malevolent spirit (*rakosh*), and cholera was not believed to spread from one person to another. To protect a compound, the local spiritual leader (*taku* or, in Bengali *Thakur*) was called and surrounded the entire compound with fibre string. At each of the four corners of the compound bamboo poles bearing a small platform about  $1\frac{1}{2}' \times 1\frac{1}{2}'$  (*rakhowra*) were erected. Clay pots of water into which priests blow holy words were placed on the platform. Prayers were recited, and candles lit. For one night only, no one was allowed to enter or leave the compound (D. R. Nalin & Haque, 1977).



**Figure 3.3: Buddhist Moghs protect their compounds surrounded by plant fiber (D. R. Nalin & Haque, 1977)**



**Figure 3.4: Buddhist Mogh *Thakur* blesses the water pots (D. R. Nalin & Haque, 1977)**

There were some natural medications to cure cholera. For example: having the water of green coconut, juice of molasses, rice water, burley, chira<sup>5</sup> water. Coconut water has carbohydrates and electrolytes such as sodium, potassium, and magnesium, which is perfect medicine against fluid loss. Molasses juice has carbohydrates, vitamin B6 and dietary minerals; rice water has carbohydrates and electrolytes, so, all the natural medications had positive effects on the patients. Consequently, some people escaped from the deadly disease, but credit went to *Kabiraj*, *Fakir* or other local healers. This natural healing system developed from the long term experimental knowledge of people. However, people could not keep confidence in those natural medications, for this reason, going to the local *Kabiraj* or *Mullah*. Bagha Mojid<sup>6</sup> is one of the examples who only survived from a dozen of his relatives; the story of Bagha Mojid is in a footnote (M. Khan, 2018). Due to the existence of the necessary ingredients against fluid loss, the natural items worked well, whereas the patients kept away from drinking and feeding. It was believed that food and water were contaminated so patients should be kept aside from all types of food; in that case, patients died within a short period.

The concept of *bibi* (mythic old lady with the white-colored dress) was familiar to the idea of people, but the name of *bibi* was varied from place to place in Bangladesh like- *ola bibi*, *jhola bibi*, *mon bibi*. In order to show their spiritual

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<sup>5</sup> Chira (Bengali name) is a well-known food item prepared by frying wet paddy and then thrashing the grains into flattened size by a husking pedal (Bengali to English Dictionary, Bangla Academy, Dhaka, 2015 print)

<sup>6</sup> Story of Mojid Khan, nickname Bagha Mojid, is one of the glaring examples of the fatality of cholera in Bangladesh. All brothers and sisters of Mojid Khan were died of cholera only he is alive. Mojid Khan was also affected by cholera several times but he was alive due to having so-called milk of tiger (in Bengali tiger means bagh) or dangerous animals, through this imaginary perception so popularly he is known as Bagha Mojid. Mr. Mojid told that his father married 7 women but everyone died of cholera and even his father also died of cholera. Now Mr. Mojid is the resident of Madaripur district in Bangladesh.

ability, during cholera time senior men and women of families gossiped about *bibi* even they claimed to see the *bibi* at night. They drew a picture of *bibi* in their mind and tried to explain it, which usually made the situation more mournful and dreadful. However, some Muslim people stated that Allah sent cholera through a white-dressed woman or an aged man with supernatural power, so, people had nothing to do except praying to Allah for remedy.

Furthermore, the peak times of cholera attack were October-November (Katrik, the name of the 7<sup>th</sup> month in Bengali (Rabbani, 2012)) and April-May (Choitra, the name of the 12<sup>th</sup> month in Bengali). Cholera reached a peak in dry weather in May and waned after rainfall (Thomas A. Cockburn, 1960). *Monga*<sup>7</sup> (starvation and malnutrition), *akal* (scarcity, miserable time), *durbhikkha* (famine), these were the common terminologies of Bengal to describe the shortage of food and miserable condition in these months (Rabbani, 2012). Besides, *mora Katrik* and *mora Choitra* terms were used to describe the epidemic situation due to infectious diseases like cholera and smallpox in these months. To give an illustration of the situation, *Mora* means dead; it was a symbolic term to identify the awful and dreadful situation of life due to sickness. People were in starvation and malnutrition because of the scarcity of food; unfortunately, at the same time, cholera attacked the people of Bengal due to unhygienic food habit and contaminated drinking water. So, both sides misery made the situation of *mora* or scourge. During drought season scarcity of pure drinking water was appeared as a crisis; water level of ponds, rivers and holes came to the lowest, tube-wells water had been contaminated due to decreased groundwater level. So, water-borne diseases like cholera had seemed

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<sup>7</sup> General meaning of *monga* is starvation, scarcity of food and deficiency of nutrition. In the British Indian gazettes or documents the word *monga* was used as scarcity. Actually the word *monga* derived from *manga*, and *manga* means high price of goods. Due to scarcity of foods the price hike was happened and people could not buy the goods that was called *monga*. (Rabbani, 2012)

widespread in the country.

### 3.3. Diarrhea and Social Belief

Diarrhea is one of the common diseases in the world. Experts of different health organizations gave some definitions and explained the causes of diseases.

WHO defines diarrhea “as the passage of three or more loose or liquid stools per day (or more frequent passage than is normal for the individual). Frequent passing of formed stools is not diarrhea, nor is the passing of loose, "pasty" stools by breastfed babies. Diarrhea is usually a symptom of an infection in the intestinal tract, which can be caused by a variety of bacterial, viral and parasitic organisms. Infection is spread through contaminated food or drinking-water, or from person-to-person as a result of poor hygiene” (WHO, 2017).

Usually, intestinal tract controls absorption and discharge of water and electrolyte to fulfil the physical needs of a human being. An adult intestine can absorb more than 98 percent of 10 liters of water per day. However, in the case of entering over water in the stomach, the zone can release it by stool water also (Keusch et al., 2006). So, three or more stools in a day which are sufficiently liquid treated as diarrhea.

On the other hand, diarrhea is a descriptive term of medical science to identify different types of clinical disease related to the passage of loose stools. Different societies have different cultures of preventing and curing the disease in Bangladesh; even diarrhea has different names based on the nature of the impact. According to the intense study of BRAC, there are four folk terminologies of diarrhea in rural Bangladesh; these are; *dud haga* (due to ingestion of breast milk by infants), *ajirno* (due to overeating), *amasha* (mucoid diarrhea), *daeria* (cholera) (A. Mushtaque R. Chowdhury & Kabir, 1991).

Remarkably, every term has its course as well as prevention and curing policy in society. (A) *Dud Haga*: English term of *dud* is milk and *haga* is stool; it is a disease of the infants during breastfeeding. Symptoms of *dud haga* are crying



due to abdominal pain and watery stool; stool color is different from natural color. Contaminated breast milk believed as the cause of the *dud haga*; the question to rural mother was how could it be contaminated, they replied, it contaminated due to touching bad air (*batash laga*) at the breast. For curing the disease, people used holy water (pani pora) bringing from elderly religious persons. In some cases, mother stopped the breastfeeding or avoided meat, fish, and vegetables.

(B) *Ajirno*: It means indigestion of food due to overeating or food poisoning. Gripping of the stomach, abdominal pain, irregularity in passing the stools and impatience are the common symptoms of *ajirno*. However, rural people of Bangladesh do not consider it as an illness, they try to give rest to the stomach; villagers are not clear about the causes of the disease (A Mushtaque R Chowdhury & Cash, 2007b).

(C) *Amasha*: English term of this Bengali word *amasha* is dysentery. People of all ages are the sufferers of the disease, stools are not watery but mixed with mucoid and sometimes contains blood. *Amasha* is considered as an illness, but people have no clear understanding of the causes of the disease.

(D) *Daeria*: The term *daeria* of rural people is cholera. All symptoms of cholera exist in the so-called *daeria*; frequent passing of watery stools, vomiting, fluid loss, thirst are present. However, people are awful to pronounce the word cholera that's why to identify as *dieria*. It was believed that as the curse of God and people who worked against religion might be affected by this disease (A Mushtaque R Chowdhury & Cash, 2007b).

From the perspective of clinical medicine, there are three major syndromes of diarrheal diseases; a) acute watery diarrhea, b) acute bloody diarrhea, and c) persistent diarrhea. Besides, there are other syndromes like; related antibiotic diarrhea, travelers' diarrhea, and specific food poisoning syndromes (Kelly,

2011). The acute watery diarrhea is cholera; dysentery is the alternative name of acute bloody diarrhea; protozoal infection is the primary cause of persistent diarrhea. Diagnosis of persistent diarrhea is serological, and its treatment is often tricky (Kelly, 2011).

### 3.4. Cholera in Bengal before 1817

The Bengal Delta was the home of cholera, and there was evidence of worshipping cholera deity in the name of *Ola Bibi* (Arnold, 1993a).<sup>8</sup> Macnamara identified the Ganges Delta as the home of cholera in the world; he wrote a chapter in his book on the history of Asiatic cholera before 1817 (Macnamara, C, 1876b). In the writing of history his (Macnamara) main concentration was in British India, however, Bengal as the part of British India as well as the home of cholera, so it got priority in the history. He remarkably wrote the word ‘Vishuchika’<sup>9</sup> as the symptoms of cholera in ancient Sanskrit writings which were expressed by Sushruta<sup>10</sup> as the recurrent disease. Besides, Galen, Whang-shooho, and Hippocrates described this form of cholera in different countries where they lived; they never met the epidemic cholera as like Asiatic cholera epidemic. Contaminated food and polluted air identified as the

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<sup>8</sup> David Arnold referred to Macnamara, C. 1876. A History of Asiatic Cholera, London, Macmillan; Hora, Sundar Lal, 1993, Worship of the Deities Ola, Jhola and Bon Bibi in Lower Bengal, Journal of the Asiatic Society of Bengal n.s. 29:1-4; Basu 1963 and giving thanks to Gautam Bhadra, identified the Bengal Delta as the home of cholera in the world.

<sup>9</sup> The word Vishuchika is now being used in Hindi language which is derived from Sanskrit language. In google translation Vishuchika means cholera.

URL:<https://translate.google.co.in/#view=home&op=translate&sl=hi&tl=en&text=%E0%A4%B5%E0%A4%BF%E0%A4%B7%E0%A5%82%E0%A4%9A%E0%A4%BF%E0%A4%95%E0%A4%BE>, Retrieved on 15<sup>th</sup> January 2019.

<sup>10</sup> “Sushruta (c. 7th or 6th century BCE) was a physician in ancient [India](#) known today as the “Father of Indian [Medicine](#)” and “Father of Plastic Surgery” for inventing and developing surgical procedures. His work on the subject, the *Sushruta Samhita* (Sushruta's Compendium) is considered the oldest text in the world on plastic surgery and is highly regarded as one of the Great Trilogy of Ayurvedic Medicine; the other two being the *Charaka Samhita*, which preceded it, and the *Astanga Hridaya*, which followed it.” Joshua J. Mark, “Sushruta, Definition”, *Ancient History Encyclopedia*, published on 12 January 2018, URL: <https://www.ancient.eu/sushruta/>, Retrieved on 15<sup>th</sup> January 2019.

leading causes of cholera. After Portuguese discovery in 15<sup>th</sup> century Europeans entered into Indian lands and got interactions with each other. Europeans found the Ganges Delta as the home of cholera; it was not flourished to the West or the East due to absent of human migration for the difficulty of communications, but cholera existed in several places of India (Macnamara, C, 1876b).

Macnamara referred Gaspar Correa, a Portuguese, who wrote about the cholera epidemic of Calicut in 1503 and Goa in 1543 where mortality was high. Another Portuguese Garcia d'Orta described cholera of 1563 in Goa where mortality was severe in June and July. Although the origin of *Vibrio cholerae* was the Bengal Delta, it existed in different parts of Indian territory. Besides, Linschot, Thevenot, Dr Fryr described the cholera epidemic of the coastal area of India in the 16<sup>th</sup> and 17<sup>th</sup> century. Macnamara highlighted the worshipping of the Goddess of cholera, *Ola Bibi*, in Lower Bengal for a long time, all the worshipping activities were to get relief from the attack of cholera.

Significantly, there was a temple of cholera Goddess in Kolkata and to reconstruct the temple an English merchant donated an amount in the year of 1720. Therefore, Mr Duncan donated 6000 rupees for the development of the temple. For the first time Bengal Medical Board recorded five cholera cases among the British troops in 1808. In 1814, a total of 46 cases recorded where 11 deaths, the disease appeared in the barrack of Fort William, where newly recruited British troops just stationed. Referring to Dr J Macpherson, Macnamara described that about sixty-four independent authors mentioned the presence of cholera in India from 1503 to 1817 where ten authors identified cholera epidemic in different parts of India and rest of the authors referred cholera to the Ganges Delta (Macnamara, C, 1876b).

Dhiman Barua denoted the Sanskrit word *vishuchika* as the origin of the contemporary concept of cholera. In the chapter of 'History of Cholera,' he

raised the debate of either *Vibrio cholerae* 01 was appeared in Europe before the first recognized cholera pandemic of 1817 or it only appeared in Bengal or different parts of India. He argued that through scientific means it is not possible to prove, a systematic review of literature nonetheless can guide the way, however, except the works of *Sushruta*, there is no literature regarding cholera before the accounts of Portuguese settlers in the 16<sup>th</sup> century. Refereeing some scholars' writings, he concluded that cholera-like disease was present in many parts of the world before 1817 and *Vibrio cholerae* was also present in different regions of India as well as in Bengal (Barua & Greenough, 1992b). David Arnold identified the Bengal Delta as the origin of *Vibrio cholerae* 01 based on the research of Macnamara and others; he mainly highlighted the worshipping of the Goddess of cholera in Bengal which indicates the long term existence of this fatal character of the disease (Arnold, 1993a).

### **3.5. Brief History of Cholera in Bengal after 1817**

After 1817, the world faced seven cholera pandemics; the first six originated in Bengal, and the last one was in Indonesia (Mandal, Mandal, & Pal, 2011). However, there are disagreements regarding dates and durations of the first six pandemics. Most of the scholars agreed that all six happened from 1817 to 1923; the seventh pandemic was started in 1961 and continued roughly up to 2010. The infection of classical *Vibrio cholerae* 01 was the causes of first six pandemics; the seventh pandemic initially caused by 01 *El Tor* biotype, but 0139 biotypes appeared in 1992.

Bengal was a densely populated area with poor sanitation; people used to have the surface water from rivers, canals and ponds. Temperature exceeds 17 Degree Celsius and humidity not less than 40 percent for a long time. So, the disease or germ can survive decade after decade and becomes ready to create an epidemic situation in the seasons of every year (Van Heyningen & Seal, 1983). There are debates on the time length of the cholera pandemic concerning the starting and

ending time. Provided that here the time length is narrated based on the book of Barua and Greenough III (Barua & Greenough, 1992b).

**The First Pandemic (1817-1823):** The first pandemic started from Jessore district of present Bangladesh in 1817. Location of Jessore is halfway between Kolkata and Dhaka. It rapidly spread in India then eastward to Japan and China and westward to the Mediterranean Sea area and Syrian border. It touched European Russia and Tiflis of Armenia (Van Heyningen & Seal, 1983). Cholera epidemics were frequent in Bengal as well as India before 1817 some major epidemics were 1781, 1783 and 1790 under the colonial rule but why the epidemic of 1817 shaped as a pandemic. Responding to the question, Greenwood quoted the historian Sticker:

What was new (the event of 1817) in the history of Indian cholera and rightly caused apprehension there as well as here was the further intelligence that this destructive epidemic no longer confined itself to a particular area and at the accustomed season of the year appeared simultaneously in several places, but itself in motion, under the influence of some mysterious impulse began to travel, attaching itself to the lines of human intercourse, spread widely in various directions, exacting everywhere hecatombs of victims (Greenwood, 1977).

On the other hand, an article in the Scientific American titled “The Year Without Summer” mentioned the causation of the epidemic of 1817. Bengali people could not harvest the land due to cold summer in 1816 followed the eruption of a volcano in 1815 in the Dutch East Indies. So, starvation was appeared in Bengal owing to the scarcity of food and famine, ultimately, cholera infection affected the humans, and it was fatal (Stommel & Stommel, 1979).

Remarkably, the ‘Report on the Epidemic Cholera Morbus as It Visited the Territories Subject to the Presidency of Bengal in the Years 1817, 1818 and 1819’ was written by James Jameson, Assistant Surgeon and Secretary to the Medical Board of India. Jameson narrated the rise, progress and symptoms of the epidemic. The primary objective of the report (1820) was to find out the

hidden causes of the broad range disorder with 22 queries to investigate the epidemics. The report was prepared from the 100 valuable communications of individuals regarding the queries. According to the report, the higher latitudes of the disease limited to the latter part of summer and the beginning of the autumn and prevailed endemically during hot and rainy seasons of the year in the poorer provinces of India. Significantly, it attacked the poor people who had an ungenerous diet, hard labor in the sun, no adequate clothes to cover in the cold and humid air of night (Jameson, 1820). Jameson identified the irritability of stomach and severe vomiting as the symptoms of the disease. In conclusion, his report was very subjective to the epidemic and showed the unfortunate situation as the cause of the disorder.

**The Second Pandemic (1829-1851):** The second cholera pandemic reached to Europe and America. First, it was exposed in European Russia in August 1829, and it reached to Moscow in Autumn of 1830. Cholera germ persisted in Afghanistan from the first pandemic, where cholera was rampant in 1929, it had travelled Persia (Iran) to Russia and spread out in Europe in the 1830s (Barua & Greenough, 1992b). British military activities and commerce facilitated the pandemic movement of cholera from India to Russia and Western Europe (Macnamara, C, 1876a). Due to the lack of proper diagnosis, only severe patients were detected, and their movement was restricted. However, the milder patients were not restricted; therefore, the disease was spread out gradually to the West (Daly & DuPont, 2008). There was severe cholera outbreak in Paris in March of 1832, as border country Belgium was affected in the spring of 1832. Progressively, Norway, the Netherlands and other European countries were affected by the second pandemic. On the travel of the disease from Russia to England European countries Bulgaria, Poland, Hungary, Germany, Spain and all were affected by the second pandemic. It also affected Arabia, the shores of America and African countries (Barua & Greenough, 1992b).

As cholera was rapidly spread out in European countries and America, they could not manage the treatment process on a specific principle; nonetheless, the different ways of treatment made the process complicated and ineffective. Cholera experts agreed on something poisonous in human stool, causing the disease but how the germ induced was entirely unknown. So, for removing the poison, local doctors gave efforts from their knowledge and experiences, where some scientific bases were grounded (Daly & DuPont, 2008).

**The Third Pandemic (1852-1859):** According to R. Pollitzer “the third pandemic was the combined result of local recrudescence due to a temporary entrenchment of the infection and repeated importations of the disease” (Pollitzer, 1959). Macnamara pointed out that it would not be possible to detect the course of a pandemic due to sporadic outbreaks in previous (Macnamara, C, 1876a). Pollitzer showed the sequence of the outbreak of 1952 in India, which was spread out in Northern Europe, the USA, Mexico, and the West Indies. Greece and Turkey were affected because of the transportation of troops from southern France for the Crimean War. Southeast Asia and the Far East were affected by the third pandemic (Pollitzer, 1959). Cholera reached in Tuscany in Italy, Filippo Pacini studied the intestinal contents of some cholera patients and detected a large number of curved bacteria in 1854, which later on called *Vibrio cholerae*. (Barua & Greenough, 1992b).

In order to remove the fearful situation of cholera international cooperation was begun and the first international meeting held in 1851 in Paris. From 1851 to 1938 total 14 international meetings were held; in 1903 the International Sanitary Convention was signed in Paris to share the epidemics related information of the signatory countries. The Health Organization of the League of Nations was formed after the First World War, and it began to circulate weekly reports on cholera and other epidemic diseases. Following the sequence, the World Health Organization (WHO) was formed under the United Nations in

1948 to promote international public health (Barua & Greenough, 1992b).

**The Fourth Pandemic (1863-1879):** The fourth pandemic severely exposed in the Mecca pilgrimage of 1865. According to Macnamara, one-third of pilgrims was died of cholera, about 30000 deaths out of 90000 pilgrims. There is a claim that the Indian pilgrims carried the cholera germ to Mecca, but Macnamara denied the argument and declared that cholera persisted in Mecca at that time and the assembling of Indian pilgrims who carried the germ made the situation worsen (Macnamara, C, 1876a). The pilgrims who returned from Mecca to different parts of the world carried the cholera germ, and the pandemic was spread out in different parts of Arabia, Syria, Mesopotamia, Egypt, Turkey. Istanbul and Alexandria became the hub to spread out in the rest of the world (Pollitzer, 1959). The people of the East and Southeast parts of Asia were repeatedly sufferers of this pandemic (Barua & Greenough, 1992b).

**The Fifth Pandemic (1881-1896):** As the result of a severe cholera outbreak in British India in 1881, especially in Punjab and Lahore, the fifth cholera pandemic was spread out. Pilgrims carried the germ from Mecca to Alexandria, Cairo and other cities of Egypt. From the early pandemic, cholera remained in Spain, France, Italy and other countries of Europe. Spain severely suffered from cholera in the summer of 1885; incidences were 160000 and deaths were 60000, cholera revisited this country in 1890 (Pollitzer, 1959). Robert Koch studied cholera in Alexandria of Egypt and in Kolkata of India, where he detected the comma-shaped organism in 1883, which was marked as the cause of cholera. The fifth pandemic was spread out in South America, Asia, Africa, and European countries (Barua & Greenough, 1992b).

**The Sixth Pandemic (1899-1923):** The sixth pandemic was closely related to the exacerbation of the cholera situation of Bengal and Bombay in the year of 1899 to 1904; it lasted until 1923. After the fifth pandemic, the local



recrudescence of cholera germ continued to persist the infection in Western Asia and some parts of Europe (Pollitzer, 1959). So, the point of spreading cholera germ from other places became auxiliary. Moreover, because of the mass movement and transportation of troops in the wartime (First World War), the cholera was rampant in various places of the world.

Due to the development of sanitation and other public health measures, the cholera outbreaks were gradually lessened from the Western world. From 1825, cholera was disappearing from the developed countries, especially from Western Europe and the USA. From 1925 to 1961, two important discoveries; the invention of cholera toxin in 1953 and the improvement of the therapy by Robert A Phillips and his associates (Barua & Greenough, 1992b) opened up the new way of cholera treatment. In the second half of the 20<sup>th</sup> century, the *Vibrio cholerae* more or less came back to its homeland in Bengal Delta with sporadic occurrences in Southeast Asian countries, some other parts of Asia and India but virulence was very few.

**The Seventh Pandemic (1961-2010):** In 1961, some cholera cases observed in Indonesia caused by new biotype *El Tor vibrio*. It was spread out in neighboring countries of Southeast Asia as a pandemic. Earlier six pandemics were caused by classical biotype *Vibrio cholerae* O1, but this new type made the public health authority unprepared. Because most of the areas became free of classical cholera for some years. However, cholera-prone areas were affected again by the new germ of cholera (Barua & Greenough, 1992b). Up to 1992, *Vibrio cholerae* O1, in either its “classical” or its “*El Tor*” biotype was the cause of cholera. The new biotype O139 was exposed after 1992.

### **3.6. Medical Responses and the Development of ORS before 1960**

The invention of oral rehydration therapy prevented millions of deaths in developing countries. The successful trial of ORS was done in the late 1960s

and early 1970s in East Pakistan presently Bangladesh, and it has been recognized as one of the most significant medical advancements in the 20th century (Guerrant et al., 2003). After the first pandemic started from Bengal, several reports were published from Britain where the reports of James Jameson, Robert Steuart, and William Scott were remarkable. Jameson expressed the ineffectiveness of contemporary medicines, and he could not show any particular guideline in the treatment part of his report. According to the report;

Bleeding, stimulants, sedatives, narcotics and other description of medicine were successively tried; according to analogical reasoning, or the peculiar opinions of various individuals, seemed to warrant their use. Each in turn failed, if not always, at least so often, as to prove the extraordinary depressing powers of the complaint, and the inefficacy of all curative means, to stop its progress, where the attack was in full violence (Jameson, 1820).

This is to say, medical responses or healing system of cholera and its causes were perceived differently in different parts of the world, however, it was well known that the foreground of the disease was British India. The peculiar environment of India with a sudden drop of temperature or heavy rainfall in the monsoon or the miasmas from rotten objects or the congested dwelling were initially identified as the causes of cholera. Significantly, death of Sir Thomas Munro, Governor of Madras, in 1827 spread the fear of cholera as the most potent vulnerable disease among the British. The most popular medical argument of 1830 was that the cholera is a contagious disease (Echenberg, 2011).

Therefore, in the early nineteenth century, political and economic reasons were assumed as the causes of cholera in France. As time went on, the majority of the French recognized cholera as the contagious disease transmitted from one individual to another. Popular medications were the stimulants or the purgatives; sometimes, both were administered together. They also included calomel,

opium, absinthe and belladonna (Echenberg, 2011). The Board of Health was created in New York city in 1805 to construct the health infrastructure, but it could not achieve the target of new development regarding health set-up. In the mid-19<sup>th</sup> century, cholera was rampant in the United States, however, there was ignorance behind the cause. Lemuel Shattuck (1793-1859) observed cholera as “a penalty for deviation from moral behavior”, and it could be avoided by “Godliness and cleanliness”, but later on he was convinced about the state intervention to uphold the public health (Hays, 2009).

The second pandemic attacked Britain in 1831, and therefore three scientific advancements emerged; chemical analysis of body fluids, water, and salt treatment and the intravenous therapy of fluid (Daly & DuPont, 2008). David Barry recognized the violent disease of northern England as the outbreak of cholera, Sunderland was the first place affected (1831) by cholera (The Lancet, 1831). By this time, William Stevens established a different school of thought regarding tropical fever and severe diarrhea. He detected that people with tropical fever and yellow fever grow darkness of blood and blackness of skin color; he also detected that adding salt directly to the venous of blood turned the blood color red. Consequently, he started to give a treatment of the severely affected patients with oral saline by which death rate decreased, but he had no clear understanding on the effect of salt and water in the blood (Daly & DuPont, 2008).

As cholera was spread out in Europe in the 1830s, it was observed that blueness or blackness developed in the severely dehydrated cholera patients, and when Stevens used the technique of oral saline mortality rate significantly decreased. Meanwhile, he became familiar in the United States and Europe for his salt therapy. Stevens was in England during the cholera outbreak of 1832, and as he had a success story of using oral saline, so, he treated the patients in England with his prescribed mixture of sodium, potassium chloride and carbonated soda.

He reported that more than 200 patients of the Cold Bath Field Prison in London were treated and one of every thirty patients died after administering the salt solution (Daly & DuPont, 2008).

However, William O'Shaughnessy identified a large amount of water, salt and carbonate in the blood of cholera patients who were treated by Stevens (W. B. O'Shaughnessy, 1831). In response to the experiment of O'Shaughnessy, Stevens presented the argument that by this way, he replaced the lost ingredients of blood, but other experts did not acknowledge his thorough change in thinking. British cholera expert David Barry along with O'Shaughnessy visited the Cold Bath Field Prison to observe the patients of Stevens and concluded with the most compelling argument that they were not the cholera patients, so the treatment was incorrect (D. Barry, 1831; W. O'Shaughnessy, 1831). Based on Stevens treatment debate was spread out among the experts of cholera in the whole world. Many unpleasant correspondences exchanged through *The Lancet* and the *American Journal of Medicine* for the next two decades. Finally, Stevens published his book in 1853 and did not change his position regarding the oral saline and blamed David Barry and O'Shaughnessy for deliberately suppressing the information of his success (Daly & DuPont, 2008).

On the ground of O'Shaughnessy's analysis and experiment of the blood of cholera patients, Thomas William Latta tried to experiment the intravenous fluid saline in 1832 using silver syringe and tube to treat the cholera patients (Latta, 1832). Although treatment was not successful considering the recovery of the patients, it was the first successful trial of intravenous fluid saline in the history of medicine. Robley Dunglison suggested calomel, opiates and cupping on the abdomen as the treatment of cholera in 1848 (Dunglison, 1848). Austin Flint (in 1866) and Fredrick Roberts (in 1874) did not recommend the saline as the treatment of dehydration (Daly & DuPont, 2008). Thus many experiments, arguments, and counter-arguments came forward in the treatment process of

dehydration, and by 1902, intravenous fluid saline got the recognition of standard treatment against dehydration (Foex, 2003).

As it discussed that Stevens mixed sodium, potassium chloride and carbonated soda in his oral saline but the problem observed in the absorption of the stomach wall. Lewis (in 1832) suggested to utilize oral alkali for absorption, but he did not experiment it. Later on, in 1910, Sellards demonstrated with oral alkali that could alkalize the acid urine of a few patients which indicated the few amounts of absorption (Cash, 1987). So, in the first half of the 20<sup>th</sup> century, the principal target of the study of oral saline was surrounded by the invention of career molecule for absorption in the stomach wall. During 1940s Daniel Darrow of the Yale University and Harrison of the Johns Hopkins Medical School advocated adding glucose with potassium and sodium chloride for oral rehydration solutions (Cash, 1987; Ruxin, 1994).

Daniel Darrow's opening statement in the article of 1949 reflected his primary objective: "Effective replacement of water and electrolyte in patients with diarrhea should be based on exact knowledge of changes in the composition of body fluids" (Darrow & Pratt, 1949). Without understanding the patients and what types of body fluids are lost, the treatment process will not be permanent although he could not show the permanent treatment of the dehydration but advocated two essential things; adding of glucose to in the oral solutions to contribute calories of the patients and understanding the quantity of fluid loss from the body (Ruxin, 1994).

Therefore, Harrison used glucose in the oral solution to treat mild diarrhea based on the principle of the source of calories. Patients are becoming weak due to diarrhea, and so he added glucose to give input of calories, but input and output measurement were not recorded accurately (Cash, 1987). Chatterjee's article was published in *The Lancet* in 1953 on 'control of vomiting in cholera and oral

replacement of fluid' focusing on the use of antiemetic and herbal medicine to treat cholera patients. Herbal medicine was used with salt, water, and glucose as an oral therapy to treat less severe cholera patients, and got favorable results (Chatterjee, 1953). During the 1950s, the main focus of the study was to relate the link between sugar and salt absorption in the stomach, but it was on the experiment without conclusion. Thus the new decade of the 1960s was begun without having well accepted and effective therapy.

### **3.7. The Cholera Research Laboratory and the Invention of ORS**

The study of diarrheal disease was centered in Dhaka, capital city of East Pakistan, by the establishment of The Pakistan SEATO Cholera Research Laboratory (PSCRL) in 1960 to study cholera and cholera-related illness. Manila, the capital city of the Philippines, was affected by the seventh pandemic (1961-2010) in September 1961. Dr Robert A. Phillips was a US Navy captain in charge of the Navy research station in Taipei, Taiwan. He was working on cholera related treatment from back 1947, later on, he was the director of the PSCRL (1967-1971). Dr Phillips sent a team from Taiwan to the San Lazaro Hospital in Manila to work with the cholera patients. Lieutenant Commander Craig Wallance led the team, and the hospital could maintain 3.4 percent mortality. In the next summer of 1962, Phillips added glucose with electrolyte solutions and used with two cholera patients. He was amazed to see the absorption of sodium with the mixing of glucose (Ruxin, 1994). All things considered, he was the first scientist to discover that when glucose was added to saline through a plastic tube to the cholera patients, their net losses were remarkably decreased. So he showed that in the presence of glucose, the saline water would be absorbed during cholera (D. Nalin, 2018).

Daniel Darrow pointed out two things; adding glucose in the salt solution and understanding of patients' condition how much body fluid is being lost by the dehydration. The first question was settled down by many pathological types of

research and finally by Dr Phillips' experiment in the Philippines. Then two trials were done; one in the Philippines and another in East Pakistan (now Bangladesh) before solving the second remark of Danniell Darrow. Therefore, both trials were failed.

Dr Phillips and his associates arranged the first trial with thirty patients in the Philippines in September 1962 (Ruxin, 1994). They used an over-concentrated solution of glucose and salts along with intravenous fluids to stop diarrhea but did not get the expected result. Consequently, five out of the thirty patients died. Concentrated oral salt and glucose along with intravenous fluid, led to heart failure. Phillips and his associates felt so bad and declared that he would never permit anyone to try this again. Subsequently, Dr Hirschhorn of cholera hospital and also Dr Pierce worked at the Hopkins' Calcutta Research Unit did physiologic studies confirming Phillips observation (D. Nalin, 2018). In 1965, David Sachar, Jim Taylor, and others demonstrated in the PSCRL that the increase of intestinal transmural potential by adding glucose to the electrolyte solution increases the absorption of the stomach wall. However, the investigators were not convinced that the oral solution would be a practical way to treat cholera (Ruxin, 1994).

The second trial was in Malumghat Christian Missionary Hospital (located in between Chittagong and Cox's Bazar district of Bangladesh) in 1967 by the staff physicians of the PSCRL, but it was failed. Physicians were cautious, and immediately they stopped the oral saline and started the IV saline, and so there was no casualty.

In July 1967 Richard A. Cash and David R. Nalin came to Dhaka as the scientist of the PSCRL. Nalin was assigned by the National Institutes of Health to work on clinical research on cholera in Dhaka and Cash was assigned by the National Institute for Allergies and Infectious Disease to work on cholera in Dhaka

(Ruxin, 1994). In the same year, they attempted to treat the cholera patients by ORS in the missionary hospital of Malumghat, The first attempt was a failure because of either patient put out more stool than they drank or treatment stopped due to vomiting (A. Mushtaque R. Chowdhury & Cash, 2007). Then the successful attempt was made in the April of 1968 (in spring) when a cholera outbreak occurred in Dhaka (the capital city of East Pakistan, now Bangladesh).

David Nalin, Richard Cash, Rafiqul Islam and Majid Molla were in the scientists and physicians of the first successful trial (See Appendix-5). Only adult male patients were dehydrated in the first successful study where a volume of diarrhea was replaced by the oral solution. Over eighty percent of IV solution was replaced by the oral solution. Twenty-nine adult patients were studied; all were admitted with severe dehydration and were rehydrated by the oral solution; in the result, they were cured (D. R. Nalin, Cash, Islam, Molla, & Phillips, 1968). Immediately after the study conducted in Dhaka, the Indian Center for Medical Research (ICMR) carried out a similar study in Kolkata. In addition to the development, effectiveness and feasibility of ORS were proved by the application of oral rehydration in the refugee camps in West Bengal in the winter of 1971. During the liberation war of Bangladesh, about one crore refugees got shelter in the lands of India (bordering areas of Bangladesh). Due to the unhygienic environment, contaminated food and drinking water refugees were affected by the cholera epidemic. Most of the cholera cases were treated by the newly invented ORS, and so mortality was less than five percent. After long time experiments in different parts of the world; thus, a successful demonstration of ORS was done in the PSCRL and the refugee camps (D. Nalin, 2018).

To give an illustration of the successful trial in Dhaka (1968) David Nalin narrated that, he addressed the second point of Danneil Darrow to understand the condition of the patients, how much they were losing the electrolyte. As



David Nalin described the whole story to the researcher like; David Nalin was assigned to study the failed trial (1967) of Malumghat Christian Missionary Hospital. He found that the same amount of oral fluid was given to all the patients irrespective of fluid losses by individual patients. For example, everyone was given one liter of oral fluid in every hour, but the need of every patient was not the same. That study quickly failed, and David Nalin was analyzing the results as part of his responsibility to check what was happening.

Furthermore, David Nalin found that ORS worked, but the methodology of rehydration was the cause of failure. If anyone gave every patient one liter an hour and half of the patients were losing two liters an hour, they would get a shock. There was a loss, and adverse got balance, and the patients were losing a quarter of a liter an hour and getting one liter to drink they would quickly become over hydrated and could go to the heart failed. So all patients failed because they did not individualize the amount and the rate of oral therapy. So, David Nalin had the insight and immediately realized that if they did a new protocol where they match the drinking rate to the loss rate, it is the loss of fluids water and electrolytes or salts and that had to work. So they reorganized the study, and they started with the most severe patients in Dhaka in the spring of 1968 (D. Nalin, 2018).

David Nalin added that at a time when Dr Phillips (Director of PSCRL) was away on a trip abroad, he was against further experiment of oral therapy due to his observations. So, the deputy director permitted Nalin even though he was against it. David Nalin and Richard Cash redesigned the study. Moreover, two Bangladeshi Physicians Dr Rafiqul Islam and Dr Majid Molla, who admitted at the time but they did not believe since this study, which in Malumghat had not worked. However, they cooperated although both Nalin and Cash had to oversee them because since they doubted it. When they were on duty, both Nalin and Cash were sharing eight-hour shifts. They saw that they (Bangladesh

physicians) started to give IV's, and there was no reason to give IV, the patients were not in a negative balance. However, afterwards, when it was successful, they realized it, and both of them (Rafiqul Islam and Majid Molla) became pioneers in the invention of ORS. It required very close supervision (D. Nalin, 2018).

Even after the invention of ORS, there was a problem of taking the technique of ORS to the doorstep of the people. The measurement of sugar and salt was a fundamental issue to transfer the technology of ORS to ordinary people's household. Initially, it was suggested to use a spoon to measure sugar and salt. However, every household did not have a spoon available for the measurement. Moreover, there was a variation in the size of the spoon. So, it became difficult to standardize the size of a spoon and its measurement.

M. A. Church first proposed using fingers for the measurement of sugar and salt. Later, BRAC and ICCDR,B worked on standardization of the measurement using fingers. They concluded that one pinch of *labon* (salt) and two scoops of *gur* (unrefined sugar prepared at home either from sugarcane or date juice) would be the best solution and closest to the recommendation by the WHO. They also suggested using *gur* instead of sugar. There were three additional benefits in the use of *gur* in the ORS; a) it was widely available in the country, b) it was less expensive than sugar, c) *gur* has potassium, which is not available in refined sugar.

### **3.8. Social History of Malumghat Trial**

In 1867, the doctors of the PSCRL got a call from the Malumghat Memorial Hospital Chittagong near to Cox's Bazar district in Bangladesh. There was a cholera epidemic in the Chittagong Hill Tracts; they needed help. Doctors of the PSCRL moved with the whole operation down there for rescuing the people. But patients were not coming to the Malumghat hospital although there was

ongoing epidemic nearby villages. Most notably when David Nalin visited in Charinga area in Hill Tracts of Chittagong district, they found that the local *mullahs* were telling the people even if they had patients with cholera that it was to die in the village then not to go to the Christian hospital. They said that the Muslims might get the stamp of the pig on their foreheads. As a result of religious antipathy and being afraid that the Christian hospital might try to convert people from Muslim to Christian, that is why, they were not coming to the hospital (D. Nalin, 2018).

Observing the whole situation, the doctors decided to visit the village to rescue the people from the epidemic. Late Dr Zayedul Haque served as a guide to the doctors of PSCRL, he was from Chittagong and spoke in the local dialect. He took the doctors of the team into the villages and visited into the *haats* (local market). David Nalin narrated a story that there was a nine-year-old girl was suffering from cholera, and she was near to death. However, her grandfather refused to send her to the hospital because of what the *Mullahs* had told him. So what the doctors did was giving her intravenous therapy on the spot, henceforth it was such a miraculous sudden recovery as soon as she got. The people were astonished by seeing this, they realized the benefits of treatment, and soon the Malumghat Christian Hospital was overflowing with patients. The death rate in the hospital was almost zero. David Nalin was newly arrived in that environment several months before that in Dhaka (D. Nalin, 2018).

Richard Cash described the trial of Malumghat Missionary Hospital in 1967. The situation was not right, and people were vomiting. They could not take anything because of cholera and simultaneously vomiting. So they had a method of testing the oral solution, that was the first clinical trial in East Pakistan. Richard Cash remarked that the Malumghat trial was premature. They realized that vomiting patients should not be given oral rehydration; it should be rehydrated by IV saline. So, the whole methodology dropped, and patients were

physiologically sound (Cash, 2018).

According to Dr Majid Molla, it was a severe cholera epidemic in Malumghat area. The whole area was affected by the epidemic, and every patient came with the collapsed position. In absence of transports, patients were coming from 12-15 miles of distance by riding on others' head or shoulder of their relatives. It was such severe cholera, but because they were caring, no one died of cholera in hospital. There was no health service delivery center in Malumghat except the Christian Hospital, and so the health care center was a blessing for the people of Malumghat. In the cholera hospital, there is a hole in every bed by which the stool is drained to the pot. The pot is measured for treatment, but in Malumghat, this facility did not exist, so they gave treatment to the patients like a rural doctor. Once Dr Molla was only one in the center, many patients were coming, and it became so difficult to manage. Dr Molla ordered to the nurses to push IV saline, even they pushed IV saline keeping the patients in the field. Dr Molla had the expertise to push IV saline in the collapsed patient. Once he was pushing IV to the patient, but Director Phillips asked him either the patient was dead or lived (M. A. Molla, 2018).

### **3.9. Field Trial in Matlab and Dilemma**

After the successful trial, the team who invented the ORS wanted to do a 600 patient field trial in Matlab Bazar at the field hospital to show that even under a single field clinic it could work. Rather than hospital research rooms. So, the team started to do it, but Philips was in at the NIH on a trip. He still felt it was too dangerous, so he told John Seale not to permit the field trial, and David Nalin was ordered to stop. It was a considerable dilemma, the team knew it would be a successful trial, but the superiors at NIH were telling them to stop. So the way David Nalin and his associates handled- it was Dr Mosley, who was in charge of vaccine trials at the Cholera Hospital. He did not report to NIH, he reported to the Centers for Disease Control (CDC) Atlanta. So he called the late

Dr Lang Muir, who was the head of the Epidemiology Intelligence Service. Lang Muir sent epidemiologists from the US and from foreign countries back and forth to handle global and local epidemics. Dr Lang Muir said he would send EIS officers from the CDC to carry out the field trial which the team would supervise. So, David Nalin would not be in danger of being fired or court-martial, and that is what he did. The trial was successful. It was the first successful big field trial of oral therapy (D. Nalin, 2018).

This dilemma was also articulated in the article “Passing the Epidemiologic Torch from Farr to the World the Legacy of Alexander D. Langmuir” that;

The field application of the successful laboratory research studies on oral rehydration salt proposed by National Institutes of Health scientists Richard Cash and David Nalin was blocked by the director of the Cholera Research Laboratory because it was "not research". Therefore, Mosley, with Langmuir's strong support, arranged a field study as part of the "non-research CDC epidemiologic agenda." Two EIS officers, Roger Rochat and Barth Reller, were sent to Matlab, where they worked "as interns 24 hours a day," managing the care of patients and replacing the intravenous fluids with oral rehydration solution as soon as the patients were able to drink. Oral rehydration was shown to be effective in preventing cholera mortality, and it reduced the volume of intravenous fluids required by 70 percent. The broad applicability of oral rehydration therapy in the clinical setting was established, and it was immediately incorporated into the standard treatment of severe dehydrating diarrhea. Subsequent field trials demonstrating the effectiveness of immediate treatment of cholera with oral rehydration salt resulted in an EIS officer's becoming severely infected with cholera. In reflecting on those years, Mosley recalls, "The support Langmuir provided was crucial to the implementation of the protocol ... He saw the worldwide impact of this, but the rest of us did not" (Foster & Gangarosa, 1996).

### **3.10. Social Causes and Treatments of Cholera and Diarrheal Diseases**

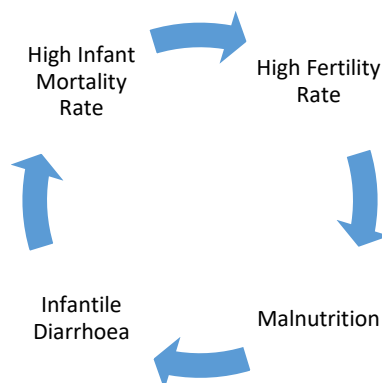
The historicity of cholera and diarrheal diseases, as well as the development of

ORT, are described in this chapter. However, without a discussion on the social causes of diarrheal diseases and its social treatment, the understanding will not be clear. A physician identifies cholera as a disease caused by *Vibrio cholerae* but it involves more than the bacteria. The rural and urban milieu especially the poor infrastructure and disadvantaged conditions of people which provides a good ambience to the bacteria for long time existence (Dasgupta, 2012). So, the social causes of cholera and diarrheal diseases are malnutrition, poverty, inadequate sanitation facility, lack of pure drinking water, lack of proper sewerage system, scarcity of water supply, poor personal hygiene, lack of hygienic residence, harmful childcare and so on (The Centre for Population Activities, 1980).

Coupled with the statistical evidence the number of the population under five years is 15.2 million in Bangladesh, where the prevalence of stunting is 41% (2011), and prevalence of under-weight is 36% (2011), the prevalence of anemia among the women (15-49 years) is 42% (2011) (USAID, 2018). According to the statistics of the World Bank per capita, GNI was 120 USD in 1973, and in 2000 it was increased by 420 USD. Then after 2000, it was increased rapidly to 1470 USD (2017). Referring to the international poverty line 1.90 USD per person per day, the rate of poverty was 44.2 percent in 1991, and it declined to 14.8 percent in 2016/2017 (World Bank, 2018). So, all parameters of socio-economic development were lower and gradually improved the situation in the study period from 1968 to 1998. Consequently, the prevalence of cholera and diarrheal diseases were gradually decreased over the period.

Social remedies of the diarrheal diseases encompass the improvement of the country economy, development of socio-economic infrastructures, confirmation of hygienic sanitation, dietary intake, availability of pure drinking water, proper supply of water and food. Malnourished children are in more risk to be attacked by diarrheal diseases; malnutrition contributes to diarrhea and diarrhea

contributes to malnutrition. Lowering immunity or resistance in the human body increases the susceptibility of childhood diseases (Chen & Scrimshaw, 1983). It also affects the fertility rate; there is a cycle of malnutrition, infantile diarrhea, high infant mortality and high fertility rate (The Centre for Population Activities, 1980).



Due to fluid loss, the main complication of diarrheal diseases is the dehydration, which has been visible through sudden weight loss, thirst, vomiting and other difficulties. So, the primary target is to rehydrate the patient to rescue from the dehydration through oral fluids or intravenous fluids. Ultimate development is achieved through the socio-economic progress, infrastructural development and confirmation of civic amenities.

### 3.11. Conclusion

People were afraid about cholera in Bangladesh even they were not willing to accept the fact. Now the population of Bangladesh is twice than 1968 and population in the capital city Dhaka is six times higher than that time, but cholera patients are less in number. In 1967, Richard Cash and David Nalin worked in the Malumghat Missionary Hospital; it located in between Chittagong and Cox's Bazar district of Bangladesh. There were cholera patients, however, they were not coming to the hospital because of the lack of proper knowledge about the hospital and religious barrier. So, hospital staffs moved to the people to bring them into the hospital (Cash, 2018). By 1998, thirty years of chronicles made the situation alter; people are coming to hospitals, they are

aware of the diarrheal diseases and can make LGS at home even packet ORS is available in grocery shops.

There are two types of fluid in a body, extracellular fluid, and intracellular fluid. Replacement of extracellular fluid is easy than intracellular fluid. Intracellular fluid is being absorbed very slowly, sodium is an extracellular component, and potassium is an intracellular component, for dehydration extracellular component is lost more than intracellular components (Wahed, 2018). Significantly, green coconut, molasses, and other natural foods recover the lack of potassium as an intracellular component. It was practiced that all types of feedings to diarrhea patients were stopped, which resulted in the severe malnutrition; then the ICDDR,B started a campaign to continue regular food during diarrhea, BRAC also participated in the campaign. Awareness was built like food would be continued what the patients wanted to have. There is a book on “Diarrhea and Malnutrition” edited by Lincoln Chen where it is marked as a vicious cycle. Either due to diarrhea mal-nutrition happened or due to mal-nutrition diarrhea happens, they got by experiment that it would be both hands from both sides (Chen & Scrimshaw, 1983).



## **Chapter Four:**

### **ORT and the Innovative Measures**

#### **4.1. Introduction**

Development of the Oral Rehydration Therapy (ORT) is entirely dependent on the continuous innovations and understanding of technological and technical essentials as well as human needs. Successful trial of glucose, sodium, and electrolyte in the human stomach against fluid loss due to cholera and diarrhea was not the completion of the invention; henceforth, it fought to adopt with the development of new technologies and methodologies as well as to remove the ignorance of medical professionals and the people of Bangladesh. Both scientific and social innovation erected the pathway of innovative measures. The struggle was triangular; scientific innovation and accurate measurement, adjustment of medical professionals with innovation and measurement, and finally, teaching people how to prepare and utilize ORS. All these happened through the testing in laboratories and the operations research in field level.

As the result of the successful trial of oral rehydration solution (ORS), The Lancet published the article in August 1968 entitled “Oral Maintenance Therapy on Cholera in Adults” (D. R. Nalin et al., 1968). Although the rationale of first innovation was exposed based on the scarcity of IV saline and its technical complexities, however, now the ORS is the mainstream to rehydrate the dehydrated patients. This long pathway was full of challenges and searching the new ways to reach the ultimate destination. At every corner of the passage, someone or some organizations took the responsibility to uphold the mission; interestingly, the pioneering field was always Bangladesh. Undoubtedly, the significant contributions of the ICDDR,B and BRAC are mingled with the success story of the ORT in Bangladesh as well as in the world. The innovative measures, background and success stories of the ORT are described in this chapter based on both the in-depth interviews and secondary sources.

#### **4.2. The Cholera Research Laboratory in Dhaka**

The Oral Rehydration Solution (ORS) and the Pakistan SEATO Cholera Research Laboratory (PSCRL) in Dhaka are closely related to each other. The entire scientific innovation was accomplished in the PSCRL later on the ICDDR,B. On this ground, the understanding of the underlying reasons of the establishment of the PSCRL is an essential part of this study. The Pakistan SEATO Cholera Research Laboratory (PSCRL) was founded in Dhaka in 1960 to research on cholera vaccine and effective solution of cholera and diarrheal diseases instead of intravenous fluid therapy. Medical advisers of the SEATO proposed that SEATO beyond its military program needs to create laboratories for medical research in different countries including Thailand and Pakistan and also a couple of other places. Therefore, in 1960, they sent a group of infectious disease experts to visit these countries and make recommendations. They recommended East Pakistan, among others to focus on cholera (D. Nalin, 2018).

The researcher tried to find out the causes of the establishment of the PSCRL. Richard Cash pointed out the reasons behind; the SEATO was a military pact lead by the USA against the Soviet Union, and Pakistan was the member of the Pact, East Pakistan was the home of cholera. So, the PSCRL was established in Dhaka due to these underlying reasons (Cash, 2018). David Nalin narrated that there was no effective vaccine and the only effective treatment that was scientifically valid the intravenous fluid therapy. It was not available in most of the affected areas, and it was unaffordable by the needy patients of cholera. Besides, they all have a military threat also, and David Nalin thinks most of the world militaries are careful to vaccinate their soldiers to prevent the diseases and keep them healthy. So it is a general health aspect but also a military aspect behind the establishment of the PSCRL. Majid Molla described that a good number of US soldiers died in the war of Vietnam due to cholera. US experts investigated and found East Pakistan as the most cholera-prone area, so they made a plan to establish an institution in the area of cholera for the continuation

of research, and finally, they established the PSCRL in East Pakistan in 1960 (M. A. Molla, 2018).

M. A. Wahed, the retired scientist of ICRDDR 'B, mentioned two reasons behind the establishment of the PSCRL in Dhaka. Firstly, After the Second World War, the US army was deployed in Taipei, Manila, Japan and they were suffering from cholera, and some soldiers died of cholera, and so they were vexed about it. At that time, SEATO headquarter was in Bangkok, and they were thinking about how to treat the cholera patients, so they were searching where the prevalence of diarrhea was more. In 1960 a team was sent to East Pakistan to search the most cholera-prone area in East Pakistan, and they got that Borguana (a district of Bangladesh) is the most cholera-prone area in the country. However, it was challenging to make a station in Borguna in the 1960s. Matlab (sub-district of Chandpur District in Bangladesh) was also cholera-prone area, it was accessible from Dhaka, so they decided to make an office in Dhaka and health center in Matlab. It was entirely under the deed of Pakistan SEATO pact; the name was given the SEATO Cholera Research Laboratory. Secondly, intravenous fluid therapy was expensive and related to technical issues so there was an urge of innovation of new thing which would be handy and cheap, the PSCRL was established to fulfil the urge (Wahed, 2018).

Emeritus Scientist of ICDDR,B Dr Mohammad Yunus thinks that a good number of US soldiers were stationed in South East Asia and Asian countries, and they were affected by cholera in remote places but had no handy treatment available, so they were willing to find out the treatment process. Pakistan was the member of SEATO Pact, Bengal Delta was home of cholera, so, they had chosen East Pakistan as the place of cholera research. Moreover, the USA, as the leader of SEATO pact, committed to the SEATO countries and betterment of its people. People were suffering from cholera, so the CRL was established to help the people of the most cholera-prone country (Yunus, 2018). Dr Sirajul

Islam, emeritus scientist of ICDDR,B, also described the Bengal Delta as the home of cholera, people suffering and need of American soldiers as the background causes of the establishment of PSCRL in East Pakistan (S. Islam, 2018). So, the experts of the PSCRL explained four significant reasons behind the establishment of the institute in East Pakistan; firstly, the military reason of US soldiers, secondly the commitment to the people based on the SEATO Pact, thirdly, East Pakistan was the home of cholera and finally the invention of either vaccine or the affordable treatment for the cholera patients.

The PSCRL jointly run by the Pakistan Government and the SEATO (1960), the headquarter of the Laboratory was set in Dhaka, and the hospital facilities started in Matlab (Z. U. Ahmed, 2014). The Dhaka Hospital of the PSCRL was established in 1962, and the Health and Demographic Surveillance (HDS) at Matlab was run in 1966 (ICDDR'B, 2019). Its reputation was spread out all over the world by the invention of ORS in 1968. In contrary, during the Liberation War of Bangladesh (1971), the PSCRL passed severe hurdle on running its activities and bound to cut some of its programs. Moreover, PSCRL and its experts worked to save the people from the epidemic of cholera in Bangladesh and the refugee camps in India. David Nalin and his associates pursued the US civil society in favor of the independence of Bangladesh (D. Nalin, 2018).

Initially, the laboratory was in Dhaka, and the health center was in Matlab. Doctors were giving the treatment to the cholera patients some times in the open field and sometimes under the abandoned shadow in Matlab Bazar; they had no fixed place for treatment purpose. Doctors of the PSCRL continued the treatment without any facility in Matlab up to 1963 then they got an abandoned barge to make a temporary field station. In Matlab, there was a two stored floating boat (Barge) of police, police were staying on the first floor, and the ground floor was used for upazila activities, there was prison inside the boat also. In the flood of 1962, the barge was shifted from river to the land, and it

became abandoned and was kept dysfunctional at the bank of a canal.

Fortunately, head of East Pakistan Police was a classmate of Dr Fahim Uddin, DG Health of East Pakistan. Dr Fahim requested to police headquarter in East Pakistan for giving the barge to the PSCRL, and it was given to SEATO laboratory. It was taken and repaired for further use as a hospital, laboratory and everything was started in the barge. The first floor was used for living the doctors, nurses and laboratory and ground floor was for the patients. By this way, it was run up to 1966, and a permanent building was constructed near to the barge. Hospital activities were shifted to the newly constructed building (1966), and in the same year, Health and Demographic Surveillance of Matlab was started with 43 thousand populations (Wahed, 2018). Every event of human life of the people of Matlab Demographic Surveillance area is recorded. According to the report of 2011, a total of 225202 people are in both active and passive surveillance (icddr,b service area- 115703, and government service area- 109499) (M. Mahfuzur Rahman, Alam, Abdur Razzaque, & Streatfield, 2012), it is called the largest population laboratory in the world.



**Figure 4.1: Present Picture of the Barge in ICDDR,B, Matlab (photo taken on 3rd February 2019)**

Stanley O. Foster and Eugene Ganqarosa described the contribution of Matlab Center that; Matlab, the site of the International Center for Diarrheal Disease Research, Bangladesh, field hospital and laboratory, is a town in rural Bangladesh. It is an internationally renowned field station for epidemiologic and clinical studies of cholera and other diarrheal diseases. Langmuir viewed Matlab as an excellent opportunity for EIS officer career development training. He brokered an agreement calling for the annual assignment of two EIS officers and additional short term EIS officers as required for special projects. During the 6 years that Mosley headed the Epidemiology Division, contributions included: 1) studies of the cholera vaccine then available showing it to be minimally effective; 2) daily diarrhea and demographic surveillance of the 278,000 residents of Matlab, providing not only data on vaccine efficacy but also detailed information on fertility, migration, and mortality; 3) extension of the research studies on oral rehydration therapy to clinical settings; and 4) rapid helicopter assessment of the Bhola cyclone, which proved effective in changing the international response from medical teams (not needed) to tools and bullocks (Foster & Gangarosa, 1996).



Figure 4.2: Name changes and evolution of ICDDR,B from 1960 to 2015. The photo was taken from ICDDR,B Dhaka.



**Figure 4.3: Cholera cot beds and intravenous fluids in the emergency recovery unit of the hospital of the ICDDR,B, Dhaka, Bangladesh**

### **4.3. The Liberation War of Bangladesh and the PSCRL**

David Nalin was in East Pakistan when the Agartala case was trialed, and it was publicized. He observed that even illiterate people on the street were listening to the broadcasting of the Agartala trial. However, David Nalin left East Pakistan in June of 1970 to join Harvard University Medical school and so it was while he was in Boston that the elections were held and they were all amazed and happy to see the democratic election by President Yahya. When the March 25th crackdown came everyone was shocked, and at that time David Nalin was at Johns Hopkins in Baltimore, and he was to go to Calcutta to take over the Directorship of the Calcutta Center for Medical Research and Training, a joint India and Johns Hopkins unit. Indira Gandhi stopped giving visas to Americans because President Nixon sided with Pakistan, and so he was stuck. David Nalin could not go to Calcutta and spend most of his time creating the Bangladesh Information Center together with several colleagues who were involved to the major lobbying organizations in Washington to stop arms aid to Pakistan and try to end the war (D. Nalin, 2018). David Nalin and his associates played a very active role in the liberation of Bangladesh. They worked in

support of Bangladesh whereas the USA was in favor of Pakistan. American people were supporters of Bangladesh, however, the government was a supporter of Pakistan. They protested against the sending of arms to Pakistan and arranged rally in front of the White House (Yunus, 2018). Also, things happened so quickly that fortunately, the war came quickly to an end. Oral therapy was used in the refugee camps in India.

Therefore, David Nalin visited the camps after the war over that was when he went back. He was the first American back into independent Bangladesh on January 2nd of 1972. Even before the US recognition of Bangladesh, he was given a letter instead of a visa. The letter was given by late MR Siddiqui, by that letter new government allowed him into the country. So he could return to the cholera laboratory and helped to re-establish it. Also, he was a senior consultant to the International Rescue Committee, which got funds from USAID. So he could give a cheque of two thousand dollars to the deputy director of the cholera laboratory to pay the salaries of 600 employees. Now David Nalin thinks it was about two thousand dollars but through the I.R.C. as a consultant that he managed to create for continued funding. Because, Islamabad had already cut off the funding naturally since they were not going to help on the desk (D. Nalin, 2018).

Richard A Cash left Dhaka July in 1970, and after three weeks of the Liberation War, he came back to Bangladesh. Because there were important things that keep this place going on and much research going on and hospital and many things. Immediately after the Liberation War, America did not recognize Bangladesh, so they stopped the money flow and so the CRL authority set up some training programs in the CRL to train people about the use of ORT. A group came from Burma to learn, so there was a way of transferring fund to make sure the people to get a salary. Because until Bangladesh was recognized diplomatically by the USA, they could not give the fund to ICDDR,B (Cash,



2018).

The US government gave support to the ICDDR,B in the name of PL-480. Wheat came as a donation to Pakistan through the ship; the name was PL-480. Sold price of wheat was given to ICDDR,B for functioning; at that time it was mainly donated by the USAID. Gradually when the CRL started to enhance the functions, it approached to the WHO, UNFPA, Australia, UK, USAID, UKAID, and they also donated. There was the only dependency on USAID then it was expanded to many organizations and countries. If it could not decrease dependency on USAID, this organization might not be continued (D. Nalin, 2018). In wartime, price of wheat was deposited in Islamabad of Pakistan and it was not distributed to the CRL, so the authority of the CRL could not pay the salary of the employees. The IRC (International Rescue Committee) was led by Dr Greenough and Richard Cash, so, the CRL administration approached to the IRC, and they gave some dollars to the institution. The CRL got money from the IRC for the payment of workers' salary.

During the Liberation War, the CRL operated only in the hospital; there was no scope to continue experiment or study due to political turmoil and scarcity of money. It was observed that three groups simultaneously got treatment in the hospital like Pakistan Army, Freedom Fighter and Rajakar (Wahed, 2018). ORS both packet and loose form were randomly used in the hospitals of ICDDR,B and other hospitals due to the scarcity of IV saline. It was difficult to send the IV saline to Matlab all time, so Matlab CRL mainly used ORS. If there was not vomiting doctors used only ORS (Yunus, 2018). Thus ORS became popular in the absence of IV saline.

#### **4.4. Mass Trial of ORS in the Refugee Camps of India**

Dilip Mahalanabis worked with the cholera patients in the refugee camps of India during the liberation struggle (1971) of Bangladesh. Refugees were living

in a very unhygienic environment and having contaminated food and water, so cholera was spread out very quickly. The refugees faced the crisis of how to deal with the cholera epidemic; they had no medicine and no knowledge. As ORT was discovered earlier of the Liberation War, Dilip Mahalanabis thought that it would be the best time to test the ORS (A Mushtaque R Chowdhury, 2018). Mahalanabis mixed ORS in drum and gave it to the people of refugee camps; there was no available packet ORS, so he utilized the salt and sugar solution very effectively (Yunus, 2018). He had the opportunity to trial among the most significant population; those were refugees from Bangladesh. If there were no use of ORS in the refugee camps, the mortality rate would be more than 40%. Due to the use of ORS, diarrheal mortality was less than 5% (Wahed, 2018).

The World Health Organization (WHO) notably published an interview with Dilip Mahalanabis in the bulletin of the WHO (Volume 87, Number 2, February 2009, pp 81-160) where he narrated the empirical study of mass trial in the Bangaon refugee camp of India.

In 1969 and 1970, I was working on research on diarrheal diseases in children at the infectious diseases hospital in Kolkata. When the cholera epidemic began in 1971, we had to leave our research and go out into the field to work with the refugees. The government was unprepared for the large numbers. There were many deaths from cholera, many horror stories. When I arrived, I was really taken aback. There were two rooms in the hospital in Bangaon that were filled with severely ill cholera patients lying on the floor. In order to treat these people with IV saline, you literally had to kneel down in their faeces and their vomit. Within 48 hours of arriving there, I realized we were losing the battle because there was not enough IV and only two members of my team were trained to give IV fluids. I didn't have the privilege of consulting knowledgeable people at that time. I had to decide on my own what to do. I had no choice but to go ahead and use ORS to the maximum, hoping for the best. I was confident that it could work, but not necessarily in these circumstances. I also feared that if it didn't work, we would have no more options. It was a huge relief when we saw that it really did work. Within two or three weeks, we realized

that it was working and that it seemed to be all right in the hands of untrained people. However, people did need some supervision and persuasion that it really would work. People knew that IV saline was the treatment for cholera because cholera is endemic in the region. At that time, we coined the term 'oral saline'. We told them that this was also saline, but that it was given by the mouth. At the time, we didn't know that it would become so well-known and that people would take it up everywhere. We were just happy that it worked there and that we could help these people. We prepared pamphlets describing how to mix salt and glucose and distributed them along the border. The information was also broadcast on a clandestine Bangladeshi radio station. The cholera outbreak was not just among refugees, but also in Bangladesh itself (WHO, 2009).

Before Mahalanabis's mass trial, it was in the controlled community trial, but he worked with the mass people. Mahalanabis and his colleagues did this experiment and showed that the mortality rate drastically came down. Many trials were done in different places and different situations, everywhere it was shown that the trial in refugee camps worked very well. That is why The Lancet recognized it as the most significant innovation of the century. In a real sense, it is simple, and its solution is also simple (A Mushtaque R Chowdhury, 2018).

#### **4.5. The CRL and Post-Independence Bangladesh**

Richard Cash was describing the post-independence socio-political context like; usually, the post-liberation socio-political context was chaotic, and the government was not clear about the situation, and many refugees were coming from India. They were coming with smallpox, cholera, other infectious diseases and malnutrition. The international agencies and NGOs were raising the issues, but everyone was busy with their duties; the government was not well coordinated. So the government was making a policy alone, and the Government was not well known about how organizations were working and organizing the whole things after liberation. Fortunately, people of war area were self-sufficient they got a loan from their relatives and managed the whole

disastrous situation. People were the best thinkers what they could do (Cash, 2018).

The CRL was facing financial crisis due to cut off the flow of US donation. In the meantime, Bangabandhu Sheikh Mujibur Rahman, Prime Minister of Bangladesh, signed the ordinance as the CRL (Cholera Research Laboratory) instead of PSCRL. The USAID accepted the name, and they started to donate the CRL. It is the evolution of the center from SEATO Cholera Research Laboratory to the Cholera Research Laboratory.

In such circumstances, David Nalin and Richard Cash had designed a training program for village doctors often referred to as quacks. Also, they figured that while they were not adequately trained doctors, they were the only health persons in many villages. Moreover, if the CRL wants to teach oral therapy simplified method to mothers, it could probably be taught effectively to the quacks first. More importantly, they would not stand in opposition at the village level ORS training to the mothers. So the CRL managed to train them in classes and then they went back to their villages. That was one of the early efforts of the CRL before the BRAC's nation-wide OTEP program. Furthermore, the CRL had to confirm the multi-level operations for its popularization and socialization. Firstly, a series of studies were necessary to show the effectivity of ORS in all aged groups. Secondly, it should reach people's doorsteps, and everyone can prepare it. All these had to be published to encourage medical acceptance; otherwise, wherever anyone went with oral therapy, they had faced the opposition from doctors who make more money on IV (D. Nalin, 2018).

During the reign of President Ziaur Rahman, Professor Ibrahim was his health advisor; he suggested the ICDDR,B be continued with the functions of Diarrhea research along with associated illnesses. Others researches were being continued due to a new sentence. Bangladesh should be added, and so 'b' was

added as ICDDR,B. It was written that all other countries would participate in finance. Now about 30 countries are participating in the donation of the ICDDR,B. More than a dozen international organizations are also participating in the donation of the organization (Wahed, 2018).

Therefore, the ICDDR,B Ordinance 1978 was signed on 6<sup>th</sup> December by President Ziaur Rahman, and effective was on 9<sup>th</sup> December 1978 for twenty-five years for its functioning then in 1998 it was extended up to 50 years (See Appendix-9). It narrated two aims and objectives of the institution;

To function as an institution to undertake and promote study research and dissemination of knowledge in diarrheal diseases and directly related subjects of nutrition and fertility with a view to developing improved methods of health care and the prevention and control of diarrheal diseases and improvement of public health programs with special relevance to developing countries. To provide facilities for training to Bangladeshi and other national in areas of the Centre's competence in collaboration with national and international institutions, but not to include conferring of academic degrees (Bangladesh, 1978).

#### **4.6. Teknaf Center of ICDDR,B**

In 1974, news came that an unknown and fearful disease was seen in the Saint Martin Island of Bangladesh by which people were dying, especially children were more susceptible. At the same time, Parliament session was running and Bangabandhu ordered his secretary to bring the director of the cholera hospital and give the responsibility of investigation. The director, along with a doctor and technicians, went there and investigated that it was all *shigellosis*, the problem was that *shigellosis* was resistant to all antibiotics (Wahed, 2018). The question came that the Saint Martin Island was isolated and medicine was not available, but how could it be resistant by all antibiotics? It went from the mainland. Therefore, in response to the crisis, the UNICEF gave 50 thousand dollars by which ICDDR,B established a station in Teknaf (1976), it was Teknaf

Research Project (Munshi, 2018).

Subsequent activities of the ICDDR,B in the Saint Martin Island encompassed the development of scientific as well as socially applicable formula to protect the *shigella*. The nickname of the disease was *Hataro*. Coupled with the studies on *Shigella* and the local phenomena the ICDDR,B accepted the policy of ORS distribution through ‘ORS Depo’. The ORS Depo was set in the particular households of Teknaf area (Munshi, 2018). ORS packet or materials of ORS were kept under the responsibility of community leader in the particular households to distribute among the nearby people during the dehydration. As people could understand the depo house, there was a sign of flying the flag. Within one and half year attack rate of diarrhea was not decreased by mortality was decreased due to the availability of ORS in the local area of Teknaf and Saint Martin. It was one of the milestones of ORS and its application. Then some other researches were conducted in Teknaf by the funding of Switzerland and other organizations. Teknaf study indicated how the treatment is better at the doorstep, by showing flag or camp (Wahed, 2018).

#### **4.7. ICDDR,B and the Use of ORS in Bangladesh**

Immediately, after the invention of ORS, the two hospitals of ICDDR,B (icddr,b in Dhaka and Matlab) were using the ORS in their hospital premises, but other hospitals or people of Bangladesh were unaware of the new invention. So, the ICDDR,B started short courses to teach the national and international doctors and nurses to disseminate the knowledge of cholera and the ORS. Scientists and physicians of ICDDR,B designed the courses in 1972 and started the experiment. By 1974, the design of the short courses got the formal shape, and after 1978 it became part of the regular activities of ICDDR,B. Dr Dhiman Barua, a senior professor, involved in ICDDR,B, taught the trainees on cholera and ORS. The trainees got both academic and practical classes on ORS formulation and its application, so it was considered very fruitful course. The

ICDDR,B hospitals collected the ingredients of ORS from the market and mixed it in the hospital premises. Trainees also acquired the knowledge of large scale mixing of ORS and the sources of ingredients collection.

The ultimate target of the ICDDR,B was to disseminate the knowledge of ORS formulation and its application, so they assisted Government of Bangladesh, NGOs and other organizations who worked to promote the use of ORS in Bangladesh. The Government of Bangladesh (1981) run the National Oral Rehydration Program (NORP) to train up the people how to prepare ORS and to distribute packet ORS among the people through hospital channels. Under the NORP they made ORS packet and supplied to the whole country where ICDDR,B promoted the government activities. The Social Marketing Company got support from ICDDR,B to produce ORS packet in significant volume and its marketing. Then BRAC was involved in disseminating the knowledge of ORS/LGS throughout the country from 1979, and it continued the national level program (OTEP) up to 1990. They worked with *Labon Gur* Solution (salt and molasses), not with the packet of ORS. The ICDDR,B was directly involved in the activities of BRAC both infield and laboratory testing.

In the course of activities, the concern of home administered *Labon Gur* Solution was either it was safe or not. Dr Mohammad Yunus and his associates, scientist of ICDDR,B, worked on *Labon Gur* Solution and found that it was effective. The title of the article is " Home-administered Oral Therapy for Diarrhea: a Laboratory Study of Safety and Efficacy" (Snyder, Yunus, Wahed, & Chakraborty, 1982). The study proved that the treatment with ORT (with home ingredients) at home was as effective as in the hospital. So, it made a scientific ground for preparing and using LGS at home (Yunus, 2018). BRAC prescribed one pinch *labon* and one full scoop of *gur*, first, they tested the samples in the laboratory of ICDDR,B for confirmation of scientific basis. They made it more simple, but there was a concern of safeness of the LGS. BRAC

always got the scientific solution from the ICDDR,B, so they got the opportunity to work in the field (Wahed, 2018). The ICDDR,B developed spoon for sodium and glucose, one smaller side was for salt, and another bigger side was for *gur*. After the solution was tested in the laboratory, one thing was important getting potassium in *gur*. Potassium was needed about 20ml; it is measured about 12 ml potassium is available in the one scoop of *gur*.

Moreover, ICDDR,B prescribed for keeping two pots to the members of the families to keep the *labon* in one pot and *gur* in another pot. Only if the technology is provided, it will not work, but it needs human to handle the technology. Then it was approached how to involve the community in the process. The target of ICDDR,B was whenever diarrhea begins; the treatment will be started. Therefore, the concept of giving training to the mothers was developed with the formula of 'Bari Mother' (House Mother). One mother will get the training from every house of 7-10 families, and the ingredients of ORS will be kept to her. If the ingredients of the LGS are kept to a mother of a house and members of that house will be affected by diarrhea, then they will go to that mother. It was then trained mother will show them how to prepare ORS and give the ingredients. So, ICDDR,B took the policy of 'Bari Mother' for spreading of the ORS to people. In Teknaf there was 'Depo System' to provide the ORS to people. Under the depo system, ingredients of ORS would be kept to a particular house of a colony, and during diarrhea episode, people of that colony would collect ORS from there. The problem of ICDDR,B was- it had no infrastructure to attend the whole country, so the study was limited to the particular areas, especially hospital-based (ICDDR,B hospitals) area in Bangladesh. So, The systems of ICDDR,B at the initial stage (the 1970s) to spread the knowledge of ORS were: 1. Bari Mother (Ingredients of ORS and zinc tablets) and 2. Depo System (Yunus, 2018).

At the initial stage (the 1960s and 1970s), the ORS was mixed with one liter of



water following the instruction of WHO. However, the problem raised that-

- a) cholera patients are mainly children; they cannot have one liter within twelve hours, so it was becoming wastage, the indication is to leave after 12 hours.
- b) sometimes mothers are not willing to leave the remaining mixture of ORS after 12 hours, so it was so risky.
- c) for home condition half a liter is enough to mix one time.

Considering all the above problems, the amount of water was reduced to half a liter from one liter. ICDDR,B and BRAC pursued to reduce the amount of water from the formula of ORS (A Mushtaque R Chowdhury, 2018).

ICDDR,B, BRAC, and SMC did extensive work on ORS in research, training, teaching and social marketing in the country that within one decade (the 1980s) it reached to every mother of the country and people got the message of ORS and how to prepare it. Then pharmaceutical industries started to produce the ORS, which was more effective advancement for production and distribution. Because every pharmaceutical has the production and supply chain in the country. However, *labon gur* solution became less important to people because people were getting ORS packets in their doorsteps. Even it is available in tea stalls and grocery shops in the whole country.

There were three treatments parallel in the ICDDR,B; 1. IV, saline 2. Oral saline 3. Antibiotic treatment by tetracycline. Tetracycline was so useful for killing the germ. The new thing has added zinc, especially for children. Both ORS and zinc were used for children. Primary research was done by S K Roy on zinc tablet then Dr Mohammad Yunus and Abdullah Baki continued the research on zinc. A later study showed that if the zinc continues ten days, the severity and duration of diarrhea would be lessened, and the use of antibiotic also be lessening. Therefore, Mohammad Yunus did another study on five days and ten days as a comparative study and showed that five days and ten days' supplement of Zinc is almost near in result. Usually, diarrhea does not exist for more than five days,

and mothers are not willing to give the tablets after diarrhea over.

#### **4.8. Patient Management through IV Saline and ORS**

Cholera patients are rehydrated through intravenous fluid or oral fluid. Management is related to the amount of fluid loss through watery stools or vomiting. The objective of patient management is to rehydrate the fluid amount based on how much the patient lost. For example; if a patient loses 10 percent of body weight and the patient's weight is 60 KG, the patient will be rehydrated at least 6KG. If the 10% body weight is lost due to dehydration, it is considered a severe case. Immediately the patient is rehydrated through IV saline then oral rehydration fluid is started. Generally, management is prescribed based on the condition of the patient, either it will be rehydrated through IV or oral saline (M. A. Molla, 2018). Majid Molla described that cholera is a very miracle disease and pleasant to treat if there are no other complications, collapsed patients are becoming well within two hours. The main problem is acidity, if the patient acquires acidity it is not possible to give ORS. So, it requires the experience of patient handling. Sometimes due to the shortage of IV saline, the doctors start ORS. In the case of less dehydrated patients, ORS is started from the beginning (M. A. Molla, 2018).

#### **4.9. The invention of Rice-Based ORS**

The experiment began in Bangladesh during the 1980s at the ICDDR,B in Dhaka. Packets of glucose ORS were not available all time due to unavailability of sugar/molasses in all seasons, especially in rural areas. IV saline is expensive, and it requires technical expertise. So, the ICDDR,B began to study and investigate what source of carbohydrate might be available in all the seasons in rural areas of Bangladesh, and it would be effective. The research was continued on potatoes, corn, rice, wheat, sorghum, and other sources. Investigating the all possible solutions worked good or better than simple sugars or molasses, but the rice was identified as the most likely not to cause allergies. So, research was

continued on the rice.

In 1982, Dr Majid Molla and his colleagues successfully experimented the rice ORS in the ICDDR,B and demonstrated that the rice powder-based ORS is as effective as the simple ORS (A. M. Molla, Sarker, Hossain, Molla, & Greenough, 1982). The study was conducted on 124 older children and adults with acute diarrhea owing to *Vibrio cholerae* or *Escherichia coli*. Half of the patients were treated by sucrose electrolyte solution (ORS), and half were treated by cereal-based electrolyte solution (rice ORS), per liter containing 30-gram rice powder and electrolyte based on the recommendation of the WHO. There was no difference in the success rate of patients compared to the treatment through ORS and rice ORS. This study suggested that rice ORS is sufficient to treat the cholera patients as like the ORS (A. M. Molla et al., 1982). Thenceforth, in the same year in West Bengal, a randomized control trial was conducted by Patra and his colleagues with a higher quantity of rice powder (50 grams per liter). It significantly reduced the duration (by 30 percent) and volume (by 49 percent) of diarrhea (Patra, Mahalanabis, Jalan, Sen, & Banerjee, 1982).

Dr Molla and his colleagues did another randomized trial between December 1982 to March 1983 in the ICDDR,B with an increased quantity of rice powder (per liter 80 grams). The study showed that even with severe cholera, the ORS could be replaced by the rice-based ORS with better absorption. It resulted in a reduction of 28 percent diarrheal stool and less consumption of ORS by 27 percent. As rice is the staple food in Bangladesh, it is presented as more available ingredient compared to the glucose and sucrose, which are the manufactured products. Moreover, it provides more nutrition in the acute stage of dehydration (A. M. Molla et al., 1985). Patra and his colleagues did another study containing rice powder (50 grams per liter) and glycine (8 grams per liter), but it did not improve the absorption efficiency (Patra et al., 1986).

Dr Majid Molla narrated the background concept of the Rice ORS during the in-depth interview with the researcher. It was 1980 and Dr Molla was visiting his home town. In the meantime, one of his relatives was affected by cholera and immediately he started treatment with oral saline. The patient was vomiting, Molla's mother was observing the patient's condition and suggested him to feed the liquid of rice powder. She argued that when Majid Molla and his siblings were kids she used liquid rice powder during diarrheal diseases. Therefore, Molla thought about the concept of his mother and calculated that it was scientifically right. Stomach wall can absorb rice earlier, so he fed some patients at his home town and got a good result than routine ORS (M. A. Molla, 2018).

After coming from home Majid Molla informed it to the authority of ICDDR,B, they listened to the remarks but did not accept. First, he trialed with some patients not informing the authority, but Dr Molla was astonished to see the immediate result of the rice-based ORS. After that, along with scientific basis and practical knowledge Majid Molla conveyed his view to the experts of ICDDR,B in detail; then they were agreed to make a trial of ORS vs Rice base ORS by their supervision following the formula of Dr Molla. The first trial was done with 4:4 patients with the same conditions; they got an outstanding result. It was a comparative study, assimilating the age, blood group, weight, and other indicators, and then it was compared and got a good result in rice-based ORS. Those who were given normal ORS they were telling, please give rice-based ORS, a patient of another ward was becoming well quickly, that happened (M. A. Molla, 2018).

According to the contemporary practices of ICDDR,B, Bengali scientist did not write the scientific proposal; the proposal was supposed to be written by the foreign experts. Majid Molla mentioned that Greenough III was the Director of ICDDR,B, and he was generous to the Bengali scientists. He suggested Dr Molla to write a proposal of Rice ORS. When Dr Molla presented the proposal

of rice ORS in the meeting of the scientists, all Bangladeshi, and foreign colleagues were criticizing him, but Greenough III was more interested in it and encouraged him to work it again (M. A. Molla, 2018). Authority of the ICDDR,B observed the dramatic result of the rice-based ORS, and finally, it was approved as the way of rehydration parallel to ORS in the normal process (M. A. Molla, 2018).

#### **4.10. Cholera Epidemic from 1947 to 1970 in East Pakistan (Bangladesh)**

Cholera appears in dry weather, goes peak in May in East Pakistan and it disappears after the rainfall. Extreme fatality is observed in May even hundred deaths in every week (Thomas A. Cockburn, 1960). Thomas A. Cockburn shows a figure (figure-4.4) in his article on 'Epidemic Crisis in East Pakistan: April-July, 1958' to substantiate the peak seasons of a year are April-May and November-December. There was a cholera vaccine which required two injections of 0.5 ml protecting an individual for six months, however, half-yearly immunization was not practical in East Pakistan.

However, people were suffering from cholera but not going to the hospital (1950s and 1960s). Because a trip to the hospital means many miles carrying by bullock cart or boats by this time patient dies. This is to say, due to absence of proper communication structure transportation system was not erected in the countryside of Bangladesh. Cockburn visited a cholera ward in Barisal in the middle of a cholera outbreak in 1958, but the ward was empty, though people in the countryside were suffering from cholera severely (Thomas A. Cockburn, 1960). Staffs of public health department could not visit the affected areas rapidly; it was seen that someone from the cholera-affected area came to health officials and informed the situation and after processing health officials went to those areas after several days, by that time people died. According to the cholera report from 1948 to 1958, cholera cases and deaths were decreased (figure-4.5) because of inoculation, environmental development and medical intervention in

all over the province.

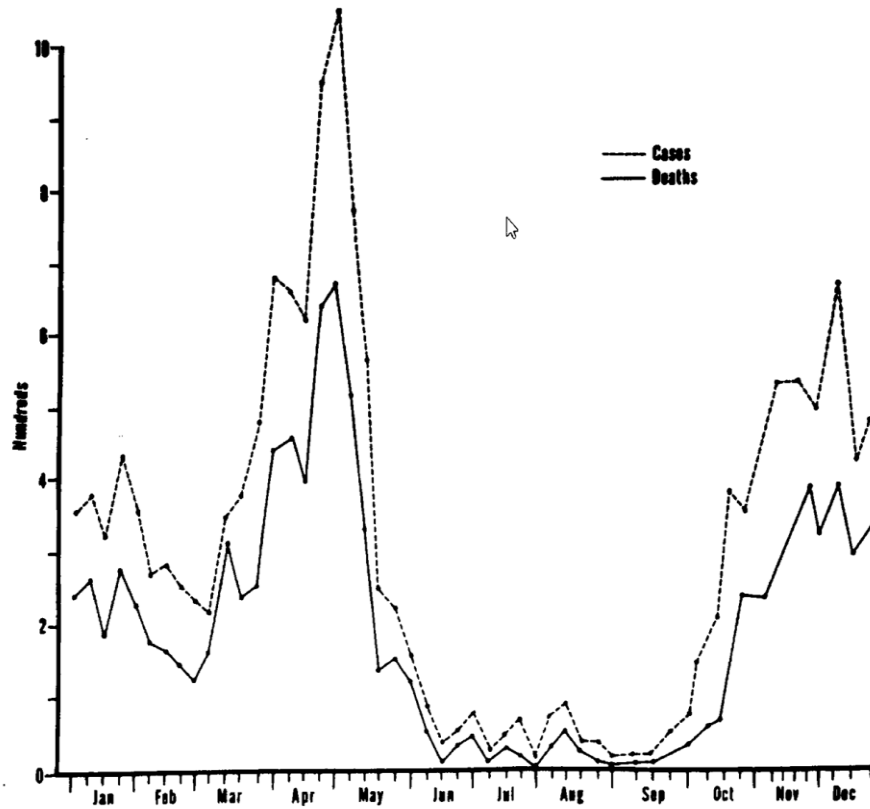


Figure 4.4: Cholera cases and deaths in East Pakistan, 1958(Thomas A. Cockburn, 1960)

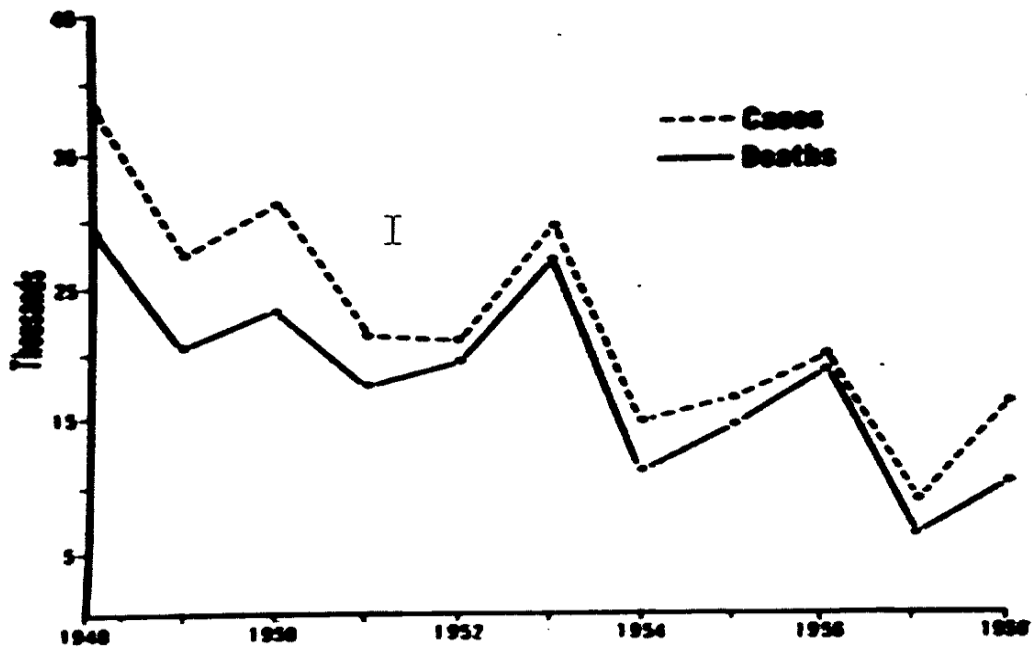


Figure 4.5: Cholera cases and deaths in East Pakistan from 1948 to 1958 (Thomas A. Cockburn, 1960)

Significantly, the *El Tor* biotype replaced the classical biotype of *Vibrio cholerae* by 1966 in India. The *El Tor* biotype originated in Indonesia in 1961 and gradually spread out in Southeast Asian countries and South Asia. However, *El Tor* appeared first in Chittagong in 1963, and it reached Dhaka in 1964, following years it was disappeared but came back in 1968. Then within five years' classical biotype, *Vibrio cholerae* was replaced into the *El Tor* biotype in Bangladesh. The biggest *El Tor* cholera epidemic was recorded in Dhaka in 1974 (M. U. Khan, Shahidullah, Ahmed, & Khan, 1983).

#### **4.11. Cholera Epidemic in the 1970s in Bangladesh**

Moslem Uddin Khan and others noted the causes of the epidemic of new biotype *El Tor*.

After the war of liberation in December 1971, several unemployed and homeless rural people flocked to Dhaka for government assistance in 1972 and 1973. Heavy floods and a food crisis affected the country in 1974. The homeless and jobless people constructed thousands of huts near the markets, railway stations, outskirts of the city, industrial parks and on unused government land. Their maximum concentration was in Ramna and Mohammadpur police zones. These settlements had no waste disposal facilities, and the few hand pump tube wells available were not enough to provide safe drinking water. People were therefore forced to use water from nearby rivers, ponds and canals, as well as from the city supply and the hand pump tube wells, for bathing, washing, and drinking (M. U. Khan et al., 1983).

Besides, factors favoring the transmission of new biotype were eating in the roadside places, having food from the stalls which were connected to the cholera outbreak and transmission through the neighbors. On the other hand, spreading of the new biotype was six weeks ahead of previous classical biotype (figure-4.6). November-December was the peak time of classical biotype in the winter season, but the cases of *El tor* reached a peak in October (M. U. Khan et al., 1983).

**Table 4.1: Shifting from classical biotype to *El tor* biotype from 1970 to 1975 (M. U. Khan et al., 1983)**

Year	Classical Inaba	Classical Ogawa	Eltor Inaba	Eltor Ogawa	Total	% Eltor
1970	2792	38	-	138	2968	4.6
1971	1042	1426	-	185	2653	7.0
1972	40	598	1	63	702	9.1
1973	1	-	10	1265	1276	99.9
1974	-	2	552	4496	5050	100.0
1975	-	-	1827	1530	3357	100.0

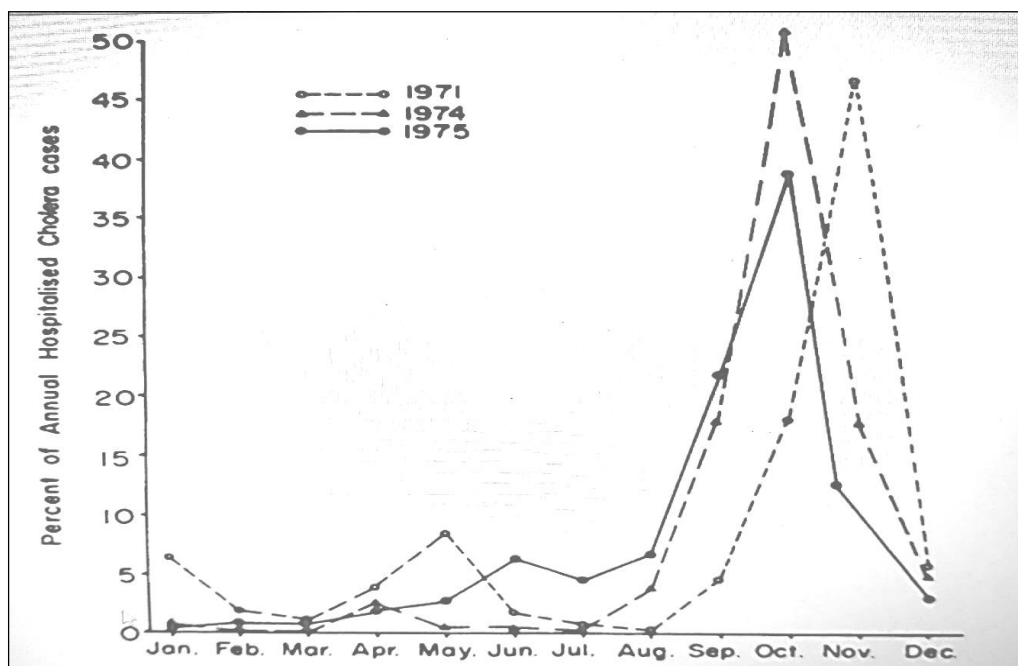


Figure 4.6: Showing the time change of cholera cases in 1971, 1974 and 1975 (M. U. Khan et al., 1983)

#### 4.12. Cholera Epidemic in the 1980s and 1990s in Bangladesh

The Epidemic Control Preparedness Program (ECPP) was started (1985-1991) with the collaboration of the Government of Bangladesh and the ICDDR,B to support the investigation in the government hospitals in sub-district level and intervention in epidemic diarrhea. Government epidemic surveillance report shows that from 1985 to 1990, the number of cholera attacks was forty to fifty thousand except the years of flood in 1987-88 in the whole country (Siddique et al., 1992).

Table 4.2: Epidemic in Bangladesh from 1985 to 1990 from the report of Diarrhea Epidemic Surveillance of Bangladesh (Siddique et al., 1992).

Year	Number of Attacks	Number of Deaths
1985	47150	4101
1986	53046	3997



1987	303391	4726
1988	988391	3676
1989	43535	1783
1990	48916	1309

There was an outbreak of cholera in the northwestern region of Bangladesh in September 1991; government epidemic surveillance reported 214856 cases and 2620 deaths between September to November (Siddique et al., 1992). To put it another way, the pathological report confirmed that only 24% of cholera patients were below five years, so, adults were affected more from cholera in 1991. However, the epidemic of 1991 produced 210000 to 235000 cases and about 8000 deaths (Siddique et al., 1992).

It is well known that home of the *Vibrio cholerae 01* is the Bengal Delta and it was pandemic after 1817 but at the end of 1992 *Vibrio cholerae in-01* became epidemic in Bangladesh. By the end of March 1993, a total of 107297 cases were reported, and 1473 were deaths. Experts observed the new organism with attention to the treatment procedures and most of the cases were the adults, which indicated that the organism had no immunological experience in past (John Albert et al., 1993). Government surveillance regarding cholera was weak, even up to the 1990s. In the epidemic of 1991 report showed that 59% of cholera patients were not visited by government surveillance staffs and 80% of patients were treated at home (Siddique et al., 1992).

A study was conducted by Dilip Mahalanabis and his associates on the new organism of cholera from January to April 1993 where they identified the new organism as the *Vibrio cholerae O139* (Mahalanabis, Faruque, Albert, Salam, & Hoque, 1994). It was a socio-demographic and epidemiological study on the diarrhea patients of the ICDDR,B, a large hospital in Dhaka city; the hospital treated 70000 – 90000 patients in a year and 1854 patients were studied based on 4% systematic sample. Twenty-seven percent (502) of 1854 patients were

*Vibrio cholerae* O139, and 3 percent (63) were positive for *Vibrio cholerae* O1 biotype *El Tor*. Mainly patients were adults and with the short history of watery stool. Seventy-eight percent of the patients were treated with the IV saline first and followed by the rice ORS. Most of the patients came from lower-income group, especially from the urban slums with unhygienic sanitation and lack of awareness on the hygiene practice (Mahalanabis et al., 1994).

**Table 4.3: *Vibrio cholerae* vs *El Tor* in the last ten years (1983-1992) (Mahalanabis et al., 1994)**

Year	No. Screened	Classical <i>Vibrio cholerae</i> (%)	<i>El Tor</i> (%)	Total (%)	An estimated total of cholera patients
1983	2854	117 (4.1%)	253 (8.8%)	370 (13.0%)	9250
1984	2945	34 (1.2%)	308 (10.5%)	342 (11.6%)	8550
1985	2287	40 (1.7%)	215 (9.5%)	255 (11.1%)	6375
1986	2580	259 (10.0%)	251 (9.7%)	510 (19.8%)	12750
1987	2789	272 (9.8%)	295 (10.6%)	567 (20.3%)	14175
1988	3262	68 (2.1%)	482 (14.8%)	550 (16.9%)	13750
1989	2384	10 (0.4%)	94 (3.9%)	104 (4.4%)	2600
1990	2383	2 (0.1%)	141 (5.9%)	143 (6.0%)	3575
1991	3641	7 (0.2%)	658 (18.1%)	665 (18.3%)	16625
1992	3474	2 (0.1%)	516 (14.9%)	518 (14.9%)	12950
Total	28599	811 (2.8%)	3213 (11.2%)	4024 (14.0%)	100600

#### 4.13. Conclusion

From the beginning of the twentieth-century intravenous saline was accepted as the treatment of diarrheal diseases to replace the fluid losses in the human body. Routinely, after drinking water body absorbs a portion of water and rest of the amount goes out by urination. Drinking saline water (glucose and salt) also go out by urination but glucose made the way of absorption which was unknown before the 1960s. The scientists discovered that glucose is necessary to catch the saline water to the stomach wall and into the bloodstream. They also found the absorption time and the degree of transmission through the stomach walls into the bloodstream. Finally, the successful trial of ORS (in 1968) for rehydrating the diarrhea patients opened up the new era in the history of

medicine.

Initially, this miraculous medicine was suggested to handle through the hospitals, not by the ordinary people concerning the wrong measurement and overfeeding, which could succeed in hypernatremia or no efficacy. The WHO prescribed to handle it carefully in the hospitals, not by the non-medical professionals (A Mushtaque R Chowdhury, 2018). Although it was handy technology and miraculous in result, it was mainly kept under the medical professionals before the beginning of the Oral Therapy Extension Program of BRAC in 1979. By this time ICDDR,B worked with 'Bari Mother' and 'Depo System' (which is discussed in the previous chapter), but that intervention was in selected areas not in mass level. First ten years after the invention of ORS was concentrated on the improvement of the formula of ORS and greater study to validate early studies. The target group of the training was doctors and nurses, and it was based on hospitals and clinics. BRAC began the mass scaling up a program of ORS in Bangladesh through the OTEP. Chapter 4 discusses the home-based education of ORS and LGS by the BRAC.

## **Chapter Five: Home-Based Education of ORS and LGS**

### **5.1. Introduction:**

After the Liberation War (1971), the Government of Bangladesh distributed packet ORS among cholera and diarrhea patients with the assistance of international organizations. The government used the existing hospital channel to distribute the packet ORS. To accelerate the promotion of the knowledge of ORS, an international workshop was organized (1979) in Dhaka with the representatives of sixty-eight thousand villages of Bangladesh where ORS related information was shared to the participants. It was decided to create a group of Rural Health Worker in every community of Bangladesh with the assistance of volunteers and the older people of the communities (Kamal, 1985). In 1981, the Government of Bangladesh launched the National Oral Rehydration Project (NORP) supported by the UNICEF with two functions; to train up the people how to prepare ORS and to distribute packet ORS among the people through hospital channels (Mosites et al., 2012).

At the same time, BRAC leaderships inspired by the declaration of the UNESCO “Year of the Child” in 1979 shifted their primary focus from family planning to the childhood diarrhea. Sir Fazle Hasan Abed, the founder of the BRAC, clearly mentioned the background of this turning. He said, the year 1979 was the international year of the child declared by the United Nations (UN), at that time he was the member of the Supreme Council of the Women and Children formed by President Ziaur Rahman of Bangladesh for the development of women and children. Meetings of the council were used to be held in Bangabhaban (Office and Residence of the President), however, in a meeting of the Council, the President questioned the members of the council what should they do to decrease the mortality of children? Sir Abed replied to the President to immunize the children and teach the mothers how to prepare oral rehydration solution at home (Abed, 2018).

In response to the remarks of Sir Abed, President Ziaur Rahman said that now confirmation of the immunization is not possible due to unavailability of electricity in sub-district level. For immunization it would have to confirm vaccination and maintain the cold chain or freezing the vaccines otherwise it would be wastage. Ziaur Rahman gave the word to Sir Abed that within the next five years every sub-district would be electrified. Then immunization will be done by the Bangladesh government, and the BRAC will help. So, now the BRAC can start to teach mothers how to prepare LGS at home (Abed, 2018).

Despite the National Oral Rehydration Project (NORP) of the government, BRAC's application of oral therapy extension program was accepted by the government. It decided to teach mothers through reaching the door to door based on the home ingredients called *Labon Gur* Solution (LGS). Early experimentation with health programming was done in Sulla project of BRAC. Therefore, through three phases of the Oral Therapy Extension Program (OTEP), the whole country was covered, and about 12 million mothers were taught how to prepare LGS at home (A. Mushtaque R. Chowdhury & Cash, 2007).

The main focus of this chapter is to discuss the Oral Therapy Extension Program (OTEP) and its execution. Before the detailed description of three phases and scaling up the program of the OTEP, the idea and activities of Sir Fazle Hasan Abed related to ORS are discussed in the background concept of the OTP (Oral Therapy Program). Excluding introduction and conclusion, this chapter is broadly divided into five headings; background concept of the oral therapy program, experimental phase, the first phase (July 1980-September 1983), the second phase (October 1983-September 1986), and third phase (October 1986-December 1990).

## **5.2. Background Concept of the Oral Therapy Program**

In the 1970s diarrheal diseases, especially cholera was rampant in Bangladesh, and people were dying of cholera, where children were the main victims of the disease. However, the thinking was how the BRAC could contribute to rescue the people from this fatal disease. The BRAC may work with oral rehydration therapy through teaching to the chairmen of union councils. When people would be sufferers of diarrhea, then chairmen would help them to prepare ORS or LGS at home. From this point of view, the whole thinking process was started. If the chairmen and members of union councils of the whole country are known about *Labon Gur* Solution (LGS), they will work with the people during the outbreak of diarrheal diseases. Many issues were thought from many perspectives, but finally, BRAC decided (1979) to teach the mother how to prepare LGS at home (Abed, 2018).

Initially, ten messages were prepared to teach mothers; then it was revised into seven messages. It was instructed to the girl trainers that if the mothers could tell the 7 points and prepare the oral rehydration solution in front of monitors, then the Oral Replacement Worker (ORW) will get the salary. It was a performance-based salary system. In this way, they became more conscious that if mothers cannot respond to the monitors she will not get the salary, so they concentrated on teaching to mothers. Typically, 45 minutes is average time to teach mother, however, trainers sometimes take 1-1.5 hours to teach them only for confirmation. If mothers do not appropriately respond at the time of the investigation, she will lose the salary that was their concern.

Notably, incentive system of payment impacted on the quality of teaching. Therefore, after completion of 30000 houses in Sulla sub-district, a survey was done to measure diarrhea episodes in those households and what was ORWs efforts to get recovery from that in the last one month. From 30000 houses 6200 houses were found that there were diarrhea episodes in last one month. That

means, one-fifth of households in every month has diarrhea history. It was not sampling but collected data from every one of 30000 households (Abed, 2018). Surveyors questioned the people of 6200 households what measure they had taken after diarrhea. They answered no, nothing was used except 6% households. They (6% houses) said that they fed *labon gur* saline to the childreb. However, 94% of households did not use the LGS which was taught to them.

In such circumstances, the BRAC authority asked themselves why did it happen, why they did not have the *labon gur* solution? They were taught but did not use at the time of diarrhea. It was discovered that girls (ORWs) who taught the mothers and visited the households, in fact, they do not believe in this medicine (*labon gur* solution). It also found that when they (girls) were affected by diarrhea they bought medicine from the market for stopping diarrhea; even they do not use the *labon gur* solution. Sir Fazle Hasan Abed, founder and chair of BRAC, was analyzing the whole matter along with the senior officials of BRAC. Finally, they decided to convince the ORWs first. The first trial project was in Sulla upazila in Sunamgonj district, so the ORWs would have to believe the effectiveness of the LGS. So, all ORWs were brought to Dhaka from Sulla and sent them to ICDDR,B to observe how the children were fed, and they were being cured. Theoretically, they were taught how the absorption process of oral saline is done in the stomach wall, why less amount of gur than the accurate measurement will be less effective for absorption and the use of salt and its measurements. They observed it both in theoretically and practically.

After completion of training in ICDDR,B, three hundred ORWs went back to Sulla with the theoretical and practical knowledge of LGS. They also felt that by this process, children would be cured. Then they again taught the next 30000 households, and after completion, the second survey was done and observed that the rate of using LSG was increased from 6% to 19% (Abed, 2018). The finding was- mothers were convinced about the LGS, but the use of percentage

was less only 19 percent. After collecting the addresses of the households, BRAC authority sent a group of students from Dhaka University to the area to find out why they did not use LGS whereas affected by diarrhea. Significantly, maximum answers of mothers were- brother said this is not good, father said this is not good, or husband said he would bring medicine from the market and so on. Moreover, it will create a problem in the future and may it destroy the fertility of their children. Many types of conversation were placed at the family level regarding the use of ORS.

After a study on the second survey, it was realized that the program designing was wrong. Concentration was given to women, not to men. Girls were trainers, and they trained mothers then mothers would feed LGS to the children during diarrhea. Thinking behind the program designing was one-sided, social perspective, especially patriarchy, was not considered in the designing. However, male members of the families were ignored in the whole programing. Consequently, they were confused about the learning of mothers with various wrong ideas (A Mushtaque R Chowdhury, 2018). Finally, it was decided to redesign the program considering the importance of male and female of a family. First one year, BRAC worked with 30000 households and prepared the program, so the first one-year program was limited within two upazilas; Sulla and Baniachong of Sylhet District in Bangladesh. After several experiments in Sulla and Baniachong, BRAC went out to the rest of the country with the Oral Therapy Extension Program (OTEP) (Abed, 2018).

### **5.3. Experimental Phase**

Before the discussion on the experimental phase of the oral therapy program, a brief description on the formation of BRAC and its activities is required to understand the underlying thoughts. On 12th November 1970, there was a big tornado in East Pakistan, that was a turning point for Bangladesh to be independent. A car race was started from Dhaka to Tehran on 12<sup>th</sup> November,



all government employees of East Pakistan government were busy with the car race. Government people were not aware of the Tornado. About 2-3 hours, water was coming to the coastal land but went back within a few minutes. Consequently, people could not live, and there was a massive destruction. In absence of proper communication system, the information of the massacre was not reached to Dhaka on a date. Yahya Khan was president of Pakistan. The Government of Pakistan did not show considerable interest to the tornado; it went entirely against the government. After the Tornado, a relief center was opened in Monpura Island of Bangladesh by Sir Fazle Hasan Abed<sup>11</sup>, Lincoln Chen, Bittu Chowdhury, John Brady, and their wives. The center was run under an organization namely 'Help'. That was the milestone of the foundation of BRAC (Wahed, 2018).

Immediately after the independence (1971), the Government of Bangladesh appealed to the civil society to participate in the rehabilitation and renovation activities. In response to the government appeal, Sir Fazle Hasan Abed established the Bangladesh Rehabilitation Assistance Committee (BRAC) along with some prominent personalities of the country. They were; Vikarul Islam Chowdhury, S. R. Hossain, Akbar Kobir, Kazi Fazlur Rahman, Professor Abdur Razzak and Poet Sufia Kamal (Sukhendra Kumar Sarker, 2017e). The BRAC was formed in 1972 as a non-government organization (NGO) to participate in rehabilitation and reformation activities of the new country. Activities of BRAC

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<sup>11</sup> Sir Fazle Hasan Abed, KCMG (born 27<sup>th</sup> April 1936 in Sylhet district of British Bengal) is the founder and chairman of BRAC, the largest NGO in the world with more than 120,000 employees. He got many national and international awards, honorary degrees and prizes for his mounted contribution to reducing poverty in Bangladesh and other countries. He was appointed Knight Commander Order of St. Michael and St. George (KCMG) by the British Crown for reducing poverty in Bangladesh and other countries. He was the key person to initiate the Oral Therapy Extension Program in Bangladesh from 1979 to 1990, and it was successfully executed under his leadership. (<http://www.brac.net/chairperson>)

were started from Derai, Sulla and Baniachong upazila (sub-district) of Sylhet district. Two reasons worked behind the selection of area; these areas are remote and surrounded by water gauge (*haor beshtito*), Sylhet is the birthplace of Sir Fazle Hasan Abed, and he knows the sorrows of the people of those areas (A Mushtaque R Chowdhury, 2018).

So, first one-year activities mostly concentrated on relief distribution and resettlement of the people after the devastating war against Pakistani rulers. At the end of 1972, Sir Abed understood only relief distribution could not alleviate the poverty of the people. However, development activities should initiate along with health, education, economic development and employment. Based on this thinking, from 1973, BRAC started development activities following the model of BARD (Bangladesh Academy for Rural Development) in Comilla. Activities under the new model program were; construction of the mass center in the village, the formation of village organizations, elderly education, family planning and health, and group-wise development activities in the villages of Bangladesh. For keeping similarity in the name of BRAC with the new programs the name was changed into Bangladesh Rural Advancement Committee (BRAC) (Sukhendra Kumar Sarker, 2017e).

Based on the experience of social works in rural areas of Bangladesh, BRAC initiated the most significant oral therapy program in 1979 along with other programs those were ongoing from an earlier time. This program gave capability and competence to the BRAC to work in a broader perspective, even going out from the state boundary (A Mushtaque R Chowdhury, 2018). Again the point of the name change came forward due to a broader perspective, especially Bangladesh and rural was not adaptive to the name of BRAC. Because it started to work in across boundary as well as both rural and urban areas, so the abbreviated name BRAC accepted as the brand name of the organization from 2009. That means BRAC is one word and name; it has no

elaboration (Huda, 2015). Now the BRAC is working in eleven countries across the world with microcredit, health, education, empowerment of poor and other programs (Sukhendra Kumar Sarker, 2017e).

### **5.3.1. Study and the Development of Thoughts**

At the initial stage of BRAC, Sir Fazle Hasan Abed regularly attended the monthly meeting of the projects. He attended a monthly meeting of Sulla project in November 1978 and raised the point of what the BRAC could do to prevent the child mortality due to diarrheal disease. From the exchange of views, four options came forward for the intervention to reduce child mortality from diarrheal diseases (Shukhendra Kumar Sarker, 2018).

1. A medical program to treat diarrhea patients, the BRAC may arrange the treatment by trained staffs.
2. Diarrhea is a water-borne disease. So, the BRAC may intervene through a program of safe water and hygienic sanitation.
3. A program to distribute packet ORS in the market so people may buy the packet from the market when needed.
4. A health education program to teach the mother how to prepare ORS at home with home ingredients.

Simultaneously, the policy-related debate was going on in the head office of BRAC in Dhaka to decide the best way to achieve the target of decreasing child mortality in Bangladesh. BRAC authority tried to get the advice of international experts on the diarrhea control program. The international year of the child (1979) gave impetus on this process (A. Mushtaque R. Chowdhury & Cash, 2007). Sir Abed was leading the whole thought provocation through triangulation of national expert's opinion and policy debate, advice of international experts and the field experiment. In the meeting of December 1978 in Sulla project, Sir Abed began the analysis and discussion on four options of the last meeting with the field level health workers and officials of the project (Sukhendra Kumar Sarker, 2017e).

However, the first opinion was cancelled based on lack of capacity to treat the patients by the physicians or trained staffs in all the villages of the country. In every village, the health center was not available as well as it was not accessible to all the sections of society, especially the poor section. The BRAC worker informed that the preferred treatment of diarrhea patients by the village doctors was the intravenous saline, the problem was- the price of each saline bag was around 100 BDT. Moreover, for every patient about 5-10 bags of IV saline were required. Average yearly income of Bangladeshi people was around 1500 BDT (1980), so, it was quite tricky to handle the matter through village doctors (A. Mushtaque R. Chowdhury & Cash, 2007).

In the discussion on the second opinion, two points came forward; one was the latrine project and the tube-well project. BRAC installed many latrines free of cost in Sulla, but people could not use either they were not habituated, or about 4 to 6 months the latrines were under the water (A. Mushtaque R. Chowdhury & Cash, 2007). They were used to defecate in the *haor* (large water body). In addition to that, BRAC also installed many tube-wells for safe drinking water, in maximum cases either the tube-wells were dysfunctional or upper sides of tube-wells were stolen, community people did not repair those tube-wells (Sukhendra Kumar Sarker, 2017e). The implication of the latrine and tube-well project of the BRAC was- the only installation was not the solution, there should build awareness to utilize and maintain the latrine and tube-wells from time to time. So, the second opinion of safe water and sanitation program was negated.

There were also two problems behind the implementation of the third opinion of the marketing of packet ORS; supply against the demand was less, and in maximum cases, people could not read the instruction given on the packet of ORS to administer the solution. Rate of literate people in the country was only 29.2 percent (Sukhendra Kumar Sarker, 2017e). Furthermore, the government

could not produce the approximate demanded number of packet ORS, so it would again burden to the poor section of people to purchase the ORS from the market. Professor Mushtaque Chowdhury argued that in Bangladesh, diarrhea is common about 6-7 times at the childhood, so, millions of packets would be required if the government would try to provide to every household in the country. The entire health budget will be required to produce the ORS packet.

Another thing was the distribution based on logistics and infrastructure. Only reaching to the household was not an end, it should be used, however, it was not possible at that time. Writing instruction on ORS packet was necessary to mix the ORS and its feeding, so who would read and understood the mixing method (A Mushtaque R Chowdhury, 2018). Moreover, transportation would create difficulty to distribute in every village of the country (A. Mushtaque R. Chowdhury & Cash, 2007). The third opinion was also annulled, considering the above issues.

The fourth opinion was health education; to teach the mother how to prepare ORS/LGS at home with home ingredients (salt, sugar/molasses and water). Dr Lincoln Chen was the director of the scientific affairs of the SEATO Cholera Research Laboratory, opined that if the supply of packet ORS is adequate and no scarcity but poor people of remote would not have access to it. People could not read the instruction written on the packet ORS; on the other hand, people have limited access to media so the campaign would not work. So, the only door to door teaching method to the mother could be the best way to increase the use of LGS in the whole country (Shukhendra Kumar Sarker, 2018). In reality, mother is the first-hand observer of the diarrheal diseases of her child. If the mother could prepare the ORS at home, she would intervene in the disease immediately after the attack through ORS. Finally, it was decided to implement the fourth opinion of health education to mother how to prepare ORS/LGS at home.

### **5.3.2. Development of ORS Formula and Application Method**

M. A. Church noted (1972) that at the time of teaching, health workers give stress on the bacterial origin of diarrhea and advise to the patient and family members to confirm better sanitation as well as safe drinking water and food. Physicians talk about medicine to cure the disease, but the instruction for oral fluids to the child at home is neglected by both health workers and physicians. He suggested the alternative measurement system by fingers and showed how fingers could be used to measure salt and sugar (Church, 1972). Professor Mushtaque Chowdhury informed that the BRAC decided to use the home ingredients to prepare ORS at home. Alternative of glucose is sugar/molasses, which are available in rural areas of Bangladesh (A Mushtaque R Chowdhury, 2018).

Moreover, salt is available in every household in the country, so BRAC authority decided to use home ingredients salt, sugar/molasses and half a liter/Adha sheer water to produce LGS. How can salt and sugar be mixed is experimented in many countries of the world? For instance, in Indonesia, they made a spoon with two heads; one was big, and another one was small, the big one was for sugar, and the small one was for salt. BRAC accumulated all the experiments and seemed the use of technicality if any of the scientific instruments would not work; it could disturb the process of learning. Suppose if the spoon is broken it will hamper the process. So, the BRAC gave impetus on the non-instrumental and handy process, no equipment would be needed for preparation, and the people would use the memory to prepare the LGS (A Mushtaque R Chowdhury, 2018).

Simultaneously, along with the development of application methods, the formula was experimented by Sir Fazle Hasan Abed in his family kitchen room following the recommendation of M. A. Church. He used various dimensions of a pinch, fist, sheer/liter and finally observed that one pinch of salt and two

fists of molasses would be the best solution similar to the recommendation of the WHO. At the same time, clinical trial of ORS vs LGS (Labon Gur Solution) was conducted in ICDDR,B to test the efficacy of *labon gur* solution. The outcome was positive by which the scientific basis of LGS was established (A. Mushtaque R. Chowdhury & Cash, 2007).

So, the formula of LGS was prepared, but some questions were not settled yet; what are the contents of the educational message, who are the recipients of the education, what is the method of teaching and who is the teacher? One by one, all the questions were answered. Initially ten points were prepared to teach, as mother is the first observer and caring the child so recipient of education will be the mothers, teaching will be given at the home of mother means where mother lives, and women health workers will be teachers to teach the mother how to prepare LGS at home (Karim, 2018). For answering all the questions, many field-level experiments and policy level programs were held in Sulla project and head office of BRAC in Dhaka. A field trial was arranged in February of 1979 in two villages- Harinagar and Anandapur- of Sulla project to get answers to all the above questions. There were ninety-five families in Harinagar and one hundred fifty families in Anandapur village, BRAC health worker Hemlata Sarker and Shopna Voumik worked to disseminate the knowledge of LGS (Sukhendra Kumar Sarker, 2017e).

BRAC got four implications from the trial in two villages: a) Illiterate mothers of rural area are capable of comprehending and remembering the new knowledge and can reproduce the knowledge by preparing the effective and safe LGS. b) Eight class pass, semi-literate, young female workers can teach mothers visiting their home correctly. c) BRAC should develop a quality monitoring system to confirm the education given by young females. d) For the quality implementation of programs, In addition, BRAC should ensure the similar system for the supply of logistics from the project to the city as well as ensuring

the receiving of quick feedback (A. Mushtaque R. Chowdhury & Cash, 2007).

In the conceptualization of diarrhea, people had some bad or superstitious practice and some wrong ideas of treatment also. There was a tradition of having *pani pora* (holy water). So if it is the water of tube well it will work due to the quality of water, people had no scientific knowledge about diarrhea and cholera. So, the BRAC authority had two objectives of teaching; 1 Removing the wrong conception of diarrhea from the society, 2 — the reformation of existing concept with slight new adding regarding diarrhea. The ultimate target was to make an education package for diarrheal treatment at home and building awareness as well. Ingredients would be collected from home. Based on these thinking and decisions, some messages were designed (Karim, 2018).

Ten points were prepared to teach mothers (A. Mushtaque R. Chowdhury & Cash, 2007)

1. Diarrhea is the condition of a patient who has more than one watery stool a day.
2. Transmission of diarrhea is by the anal-oral route. That means the feces of an infected person or a carrier enters someone else's mouth.
3. Treatment of diarrhea is oral replacement mixture, fluid and food.
4. Oral replacement mixture is a mixture of sugar and salt in water. *Labon-gur* mixture is one kind of replacement mixture.
5. *Labon-gur* mixture is made by mixing a three-finger pinch of salt and two four-finger scoops of gur in one-half seer of tube-well or boiled water and stir.
6. You should begin giving *labon-gur* mixture after the first watery stool.
7. For children, the amount of *labon-gur* mixture should equal the water in the stools. If the mother does not know, let the child have as much as he desires. For adults, give one-half seer for each stool.
8. *Labon-gur* mixture can be dangerous when:
  - a. Too much salt is added to the mixture, and
  - b. Infants and small children are not given small, frequent feedings.



9. A doctor should be consulted when:
  - a. Diarrhea lasts for more than two days
  - b. The patient cannot take fluid by mouth, and
  - c. The patient has severe diarrhea and cannot replace the water he loses in his stools with a *labon-gur* mixture
10. Nutritional advice for a patient with diarrhea includes:
  - a. During diarrhea he/she should continue to take food and fluid, and
  - b. After diarrhea he/she should take more than the average amount of food for seven days.

#### **5.4. The Pilot Project**

Before starting the expanded project, a small pilot project should be done to examine the prepared methodologies of work and to solve the management issues related to implementation (Abed, 2018). So, BRAC began a pilot project (experimental project) in July 1979 and continued up to May 1980. The target of the pilot project was to understand some specific issues like;

- Were the messages carry complete and concise instruction
- How long the illiterate women of remote villages could remember the messages
- Would mothers prepare the *labon-gur* solution accurately
- Would the ratio of ingredients standard according to the rule of the WHO?
- Would the people use LGS during diarrhea episodes?
- Would it possible to confirm the teaching by the female health workers
- What would be the feasible salary system for the female health workers
- How would the monitoring system be conducted to ensure the quality of education?
- What would be feasible methods to teach the mothers how to prepare LGS at home

There were six existing camps of BRAC in the Sulla<sup>12</sup> project and so the pilot project of oral therapy program was started in Sulla. Twenty female workers were recruited from the locality of Sylhet district, and they were designated as Oral Replacement Worker (ORW). Initially recruited workers got five-day training at the headquarter of Sulla project in Markuli area. Both theoretical and practical training was given, and as part of the training, the ORWs trained in the nearby villages with the support of the health workers who worked in the pre-pilot project in Anandapur and Harinagar (A. Mushtaque R. Chowdhury & Cash, 2007). Activities of the pilot project were started with 3-4 ORWs in every camp under the supervision of camp in-charge. From July to September (1979), teaching in Sulla project was continued, and around 9000 mothers were taught the ‘ten points to remember’.

Related officials and ORWs of the pilot project in Sulla (Sukhendra Kumar Sarker, 2017c);

- |                            |  |
|----------------------------|--|
| 1. Sir Fazle Hasan Abed    | Executive Director                       |
| 2. Sukhendar Kumar Sarker  | Project Administrator, Sulla Project     |
| 3. Tedd Vincent Ellerbrock | Medical Officer, Sulla Project           |
| 4. Mushfiqur Rob Chowdhury | P. O. (Admin)                            |
| 5. Monoranjan Sarker       | Assistant Medical Officer, Sulla Project |
| 6. Azizul Karim            | Camp In-charge, Sulla Project            |
| 7. Shahabuddin Ahmed       | Camp In-charge, Sulla Project            |
| 8. Halim Chowdhury         | Camp In-charge, Sulla Project            |
| 9. Abu Bakar Siddique      | Team Coordinator                         |
| 10. Kamrul Islam           | Team Coordinator                         |
| 11. Fazlul Karim           | Team Coordinator                         |
| 12. Rotish Sarker          | Monitor                                  |

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<sup>12</sup> A sub-district in Sylhet district

13. Shahadat Hossain	Monitor
14. Pronob Das	Monitor
15. Joynal Abedin	Monitor

On the other hand, the Oral Replacement Workers were Hemlata Sarker, Kamrunnahar, Shamsunnahar, Gopa De, Jhorna Dasgupta, Purnima Pal, Shuruchibala Shil, Shondha Bhattacharya, Shila Das, Aroti Talukdar, Nargis, Jesmin Siddique, Nurunnahar, Mira Chokrobarti, Rita Roy, Mukul, Nilima Roy, Chonchola Pal, Rita Chokroborti, Beli De, Mira Nondi, and Shuprova Das (Sukhendra Kumar Sarker, 2017c).

It is observed that most of the ORWs were non-Muslim, especially from the Hindu religion. The researcher questioned the project administrator S. K. Sarker, why most of the ORWs were recruited from the people of Hindu religion at the initial stage? He replied that due to religious sentiment Muslim parents or guardians did not agree to permit the girls to work outside the houses, so, the BRAC authority recruited non-Muslim female health workers (Shukhendra Kumar Sarker, 2018). He also informed that although the pilot project was in Sulla of Sylhet district ORWs were recruited from Jessore also. Families in Sylhet area were not interested in permitting the girl to work with BRAC, that is why BRAC recruited female health workers from Jessore district. Guardians of the families were more liberal in Jessore than Sylhet; so, it was comparatively easier to recruit the female workers from Jessore.

Fazlul Karim, team coordinator of Sulla project narrated the reasons behind the choosing of Sulla upazila as the first pilot project of the oral therapy program. He said that Sulla was the diarrhea prone area where half of the year was dry, and half of the year was full of water. Causes behind choosing Sulla were:

1. It was one of the most diarrhea prone areas of Sylhet district.
2. Majority people were Hindu, and at the time of liberation war, it was severely

damaged.

3. There were activities of BRAC in Sulla before the OTEP, and BRAC made relief center in Sulla.

4. BRAC distributed oral saline in this area before the trial.

5. Sylhet was a home district of the BRAC founder Sir Fazle Hasan Abed, and he knew the socio-economic dynamics of the area.

6. Rehabilitation activities started in India at the border area of Sylhet. So, after the independence (1971), founders of the BRAC established relief centers in Sulla area of Sylhet district (Karim, 2018).

Therefore, the pilot project was extended (1979) from Sulla project to the neighboring upazilas of Ajmirigonj and Baniachong to gather knowledge of work where BRAC had no previous activities. Whole Sulla upazila was under the programs of BRAC, and there was the noticeable presence of BRAC workers, however, new two upazilas were not in the programing. So, the experience of new areas would help to frame the new program for rest of the country. In the Sulla project, 3-4 ORWs worked under the supervision of camp in-charge, but new upazilas were covered by different policy where two teams were formed with 15-16 ORWs with one male supervisor and on the cook. The ORWs visited six days in a week and taught 8-20 mothers in a day. Initially, there was no restriction of number in a day. So, they taught as much as they could. When the incentive salary system was introduced, the number was restricted up to a maximum of ten mothers in a day (A. Mushtaque R. Chowdhury & Cash, 2007).

Remarkably, there was teamwork among the team members; ORWs were individually involved in teaching ten mothers in a day; it was a practical class. After confirmation of the learning of mother, the health workers left the house as if her payment was dependent on the performance of mothers. Male health workers were initially involved in providing security of female health workers

later on they were involved in teaching the male members of families and propagating in village, market, schools and religious institutions and other places. Every day they started the activities in the morning and continued before sunset, everyone was bound to come back to camp before sunset. Reaching camp and after taking rest experience sharing meetings were held regularly, sometimes sharing meetings were extended up to midnight. It was recognized that these sharing meetings gave feedback and new thinking for solving new problems.

It was uncomfortable to the ORWs that rural people are treating health workers as family planning workers. From the earlier time, people had a negative approach towards the family planning workers, so, ORWs were victimized by the set ideas. In response to the problem, it was decided to inform the villagers one day before going of ORWs that these women are not working for family planning but to teach the mother how to prepare LGS at home. Mainly, male health workers were engaged to create a favorable field for the ORWs in the village. Moreover, male workers also giving time to convince the male members of families. That means female health workers were teaching at home, and male health workers were convincing the males outside the home. By this way, the work became easier than previous programing (Sukhendra Kumar Sarker, 2017c).

Beside regular feedback program, there was a monthly project meeting at Sulla office of BRAC, which was devoted to discussing the problems, way of solution and progress of the activities. Monitoring reports were also discussed in the project meeting, how mothers prepare the LGS and how the quality of LGS maintained, either the prepared LGS standard recommended by the WHO, everything was discussed in the monthly project meeting. It seemed like the central hub of innovating implementation methods to scaling up the OTEP program (A Mushtaque R Chowdhury, 2018). However, it was observed that a

portion of mother became puzzled to mix the salt and sugar/molasses, sometimes they were giving two pinches of salt and one fist of sugar/molasses though the formula was reversed. So, BRAC authority thought and found the new formula that both measurements would be one; one pinch of salt and one full fist of sugar/molasses. This new formula was tested in the laboratory and got standard to the formula of the WHO. So, it was decided to teach one pinch of salt, and one full fist of sugar/molasses would be mixed with *adha sheer* (around half a liter) water (Karim, 2018).

Incentive salary system was set based on the grading of mothers, who were taught the ten points and preparation of LGS at home. Monitors asked the mothers and based on their accurate reply and preparation of LGS. There were four grades (A. Mushtaque R. Chowdhury & Cash, 2007);

Grade A: If mother could correctly remember all the ten points and could prepare the LGS, it was marked as A grade. For A grade answering the ORW got 4 BDT against each mother.

Grade B: If mother could correctly remember 7-9 points and could prepare the LGS, it was marked as B grade. For B grade answering the ORW got 2 BDT against each mother.

Grade C: If mother could remember less than 7 points and could prepare LGS, it was marked as C grade. For C grade answering the ORW got 1 BDT against each mother.

Grade D: If the mother could not prepare LGS even could remember the points that marked as D grade. For D grade answering the ORW got nothing.

It was observed notably that marking was mainly dependent on the preparation of LGS. If a mother could not prepare LGS correctly but could remember correctly all the ten points she was not getting marks. Later on, the remuneration was increased based on necessity. Thus, through the one-year of pilot project from July 1979 to May 1980, the formula and the methods of application were

innovated and experimented. So, the sphere of large scale program was opened to the BRAC authority, and the first phase of Oral Therapy Extension Program was begun from July 1980.

### **5.5. First Phase of Oral Therapy Extension Program**

The Oral Therapy Program was renamed as the Oral Therapy Extension Program (1980) due to its expansion of health education throughout the country. The total program was divided into three phases, with ten years of duration. In the first phase, five districts out of twenty districts were covered; Sylhet, Faridpur, Jessore, Khulna and Kustia (Sukhendra Kumar Sarker, 2017b). The pilot project provided a design of oral therapy extension program where the underlying issues of the program were tested and adopted. In the front line, the ORWs executed the program along with 14-16 team members where one team coordinator with the responsibility of program organization and one cook worked together.

Both male and female worked in the team; every one of the team was living in the camp with a separated quarter for both female and male. The responsibility of program organizer (PO) was to find out the place of living, confirm the security of female health workers, and inform the rural elites about the ORWs before their coming to the villages. From 7.30 am, the ORWs started work in the selected villages by introducing themselves as the ORWs. They described the message of seven points and taught how to prepare LGS at home with home ingredients, and before leaving the household, she was concern about the confirmation of preparation of LGS. As the learning was directed to the salary, so in some cases, she repeated whole learning for the satisfaction and confirmation that the mother would be able to demonstrate in front of the monitors. Every ORW taught a maximum of ten mothers in a day, and she was compelled to reach the camp before the sunset.

Program strategies were changed based on demand and facing the new challenges from 1980 to 1990. The Research and Evaluation Division (RED), the Technical Advisory Committee (TAC) and the learning of OTEP staffs played a vital role to change the strategy of the program. The innovation and changes were: the alteration of the instructions of LGS, the improvement of teaching quality, the reinforcement of understanding through monitoring, the tracing of the activities of monitors, the establishment of field laboratories, the lessening the sodium concentrations in the water of coastal areas, the revision of message, increasing the involvement of male, expanding the length of village stay of the ORWs, the caring of diarrheal patients, promotion in the schools, group teaching, trial of cereal-based ORS, contacting the medical professionals, program designing for tea estate workers and the building a library movement (A Mushtaque R Chowdhury & Cash, 2007a).

Professor Mushtaque Chowdhury narrated that measurement of one pinch, and two scoops were accepted at the initial level, it was the small measurement, but the monitoring was continued parallel that if the measurement were wrong, it would be the cause of death also. If salt is given more than the required amount, then it would be hypernatremia, so mothers needed to learn it well. BRAC monitoring was so tight as if no occurrence would be done. Once it was observed that sodium was increased in a particular area, then it was found that mother mixed salt and sugar wrongly. So salt became two and sugar/molasses became one, it was seen hazardous to BRAC authority. Assuming that when the program would be ended, and no monitoring continued, there would be more chance to mix on the wrong method. BRAC authority started to think again, and work in the laboratory with the collaboration of the ICDDR,B. Finally, the solution was found one unit for both measurements; one pinch of salt and one full scoop of sugar/molasses. So, a new formula was set one pinch of salt, one full scoop of sugar/molasses and *Adha sheer* water (A Mushtaque R Chowdhury, 2018). ORWs permanently marked with *Adha sheer* in the pot of



household for further use after the learning.

In the first phase of OTEP, the quality of teaching was improved by using flipchart in the communication of ORW and mother. Shefali Bishwas, the oral replacement worker of OTEP, shared the experience of showing flipchart. Mothers learned how to prepare LGS by one pinch salt, one scoop of molasses (gur) and half a liter (*adha sheer*) water then it was the women (mother) who were the female head of the family, there was a flip chart with ten points and they were taught all of them. In the flip chart, there were two boys both were healthy then one was affected by diarrhea, then another was also affected by diarrhea. One came under the treatment of LGS, and another kept aloof from the treatment. How the first one got the cure, this thing was shown to the mothers. The mixture of salt, sugar, and water was shown to them by the flipchart also (Biswas, 2018). Chowdhury and Cash noted that “the development of flipcharts with clear pictures (and no writing) was the direct result of this observation as the charts created more interaction between ORW and mother. ORWs used this flipchart to deliver the message by soliciting questions from the mother on the messages (A Mushtaque R Chowdhury & Cash, 2007a).

On the other hand, it was observed that women could prepare LGS at home, and they knew all the ten points, but during the diarrhea of their children, they did not use the LGS. The reason behind the unwillingness of female was the negative mentality of male about the LGS; they did not accept the learning of women. So, BRAC started meeting with the males of family parallel to the females. *Purush Shova* (meeting of males) was a tool to popularize the LGS among the male members of the families. Males were taught by the male workers at *haat* (local market), bazar, schools, tea stalls, fields, religious institutions and different places. From May 1982 this meeting was emphasized, and so acceptance of LGS was increased in the society (Sukhendra Kumar

Sarker, 2017b).

Secondly, there was *Masjid* Forum (Mosque Forum) to boost the imam (who leads the prayer), *muajjin* (who calls for prayer) and the *musolli* (who are praying in the mosque) on the need and use of LGS during diarrhea. The imam<sup>13</sup> had a vital role in society so, without convincing them, it would be difficult to confirm the mass acceptance of LGS at the village level. So, BRAC male health workers visited the imam and convinced them even they were taught how to prepare LGS at home. Moreover, due to influence, some imams gave a speech on the necessity of LGS in their *khutba* (specific speech before weekly Jumma prayer) and some cases they allowed the health worker to talk about LGS at the mosque before the *khutba*. Sukhendra Kumar Sarker thinks it had a tremendous result for the acceptance of LGS; he remarked that religious institution should be utilized for the development activities of the country (Sukhendra Kumar Sarker, 2017b).

Mr Sarker shared an experience related to *olema* (Muslim priest) and religious people that religious people blamed the BRAC workers as the workers of family planning. They (religious people) made the confusion that ORWs were feeding family planning medicine to the rural women with saline, but they (BRAC workers) tried to handle it very carefully as if people could accept them with honor. Firstly, they (BRAC workers) tried to make them (religious people) understood they were not family planning workers but oral replacement workers and working for oral rehydration therapy. They were teaching the mother how to prepare *Lobon Gur* Solution at home. The ORWs were instructed to drink prepared LGS first by themselves then mother. Consequently, they got confidence and responded to the ORWs positively.

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<sup>13</sup> Imam: who leads the prayer in the mosque

Thirdly, the School Forum was another tool to spread the knowledge of LGS in the country. There were two types of the reasoning behind forming of the school forum; first was to create a cadre group who would spread the knowledge of LGS and help the people during diarrheal diseases by preparing LGS. The second was to utilize the important positions of school teachers. Usually, the school teacher had dignity in society, and people respect their advice and talks, so if they recommend people to use LGS, then it would be popular. Every student was responsible for teaching ten families surrounding his/her house, and they would report to the responsible teacher if any case appeared in the locality. Every student was given the badge of '*daeria protirodh korun*' (Prevent Diarrhea). There was competition among the schools based on performance and system of the award with first, second and third prize based the maximum services through the students and teachers of the schools. Both male and female health workers trained the students and teachers of the schools (Karim, 2018).

Fourthly, Teachers workshop was arranged by the BRAC health workers to convey the messages of LGS. By communicating Upazila Education Officer (TEO), male health workers of BRAC attended the regular monthly meeting of upazila and gave a lecture on the LGS. TEO also advised the teachers to recommend diarrhea patients to have LGS during diarrheal diseases. Teachers were respected by the people of the society, so it was an effective process to spread the messages of LGS.

Fifthly, formation of Quack Forum was one of the essential ways to disseminate the knowledge of LGS in rural areas. It was observed that quacks had a significant influence on the patients because they were the first doctors of the patients. There were two policies in the formation of the quack forum; if they could suggest the patients for having LGS during diarrhea or at least they would not negate the people to have LGS during diarrhea. Male health workers were responsible for arranging the meeting of quacks. Local elites were invited to

attend the meeting of the quack forum, so the quacks could not avoid the lesson. Remarkably, quacks were not ready to accept the new formula of LGS because it was against their interest. In general, people were supposed to come to them, and they pushed IV saline and got a handsome amount of remuneration, but it created hindrance, so they were not ready to accept the ORS/LGS formula. Some important points were taught to them like; what is diarrhea, what are the symptoms and types of diarrhea, how and why does diarrhea appear, what is the result of diarrhea, what are the treatments of diarrhea, what is the way of preparing LGS? Also, some essential tasks related to diarrhea (Sukhendra Kumar Sarker, 2017b).

Sixthly, for creating women cadre in the village, women seminar was organized with the meritorious and extrovert women of the villages. They were taught LGS through practical class and showing the flipcharts. Later on, it was observed that these women cadres did not play any role to promote the LGS, so it was abandoned.

Seventhly, *Haat* Forum (*haat* is local the market in the village) was another method to disseminate the knowledge of LGS at the local market. Males were busy at day time with different activities, so it was difficult to organize them at day time, but they were supposed to come to *haat* on the day of *haat* (at least two days in a week). So, it was decided to announce the symptoms of diarrhea, formula to prepare LGS, feeding rules, and the nutrition-related information through the mic in local *haat*. Male health workers of BRAC were responsible for this *haat* forum and its arrangement (Shukhendra Kumar Sarker, 2018).

It was observed that through the *Purush Shova*, group meeting, imam meeting, teachers' workshop, *masjid* forum, doctors' meeting and *haat* forum awareness was built but a particular group of people were out of learning. So, the concept of spot seminar was implemented at any place where BRAC health workers got

the local people.

Taking all things in consideration, the monitoring team was renamed as the reinforcement team. The first phase was started with the concept of monitoring 5-10 percent of mothers after one month of teaching. Usually, the ORWs were engaged in teaching mother one time at their homes. Besides, mothers would have the scope to get reinforcement from the media; radio and television. BRAC authority decided to provide the messages to mothers second time, and the responsibility was given to the monitors. So, from September of 1982, the monitoring team was renamed as the reinforcement team with the responsibility to provide the knowledge of LGS and seven points to mothers second time (A Mushtaque R Chowdhury & Cash, 2007a).

Significantly, searching diarrhea patients and caring were the critical way to popularize the LGS among the people. After the survey (1982), it was found that use of LGS was reached up to 40 percent, but it was perceived to be 80 percent. So, ORWs were in tension that without increasing the use of LGS, the diarrheal mortality would not be declined. So, research was begun to find out the reasons behind, and finally three points came forward; a) people had no faith on the handy technology of LGS against the dangerous disease of diarrhea, b) molasses itself creates watery stool so how the molasses would work for its cure, c) Children were mainly affected by diarrhea. Parents were not willing to experiment with new medicine on their children (Rob, 2018).

After getting all the reasons, it was decided to find out the diarrhea patients from the village, and they would be fed LGS, and after cure, a meeting would be arranged to inform the people how the patients were cured (Rob, 2018). Therefore, searching for diarrhea patients was started, and treatment was given by the LGS, male health worker took care of them, and finally, maximum patients were cured. So, after the effective medication meeting was arranged to show success. Thus the acceptance level was increased in the society to use LGS

at home.

Initially, all the samples of LGS were sent to ICDDR,B for analysis, but it was becoming difficult to send all the samples due to the expansion of the program. So, by the assistance of M A Wahed, scientist of ICDDR,B, field laboratories were set at the area offices of BRAC (A Mushtaque R Chowdhury, 2018). M A Wahed shared his experience of setting the field laboratories in the whole country. He observed that for investigating all the collected samples, a lot of machines and workforce are needed; he was thinking about how to make it simple. Measurement of sodium is some extent difficult, it requires a machine and technical person available, but measurement of chloride is comparatively easier, and both have similarity in measurement. The exciting thing was sodium= 133, potassium 20, and chloride is 90, potassium and chloride= 110, it was enough for one unit of ORS actual ingredient. There is a good relationship between sodium and chloride, which help us work efficiently to identify the amount of both sodium and chloride (Wahed, 2018).

The concept was come in a persuasive manner that, if chloride is okay, then sodium will also be okay. This technic was cost-effective, and therefore the BRAC recruited Shamsuzzaman of Rajshahi University<sup>14</sup> who worked in the whole country to teach the technic for sample investigation. He set up the tools in different districts for investigation. M A Wahed presented a report on 5 to 6 hundred samplings to identify how much the variation was in the ingredients. Critical scientists always tried to say variation was a lot, but in actuality, it was not. There are two things; one is in laboratory another one is in population, there is a big difference between two (in the laboratory or population level), and M A Wahed could combine both very efficiently. A few percent of total samples were

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<sup>14</sup> Rajshahi University is one of the public universities, established in 1953 in Rajshahi city, a divisional city, of Bangladesh.

tested in the laboratory of ICDDR,B, and the test result was quite good (Wahed, 2018).

During the phases of OTEP the 'ten points to remember' was revised five times, and in the final version, the total points were kept seven (A Mushtaque R Chowdhury & Cash, 2007a). Seven points to remember were:

1. What is the *dud haga*, *ajirno*, *amasha*, *daeria* or cholera and their harmful effects? These are all characterized by loose motions. With each loose motion, salt and water drain out from the body. If this draining continues for some time, the body becomes dehydrated. Severe dehydration leads to death. So, action should be taken in of *dud haga*, *ajirno*, *amasha* and *daeria*.
2. Symptoms of dehydration: the dehydrated patient develops certain signs and symptoms such as sunken eyes, dry tongue, thirst, sunken fontanelle (in case of a child) severe weakness, reduced volume of urine, etc.
3. Simple management of loose motions: The simple treatment for dehydration is to replace salt and water loss from the body. Remember, the patient dies due to dehydration (loss of salt and water). So whenever a patient gets *dug haga*, *ajirno*, *amasha*, *daeria* or cholera, give oral saline from the very onset of the disease (immediately after the first loose stool).
4. Preparation of oral saline: Oral saline is prepared with a three-finger pinch of salt and one fistful of *gur* in one-half seer of drinking water, well stirred. Care should be taken to mix *labon*, water and *gur* in the right proportions. A fistful of sugar can be used if *gur* is not available.
5. Administration of oral saline: Adult patients should take half a seer of oral saline after each loose motion. Children should be given only as much as they want, but at frequent intervals. Once saline is prepared, it may be kept 4-6 hours only.
6. Advice on nutrition: During *dud haga*, *ajirno*, *amasha* or *daeria*, the

patient should be given plenty of water and food like rice and curry along with oral saline. In the case of children, breast milk/normal diet should continue. The increased amount of food should be given at least seven days after recovery. It will prevent malnutrition and weakness of the patient.

7. Prevention: To save ourselves from this illness, we should drink tube well water. If unavailable, water should be boiled before use. Bad food should never be eaten. All foodstuff should be covered well so that flies cannot sit on them. Hands should be washed with soap or ash after defecation. Remember that breastmilk is always right. Children put to the breast immediately after birth. If mother feed breastmilk, the child would rarely be affected by diarrheal diseases (A Mushtaque R Chowdhury & Cash, 2007a).

There were many tea estates in Sylhet district, and the labors of the tea estates were disciplined force, but the problem was- they were not available at day time due to their duties. For teaching the labors of the tea estates, the strategy of OTEP was changed based on the recommendation of two members' committee headed by Kamrul Islam. There are strata of engaged people in tea estates; below the owner, there is a manger, then *tilababu* (head of a particular small hill), *sarder* (head of a line) and then the labors. So, it was decided to teach the *tilababu* through the workshops; then they would teach the *labours* of the tila (hill). Later on, *sarders* were also included in the teaching session. It was notable that when the labors of tea estates attended the teaching session, they were given the salary of one day (Sukhendra Kumar Sarker, 2017b). Because he/she would have no chance to get work for that day due to participate in the teaching session.

Another key thing was- the stay time of ORWs in a particular place was extended to increase the use rate of LSG by the people of trained areas. From



the regular monthly meetings and feedback meetings, it was understood that the local people had a lack of trust to both the ORWs and the LGS. According to the program design, the ORWs stayed in a union only two weeks, so they were busy with the teaching and did not get time for rapport building with the local people. People do not have any medicine without trust. Moreover, they had bad impression about the ORWs, so, they did not utilize the LSG of the ORWs. People treated the ORW team as the *Jatra* party (theatre party), beautiful women of the teams were treated as the heroine (A Mushtaque R Chowdhury, 2018). So, the only two-week stay could not change the misconception of the local people.

In addition to the above mentioned policy, the concept of an extended stay in a union level had more justification for reducing the misconception as well as increasing the use rate of LGS. If the ORWs stayed more time, they would get more opportunity to interact with village people and intervene in the diarrheal diseases by LGS, which would ultimately play a vital role to acquire more acceptance of the people. A pilot project was launched under the leadership of Fazlul Karim to experiment with the new concept in Lashkarpur union of Hobigonj district in May 1981.

The Lashkarpur model trial adopted the new policy of extended time in a particular place. So, the number of team members was reduced; the team was formed with 5-6 ORWs, 2 POs and one cook. Stay time was given six weeks to teach mothers and motivate the male members of the families. After the pilot project, the evaluation was found that the usage and awareness were four to five times higher than the previous system (A Mushtaque R Chowdhury & Cash, 2007a). Fazlul Karim shared that after the experiment of Lashkarpur model, some expected changes appeared. People of the union were more conscious about the diarrheal disease, the use rate of LGS is higher than other places, everyone knows the ORWs of BRAC, and they do not have a misconception

about the ORWs (Karim, 2018). So, based on this study, the number of team members was newly determined (10 persons) with 7 ORWs, 2 POs and one cook. Ten mothers were taught by ORW in a day, but the time of stay in the village was extended four to six weeks.

Accordingly, the first phase of OTEP was ended with the innovation of many new ideas and application methods in September 1983, and the Second Phase of OTEP was started from October 1983.

### **5.6. Second Phase of Oral Therapy Extension Program**

The second phase of the oral therapy extension program (OTEP) was started immediately after the first phase, from October 1983 to September 1986. It covered eight districts out of twenty districts; Dhaka, Comilla, Noakhali, Mymensingh, Tangail, Barishal, Patuakhali and Jamalpur. In the first phase of the OTEP, some critical issues were settled and developments were achieved; organizational development and creating a skilled workforce, building the supply chain of logistics and its utilization process, designing and re-designing the program strategy and so on. Richard Cash led an evaluation team to assess the activities of the OTEP in January-February of 1983 where other members were Shushoma Vatia of ICDDR,B and Imita Kornaz of Swiss Development Corporation. The development of technology and especially way out technological development were very significant. From the assessment, it was observed that about 89 percent people of the covered area by OTEP could prepare LGS or know about the messages of LGS (Cash, 2018). So, after getting the assessment, the BRAC authority and health workers were encouraged by international recognition and their comments regarding the progress of LGS (S. K. Sarkar, 2017).

In the second phase, all districts were covered step by step, but Noakhali district was covered immediate implementation process within three months by

utilizing the 1300 health workers of BRAC. Fazlul Karim narrated the causes behind the immediate implementation process. He said, the society of Noakhali was conservative, so how to teach mothers of Noakhali it was another challenge for the BRAC. They found out the policy of united work through the 1300 health workers of BRAC, and suddenly they started, and within three months it was ended to teach the mothers of Noakhali in 1986. Conceptualization behind that was if many people work together and all areas of Noakhali would be covered simultaneously, then people would not bother and blame, so it happened. Fazlul Karim was appointed as the manager of Laxmipur *mohokuma* (later on the district). People helped them to execute the sudden policy in Noakhali, so, many policies were adopted based on need and demand. In average a district was covered through a one-year phase by phase, and four or five districts were covered at a time. Specially Noakhali was covered within three months of sudden activities. This policy was accepted to protect the negative approaches and misconception of people (Karim, 2018).

In the second phase of the OTEP, one new program was run parallel that was Concentrated Reinforcement Program (CRP) in 150 unions of 150 upazila (sub-district) of seven districts except for Noakhali district. CRP team worked in the union, which was located in the middle of upazila with the concept of spreading the information to other unions. CRP team was formed with seven members where three were male, and 4 were female workers and would stay in a union for six months. Along with the messages of LGS the team worked for training the health care nurses and midwives, personal and public health education, breastfeeding and providing knowledge of supplementary feeding to the children (S. K. Sarkar, 2017). Besides special reinforcement teams were sent to the districts of the first phase except for Sylhet. The team was formed with four male health workers who stayed 8-10 days in every union to reinforce the message of LGS.

The main concentration of the second phase was to re-examine the messages of the LGS and find out the new ways to spread out its knowledge. It was observed that the mother did not feed LGS during dysentery (*amasha*), but it should be given to the dehydrated patients due to dysentery. So, in the second phase, mothers were taught to give LGS to the children during dysentery. In the first phase, mothers were recommended to clean the nipple of the breast before feeding, but it was observed that mothers were cleaning the nipple without washing hand, so it created more problem than the previous way. In this situation, it was recommended to start breastfeeding without cleaning the nipple. Washing hand after defecation by soap or ash was meaningful learning of the second phase. Besides, it was suggested to bring the water vessel by the right hand as if germs could not be spread out. Mothers were also taught the symptoms of the diarrheal diseases with more importance like; going down of eye coat, thirstiness, inactiveness, reducing the urination, coolness in leg and hand, and convulsions (S. K. Sarkar, 2017).

Besides, group-wise teaching strategy experimented in the second phase. 4-5 mothers were taught together; a study showed that the result of individual teaching and group teaching was similar. Sugar and liquid molasses could be used instead of thick molasses, *fitkiri* (locally available material to purify water) could be used to purify the water of ponds or any open space, local names of diarrhea were highlighted to make them understood to use LGS. So, all the trifles were taught to mothers related to LGS in the second phase of OTEP (S. K. Sarkar, 2017).

In the meantime, a study on rice-powder electrolyte solution showed the efficacy and safety to use to rehydrate the dehydrated patients due to acute diarrhea (A. M. Molla et al., 1982). Another study on rice-based oral rehydration solution demonstrated the effectiveness to decrease the volume of stool in acute diarrhea (A. M. Molla et al., 1985). Dr Majid Molla shared the ideas and finding

of rice ORS to the authority of BRAC, and he influenced them to work with rice-based ORS in the rural areas of Bangladesh. In response, at the end of 1986, a trial project was taken to justify the feasibility of rice-based ORS in a union of Lakshmipur district under the supervision of Fazlul Karim. However, the result found that preparation of rice-based ORS is harder than LGS. Moreover, every household has no rice-powder and making rice powder is time-consuming. So, BRAC decided not to work with rice-based ORS in the OTEP (Karim, 2018). Thus the second phase was ended, and the third phase was begun from October 1986 and continued up to December 1990.

### **5.7. Third Phase of Oral Therapy Extension Program**

The third phase of Oral Therapy Extension Program began October in 1986 in seven districts of Bangladesh; Pabna, Rajshahi, Bogra, Rangpur, Dinajpur, Chittagong and Cox's Bazar, and ended December in 1990. The third phase was mingled with Mother and Children Health (MCH) Program of BRAC. Two things influenced BRAC to blend two programs into one program; firstly, BRAC proved the capability to run the nationwide program, and its workforce became skilled to handle the big program. Secondly, acceptance of BRAC was increased to the government of Bangladesh. In this backdrop, BRAC decided to run Mother and Children Health Program along with OTEP in the above mentioned seven districts (Sukhendra Kumar Sarker, 2017a). They argued that mother health care would confirm the children healthy; both were interrelated.

There were two projects in the MCH Program. First one was OIA (ORT, Immunization and Vitamin A); providing knowledge of LGS and its preparation, vaccination and the distribution of Vitamin A drops were the prime activities of the project. This project was primarily executed. The second project was limited only in six upazilas; it was an experimental project. There were eight elements of the project; training of diarrhea, vaccination, distribution of vitamin A capsule, nutritional education, training of midwifery, safe water and

sanitation, family planning and comprehensive treatment. BRAC authority observed that if they begin all the works, it might be thriving, but BRAC would not work a long time in this project. Because the government was working with all the elements, so, BRAC decided to achieve the target of awareness building regarding all the health facilities, and it would also create a bridge between government health employees and the people. Through regular scaling up the third and final phase of OTEP was ended with great achievements.

Sukhendra Kumar Sarker discussed the results of OTEP with statistics and numbers. There were 21 districts in Bangladesh (later on it was increased to 64 districts), the OTEP covered 20 districts except for the Chittagong Hill Tracts. Due to political unrest and lack of transport and communication, the Hill Tracts district was not covered in the OTEP. Including pilot project (58000 households) total of 11850654 households were taught the LGS and messages of diarrheal diseases. The ORWs reached to 75992 villages of 4254 unions under 423 upazilas. 3.8 percent of total learned mothers were monitored; in number, it was 447857 mothers. 35844 students of primary schools and 2913578 students of secondary schools were trained, who worked to spread the messages of LGS in the villages. Besides, 2329000 scripts, 713000 posters and 338000 folders were distributed. Moreover, spots were promoted in Radio and Television for publicity. About 427606 diarrhea patients were treated and cared during the OTEP (Sukhendra Kumar Sarker, 2017a).

**Table 4.4: Statistics of OTEP activities in three phases (Sukhendra Kumar Sarker, 2017a).**

Details	First Phase	Second Phase	Third Phase	Total
Districts	5	8	7	20
Upazila	113	168	142	423
Union	1159	1710	1385	4254
Village	20668	26922	28402	75992
Taught Households	2512746	4983793	4296115	1179265
Number of Monitored	169788	204288	73781	447857

Mothers				
Graded Mothers				
A	49.5	54.30	50.04	-
B	47.56	44.25	44.55	-
C	2.12	1.25	5.06	-
D	0.82	0.20	0.35	-
Rate of Use	35%	46.9%	48.4%	-
Sample Analysis				
Chloride	96406	172750	63356	332512
Sodium	2071	971	454	3496
Potassium	2071	971	454	3496
Glucose	1768	850	454	3072
Chloride Concentration				
Below 30	.99	1.4	1.97	-
30-99	91.39	90.5	89.15	-
100-119	5.39	5.7	5.82	-
120+	2.23	2.4	3.06	-
Patient Caring	95000	202551	130055	427606
Education in Primary Schools	6864	12634	9767	29265
Education in Secondary Schools	1239	2749	2591	6579
Teaching to the Students	622000	1290580	1000998	2913578
Budget	35889230 (BDT)	94560632 (BDT)	274439685 (BDT)	404889547 (BDT)
TT (2 doses)	-	155373	-	155373
Midwife Training	-	9000	5194	14194
Nurse Training	-	26913	250	27163
7 point scrip	429000	900000	1000000	2329000
Poster Distribution	138000	250000	325000	713000
Folder Distribution	121000	102000	115000	338000
Radio Spot	600	2305	2560	5465
TV Spot	122	1187	1350	2659

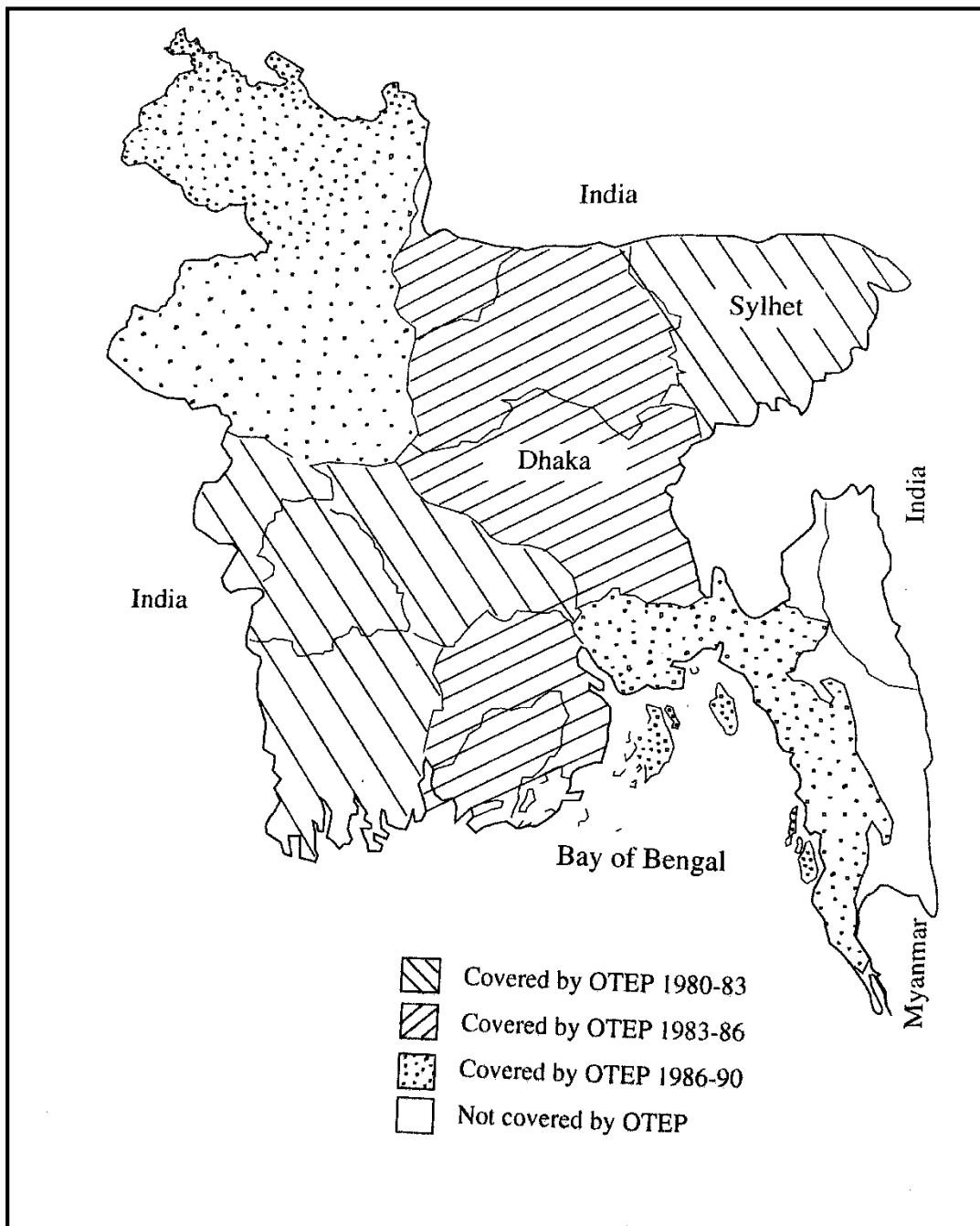


Figure 4.7: Map of Bangladesh based on covered areas (A. M. Raza Chowdhury & Cash, 1996).

### 5.8. Conclusion

Richard Cash opined that the BRAC rightly adopted the right technology in society. He visited the field activities of the OTEP because he was one of the principal advisors of the OTEP. So, the measure of success was not the covering of the whole country, it was, how much IV could be saved, how much people



could be safe, how much people could start it from a rural level. This is a significant issue that mothers could prepare LGS at home; it is not literal but practical; the BRAC could teach the mothers (Cash, 2018). Comments of M A Wahed of ICDDR,B regarding the OTEP program was- it was the great success of BRAC to teach the mother how to prepare *Labon Gur* Solution. BRAC took the challenge of teaching the mothers how to prepare homemade ORS. He remembered that earlier the most patients of diarrhea came to the hospital with severely dehydrated and a comma. After coming the doctors of ICDDR,B pushed IV saline in two hands and two legs. Nowadays, those types of patients are not coming due to using packet ORS immediately after the outbreak. People are getting packet ORS nearer shops, or people can prepare ORS at home, so the condition is improved as well as the considerable cost of IV saline is saved (Wahed, 2018).

From all considerations, the OTEP program of BRAC was a mass program to teach the mother how to prepare LGS at home. BRAC tried to reach scientific thing to community people through social science approach. However, the whole technology was developed and studied in the ICDDR,B and execution to reach the community people was done by the BRAC. The central point is salt, sugar, and water to prepare ORS at home, which was tested in ICDDR,B. Messages were developed step by step. Innovation, execution, and supervision were the integrated parts of the OTEP program. It also proved how people could remember through monitoring.

At the same time, research teams continued periodical research either the program was on track or out of track. 10% of the total budget of OTEP was allotted for research and development. First, it was on a small scale in a single upazila then two upazilas were included for study, in village-level 14/15 health workers were working on teaching the mother how to prepare LGS at home. These workers recruited by advertisement, and after selection, they were trained

up for the program for both classroom and fieldwork. The program was designed and redesigned, from oral teaching to pictorial teaching, many methods were used, and finally, it was shaped.

After all, different types of challenges were overcome in different phases of the development, like; superstition, male-dominated society, single dimension program from BRAC side. Real knowledge was given to people to remove the superstition; males were also taught and understood the importance of the ORS prepared at home. Immunization, vitamin A capsule, as well as other programs of the government were included to change the claim of a single dimension program. Many pharmaceutical companies started to produce the ORS and continued marketing in the market. Initially, the Social Marketing Company (SMC) produces all packet ORS by different companies; they also continued social marketing through the dissemination of knowledge, now use rate in packet form is universal. More than 80% of dehydration patients have ORS even after sweating people use to have ORS. Once homemade LGS was more in use after teaching the mothers, nowadays, due to the availability and accessibility of ORS packet in everywhere use rate of LGS has been lessened. Even grocery shops and tea stalls are keeping ORS packet in rural areas for selling out.

The OTEP program was not executed in the Chittagong Hill Tracts district in Bangladesh. The BRAC started work in Hill Tracts in 1998. However, due to the spillover effect, they got the message of ORS, and a portion of people know the preparation process of ORS at home.

## Chapter Six:

### Social Science Approaches and Social Marketing of ORS

#### 6.1. Introduction

Social science deals with human behavior in its social and cultural aspects (Nisbet, 2018). The social sciences give logical approaches to understand the relationships among individuals, organizations and institutions. Social science approaches help to understand the principles of individual or collective behavior within a social setting and the techniques of empirical evidence are used to test and develop the principles (University of Puget Sound, 2019). The social science approaches were fruitfully used in the dissemination of the knowledge of ORS and LGS as well as social marketing of ORS in Bangladesh. ORS was popularized by the ICDDR,B and the BRAC with the collaboration of the Government of Bangladesh throughout the country, where women were in the front line. Every woman has a social background, who was trained and who was a trainer. Science and technology have a unique system, however, the instruments of the dissemination of ORS related knowledge were used based on social position. So, the ORWs used pots/mugs to measure the half-liter water, somewhere it was steel pot, somewhere it was a silver pot, and in some cases it was pottery. Husbands or guardians of both trainers and trainees were managed by a different formula. This managing system is related to a social approach based on social position. Consequently, upper-class families were managed by one way and lower and middle class in different ways.

On the other hand, the doctors and nurses in hospitals, even general physicians of the ICDDR,B had no proper knowledge of ORS. They showed reluctant to use ORS to the diarrheal patients. So, the persons who had research experience on ORS they tried to manage the people, doctors and nurses to use the ORS. In addition, religious people were not convinced first to the scaling-up a program of ORS; they protested against the way of execution and the involvement of female health workers. *Imam* and *mullah* were confused either they were

feeding the peel of contraceptive or anything else. The dissemination of the knowledge of ORS among the villagers was a challenging job to the BRAC. Facing the challenges, they launched the most extended program, namely the Oral Therapy Extension Program, to teach the mothers how to prepare ORS/LGS at home. They formulated the policies based on socio-political and economic contexts of contemporary society.

The American Marketing Association defines ‘Marketing is the process of planning and executing the conception, pricing, promotion, and distribution of ideas, goods, and services to create exchanges that satisfy individual and organizational goals’ (Donovan & Henley, 2010). Social Marketing is one of the branches of marketing which works for the wellbeing of the community. It is concerned to achieve the desired social changes and the continuation of marketing to maintain the achieved changes. Social change practitioners and social marketers work not only to achieve desirable social changes but also to counter the undesirable changes. If the wellbeing is not the objective of marketing, then it is not considered as social marketing (Donovan & Henley, 2010). Education, motivation and regulation are three methods of developing social marketing. Education and motivation are at the individual level to change the behavior and advocacy for regulation are aimed to achieve structural change. Education is an effective method when ignorance or unawareness is the barrier to achieve the target.

In other words, social mobilization is obligatory in the developing countries for social changes. Social mobilization is the process of getting together of all allies of development programs for raising people’s awareness through the delivery of resources and services based on community participation (Donovan & Henley, 2010). Community leaders like- political, social and religious leaders; the beneficiaries, organizers, journalists, planners, trainers, and others work together to mobilize the community people and make the program effective.

Following these methods, social mobilization was confirmed, and the ORS program successfully implemented in Bangladesh. This chapter notably encompasses the social science approaches in different phases of knowledge dissemination and the ways of social marketing to reach the people of entire country within short period of time.

## **6.2. Social Science Approaches in the Application of ORS**

The approach is always subjective and value-laden; it is a matter of value preference in the selection of subject matter and viewing (Marume, Jubenkanda, & Namusi, 2016). The approach is a general term which is broader than theory and methodology; it includes the purposes of study, explanation, understanding and normative evaluation. It accommodates the underlying assumptions of human behavior both from individual and social groups (Della Porta & Keating, 2008). The main obstacle in the application of ORS formula was that people were not accepting the ORS as the medicine of cholera or diarrheal diseases. Even doctor, nurse and attendant were not accepting it as the medicine of cholera. When the ICDDR,B started to feed ORS, relatives of the patients commented that ICDDR,B was not supporting the patients with proper treatment, which was given earlier through IV saline. People had no confidence in ORS; the only IV saline was treated to them as medicine. So, ICDDR,B faced the challenge to change the view of doctor, nurse and hospital authorities. Based on social science approaches of ICDDR,B, the government, and NGOs (both national and international), the whole scenario was changed within three decades from the invention of ORS (1968) (Yunus, 2018).

Dr Mohammad Yunus, scientist of ICDDR,B, discussed the causes behind the dissatisfaction of the doctors, the nurses and the patients to use ORS were;

1. What was fed (ORS) was going out by watery stool or vomiting; they could not understand how it worked in the stomach wall. People perception was- stools are passing due to other reasons, so having ORS has no impact on it. Most

of the patients were not accepting the argument of the experts.

2. When IV saline was pushed, within a few minutes, the patients were seen well, but it was taking some hours to improve, so people and the doctors had no patience to wait a bit more.

3. As much amount was passing through stools, and that amount was supposed to be refilled by IV saline or ORS. The measurement of watery stool in a bucket was repulsive to the nurses or the relatives of the patients.

4. Generally, the attendants fed ORS to the patients, and they were not habituated to feed it the patients again and again. Usually, diarrhea patients were not willing to have anything moreover if it was being fed by the attendant; they were showing more unwilling to the ORS. They thought it would be the responsibility of the nurses or others of the hospital whenever they were hospitalized.

5. Nurses got easy to set IV saline, and it was hassle-free, but for feeding the ORS, again and again, they would have to request the attendant to feed them, so, hospital staff was unwilling to the ORS at the initial stage (Yunus, 2018).

Furthermore, at the time of the cholera season, it was very much difficult to manage the patients through only IV saline due to the scarcity of production and distribution. So there was only alternative to feed the ORS with a minimum price which was not attractive to all. ORS is not only rehydrating cholera or diarrhea patients, but all other dehydration problem is solved by the ORS. If the doctors had no research on the ORS, they could not understand the effectivity of it, however, visibly it was seen everything was going out. Therefore, ICDDR,B started a series of training courses for local and foreign doctors (Yunus, 2018).

Remarkably, the idea was to train the doctors and the nurses so that the nurses would teach the mothers how to use it at home. Moreover, the mother will start ORS immediately after the dehydration. ICDDR,B started 'Bari Mother'

program to teach one of the women of a colony. The other women tend to follow her lead, and if she is convinced that *Labon Gur* Solution is a complete solution for rehydration. This idea worked tremendously with the BRAC program of OTEP in Bangladesh (D. Nalin, 2018). BRAC started to teach the LGS to mother at home with available ingredients. The whole program designing was based on understanding the human needs, any single method or methodology was not used to scale up the program, but multi-approaches were applied there.

In addition, the important point was how to educate mother about her diseased child. Scientists of the ICDDR,B developed simple clinical signs such as looking at the child's eyes are sunken, which mothers recognized sooner than doctors. If it is dehydrated and mother pinches the skin of the child, then the skin will stand up, it will not go down. The idea was to facilitate mothers through popular teaching methods with home ingredients (D. Nalin, 2018). So, *Labon Gur* Solution (LGS) was innovated, which was useful to prevent the dehydration.

### **6.2.1. Religious Hindrance**

It was 1967, there was a severe cholera outbreak in the locality of Christian Hospital in Malumghat, in between Chittagong and Cox's Bazar district. David Nalin and Richard Cash both visited the locality of the hospital. They observed that cholera patients were not coming to the Christian Hospital because the local *mullahs* were fearful that the Christian hospital might try to convert them to Christianity and so they were telling the relatives of patients not to go to the hospital. In response to the inappropriate propaganda the doctors of the hospital went to the houses of patients and provided treatment on the spots. People observed the way of treatment and cure of the patients. Therefore, local *mullahs or gurus* could not make hindrance in the coming of patients to hospital (D. Nalin, 2018). When they finally came to the hospital, the physicians of the hospital showed them how effective treatment was in the village.

In addition to the above narrative, the villagers also told the story to the doctors about creating hindrance by the local *mullah*. The mother would get the stamp of the pig on her forehead, so they would begin to become exposed to *haram* elements. It was ended up by the active support of Dr Zahidul Haque, who was well known about the dialect of Chittagong (a dialect of Chittagong is quite different from smooth Bengali language). David Nalin remembers when they were giving intravenous fluid to the patient in one of the *haats* (local market). A considerable crowd was there who heard about the revival of the dying patient. They were known about cholera but not known about the treatment of cholera. People perception was; cholera means death and death is the ultimate destination of cholera patient. If it does not die, means, it is not cholera (D. Nalin, 2018).

It was 1974, Mr Sarker was working in the BRAC's Derai camp of Sulla project in Sylhet district for spreading the knowledge of family planning. Once he raised the necessity and benefits of family planning, local people were highly agitated and tried to get out him from the village. They said that family planning was ultimately an anti-Islamic approach; it should not be spread out in the village. Besides, female workers of the family planning program were treated very negatively. So, amid this sentiment, how could the oral therapy program implemented by the female health workers it was the primary concern of the BRAC (Shukhendra Kumar Sarker, 2018). However, due to multi-facet efforts, which is discussed in earlier chapters, the society accepted the teaching of ORS and LGS. Now ORS is part of day to day life in Bangladesh.

For instance, Oral Replacement Workers (ORW) both male and female were living in the same residence with separate room that was a serious concern to the *olema* (Muslim learned persons). Mr Sarker said that when they were working in Baniachong sub-district of Sylhet district, once a group of *olema*



came to the center where the ORWs lived, and Mr Sarker was present there. They (olema) complained that- okay, they understand ORWs are working for saline, but males and females are living in the same residence, which is entirely illegal in Islamic Shariah (Islamic Rule). Comparing male and female with fire and ghee, they claimed that fire and ghee could not be located in the same place; it must be melted or poured. In response to the allegation of *olema*, Mr Sarker said, they were right, and it must be melted. However, his argument was- every family dealt with fire and ghee where brother and sister, male and female live in the same location but why problems do not arise. Due to the thinking process, both brother and sister think about each other with honor and responsibility, which hindered the melting and pouring. The same thing is being happened in the centers of BRAC, where male colleagues work with female colleagues with responsibility and honor. Mr Sarker's second argument was- they are working for a long time in this area, did the *olema* get any allegation of female harassment by her male colleagues in the centers. Finally, the olema team went back with satisfactory answers (Shukhendra Kumar Sarker, 2018). So, the way of handling was significant to mitigate the social crises.

### **6.2.2. Removing Ignorance**

The mixing of a pinch of salt, a full fist of molasses/sugar, and half a liter of water- is the central message of the ORS program, among the people of Bangladesh, led by the ICDDR,B and the BRAC. They taught mothers, and mothers were capable of preparing the LGS (*Labon Gur* Solution). However, difficulty arises to confirm the measurement of half a liter water. In maximum cases people had no idea about one liter or half a liter, only liter containers were available in the houses of cow farmers. BRAC concentrated on the solution, and it made the simple way of making the ORS. Trainers kept container of half a liter and one iron pin in their bags, and they showed it to mothers, and the mothers understood the measurement by their pots. BRAC workers showed mothers how to confirm 500 ccs or half a liter, and marked half a liter by iron

pin in the available pots of households. It was a straightforward strategy of BRAC: they taught 1,1,1 solution to mothers. (Cash, 2018). One pinch of salt, one fistful molasses or sugar and one half a liter water, so, mothers got the knowledge of measurement as well as the preparation of LGS at home.

It has another set of an unpleasant experience that doctors and nurses were not comfortable with the ORS. Dehydrated patients came to the hospital, but they did not provide the treatment of ORS, and there was a mental barrier among the doctors and nurses. So, BRAC started from the bottom and empowered the people, doctors and nurses were not interested in using, but people were using and getting a good result. The medical professionals were fallen into a challenge if health patronization starts at home; they do not have the position that they had (Cash, 2018). First of all, the mother knows how to prepare LGS at home, so they are not buying the ORS packets. Also, the number of cholera cases now are coming down to the hospital. Children were getting security at home due to mothers' knowledge about the symptoms and treatment of diarrheal diseases, that was the major killer of children in Bangladesh.

On the other hand, *Labon Gur* Solution (LGS) was unbelievable to the people of Bangladesh. By the triangular efforts of ICDDR,B, Government of Bangladesh and BRAC, it was reversed, and people accepted as well as utilized during dehydration. This challenging task was accomplished in different ways (A Mushtaque R Chowdhury, 2018);

1. Many tools of communication were used like; mass interaction, face to face contact, media advertisement through radio and television. Rural people were used to listening radio, it was an independent source to them, and the level of their trust was increased day by day. Rural people could link up the ORWs speech and radio's advertisement.
2. There were rural doctors (quacks), who were the active group against the ORS. Usually, people were used to going to the village doctors during suffering

from cholera, and IV saline was a standard treatment for them. A significant source of income was IV saline; obviously, they were against the ORS or LGS. In maximum cases, they propagated against the ORS or LGS; they tried to keep the broader idea regarding cholera among the mothers. The ICDDR,B and BRAC authority understood that the quacks would never come fully under the favor of ORS, so they have to do something by which they would not protest at least, or they play a neutral role. ICDDR,B arranged training programs for the quacks and BRAC formed the village doctor forum to make them understood about the ORS/LGS. The main target was to neutralize the force which was successfully achieved.

At the initial stage of the OTEP, main concentration was to women because learners were women and the frontline workers (trainers) were women, so the concentration was only to women. It was observed that women could prepare the LGS but did not use due to not getting permission from male members of the households. So, many forums were formed to accelerate the circulation of the knowledge of ORS and LGS among the male members of the families (A Mushtaque R Chowdhury, 2018). ORWs were working in households where male members of the families made obstacle to use the LGS, so, educational institutions, religious institutions, meeting places were utilized to circulate the information among the males. Everywhere health workers of BRAC had to manage the people by applying the communication tools.

Even mosques were places of work, for example- in every Friday at the time of Jumma (weekly prayer) BRAC staff was used to go to mosques and talked to *imam* and *masjid* committee for permitting them to talk five minutes on ORS. Normally, *imams* did not oppose the proposal and gave time to talk to the people; they had prestige as they came from outside of the village. BRAC staff usually told two things; what were the result of diarrhea and its long term effect on the body, what should they do in the time of diarrhea. Secondly, they told in

the mosque that a group of women would visit the village from BRAC; please cooperate them to teach the LGS to the mothers (Shukhendra Kumar Sarker, 2018).

Generally, health workers suggested people for using the water of the tube well. If it is the water of a pond or river, it was suggested to boil first and make it reasonable and then utilized for LGS. It was a problem to collect the water of tube well then BRAC tested both tubes well and pond water (boiled) in the lab of ICDDR,B, it got similar in effect. Then health workers suggested to use the water whatever easily collected, but water pot should be cleaned. The primary target was to rehydrate the patient immediately after the dehydration.

Another key point was the formula of water measurement; the government was working with one liter following the prescription of WHO and UNICEF, whereas the BRAC was working with half a liter. There was wastage of saline water if it was made of one liter. Then BRAC motivated the government to follow the half-litre measurement, and finally, it (half a liter) was accepted by the WHO and the government of Bangladesh.

Fazlul Karim, the team coordinator of OTEP, thinks that the whole OTEP was a learning program. The strategy was- to listen to the concept of people. They selected the right and the wrong perception; then the policy was adjusted considering the situation. The right perception was appreciated, and the wrong perception was technically denied and made them understood to deny in the future (Karim, 2018). Health workers were mainly trained to understand the process of how to communicate with people. For instance, there was practice in society to have *pani pora* (drinking holy water) during cholera; they added that no problem with *pani pora* but it should be collected from a tube well, it should not be a pond or river water. If there was no free tube well, the drinking water needs to be boiled for forty minutes. They did not alter the traditional knowledge

but rectify the conceptualization regarding the knowledge. They had two policies: for injurious knowledge, they tried to correct it, and for malpractice, they tried to abandon it. People know how to utilize, but they tried to correct the way (Karim, 2018).

### **6.2.3. Multidisciplinary Team**

There were two major aspects of the history of ORS in Bangladesh; scientific development and application of ORS program. Urge of innovation was equally applicable in both parts. So, multidisciplinary team worked together and coordinated their services for achieving the specific set of goals. One was the scientific part which was led by scientists and doctors like; David Nalin, Richard Cash, Robert Phillips, Greenough III, Rafiqul Islam, Majid Molla, Dilip Mahalanabis, Lincoln Chen and other experts where the leading organization was the ICDDR,B. In the application part, social scientists, statisticians, anthropologists, epidemiologists, management experts, historians and many professionals were engaged based on need. Sir Fazle Hasan Abed, Professor Mushtaque Chowdhury, Abbas Bhuiyan, M A Wahed, Sukhendra Kumar Sarker and other experts mainly contributed to the application method and its execution. Professor Mushtaque Chowdhury thinks the whole engagement of multi-disciplinary experts was not pre-planned, but it was based on necessity. Gradually, involvement was increased to face different kind of challenges (A Mushtaque R Chowdhury, 2018). M A Wahed spoke in the same way; he said that all the multi-disciplinary people came in the same platform due to need. It was an utterly need-based association (Wahed, 2018).

### **6.2.4. Communicative and Performance-based Program**

Significantly, the OTEP was one of the most crucial mass communication programs in the world. How science was brought to the doorstep of people through communication, the OTEP is the glaring example. It has to be mentioned that senior citizens were not eager to leave the traditional ideas, and

they did not accept the male and female working together and living outside of their home. These senior citizens were brought to the program of the male forum, Imams were trained up and made them understood the need for ORS and its trial in village level. Health workers usually went to the mosque on Friday with prior contact to Imam for talking some issues of ORS with the general people. All Imams of a union were called in a specific place for the workshop which worked well to convince the Imams. Target was to lessen the protest at least; they would not be in favor but not work in disfavor that was the target. The ORWs wore *saree*<sup>15</sup> and full sleeve of the blouse and heading umbrella, which was the acceptable manners to the people, so, they did not get firm ground to protest the ORWs. (See Appendix-3)

In the matter of recruitment, the standard tradition was to recruit SSC pass girl as the Oral Replacement Workers, but in Sylhet district, SSC pass girls were less in number, and whom were SSC pass they were not interested to work in BRAC, so the policy was changed and recruited VIII pass girls (Karim, 2018). They were trained up for becoming an expert in interactive communication. SSC pass girl could learn the process within one week, however, Non-SSC pass girls were supposed to take time about two weeks.

Moreover, the innovative method of fixing salary on performance made the OTEP program vibrant. An oral replacement worker taught a maximum of ten mothers and a minimum of eight mothers every day. To ensure quality, the number of households was decreased to 10 from 15-20 for every health worker in a day. It was based on *khana*<sup>16</sup>, and a girl covered every month about 240 *khanas*, and from that amount, 10% *khanas* were reexamined for testing the real picture of learning after 2 - 4 weeks. The ORWs wrote daily reports in the diary,

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<sup>15</sup> Saree is long dress of woman for covering the whole body. It is famous in Bengali culture.

<sup>16</sup> The English term of khana is food. But it means how many people have food together in a single cooking. It also mean the family.

and that was sent in report form to area managers for preservation and monitoring. It was a unique concept that salary was given based on the answers of the learners not by trainers. Initially, many girls did not get the minimum salary for having food; then Sir Fazle Hasan Abed announced that BRAC would bear the cost of having food. So, the difficulty regarding the payment of food cost was reduced. Therefore, it was observed that a girl could earn a maximum of 2000 BDT per month by their quality works (Karim, 2018).

In addition, the importance of teaching was given to the preparation of LGS and its proper utilization. In every area, there was an area manager who selected the 10 percent mothers for monitoring. Through using code number the name of 10% mothers was handed over to the monitor to survey the real picture of learning. Monitors usually asked ten/seven questions to the learners; numbering was set based on the weight of question and answer. Preparation of LGS and feeding of LGS were the highest weight in number sets. If a mother could prepare LGS and did not tell the points the trainer got salary for teaching that mother. But if a mother could not prepare LGS but could tell even all the points the trainer was not paid for that. So, the important thing was the preparation of LGS.

Routinely, male contact was started before reaching of ORWs, even union council chairman, and members were contacted for their support. Letters of UNO, OC and other high officials were given to the union council for their cooperation. BRAC worked with some of the government health programs to be involved with health officers of government hospitals; it was a more convenient way to be attached to them. Then it was decided to give order from the minister-level to the grass-root level for supporting the ORWs (Karim, 2018). Quality of teaching was maintained by monitoring and observation of upper-level official that means not by the health workers. There was a team to monitor the field level monitors, 10 percent of total monitors were engaged in

upper-level monitoring. To maintain the quality by the upper-level monitoring system was tricky, but the BRAC made the whole process more manageable by the program method based on operations research.

#### **6.2.5. Model-based Programing**

Before starting of the OTEP, throughout the country, BRAC arranged a pilot project in Sylhet district even after starting the OTEP it continued model based program for initiation of new techniques or tools in the program designing. Laskharpur mode and trial in Rakhalia are of Lakshmipur district are the major examples of the policy of BRAC. Male forum, spot meeting, school meeting, union council meeting, meeting with the members of union council, student meeting, masjid forum, record keeping, how to demonstrate LGS to the family members by having LSG to diarrhea patient on the spot, all these methods were experimented and developed in Lashkarpur model trial. Instead of 14 days, how could stay duration continue up to one month. Four women and two men were involved in Lashkarpur test and found out the way of functioning based on the experience of the test. All methods were innovated based on demand and due to facing different types of challenges. Besides, through the trial of Rakhalia, rice ORS was rejected as the formula of teaching mother (Karim, 2018). By this process, new points were accepted and somethings were excluded from the program, and thus, techniques were changed based on necessity.

#### **6.2.6. Norms of ORWs in Field Level and Camp Level**

BRAC decided to give leadership to the male person of the team. Union council office, school, madrassa, club or any place that was selected by the team coordinator for the living of ORWs. There were two-room sets, one room was for a male, and another room was for female, after all, the problem was seen, but it was under the strict supervision of team coordinators, monitors and researchers. Therefore, BRAC developed some principles for inside the room and outside the room. It was named the rule of *ghore* (inside the camp) and



*bahire* (outside the camp or in field). Interaction of single male and female was entirely prohibited. Approaching male and female was based on the group, not any single approach for any reason. These rules were strictly followed by the ORWs (Karim, 2018).

There were 19 norms in field level and 15 norms in camp level, which should be followed by the ORWs (Sukhendra Kumar Sarker, 2017d). BRAC authority prepared all the norms to generalize the activities of ORWs in the whole country.

### **Field Level**

1. To search diarrhea patients at the household during the visit and inform the team coordinator to take care of the diarrhea patient.
2. To teach the messages of watery stool and diarrhea as well as its prevention to the women through flip charts.
3. To continue teaching along with a woman.
4. To make oral saline by the trained woman.
5. To search *adha sheer* water pot after teaching how to prepare saline.
6. To select the *adha sheer* water pot or give a clear mark for *adha sheer* water in any pot of household.
7. To check the taste of LSG by ORW first then by the woman who was taught the preparation of LGS.
8. To teach four essential things; what is diarrhea? Process of the preparation of LGS, rules of usage, and when LGS will be started to feed the patient.
9. To justify after the teaching of LGS, either the woman could understand all the points or not.
10. To reinforce if any point is forgotten.
11. The speech should be evident during teaching.
12. To take care, either the woman could understand the points or not.
13. To be careful about any missing house from the teaching.
14. To sympathize to the colleagues in the field.

15. Not to call the colleagues by name in the village.
16. To insist on the learned woman, teach other women of the family what she learned on that day.
17. To confirm the diary of the learned women.
18. Not to roam the village with the indecent or improper dress.
19. To give the umbrella overhead during the movement in the village and the way.

### **Camp Level**

1. To go out to the field at 8.00 am come back to the camp at 4.00 pm
2. Going to the field together and coming back together.
3. Preparation of sleeping within 10.00 pm
4. One weekly meeting in a week and it should be ended within 1.00 pm.
5. More than one ORWs will visit the room of Team Coordinator (TC) for giving the diary and bringing back the diaries from the TC.
6. The little problem among the ORWs will be placed to the leader of ORWs. If the leader fails to solve, it will be placed to the team coordinator. Finally, the problem will be solved by the efforts of all.
7. For any urgent need, ORWs will have the option to visit the room of TC, but it should be more than one together with the permission of TC. Same rules for TC and cook to enter into the rooms of ORWs.
8. ORWs never go to the room of TC at night.
9. TC and ORWs will have food in their rooms and cook will serve the foods.
10. Listed relatives of the ORWs will not directly meet to the ORWs except the permission of TC.
11. At any circumstance, no arrangement of music in the team.
12. Every one of the team will follow the instructions of stay and having food.
13. Weekly report will be submitted to the TC at the end of the week
14. At any circumstance, all will not leave to the field keeping one in the

camp.

15. To be careful about the cleanliness of surroundings and everyone will take care of hygiene.

#### **6.2.7. Discussion on the Norms**

Shefali Biswas explained the norms of ORWs in day to day life both for field and camp level. There were 19 norms to conduct the daily activities in the field and 15 norms to conduct the activities in camp, everyone followed all the instructions. Otherwise, BRAC authority imposed penalty due to unruly to the norms. Everything was black and white what they would do or would not do. She mentioned that everyone followed the instructions because of interdependency. There was an unwritten norm about going toilet at night (toilet was outside of the camp) that at least four ORWs would go together and male persons of the camp would be informed. This instruction was for confirming the security. Shefali Biswas observed that no female ORW denied to go outside at night, leaving from a deep sleep, everyone was cooperative considering the point of her turn. One entered into the toilet, and the remaining three were standing outside the toilet. If there was any problem as if they could resist that. Male colleagues waited by opening the door, but four girls went up to the toilet (Biswas, 2018).

In the designing of field level norms, some social science issues were addressed to confirm medical intervention. The society was conservative and mostly religious, so, BRAC confirmed the socially accepted dress up like *saree*, full sleeve blouse and the head was cover by a fringe of *saree* as well as an umbrella. That was common women dress up in the society of Bangladesh; the BRAC accepted that dress up. Moreover, it was strictly prohibited to wear an indecent dress in moving rural households. Norm of ORW was to take care of the diarrhea patients in the households, and team coordinator had a particular concentration on the diarrhea patients, that was influential in increasing the acceptance of

ORWs activities in the society. Some technical aspects were also used to make the women understood the LGS, like; using flip charts and measurement of *adha sheer* by the pot of ORW.

There was a strategy to teach a woman along with other women; more emphasis was given to the preparation of LGS by the hand of the trained woman and the reinforcement of knowledge to avoid the habit of forgetfulness. It was teamwork and to confirm the team spirit, some norms prescribed; everyone was directed to sympathize to other colleagues and to help each other in the critical situation. Moreover, if the performance of any one of the team was weak, other colleagues would help her for the development. So, dealing with patients, teaching methods, learning of women, the behavior of ORWs and all other related approaches were prescribed to confirm the social acceptance of the program and its smooth application.

Also, the fifteen norms of the ORWs at the camp level were the consequences of social science approaches. People did not like to see the movement of women at evening or night, so BRAC decided to continue work in daylight from 8.00 am to 4.00 pm. Considering security issues, the ORWs were directed to go to the villages together and come back to the camp together. It also expressed the united effort, and people did not consider only one or two women were teaching, but a group of people were involved in the teaching activities of LGS. Keeping health of ORWs in mind the BRAC authority fix the time of sleeping and duty hours. Although male and female workers were staying in a camp, there was a restriction in the movement of them from one room to another room, and it was firmly followed. This norm was shown to the people of the villages to avoid social stigma. Besides, any singing song or music was prohibited in the camp of the ORWs.

### **6.2.8. Narratives of Shefali Biswas, an Oral Replacement Worker**

Shefali Biswas joined in the Oral Therapy Extension Program as an Oral Replacement Worker (ORW) at the age of 18 in 1982. She was born in Meherpur under greater Kustia district, and she started work at the Hatdi village of Gangni upazila in Meherpur, it was under Chuadanga region of BRAC office. Usually, rural people did not accept the girl of 17/18 years old outside of the house and teaching the women, so, there was a problem of acceptance. Moreover, the ORWs were living in a school's room or union council's room during the execution of the program, which was not also accepted to the rural people. So, their target was to motivate the people by generosity and well behavior. They wore long sleeves blouse, *saree*, and an umbrella on the head. At first rural people did not receive them well but later on their movements, talking to each other and their manners motivated them to be convinced and took a lesson of LGS from them (Biswas, 2018).

She remarkably mentioned that every ORW could not motivate the mothers or the family members equally, but it was dependent on the capacity of the health worker. Mother responded based on their needs. For example, when Shefali Biswas went to a household, mother understood it was not her need, so, she showed disagreement to give time. All people are not equal in a sense, so, she was behaving very roughly. Shefali asked permission to seat or take rest for a few minutes in her house, then she asked her some ordinary things and came back on that day, but Shefali's target was to teach that woman. Shefali initially dropped that household from the sequence, and the second day again knocked her with a simple conversation. When she visited that house on the third day, she approached just like this way- 'you have already learned how to prepare the LGS' because she saw other women and understood the matter. Then the woman replied yes, she learned and could prepare it. Shefali praised her talent, and she can receive anything quickly, that means, Shefali tried to motivate her as if she would be eager to understand the matter. Shefali's target is to prepare the LGS

by her hands. Then Shefali expressed her thirstiness and requested her to prepare LGS, and she rightly prepared (Biswas, 2018).

There was pre-survey in the village where male workers tried to motivate the males from different angles like by school forum, masjid forum, haat forum and various forums. People were informed in union council, spot seminar, tea stall and different places where males were gathered. In contrast to the provided information, some households were problematic; so the ORWs escaped those households. They did not show any arguments to the husbands of the women but followed the instruction. However, they tried to make them understood, and in maximum case, after their convincing speeches, they were convinced and gave permission to his wife to learn the LGS. Sometimes husbands requested the ORWs to come the next day due to some household works or others. Some people showed total disagreement to listen to the speech of BRAC health workers either they were shocked by BRAC and its activities in anywhere, or they did not like the activities of the ORWs. Otherwise, ORWs could convince people to listen to them. Those escaped households were visited by male workers at the last phase of work when the team came back from that village. It means they tried to teach them by their last effort. The health workers went to those escaped households at the time of their farewell, that was last time trying, and they managed them, and finally, they could teach them in maximum cases. She mentioned that if 19 households out of 20 households in a village learn the LGS, then one woman would be automatically learned by other women through their gossiping and practices. After our departure from any household, they started a discussion on the event then others got the messages, so everyone got the points due to circumstances. Their target was to cover every household in the village, so they achieved the target.

Interestingly, rural people kept the ORWs in their secret supervision and followed the movements of the ORWs. Many people were moving around the

living quarter of the ORWs to identify either they were being involved in any illegal activities. When they did not get anything wrong with the ORWs, then they also recognized them as a decent team. If anything happened by the male, then the female of the household knows, when ORW visited that house, they informed the ORWs about the moving around of her husband or brothers near to the rooms where the ORWs lived. Some villages were escaped where the rural leader and *moulovi* did not permit the BRAC health workers to work, so, it happened. They thought BRAC brought out the girls from houses, so the girls are immoral; even boys are also immoral. They always tried to keep the ORWs under observation, but when the team went out of the village, they certified that they were well behaved and cordial in manners. Usually, female health workers did not go to the market; without field visit, they did not even go outside from the room.

Shefali Biswas described that it was a big lesson in her life, however, due to the program she could visit the country from the root level, so a picture of the whole country is clear to her. Based on people's need, BRAC entered into the mind of people, that was a big project. The reason behind that was: everyone in BRAC was dedicated to the BRAC. She was not used to having rice in the morning, but in the camp of the OTEP, she had to have full stomach rice because she would walk a long path to reach the targeted areas. In the field, morning food was standard that was considered as the first food for a day. Firstly, it was hard to have rice in the morning, but later on, they were used to the process. Even she could not wear *saree*, so their seniors teach them how to wear *saree*, junior ORWs were standing in front of senior ORW to make the *saree* wearing perfect. Because *salwar* and *Kamis* were not allowed in the fieldwork and everyone was bound to wear *saree*. All these lessons she got from BRAC, the learning process is endless. Still, she is learning from the BRAC. She likes BRAC very much, and she got an award in 2013 for her performance in BRAC (Biswas, 2018).

### **6.3. Social Marketing of ORS in Bangladesh**

#### **6.3.1. Social Marketing**

G. D. Wiebe raised the question of “why can’t you sell brotherhood and rational thinking like you sell soap?” (Wiebe, 1951). This question implies that sellers can sell commodities efficiently, whereas they cannot sell out social objects. The article argues that radio and television create a powerful motivation among buyers to buy certain commodities. But the sponsors of social objects do not direct the social mechanism for motivating people concerning the distance audience, compatibility of the mechanism, adequacy and existence, so, they are not getting expected results. Wiebe also noted that if they could fulfill the lacking and apply the mechanism, they would get the expected results compared to the commercial sponsors (Wiebe, 1951). Joe McGinniss’s book “The Selling of the President 1968” placed a different view regarding marketing. He questioned the US voters- what thing does influence you to cast a vote? Presidential candidate or good campaign? The writer replied that the advertisers, public relation activists, photographers, artists, copywriters and others joined together to make the candidate as the favorite brand of the USA. His argument implies that a presidential candidate can be sold if proper marketing and campaigning are existed (McGinniss, 1969).

Philip Kotler and Gerald Zaltman gave a comprehensive idea about the concept of social marketing in their article “Social Marketing: An Approach to Planned Social Change” (Kotler & Zaltman, 1971). They defined social marketing and identified the instruments of social marketing and the system of application with an examination to carry out effectively. The authors defined social marketing as:

Social marketing is the design, implementation, and control of programs calculated to influence the acceptability of social ideas and to involve considerations of product planning, pricing, communication, distribution, and marketing research (Kotler & Zaltman, 1971).

The authors tried to show social advertising as an established phenomenon in



the USA. They remarked that;

An increasing number of nonbusiness institutions have begun to examine marketing logic as a means to furthering their institutional goals and products. Marketing men have advised churches on how to increase membership, charities on how to raise money, and art museums and symphonies on how to attract more patrons. In the social sphere, the Advertising Council of America has conducted campaigns for social objectives, including "Smokey, the Bear," "Keep America Beautiful," "Join the Peace Corps," "Buy Bonds," and "Go to College" (Kotler & Zaltman, 1971)

The social marketing suggests a useful and innovative approach to the challenges in the health care field (Andreason, 2004). The ultimate goal of social marketing is not only to help people to know more thing but also to change the people from what they are doing. For a successful campaign, the focus should be given to both on the product and targeted audience (Hertzog & Williams, 2007).

However, the Population Services International (PSI) of the USA initiated a project, namely the Social Marketing Company (SMC) at the beginning of the 1970s to promote the various activities of the family planning program in Bangladesh. The PSI (US-based non-profit organization) in collaboration with the Government of Bangladesh initiated the project in the 1970s to face the challenge of rapid population growth in Bangladesh through the funding from USAID (United States Agency for International Development) (M. Rahman & Khan, 2008). The Social Marketing Company (SMC) began activities (the 1970s) primarily to improve the health and quality of living as well as provide public health support to the underprivileged section of society in Bangladesh. It worked through the financial and technical support of the national and international governments and the donors. Rahman and Khan remarked that;

Social marketing is the application of commercial management techniques for popularizing and selling products and services that offer clear benefits to the people at prices they can buy. Thus, easy accessibility through wide availability and high affordability forms the key element of social marketing. The model of social marketing SMC

adopted and continues to practice has two components - multi-strategy communications for initiating desired behavior change, and suitable, affordable, readily accessible product and service for sustaining the changed behavior using the techniques of commercial marketing (M. Rahman & Khan, 2008).

The main focus of health-related social marketing is to influence the health behavior of community people. Social marketers utilize a broader area of health communication strategies like; mass media, interpersonal communication, promotion of products, dissemination of knowledge and other modes of communication (Evans, 2006). There are six basic stages of social marketing: a) developing plans and strategies, b) selecting communication channels and materials based on target audience, c) developing materials and pretesting, d) implementing the communication program, e) assessing effectiveness, f) and refining the material for advance communications (Evans, 2006).

### **6.3.2. Social Marketing of Oral Rehydration Solution (ORS)**

The Government of Bangladesh established a production unit of the intravenous fluid in 1973 for the fulfilment of the demand of cholera patients. Government supply was not sufficient, and so, IV saline was imported and supplied by the international agencies. The government launched the National Oral Rehydration Program (NORP) in 1979 to produce the packet ORS and spreading of its knowledge. The government set up the ORT corners in the upazila health complex and up to 1992 total of 68 ORT corners were functioning (A Mushtaque R Chowdhury & Cash, 2007a). These corners were established to demonstrate the effectiveness of oral rehydration therapy, to train the doctors and nurses and for the clinical management of cholera and diarrheal diseases as well as to provide the education of ORS and LGS to mothers.

In addition, the SMC started to produce 'ORSaline' in Bangladesh through two local manufacturing companies in 1983; the Gonoshasthya Pharmaceuticals and the Essential Drugs Company (A Mushtaque R Chowdhury & Cash, 2007a). By

the fund of USAID, the SMC began the mass media campaign to popularize the 'ORSaline' in Bangladesh. It functioned well and the sale was rapidly increased. The sale of first year of 1983 was 42880 packets of ORS, and in 1992 it was reached to 16 million (A. M. Chowdhury et al., 1997). Consequently, government intervention of ORS was run based on the liaison of SMC and the Government of Bangladesh. SMC and private companies now selling the packet ORS but the government distribute it free.

In 1986, E. C. Green conducted an anthropological study on "Diarrhea and the Social Marketing of Oral Rehydration Salts in Bangladesh" to understand the knowledge, attitude and practice related to diarrhea and ORS in Bangladesh (Green, 1986). The objective of the study was to assist in designing a culturally sensitive marketing program of ORS in Bangladesh. The study found that 58% of sampled households tried ORS to rehydrate the diarrhea patients at least once. People had a positive perception about ORS as the medicine of diarrhea patients, and there were no noteworthy cultural barriers in society to adopt ORS. The study suggested that ORS could be promoted as the medicine against diarrhea among the children with the symptoms of immobility, weakness, weight loss, sunken eyes, dehydration and thirst. Due to the promotional program of BRAC, the rural people could administer ORS by themselves and so ORS could be marketed as the medicine which could strengthen children against suffering from diarrhea (Green, 1986).

Thus, using innovative techniques to circulate the messages of ORS, the SMC reached the whole country even in the remote villages within few years. It used mass media like radio, TV, newspaper, posters, and other tools to propagate the messages. Now the brand name of SMC 'ORSaline' has become the generic name of ORS in Bangladesh. In 2016 the total sale of packet ORS was 484.55 million in Bangladesh (SMC Enterprise Limited, 2016). The advertisement of SMC was mostly informative and targeted to disseminate knowledge of

diarrheal diseases and the preparation of ORS as well as its effectivity. The Daily Ittefaq, a national Bengali newspaper, published an advertisement of ORS on 7<sup>th</sup> January 1987 with some information. The Observer of Bangladesh, an English national newspaper, published an advertisement of ORSaline on 17<sup>th</sup> February 1987 as the English version of Bengali advertisement. Both are the initial advertisements of ORS in the national newspapers.

**ওরোস্যালাইন**  
খাওয়ার স্যালাইন  
**ORSaline**

সকল প্রকার ডায়ারিয়া ও ডিহাইড্রেশনের জন্য

৪০০ মিলি বা ১ লিটার করে নতুন উন্নত ফর্মুলা  
শিশুদের পক্ষে ওজু মিশ্রিত থেকে চলে।  
১৫ মিনিটে ১০-১৫ মিনিটে পুনরায় পানীয়।

১০০ প্যাকেট	১০০ টকা
২০০ প্যাকেট	১৯০ টকা
৫০০ প্যাকেট	৪৬০ টকা
১০০০ প্যাকেট	৮৬০ টকা

নতুন উন্নত ফর্মুলা

**ডায়ারিয়া বা পাতলা পায়খানা জন্মিত ডিহাইড্রেশন থেকে জীবন বাঁচায়**

ডায়ারিয়া বা যেকোন ধরনের পাতলা পায়খানা হলে শরীর থেকে দ্রবকারী পানি ও লবণ বেরিয়ে গিয়ে শরীরে দেখা দেয় ডিহাইড্রেশন বা পানিশূন্যতা, যা ডায়ারিয়া বা পাতলা পায়খানায় শিশুমৃত্যুর প্রধান কারণ।

এই ডিহাইড্রেশন বা পানিশূন্যতা রোধ করা বা চিকিৎসার সবচেয়ে সহজ উপায় হলো, খাওয়ার স্যালাইন যা বাবুহারা শরীরে পানি ও লবণের ঘাটতি পূরণ করে এবং রোগী সুস্থ হয়ে ওঠে।

ওরোস্যালাইন একটি উত্তম প্যাকেটকৃত খাওয়ার স্যালাইন। আপনার শিশুর পাতলা পায়খানা আরম্ভ হওয়ার সাথে সাথে ওরোস্যালাইন খেতে দিন এবং বন্ধ না হওয়া পর্যন্ত খাওয়াতে থাকুন।

ওরোস্যালাইন সব ওয়ুথের লোকেরা পানীয়। প্যাকেটের সাথেই খাওয়ার বিধি দেয়া আছে।  
বিশুদ্ধ খাওয়ার পানিতে মিশানো ওরোস্যালাইন ১২ ঘণ্টা হয়ে গেলে ফেলে দিয়ে নতুন করে বানিয়ে নিন।  
সর্বোচ্চ খুচরা মূল্য : টাকা ১৮০ পয়সা।

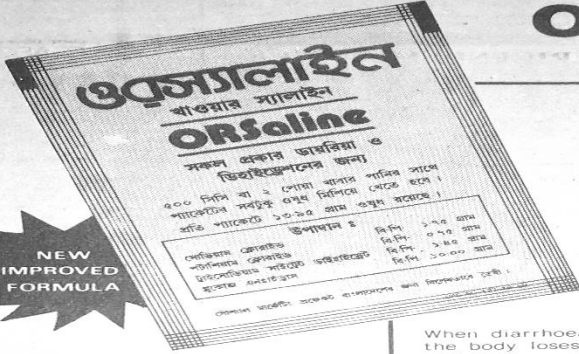
সোশ্যাল মার্কেটিং প্রজেক্ট  
ঢাকা-বাহলাদেশ

ওরোস্যালাইন ডায়ারিয়া বা পাতলা পায়খানা জন্মিত ডিহাইড্রেশন বা পানিশূন্যতা রোধ ও চিকিৎসা করতে অত্যন্ত কার্যকর।  
সর্বসময় হাজার কক্ষে কয়েক প্যাকেট ওরোস্যালাইন রাখুন।


Figure 6.1: Advertisement on 7th January 1987 (The Daily Ittefaq, 1987)

# ORSALINE

## Oral Saline



**NEW IMPROVED FORMULA**



**PREVENTS THE DANGER OF DEHYDRATION CAUSED BY DIARRHOEA OR LOOSE MOTION**

When diarrhoea or loose motion strikes and the body loses essential fluids and salts, it suffers from dehydration or loss of fluids. This is the chief cause of child deaths resulting from diarrhoea or loose motion.

The easiest way to prevent and cure dehydration or loss of fluids and bring the patient back to health is to replace the lost fluids and salts with Oral Saline.

**ORSALINE** is the ideal packaged Oral Saline. As soon as your child has loose motion, administer **ORSALINE** to him and continue to give him **ORSALINE** as long as the loose motion continues.

**ORSALINE** is available in all Medicine shops. Every packet contains information about administration and dosage.

A solution made of **ORSALINE** and drinkable water which is more than 12 hours old should be thrown away and a new solution made.  
Maximum Retail Price: Tk.1.80

**SOCIAL MARKETING PROJECT**  
DHAKA - BANGLADESH



**ORSALINE**

Extremely effective in preventing and curing dehydration or loss of body fluids due to diarrhoea or loose motion.

Always keep a few packets of **ORSALINE** handy.

Figure 6.2: Advertisement in the Daily Observer on 17th February 1987 (The Daily Observer, 1987a)

The instruction of how to prepare ORS is written on the packet of ORSALINE. Packed medicine needs to be mixed in two-quarter liters of water (500 CC) at a time and feed to the diarrheal patients. Besides, in the information part of the advertisement five necessary information is given; prime cause of death of diarrheal patients is marked due to loss of essential fluid and salts from the body, feeding oral saline is the easiest way to rehydrate the patients, ORSALINE is the ideal medicine, and it should be administered up to the motion continued, availability of ORSALINE, and how long (12 hours) the mixed medicine is usable. The advertisement was continued in both English and Bengali newspaper with

essential information. It is observed that over time, the pattern of information was changed.

**ORSaline**  
I always keep it handy.

Careful mothers keep **ORSaline** handy. Your child may suffer from diarrhoea or other forms of loose motion at any time. So, be prepared - keep several packets of **ORSaline** at home.

**ORSaline** - Very effective in the prevention and treatment of dehydration or loss of body fluid caused by diarrhoea or loose motion.

খাওয়ার স্যালাইন  
**ORSaline**  
সকল প্রকার ডায়রিয়া জনিত ডিহাইড্রেশনের জন্য  
২০০ মিলি বা ২ পোয়া বাবার পানির সাথে প্যাকেটের সবটুকু ওষুধ মিশিয়ে খেতে হবে।  
প্রতি প্যাকেটে ১০-৯৫ গ্রাম ভর্যুণ রয়েছে।

উপাদান :	
গেডিয়াম ক্লোরাইড	মি.মি. ১.৭০ গ্রাম
শর্টলিফাম ক্লোরাইড	মি.মি. ০.৭০ গ্রাম
ট্রাইসোডিয়াম সাইট্রেট ডাইহাইড্রেট	মি.মি. ১.৪০ গ্রাম
সুক্রোজ একসিক্লোস	মি.মি. ২০.০০ গ্রাম

ওষুধের সংক্রান্ত সকল প্রশ্নের উত্তর জানতে হলে :  
ডা. এ. এফ. এম. ডি. ১২৭-৪১-৪১

Oral Saline saves the lives of children

**সামুদ্র জীবন বৃক্ষা মাট**

SOCIAL MARKETING PROJECT  
DHAKA BANGLADESH

Figure 6.3: Advertisement on 7th April 1987 (The Daily Observer, 1987b)

By the above advertisement, mothers got importance for utilization of ORS. Moreover, the effectiveness of ORS is written in the information part. Some advertisements of the SMC in the national English and Bengali newspapers of Bangladesh in the 1980s and 1990s, which showed the trend of the lesson.

## ওরস্যালাইন ছিল বলেইতো খোকার মুখে আবার হাসি ফুটেছে।

কদিন আগে হঠাৎ করে খোকার ঘনঘন পাতলা পায়খানা শুরু হলো। বিপদ দেখে আমি তক্ষুনিই একে খাওয়ার স্যালাইন ওরস্যালাইন খাওয়াতে শুরু করলাম।


কাণ্ড আমি জানি ডায়রিয়া বা ঘনঘন পাতলা পায়খানা হলে শরীর থেকে পরকারী পানি ও লবণ বেরিয়ে শরীর শুকিয়ে যায়। এই অবস্থা চলতে থাকলে শরীর পানিশূন্য হয়ে মৃত্যুও হতে পারে। তাই খোকার শরীর যাতে পানিশূন্য না হয়—সেদিকে লক্ষ্য রেখেই

যতক্ষণ পাতলা পায়খানা চলেছিল ততক্ষণ প্রতিবার পাতলা পায়খানার পর খাওয়ার স্যালাইন খাইয়ে দিলাম।

তাইতো দেখতে না দেখতেই কয়েক দিনেই খোকা আমার সুস্থ হয়ে উঠেছে—আমের মতো হাসি ফুটেছে।

ওরস্যালাইন পেছের পানির ঘটিটি পূরণ করতে এবং পানিশূন্যতা রোধে অত্যন্ত কার্যকর।


ওরস্যালাইন— শিশুর স্বীকৃত ঝুঁকি করে।



ডো. শ্যামল চক্রবর্তী প্রমোদক

Figure 6.4: Advertisement in the Daily Ittefaq on 11<sup>th</sup> November 1987

Sunday  
1992, 22 Nov



### ডায়রিয়া হলে— সাথে সাথে শিশুকে খাওয়ার স্যালাইন খেতে দিন।

**কিভাবে প্যাকেটের স্যালাইন বানাবেন:**  
আধা লিটার অথবা দু'পোয়া বিশুদ্ধ পানি নিন। এক প্যাকেটের সবটুকু ওষুধ পানিতে ঢেলে দিন। এবার ভালো করে মিশিয়ে নিলেই খাওয়ার স্যালাইন তৈরী হয়ে যাবে।

**কি নিয়মে প্যাকেটের স্যালাইন খাওয়াবেন:**  
**শিশুর বয়স—**


- \* ১ বছরের কম হলে প্রতিবার পাতলা পায়খানার পর ১০ থেকে ২০ চা-চামচ
- \* ১ বছর থেকে ৫ বছরের মধ্যে হলে প্রতিবার পাতলা পায়খানার পর আধা পোয়া থেকে ১ পোয়া
- \* ৫ বছরের বেশী এবং প্রাপ্তবয়স্কদের কেলায় প্রতিবার পাতলা পায়খানার পর ১ পোয়া থেকে ২ পোয়া পরিমাণ খাওয়ার স্যালাইন খাওয়াতে হবে।

**কতক্ষণ খাওয়াবেন:**  
যতক্ষণ পাতলা পায়খানা চলেবে ততক্ষণ সঠিক পরিমাণে খাওয়ার স্যালাইন খাইয়ে যেতে হবে।

**প্যাকেট থেকে বানানো স্যালাইন কতক্ষণ ভালো থাকে:**  
বানানো খাওয়ার স্যালাইন বানানোর পর থেকে ১২ ঘণ্টা পর্যন্ত ভালো থাকে। ১২ ঘণ্টা পর বানানো স্যালাইন ফেলে দিয়ে নতুন করে বানিয়ে নিতে হবে।

**মনে রাখুন:**  
স্যালাইন খাওয়ানোর পরশাপানি শিশুকে কুকের দুধ আর বড় বাচ্চাদেরকে স্বাভাবিক খাবার খেতে দিন

খাওয়ার স্যালাইন নিয়মমত খাইয়ে  
শিশুকে সুস্থ রাখুন।



খাওয়ার স্যালাইন  
**ওরস্যালাইন**

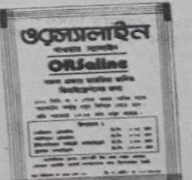


Figure 6.5: Advertisement in the Daily Ittefaq on 22nd November 1992



Figure 6.6: Advertisement in the Daily Observer on 8th March 1995

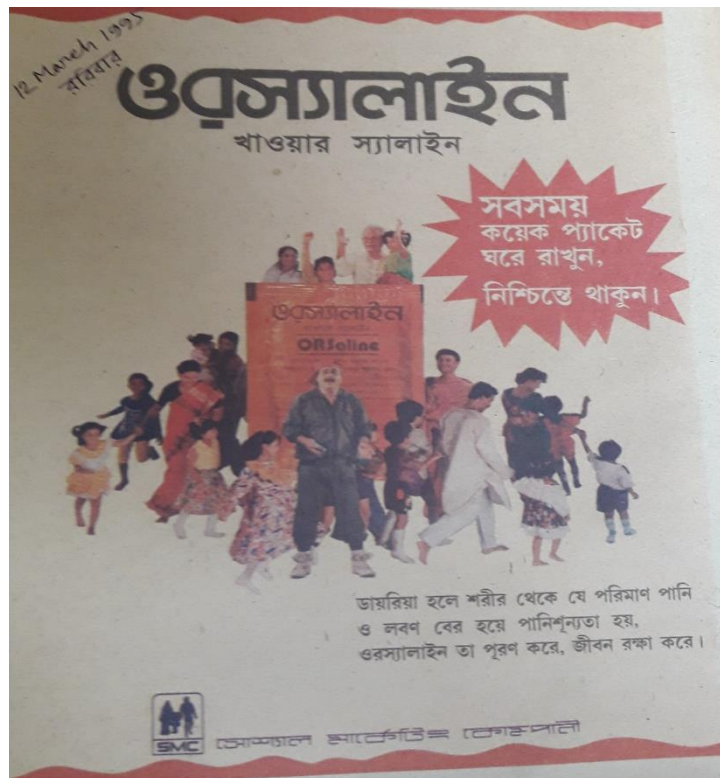


Figure 6.7: Advertisement in the Daily Ittefaq on 12th March 1995



Besides, Health Education of Bureau of Bangladesh continued circulation for awareness building in the media. On 26<sup>th</sup> April of 1989, the Bureau published an advertisement in the Daily Ittefaq with some specific instructions.

**সাচেতন নাগরিক হিসাবে স্বাস্থ্যাবধি নিজে মেনে চলুন  
ও অন্যকে তা জানতে ও মানতে সাহায্য করুন।**

- কলসী করে হলেও টিউবওয়েল বা ট্যাপের পানি সংগ্রহ করুন।  
এই পানি খাওয়া এবং খানাবাসন ছোয়ার কাজে ব্যবহার করুন।
- টিউবওয়েল বা ট্যাপের পানি পান করা না গেলে সম্ভব হলে  
পানি (টেমপারেচারে ৫-১০ মিঃ) ফুটিয়ে পান করুন।
- এক কলসী পানিতে চা চামাচের পূর্ণ এক চামচ ফিটকিরি মিশিয়ে  
৬ ঘণ্টা পরে পান করতে পারেন।
- এছড়া আধখানা পানিশোধক বড়ি দিয়েও মাঝারী সাইজের এক  
কলসী পানি নিরাপদ করা যায়।
- বন্যা পরিস্থিতিতে যে কোনভাবে প্রাপ্ত পানি ফুটিয়ে, পানিশোধক  
বড়ি বা পরিমাণমত ফিটকিরি মিশিয়ে পান করতে পারেন।
- পচা বা বাসি খাবার খাবেন না। খাবার ঢেকে রাখুন।
- খাওয়ার আগে ভাল করে হাত ধুয়ে নিন।
- উচু জমিতে গর্ত করে মলত্যাগ করুন এবং মাটি দিয়ে ঢেকে দিন।
- মলত্যাগের পর হাত সাবান বা ছাই দিয়ে ভাল করে পরিষ্কার  
করে ফেলুন।
- মরা পচা জীবজন্তু দেখা মাত্রই মাটিতে পুঁতে ফেলুন যাতে পানি  
বা আবহাওয়া দূষিত করতে না পারে।

**ডায়রিয়া হলেঃ**

- সংঙ্গে সংঙ্গে স্যালাইন শরবত খাওয়ান এবং এলাকার স্বাস্থ্য-  
কর্মীদের সংঙ্গে যোগাযোগ করুন।
- প্রয়োজনে ডাঙের মাড়, চিড়ার পানি, ডাবের পানি, লেবুর  
শরবত, হালকা চা ইত্যাদি খেতে দিন, রোগীকে স্বাভাবিক  
খাবারও খাওয়াতে থাকুন।
- শিশুরোগীকে মায়ের দুধ অবশ্যই খেতে দিন।
- ডায়রিয়া পরবর্তী অন্ত্র রোধের জন্য শিশুকে ভিটামিন এ  
ক্যাপসুল খেতে দিন।

স্বাস্থ্য শিক্ষা বুরো, স্বাস্থ্য অধিদপ্তর ৯১-৫৬৩: ৯১৫১-৯১৫১

Figure 6.8: Advertisement for awareness building in the Daily Ittefaq on 26th April 1989 (The Daily Ittefaq, 1989)

In the heading of ‘Health Rules for Conscious Citizens which to be Obeyed and Circulated to Others’ some instructions were given concentrating on diarrheal diseases.

- To collect the water of the tube well and tap even though it is difficult. Use it for drinking water and washing the dishes.
- If tube well water or tap water is not available, use boiled water (after 5-10 minutes boiling) for drinking.
- To drink the water after 6 hours of using four spoons of *fitkiri* (locally available material for purification) in a pitcher.
- Besides, using half of purifying tablet in a middle size pitcher water can be safe.
- During the flood, water can be drunk by boiling or using *fitkiri* or using a purifying tablet.
- Do not eat stale and rotten food. Cover the food.
- Wash hands before having food.
- Defecate in high land after digging and cover with soil.
- Clean the hands in a better way by soap or ash after defecation.
- Bury the dead or rotten body of animals as if weather and water cannot be polluted.
- During Diarrhea;
  - Feed oral saline immediately and communicate with the health workers
  - Provide rice starch, *chira* water, green coconut water, lemon juice, light tea to the patients. Give regular food to the patients.
  - Give breastfeeding to the children
  - Give vitamin A capsule to prevent the blindness after diarrhea

Thus many advertisements in newspaper, radio and television were given to spread out the knowledge of diarrheal diseases and ORS to the people of Bangladesh both by government sponsorship and the organizations, national and international. Due to social marketing through the patronization of the government and the agencies, the whole process was organized efficiently, and the knowledge was spread out rapidly, even in the remote villages.

The Population Services International (PSI) has been operating the ORT program in more than 45 countries in the world. The PSI started an education program to educate school children, parents and the health care professionals in Bangladesh from 1986. Through social marketing, the Bangladesh program got extraordinary success with achieving 75% of total market share (PSI, 1998). The success was remarkably reflected in two surveys; one was conducted in 1987/88, and another was conducted in 1994/95. Both surveys covered major vital areas like; popularity of ORT, the popularity of packet ORS, understanding of ORT and proper use of ORT. Popularity regarding diarrhea treatment by ORT was increased from 29% to 45% in rural areas and from 32% to 55% in urban areas of Bangladesh. The popularity of packet ORS (ORSaline) was almost doubled from 1987/88 to 1994/95 in both urban and rural areas; in rural areas, it was increased from 13% to 29% and reached 38% in urban areas from 17%. The recognition of ORSaline brand was reached to 79% in rural areas from 22%, and in urban areas, it was reached to 87% from 38%. Parents have an understanding of why and how the ORT works and so the proper use of ORT was increased. For instance, from the beginning of diarrhea episode, 76% (1994/95) parents started ORS in rural areas (raised up from 67% in 1987/88), 82% in urban areas (up from 70% in 1987/88) (PSI, 1998).

### **6.3.3. Brand Names of ORS and its Pricing in Bangladesh**

Along with the Social Marketing Company, many pharmaceuticals companies created brand names of ORS in Bangladesh. In the table- 6.1, some companies with the brand names are mentioned. Although the prominent brand of ORS is ORSaline of the SMC, other brand names of the pharmaceuticals companies are being popular in the market. In the present market (2019) unit price of ORSaline of the SMC is the highest (5.00 BDT unit price), and the unit of Renata Limited is the lowest (3.06 BDT unit price) (see table-6.1). In 1997, the unit price of ORSaline was 3.00 BDT equivalent to \$0.075, In 2012, it was increased to 4.58

BDT equivalent to \$0.06 (University of Washington, 2014), in 2019, the unit price is increased to 5.00 BDT equivalent to \$0.059. Although the unit price has been increased in BDT, the pricing tendency of ORS is lower compared to USD. Due to the accessible price of the packet ORS in Bangladesh, people can avail ORS packet comfortably.

**Table 6.1: Name of some pharmaceuticals companies in Bangladesh with brand names of ORS and its unit price (MedEx, 2019).**

Brand Name	Dosage Form	Strength	Name of Pharmaceuticals Company in Bangladesh	Unit Price
ACI ORS	Powder	13.95 gm	ACI Limited.	4.60 BDT
Acme's ORS	Powder	13.95 gm	Acme Laboratories Limited.	5.00 BDT
G-ORS	Powder	13.95 gm	Gonoshasthaya Pharmaceuticals Ltd.	4.00 BDT
Neosaline	Powder	10.25 gm	Eskayef Bangladesh Ltd.	4.58 BDT
ORS	Powder	13.95 gm	Popular Pharmaceuticals Ltd.	4.58 BDT
ORS Saline-Plus	Powder	10.25 gm	Renata Limited	4.30 BDT
ORS Saline-R	Powder	10.25 gm	Renata Limited	3.06 BDT
ORS-BRAC Saline	Powder	13.95 gm	Renata Limited	3.20 BDT
ORS-N	Powder	10.25 gm	Renata Limited	3.06 BDT
ORS-Rena Saline	Powder	13.95 gm	Renata Limited	3.20 BDT
Orsaline-N	Powder	13.95 gm	Essential Drugs Company Ltd.	3.45 BDT
ORSaline-N	Powder	13.95 gm	Social Marketing Company	5.00 BDT
Unisaline	Powder	10.25 gm	Ibn-Sina Pharmaceuticals Ltd.	4.58

					BDT
Ziska Saline	Oral	Powder	13.95 gm	Ziska Pharmaceuticals Ltd.	5.00 BDT

#### 6.4. Conclusion

Many people were skeptical when the program of oral saline was launched by the BRAC in Bangladesh. Scientific development and use of social science approach in the application made the whole program smooth and feasible. The inventor organization, the SEATO Cholera Research Laboratory later on the ICDDR,B, and its related individuals consciously supported any promotional initiative of ORS either taken by the government or the organizations. Scientific development, the innovation of formula and the laboratory testing were supported by the ICDDR,B. Moreover, it continued the research on diarrheal diseases and the ORS, so, all types of initiatives got research basis which paved the ultimate way of success. Majority of Bangladeshi people were Muslim, and most of them were illiterate in the 1980s, so, without social science approaches in the execution of the program and social marketing policy in the promotion of ORS, it was not possible to accomplish.

## Chapter Seven:

### Conclusion

A social history of Oral Rehydration Solution (ORS) in Bangladesh from 1968 to 1998 described the overall development of the use of ORS in Bangladesh through the combined efforts of the Government of Bangladesh, non-government organizations, international agencies, and the community people of the country. Causes of diarrheal diseases and their medicines were unknown to the people of Bangladesh before the successful trial of ORS in Dhaka, in 1968. Superstition, religious activities and treatment of local healers based on assumption were the so-called remedies for dehydration perceived by the people. Even after the innovation of the ORS, people had no idea that this handy technology had a miracle to rehydrate the severely dehydrated patients due to diarrheal diseases. Initially, knowledge of ORS and its application was kept in hospitals or public health institutions. The main challenge was how to disseminate the information of ORS to people, however, the technique was very easy and affordable. After the independence of Bangladesh, more than eighty percent population was illiterate. Gradually, by the effort of government and non-government organizations and institutions the number of educated people was increased, and awareness regarding dehydration was built up through their combined efforts. Within three decades after the invention, a substantial change appeared among the people of Bangladesh regarding the treatment of diarrheal diseases, especially by oral rehydration therapy. The overall discussion of the research is narrated in the conclusion with numerical order.

1.

Diarrhea was the primary cause of mortality and morbidity as well as a cause of malnutrition in Bangladesh. In 1980, it killed about five million children who were under five years in the world (H. S. Ahmed & Molla, 1987). The Bengal Delta is considered as the home of *Vibrio cholerae*, which was the leading cause of cholera for thousands of years. Due to mild temperature, the cholera organism

was persisted in this area for an extended period and attacked humans over time. The temperate climate of mild to cold winter and warm summer, so, it is an excellent place for an organism to survive for year after year. Naturally, the organism lives in open water body like; pond, river, canal, well and other open bodies. People of the Bengal Delta were accustomed to having water from open water sources thereupon the organism entered into the human body through the drinking water. Secondly, people were used to defecating in open places or open water body like canal, *beel*, river through which the organism was spread out from one place to other places. It is observed that people were collecting water from one side of the river or canal and other people were defecating on another side of the water flow. There was no hygienic sanitation in the rural areas of Bengal (up to 1960s), which was one of the significant causes of the cholera epidemic in the Bengal Delta. Lack of knowledge regarding hygiene in day to day activities and food habits made the situation worsen, that was the ultimate cause of diarrheal diseases in Bangladesh.

So, dissemination of hygiene knowledge and removing the ignorance from society were the ultimate goal of the experts and the Government of Bangladesh to combat against the diarrheal diseases. The Western world understood pre-emptive measures to prevent cholera. Therefore, they initiated international meetings for the exchange of views as well as constructed modern sanitation and drainage system by which after 1925, the cholera epidemic was drastically declined from the West.

2.

There are different types of diarrhea; diarrhea due to *Vibrio cholerae*, diarrhea due to rotavirus, diarrhea due to dysentery, *dud haga*. Patients with different types of diarrhea were coming to the hospital. How much salt dehydrated from the body in different types of diarrhea? So, it observed that due to cholera, drainage of sodium from the human body is high and due to rotavirus drainage

of sodium is less and for an *echoly* average level of reduction (Yunus, 2018). Only the oral salt solution increases diarrhea; the question was come to give a career, based on physicist experiment amino acid can be the career, as amino acid glycine was chosen first and it worked very fine. However, the problem was- glycine is very expensive, and it is not readily available, then the experiment was started with carbohydrate that was glucose. Instead of glycine glucose was added, and it worked as like as glycine (Wahed, 2018).

So, finally, salt, glucose, and water were recognized as the ingredients of ORS. On the ground of ORS formula, BRAC was working in the field and observed that glucose was not available everywhere then they experimented with sugar, but it was not also available in every household of Bangladesh in the late 1970s. Therefore, the experiment started with *gur* (molasses). Subsequently, BRAC's whole OTEP program was designed based on available ingredients sugar/*gur* (molasses). The new experiment was started with rice powder. It has carbohydrate, and it also produces glucose and sucrose, which is being broken down and work as career molecule in the stomach wall. Advantage on using rice ORS was that it does not increase the episode of diarrhea. In glucose ORS, first-time episodes of diarrhea are increased then decreased. Rice ORS takes time to be broken down, and it became easily adjusted, which is not seen in glucose ORS. Rice is multi carbohydrate food, so how it would be adjusted for the required amount of glucose. For 20-gram glucose, 40-gram rice was required because it is 50-50 in the ratio (Wahed, 2018). Thus, the evolution of ORS, LGS and Rice ORS were accomplished.

### 3.

Cholera and diarrhea have social conceptualization in Bangladesh based on severity. Frequent watery stools with vomiting are marked as 'kolera', 'dasto', 'colira', 'kalana' and different local names. During cholera or diarrheal diseases, especially for children, parents do not go to doctors, and they cannot understand



the cause of dehydration. They perceive it as *kharap batash* (bad air) is blown to him that is why the watery stools are going on and vomiting. Sometimes they bring *pani pora* (holy water) from the religious persons for removing *kharap batash*, sometimes they do not do anything, and after a particular time, the child becomes cure or die. In some cases, the dehydrated patients died within a short period after the diarrheal attack. There are common types of cholera: *dud haga* (due to ingestion of breast milk by infants), *ajirno* (due to overeating), *amasha* (mucoïd diarrheal), *daeria* (cholera). All these types of watery stools are socially determined from a prolonged period in Bangladesh. However, after recovery from diarrheal diseases, the children are becoming weak and thin, lowering the eyesight, and other complications appear.

In addition to the awkward conception, curse and sin were considered as the causes of cholera. Muslim priest explains that illicit sexual intercourse is the primary cause of cholera, and children are being affected due to the sins of parents. It was believed that as the curse of God and people who worked against religion might be affected by this disease. *Ola bibi* or *jhola bibi* or *mon bibi* is the carrier of cholera disease. Bibi is called Ma (mother) for showing respect as if it harms little. Religious treatments were: for Muslim- prayer, *azan*, *bondhokora*, hanging *tabiz* (sacred writing), *pani pora* (holy water for drinking), firing, hanging cholera flags, sacrificing animals mainly black goat; for Hindus- worship of Goddess, *bondhokora*, *pani pora*, firing; For Buddhist- surrounding the house with fiber of plants, small platform by bamboo in the four corners of house, blowing holy words in the clay pots. People from cholera-affected homes were restricted from bazar except one night in a week.

#### 4.

There were some natural medications to cure the cholera-like; having the water of green coconut, juice of molasses, rice water, burley, *chira* water. Coconut water has carbohydrates and electrolytes such as sodium, potassium,

and magnesium, which is perfect medicine against fluid loss. Molasses juice has carbohydrates, vitamin B6 and dietary minerals; rice water has carbohydrates and electrolytes, so, all the natural medications had positive effects on the patients. Consequently, some people escaped from the deadly disease, but credit went to *kabiraj*, *fakir* or other local healers. This natural healing system developed from the long term experiences of people, but people could not keep confidence in those natural medications, for this reason, going to the local *kabiraj* or *mullah*. The peak times of cholera attack were October-November (Katrik, the name of the 7th month in Bengali (Rabbani, 2012)) and April-May (Choitra, the name of the 12<sup>th</sup> month in Bengali).

This is to say, *Fakir*, *Maulana*, *Guru* got priority for treating the diarrhea patients based on religious faith. Religious healers administered holy water (*pani pora*), blow over the patients, prayed for the improvement of patients and gave *tabiz* for hanging on neck or hand. They gained faith of the patients based on so-called spiritual ability or meditation or study of holy books. *Kabirajs* got knowledge from yunani or ayurvedic formula of medicine; they also used shamanistic components in their treatment process.

## 5.

The major indigenous health practitioners in the villages of Bangladesh from the 1960s to 1990s were allopathic *daktars* (derived from the word ‘doctor’), homeopathic *daktars*, religious healers, and *kabirajs* (Green, 1986). In maximum cases, allopathic *daktars* and homeopathic *daktars* are not formally trained up from medical institutions. They are trained up by another *daktar* or self-trained up. Some have the training of a short course from government or government-approved private training institutions. *Daktars* are considered as quacks, and they are giving medicine for all types of diseases. Initially, they were not willing to prescribe or sell ORS for diarrheal diseases, gradually, Government, Non-Governments organizations gave importance to their support

for spreading the knowledge of ORS. IV saline was effective medicine as well as beneficial for the quacks, due to some technicalities they got more income for pushing IV saline. However, over time, they accepted the formula of ORS and prescribed to the patients.

6.

The US Government established the SEATO Cholera Research Laboratory in Dhaka (capital of East Pakistan) for some reasons; to save the US army from cholera attacks in South East Asia and to find out effective vaccine or medicine of cholera (A Mushtaque R Chowdhury, 2018). The Bengal Delta was the home of cholera, so they chose the area for investigation and innovation of new drug. The Cholera Research Laboratory was established in 1960 in Dhaka simultaneously Matlab Cholera Hospital and demographic surveillance were run to experiment in the field level. After a long period, a successful trial of ORS in 1968 was done in Dhaka based on the effective measurement of input (ORS) and output (watery stool). David Nalin and Richard Cash observed the Malumghat Trial (1967) meticulously and found the flaw that the hypernatremia was occurred due to the gap between input and output measurement of ORS and watery stools. After the invention of ORS as an effective therapy of dehydration because of cholera and diarrheal diseases, the only obstacle was how to disseminate the knowledge of ORS to the mass people, so, ICDDR,B and BRAC led the whole process where government, national and international organizations cooperated in the process.

7.

The Oral Therapy Extension Program, a nationwide program of BRAC, has great feedback that mother could prepare LGS at home. The health workers, team leaders, organizers were dedicated to the program execution. As it was the action research, so the parallel development of activities and researches were going. Sir Fazle Hasan Abed is a pioneer in this program; in maximum cases,

his thinking was implemented in the OTEP program of BRAC (A Mushtaque R Chowdhury, 2018). His role was vital; especially he led the overall activities of the organization through the triangulation of planning, execution and research. His associates worked unitedly without considering any personality cult in this process; there was only one target how to take it forward for the achievement of the goal. M. A. Wahed mentioned the material culture of BRAC, especially the simplicity of the top leader. There is a culture in BRAC that no one calls Fazle Hasan Abed- sir - but Abed vai (brother). Abed also liked that and encouraged people to say him, 'brother'. It has an extraordinary impact on the human mind, which encourage people to work shoulder to shoulder and with dedication. Abed realized the people's sentiment, and he shaped the mind accordingly, so, a successful OTEP program was done in Bangladesh (Wahed, 2018). Shefali Biswas<sup>17</sup> became emotional when talking about Sir Abed especially, she was telling about his ideology of simplicity; all the staff of BRAC belong to the ideology of Sir Abed. Bonding is robust, constructive and cordial. He can nicely motivate the people, and anyone will get rid of the crisis and problem after his counselling (Biswas, 2018).

8.

Multi-disciplinary experts were involved in the development of ORT and its implementation in Bangladesh. Involvement of scientists, physicians, management experts, epidemiologists, social scientists in the program of oral rehydration therapy was happened based on need, and the number was increased due to face the new challenges. This togetherness was the demand of program and problem solving, where everybody contributed, the immediate success of Bangladesh is not the individual contribution of a particular organization it was the result of the activities of all (A Mushtaque R Chowdhury, 2018). ORT was

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<sup>17</sup> Shefali Biswas was health worker of OTEP programme of BRAC. She is only one woman who could continue the work in BRAC up to 2018 from the grass root health worker. Now she is working in the head office of BRAC in the HR department.

the milestone in the history of medicine and BRAC became part of history by spreading out the knowledge of ORT among the mothers of Bangladesh. In 1972, it was estimated that about 2.5 lac people died of diarrhea in Bangladesh every year, where most of them were children. If those statistics were right and no intervention was done up to now, it would be 5 lac people die of cholera per year. Now only 20 thousand people are being died of diarrhea and diarrhea-related diseases every year in Bangladesh according to the statistics of the WHO (A Mushtaque R Chowdhury, 2018).

9.

The universality of treatment of ORS against dehydration which extremely attracted the experts and ordinary people. ORS treatment became a universal treatment for all, even today it is being used for Ebola and anything which needs rehydration from any form of diarrhea or dehydration from anything (Cash, 2018). Significantly, OSR led in 1971 during the Liberation War of Bangladesh. Dr Dilip Mahalanabis at the Calcutta Hopkins group to use ORS in the refugee camps where cholera had broken out. There was scarcity of IV saline, and the condition was disastrous. He was using oral therapy to reduce death rate below 6 percent, under those conditions, it was quite a good result because otherwise, it could have been 70 percent death (D. Nalin, 2018).

By the activities of the government, ICDDR,B, BRAC and other institutions, the demand for ORS was created, awareness and consciousness were developed among the people. In the technical aspects of the massive Oral Therapy Extension Programs, the ICDDR,B supported the BRAC as if the target of both institutions was the same. In the private sector, the Gonoshastho Kendra started first to produce the packet ORS and supplied in the market now maximum pharmaceutical companies are producing the ORS. Presently, the use rate of ORS in the country is about 80% where the maximum is packet ORS (A Mushtaque R Chowdhury, 2018). The fact was that this type of big program

(OTEP) was not executed in any place in the world. So if anyone wants to talk about ORT, the name of BRAC has come forward. By this program, BRAC was able to innovate many things, so its learning was usable in every sector. Incentive salary system, monitoring formula, implementation research were initiated by the ORT program of BRAC (A Mushtaque R Chowdhury, 2018).

10.

Only Mohakhali Public Health Institute in Bangladesh produced the intravenous fluid saline up to 1985, and it could not fulfil the demand of the market so, more than fifty percent IV saline was imported from the foreign countries. Especially all the saline which is available in the open market are imported, but the system of import is not smooth, moreover; it depends on the desire of the importers. So, the price is shown as an imbalanced situation. According to the statistics of the World Health Organization, the demand for total saline bags in the country was four million (1985). The Public Health Institute could produce two million, so, the rest of the number was imported from foreign countries, and importers fix the price based on their desires (Hasan, 1985). Due to dependency on some businesspeople, the artificial crisis was being shown in the saline market. On the other hand, government-produced saline was being sold in the open market, so fraud activities of the traders and the hospital authority made the situation aggravated (Kobir, 1985). Then in 1990s private pharmaceutical companies started to produce the IV saline in Bangladesh, on the other hand, IV saline was replaced by the Oral Rehydration Saline, and through the combined efforts the scarcity of IV saline was reduced before 2000 AD.

After the independence of Bangladesh government started (1979) the National Oral Rehydration Program (NORP) and there were two parts of the programs; to distribute the ORS packet freely and to train the people how to prepare ORS. An international workshop was organized, in 1979, in Dhaka with the representatives of sixty-eight thousand villages of Bangladesh where ORS

related information was shared to the participants. It was decided to create a group of Rural Health Worker (RHW) in every community of Bangladesh with the assistance of volunteers and the older people of the communities (Kamal, 1985). Besides the government programs, there was a massive program (OTEP) of the BRAC to teach the mothers how to prepare ORS at home. The program covered the whole country except the Chittagong Hill Tracts within 1979-1990. The ICDDR,B continued teaching and training programs for the medical professional and non-professional people how to make ORS. Training sessions were arranged in hospital, in the research laboratory in Dhaka and surveillance area in Matlab. They confirmed the experiment in the surveillance area regularly. Besides, 'Bari Mother' concept of ICDDR,B was an effective method to teach the people how to prepare ORS at home.

11.

BRAC accepted the application and operation aspects, and ICDDR,B took the research aspect. The target was to make the process available to the mass people of the country. BRAC collected *Labon Gur* from the home of people, but the ICDDR,B took the approach of providing *Labon Gur* from the institution, so the formula was the same, but a way of the collection and execution was different. Moreover, the ICDDR,B provided the two-headed spoon for the measurement of salt and sugar/molasses instead of one pinch and one scoop (Yunus, 2018).

BRAC health workers visited about 12 million households in the country, but the number of women taught was much more because, in every household, more than one mothers stayed. Within ten years of program 75000 villages of 4254 unions in 20 districts were conducted (A Mushtaque R Chowdhury & Cash, 2007a). Considering the success of the spreading of knowledge of ORS in Bangladesh by the initiatives of BRAC, the 'ORS Award' was given to the BRAC by the ICDDR,B in February 1994, celebrating the 25 years of the

invention of ORS (A. M. Chowdhury et al., 1997).

12.

Oral Rehydration Therapy (ORT) including ORS, LGS, Rice Saline, Zinc all were experimented and successfully used in Bangladesh from 1968 to 1998. Ingredients of one unit packet ORS are; 1.75-gram salt, 1.25-gram sodium bicarbonate, .75-gram potassium chloride, and 20-grams sugar or 10-gram glucose (Kamal, 1985). With these ingredients mixing of half-liter safe normal drinking water prepare the ORS. ICDDR,B, BRAC, and other private companies produce packet ORS following the formula, keeping it in dry it can be used 4-5 months (Kamal, 1985). In the 1980s, a combined effort was given to prevent cholera and diarrheal diseases, but it was not entirely controlled because of the lack of safe drinking water. So, with the funding and close observation of the UNICEF and other international and national organizations, the government concentrated on setting tub-wells in every locality of the country, and so, at the end of the 1990s, a substantial change happened in the supply of safe drinking water throughout the country. Many voluntary organizations financed by the community people and different institutions in the whole country worked to build up the awareness regarding the necessity of safe drinking water, diarrheal diseases and preparation of ORS at home.

13.

Some students of Social Welfare Institute of Dhaka University attended the training of ICDDR,B and started work mainly in the slum areas of Dhaka city even they formed sixty-two groups to teach the people of urban slums (Kamal, 1985). Their main slogan was 'know thyself and inform at least four people'. Besides, they started to train a group of people to prepare themselves as trainers. The *Nari Kollan Songstha* (The Women Welfare Organization) of Cox's Bazar trained up fifteen girls to disseminate the knowledge of ORS among the people of Cox's Bazar area. Besides, ICDDR,B trained up the girls of urban slums in



the name of Urban Voluntary Program (Kamal, 1985). Finally, it was seen that students, teachers, community leaders, religious leaders, family planning workers, para-medical doctors, *kabiraj*, *boidho*, quacks, midwives, compounders and other professionals and technical persons were involved in the awareness-building programs and teaching of the preparation of ORS/LGS at home. In this backdrop, the success appeared, and so, packet ORS, LGS, Rice Saline are now part of the day to day culture in the country. Usually, most of the people in the country keep ORS packet at home and even it is available in the tea stall of the remote villages in Bangladesh.

14.

Currently, in the first 50 years (1968-2018), ORS is credited with saving well over 100 million lives of infants, children and adults with life-threatening dehydrating diarrhea. David Nalin is pleased about the Well-documented success of ORS and ORT and in Bangladesh. ORS is a simple solution with a simple clinical methodology. The solution alone does not work without knowing how to give; it also prevents starvation and malnutrition (D. Nalin, 2018).

Death due to diarrhea is nothing but unawareness of how to rehydrate the patients. Diarrhea caused by fluid and electrolyte loss, treatment is to rehydrate the fluid and electrolyte. It became easy after the invention of ORS; otherwise, the dehydration was the deadly ailment of the human. During cholera, body fluid is becoming drained through watery stools. Main things of ORS are- it is readily available, and people can easily carry out the solution. So, now people of Bangladesh are used to the formula of ORS both in packet and homemade, and it has been part of daily life.

In 1978, the editorial of The Lancet declared the invention of ORS as the important medical advance in the twentieth century (“Water with sugar and salt,” 1978). Jashua Nalibow Ruxin, on the 25<sup>th</sup> anniversary of the invention of

ORS, identified the ORS as the 'magic bullet' (Ruxin, 1994). Experts of Oral rehydration solution recognized it as the miracle for treating the dehydrated patients. The world notably recognized the importance of ORS and the first successful trial of ORS in East Pakistan (now Bangladesh) in 1968. Researchers of ORS also got the recognitions from different organizations and countries. David R. Nalin, Dilip Mahalanabis, Norbert Hirschhorn, Nathaniel F. Pierce recognized with the award of the Pollen Pediatric Research Prize on 29<sup>th</sup> July of 2002. From 2002 onward, 29<sup>th</sup> July has been observed as the ORS day to build the awareness and to increase the utilization of ORS in the world. Stanley G. Schultz, Richard A. Cash, David R. Nalin, Dr., and Dilip Mahalanabis received the Prince Mahidol Awards (Thailand) in 2006 for contribution in the treatment of cholera. On the 50<sup>th</sup> anniversary day of the ORS, David Nalin and Richard Cash commented, on 18<sup>th</sup> August of 2018, in The Lancet titled '50 years of oral rehydration therapy: the solution is still simple' (D. R. Nalin & Cash, 2018), this is truly simple. It is a simple solution due to simplifying the solution to the problem.

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## Appendix 1: List of interviewees with designation and interview schedule

SL	Name and Designation	Involvement with ORS	Date, Place and Medium of Interview
01	David Nalin (born April 21, 1941) is a physiologist of USA. He got Pollin Prize for Pediatric Research (2002) and Prince Mahidol Award (2006) from Thailand. Now residence in Philadelphia, Pennsylvania, USA. He joined in the PSCRL in 1967.	He is one of the members of the team who successfully trailed the ORS in 1968 in the PSCRL, East Pakistan. Worked in the CRL and ICDDR,B	Skype interview was recorded on 27 <sup>th</sup> of June 2018, from 9.50 pm to 11.00 pm Skype Id: 4846535645
02	Richard A. Cash, MD, MPH (born June 9, 1941). He is Senior Lecturer of Harvard T H Chan School of Public Health, Department of Global Health and Population. He got Prince Mahidol Award in 2006. He joined in the PSCRL in 1967.	He is one of the members of the team who successfully trailed the ORS in 1968 in the PSCRL, East Pakistan. Worked in the CRL and ICDDR,B	Face to Face interview was recorded at the campus of J. P Grants School of Public Health, BRAC University, on 5 <sup>th</sup> August 2018, from 12.30 pm to 1.30pm.
03	Abdul Majid Molla (born in 1941). He is a retired scientist of ICDDR,B. He joined in the PSCRL in 1965.	He is one of the members of the team who successfully trailed the ORS in 1968 in the PSCRL, East Pakistan. Worked in the CRL and ICDDR,B. Moreover, he has pioneering role to invent Rice ORS	Face to Face interview was recorded at his residence in Dhaka city, capital city of Bangladesh on 28 <sup>th</sup> June 2018 from 10.00 am to 12.5 pm. Address: House-44, Road- 43, Gulshan-02, Dhaka.
04	Mohammad Yunus MBBS (Dhaka), M, Sc. CHDC (London). He is emeritus scientist of ICDDR,B at Executive Director's Division. He joined PSCRL on 27 <sup>th</sup> November 1968	Dr. Yunus and his associates successfully trialed the LGS in the ICDDR,B	Face to Face interview was recorded at the premises of the ICDDR,B, Dhaka on 26 <sup>th</sup> June 2018 from 11.30 am to 1.05pm
05	Md. Sirajul Islam, PhD (London), Environmental Microbiologist and Head, Environmental Microbiology Laboratory, LSD, ICDDR,B.	He contributed in the scientific development of ORS and ORT. He invented 'Siraj Mixture' to neutralize the algae to control cholera	Face to Face interview was recorded on 25 <sup>th</sup> June 2018 from 11.00 am to 12.00 noon at the

	Now he is emeritus scientist of ICDDR,B		first floor of ICDDR,B Building in Dhaka
06	M A Wahed, retired scientist of ICDDR,B	Under his supervision the laboratory test of ORS and LGS formula was done in ICDDR,B and field level	Face to Face interview was recorded on 21 <sup>st</sup> June 2018 from 4.00pm to 5.30 pm at his residence in Dhaka city. Address: ICDDR,B Housing, Pallabi, Mirpur.
07	Masood-ul-Hoque Munshi, MBBS (Dhaka), MPH (Harvard, USA). He was Director of Teknaf ICDDR,B. Now he is serving as the Principal of Gonoshasthaya Institute of Health Science	Under his supervision both 'Bari Mother' and 'Depo System' were run in Teknaf area.	Face to Face interview was recorded at the campus of Gonoshasthaya Institute of Health Science in Savar, Dhaka, on 22 <sup>nd</sup> June 2018 from 10.30 am to 1.00 pm.
08	Sir Fazle Hasan Abed, KCMG (born 27 <sup>th</sup> April 1936 in Sylhet district of British Bengal) is the founder and chairman of BRAC, the largest NGO in the world with more than 120,000 employees. He got many national and international awards, honorary degrees and prizes for his mounted contribution to reducing poverty in Bangladesh and other countries. He was appointed Knight Commander Order of St. Michael and St. George (KCMG) by the British Crown for reducing poverty in Bangladesh and other countries.	He was the key person to initiate the Oral Therapy Extension Program in Bangladesh from 1979 to 1990, and it was successfully executed under his leadership. He invented the <i>Labon Gur</i> Solution (LGS) in his family kitchen room with different measurement.	Face to Face interview was recorded on 3 <sup>rd</sup> July 2018 at the BRAC Center, Mohakhali, Dhaka, from 4.00 pm to 4.40 pm
09	A Mushtaque Raja Chowdhury, Vice Chair of BRAC	He is an academician as well as organizer and administrator of OTEP program in Bangladesh. He is author of many books and a good number of research	Face to Face interview was recorded on 28 <sup>th</sup> May 2018 at the BRAC Center, Mohakhali, Dhaka from 11.00 am

		articles on ORT and ORS.	to 11.50 am.
10	Sukhendra Kumar Sarker, author of <i>Akti Ujjal Oddy</i> , Punjeree Publications. He was project Administrator of Sulla Project. He was director of Administration, Monitoring and Investigation of BRAC.	He was one the field level organizers of OTEP program of BRAC.	Face to Face interview was recorded on 15 <sup>th</sup> April, 2018 from 10.00 am to 12.05 pm at 8 <sup>th</sup> floor of the head office of the BURO Bangladesh. Address: House No: 12/A, Block No. CEN (F), Road No. 104, Gulshan-2, Dhaka-1212.
11	Falul Karim, retired Official of BRAC	He was team coordinator of the Sulla Project (experimental project on ORS in 1979) of BRAC. Under his leadership Lashkarpur Model Trail was done. Besides, trail in Lakshmipur to assess the rice ORS was done under his leadership. He was fully involve in OTEP	Face to Face interview was recorded on 17 <sup>th</sup> June 2018 from 11.00 am to 1.00 pm. Now he is living countryside namely Hajirhat of Lakshmipur district. The interview was recorded from his residence at Hajirhat of Lakshmipur in Bangladesh.
12	Abdur Rob, retired official of BRAC	He was involve in OTEP program of BRAC from the beginning to the end	Face to Face interview was recorded on 1 <sup>st</sup> July 2018 from 5.00pm to 6.00 pm at his residence in Dhaka city. Address: House 2, Road 2, Sector-3, Uttara, Dhaka.
13	Shefali Biswas	ORW (Oral Replacement Worker) of OTEP program of BRAC	Face to Face interview was recorded on 20 <sup>th</sup> June 2018 from 10.30am to 12.10pm at the ninth floor of BRAC Center, Mohakhali, Dhaka.
14	Mohammad Abul Age: 60 Profession: Peasant	He got teaching of male health workers of OTEP	Face to Face interview was

	<p>He has 6 sons Address: Post Office: Ekorkandi, Upazilla- Vedergonj, District- Shariatpur, Bangladesh</p>		<p>recorded on 29<sup>th</sup> July 2018 from 10.00am to 11.00 am at his residence in Shariatpur</p>
15	<p>Firoza Begum Age: 55 Profession: House wife She has two daughters and four sons. Address: Village- Bojrushar, Post office- Khasherhat, Upazila- Kalkini, District- Madaripur, Bangladesh</p>	<p>She got teaching of female health worker of OTEP</p>	<p>Face to Face interview was recorded on 25<sup>th</sup> July 2018 at 1.00 pm to 2.00 pm at her residence in Madaripur, Bangladesh</p>
16	<p>Abdul Majid Khan (his story is given in the footnote in the text) Age: 70 Profession: Farmer He has two daughters and four sons. Address: Village- Bojrushar, Post office- Khasherhat, Upazila- Kalkini, District- Madaripur, Bangladesh</p>	<p>He got teaching of male health worker of OTEP</p>	<p>Face to Face interview was recorded on 25<sup>th</sup> July 2018 at 3.00 pm to 4.00 pm at her residence in Madaripur, Bangladesh.</p>
17	<p>Kohinur Begum Age: 60 Profession: House wife Husband's name: Jalal Uddin Bepari She has two sons Address: Village- Bhaggokul, Post Office- Bhaggokul, Upazila- Srinagar, District- Munshigonj, Bangladesh</p>	<p>She got teaching of female health worker of OTEP</p>	<p>Telephone interview was recorded on 28<sup>th</sup> July 2018 from 10.00 am to 10.25am</p>
18	<p>Rejia Begum Age: 80 Profession: Housewife Husband's Name: Shamsul Haque Address: Village: South Bashgari Post: Khasherhat Thana: Kalkini District: Madaripur</p>	<p>She got teaching of female health worker of OTEP. She described many previous experiences regarding cholera epidemic in Bangladesh</p>	<p>Face to Face interview was recorded on 8<sup>th</sup> August 2018 at 2.00 pm to 3.00 pm at her residence in Madaripur, Bangladesh.</p>
19	<p>Sayed Nazmul Alam Age: 70 Profession: Farmer He has three sons and one daughter Address: Post Office: Urania, Upazilal- Mehendigonj, District-</p>	<p>He got teaching of female health worker of OTEP</p>	<p>Face to Face interview was recorded on 27<sup>th</sup> July 2018 at 1.00 pm to 2.00 pm at her residence in Barishal Bangladesh.</p>

	Barishal, Bangladesh		
20	Shah Alam Age: 68 Profession: Business He has two sons and two daughters Address: Upazila- Mehendigonj, District- Barishal, Bangladesh	He got teaching of female health worker of OTEP	Face to Face interview was recorded on 25 <sup>th</sup> July 2018 at 10.00 am to 11.00 am at her residence in Barishal Bangladesh.
21	Shopnahr Age: 60 Husband's name: Shafiqul Islam Profession: Housewife She has four sons and two daughters Address: Village- Hyderabad, Post Office- Hyderabad, Upazila- Muradnagar, District- Comilla, Bangladesh	She got teaching of female health worker of OTEP	Telephone interview was recorded on 28 <sup>th</sup> July 2018 at 8.00 pm to 8.25 pm.
22	Anowara Begum Age: 62 Profession: House wife Address: Village- Bojrushar, Post office- Khasherhat, Upazila- Kalkini, District- Madaripur, Bangladesh	She got teaching of female health worker of OTEP	Telephone interview was recorded on 8 <sup>th</sup> August 2018 at 7.35 pm to 7.55 pm.
23	Mohammad Ali Age: 68 Profession: Village Doctor (quack) He has four sons and three daughters Village- South Raipur Post Office: South Raipur Upazila- Raipur District- Lakshmipur Bangladesh	He got teaching from BRAC about ORS and LGS	Face to face interview was recorded on 16 <sup>th</sup> June, 2018 at 11.00 am at his residence in Lakshmipur district, Bangladesh
24	Ayesha Begum Age: 65 Profession: Housewife She has three sons and two daughters Village: Moddho Raipur Post Office: South Raipur Upazila- Raipur District- Lakshmipur Bangladesh	She got teaching of female health worker of OTEP	Face to face interview was recorded on 15 <sup>th</sup> June, 2018 at 10.00-11.00 am at her residence in Lakshmipur district, Bangladesh

**Appendix 2: Some photographs which represent the development of ORT in Bangladesh, collected from different sources.**

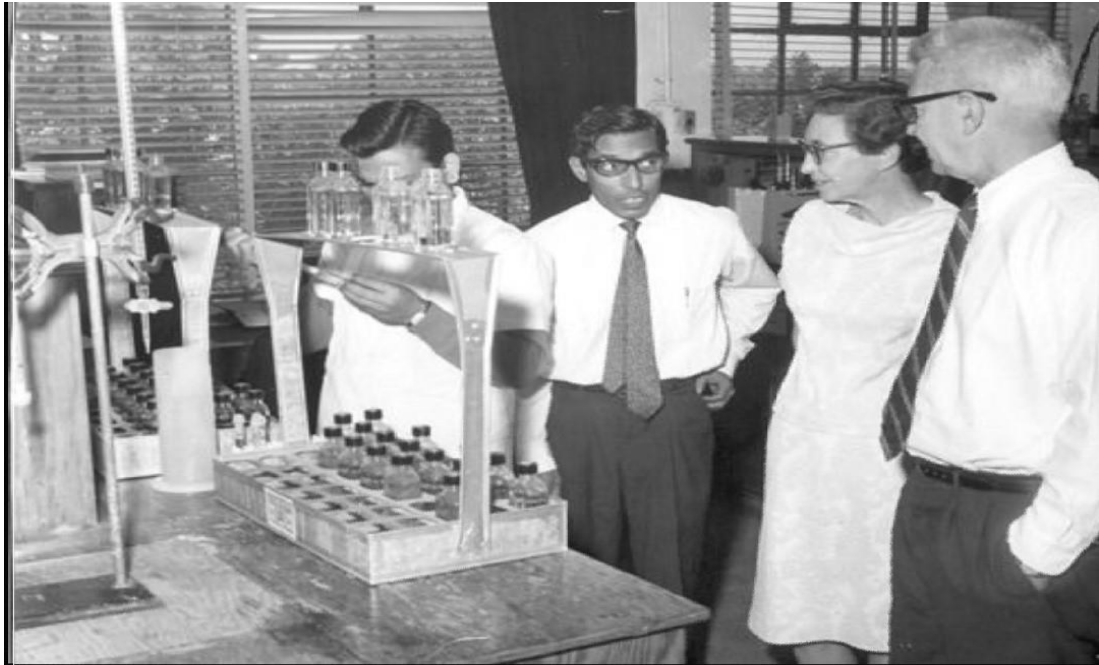


**A physician from the Communicable Disease Center and his companion, a Pakistani physician, prepare to give inoculations against cholera.**

**Source: Cockburn, T. A. (1960). Epidemic Crisis in East Pakistan, April-July, 1958. Public Health Reports, 75(1), 26-36**



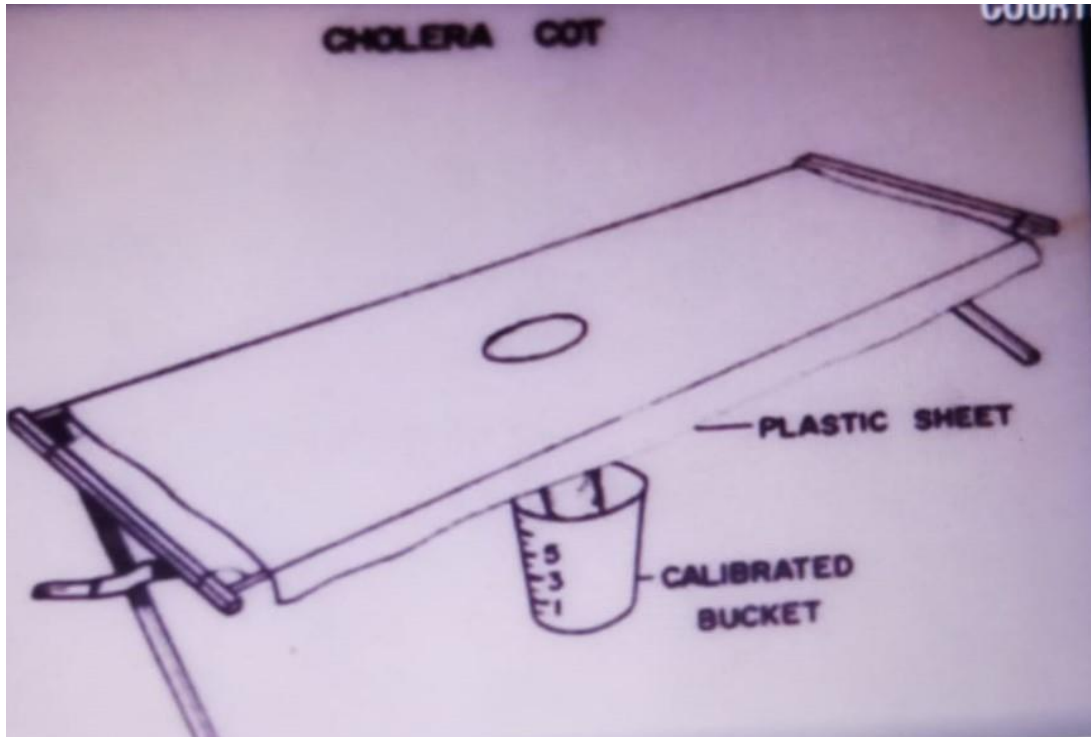
**Woman is drawing water from a polluted pool and her relatives are waiting at the bank of the pool. Source: Cockburn, T. A., & Cassanos, J. G. (1960). Epidemiology of endemic cholera. Public Health Reports, 75(9), 791-804.**



**From right: Dr. R. Phillips (ex-Director of PSCRL and one of the inventors of ORS methodology), Dr. Ruth Hare (consultant of Chemistry Lab in CRL), Mr. Sayed Zafar Ahmed (Section Chief of Chemistry Lab) visiting the Chemistry Lab in 1968. Source: Collected from the Facebook page of M A Wahed, retired scientist of ICDDR,B. <https://www.facebook.com/profile.php?id=100008534026375>**



**David Nalin was taking care of a cholera patient in ICDDR,B hospital in 1968. Photo collected from the documentary of Al-Jazeera. Source: <https://www.aljazeera.com/programmes/thecure/2013/09/201392014591184128.html>**



Scratch of Cholera Cot. Source: David Nalin



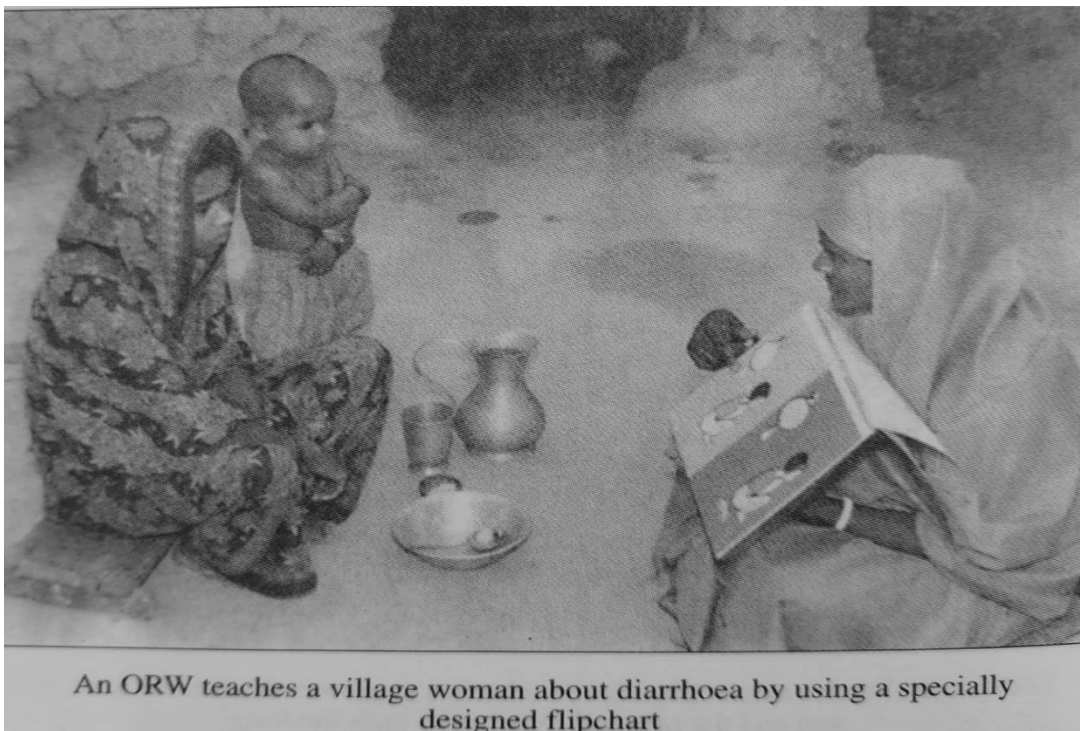
Bari-mother of ICDDR,B, demonstrating the preparation of ORS. Source: The Annual Report of ICDDR,B 1979.



### Appendix 3: Some Photographs of Oral Therapy Extension Program



Source: Chowdhury, A. M. R., & Cash, R. A. (1996). *A simple solution: Teaching millions to treat diarrhoea at home*. Dhaka, Bangladesh: University Press.



Source: Chowdhury, A. M. R., & Cash, R. A. (1996). *A simple solution: Teaching millions to treat diarrhoea at home*. Dhaka, Bangladesh: University Press.



The mother prepares her first batch of lobon-gur solution under the watchful eye of the ORW

Source: Chowdhury, A. M. R., & Cash, R. A. (1996). *A simple solution: Teaching millions to treat diarrhoea at home*. Dhaka, Bangladesh: University Press.



The ORW tastes the solution to insure the mother that its "safe" and ensure herself that its correctly prepared

Source: Chowdhury, A. M. R., & Cash, R. A. (1996). *A simple solution: Teaching millions to treat diarrhoea at home*. Dhaka, Bangladesh: University Press.



The final test having the child with diarrhoea drink the lobon-gur solution

Source: Chowdhury, A. M. R., & Cash, R. A. (1996). *A simple solution: Teaching millions to treat diarrhoea at home*. Dhaka, Bangladesh: University Press.



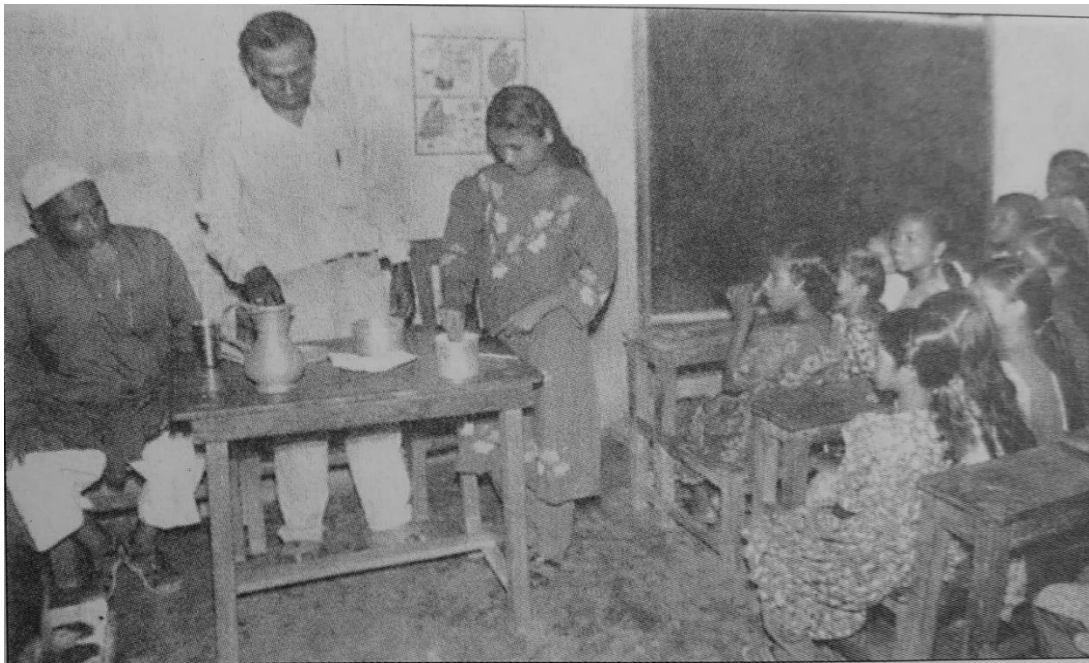
A field laboratory to test the chloride concentration of samples of home prepared lobon-gur solution

Source: Chowdhury, A. M. R., & Cash, R. A. (1996). *A simple solution: Teaching millions to treat diarrhoea at home*. Dhaka, Bangladesh: University Press.



The village men are also taught by BRAC so that they will support the programme

Source: Chowdhury, A. M. R., & Cash, R. A. (1996). *A simple solution: Teaching millions to treat diarrhoea at home*. Dhaka, Bangladesh: University Press.



School children are taught to make lobon-gur solution under the watchful eyes of the BRAC worker and the teacher

Source: Chowdhury, A. M. R., & Cash, R. A. (1996). *A simple solution: Teaching millions to treat diarrhoea at home*. Dhaka, Bangladesh: University Press.

**Appendix 4: Some report formats of Oral Therapy Extension Program**

Source: Sarker, S. K. (2017). *Akti Uzzal Oddhay: Diaeria Protirodhe BRAC* (1st ed.). Dhaka: Panjeree Publications Limited.

ORW  
CODE No.  
TEAM No.  
PERIOD

**ORAL THERAPY EXTENSION PROGRAMME (OTEP)  
ORW ACTIVITY MONITORING FORM**

OBSERVE ..... OF THE  
FOLLOWING  
(no)

Sl. No.	Learner's name	Name of Head of Household (HH)	Learner's relationship with HH	Para	Village	Union	What is the first symptom of Diarrhoea (1)	When loose motion turns into Diarrhoea (1)	Treatment (LGS, Water & Normal diet) (1)	When to begin & why (1+1)	How much (1+1)	Prevention (k)	Nutrition (1+1)	Total Correct	LGS-Practical Preparation	Grade	Sample vial number	Water Measurement (in c.c)	Name of Youngest Child	Monitor (Code No.)	
1.																					
2.																					
3.																					
4.																					
5.																					

Nos. 1-7: Number in the Bracket indicates allocated marks.  
1. Labon-Gur-Saline: C=Correct, N=Not correct, O=No knowledge

**GRADES**  
A=10 marks and LGS Correct, B=7 to 9½ marks and LGS Correct,  
C = Less than 7 marks and LGS Correct  
D = LGS not Correct

Grading Abstract			
A	B	C	D

## ORAL THERAPY EXTENSION PROGRAMME (OTEP) ORW's Monthly Salary Calculation Sheet

ORW's Name:

Month:

Monitoring Grade	No. of household monitored per Grade	Total household monitored	% of household monitored per Grade	Total household visited during the Month	No. of household per Grade	Payment for each household per Grade	Total Payment Grade wise
A.							
B.							
C.							
D.							
Sub Total							TK.
Fringe benefit							TK.
Deduction (if any)							TK.

Total Taka

Certified by

**শিশু ও মাতৃস্বাস্থ্য কর্মসূচি**  
**খাবার স্যালাইন শিক্ষাদানে স্বাস্থ্যকর্মীর মাসিক ফলাফল**

তিথি :

মাস :

ক্রমিক নং	স্বাস্থ্য কর্মী	মোট পর্যবেক্ষণ	নির্ভুল স্যালাইন তৈরি	কী কী রোগ হলে পানিশূন্যতা দেয় এবং কেন?	পানিশূন্যতার লক্ষণ	পানিশূন্যতা পূরণ	কখন খাওয়ানো শুরু করতে হবে এবং কেন?	পরিমাণ কখন ডাকার দেখাতে হবে?	প্রতিরোধ	পুষ্টি	৩০-এর নিচে	১০০-এর উপরে	মন্তব্য
১.													
২.													
৩.													
৪.													
৫.													
৬.													

সাধারণ মন্তব্য :

এলাকা ব্যবস্থাপক :

BRAC/OTEP

**CHECKLIST FOR AREA MANAGER:**

2. Pre-Operation Study:
  - Query on activity on return to team
  - Physical verification while visiting team (if possible before ORW operation starts)
    - i) To meet with Upazila Chairman/UNO
    - ii) To meet with UHFPO and UEO
    - iii) Meeting with other Government & Non-Governmental institutional heads
    - iv) Postering in important places & offices
3. Pre-Contact:
  - Meeting with U.P Chairman and base village member
  - 15-20 male interview of base and one operated village
4. School Forum:
  - Base School visit, furthest school visit
  - Presence in one school forum
5. Mosque Forum:
  - Discussion with Imam of base mosque
  - Discussion with any one Imam of any operated village
6. Seminar:
  - a. Male
    - To attend one seminar
    - To discuss with 5-6 core participants (including quack) of seminar conducted earlier.
  - b. Quack
    - To attend in seminar
    - Meeting with some quacks and pharmacy assistants
7. Publicity:
  - Checking of Posters in different offices, Pharmacy, School, Hotel, Barbar shop.
8. Patient Care Follow-Up
  - Interview with 2-3 patient already cared previous day
  - To talk with attendants of demonstration meeting
9. Supervision:
  - To check the diary of P.O. & ORW
  - To see physically reality of feed-back on following day.
  - Practical observation of the process of supervision of minimum 2 ORWs.
  - Spot checking of previous ORW work:



- Mog Checking
  - LGS preparation by taught women
  - Enquiry on-points (important)
  - Meeting with ORWs, if necessary
10. Management, Administration & Accounts:
- Daily Roster, Diary, Files and Registers, Reports, Stock & Account
  - Discussion with all team members

**REINFORCEMENT TEAM:**

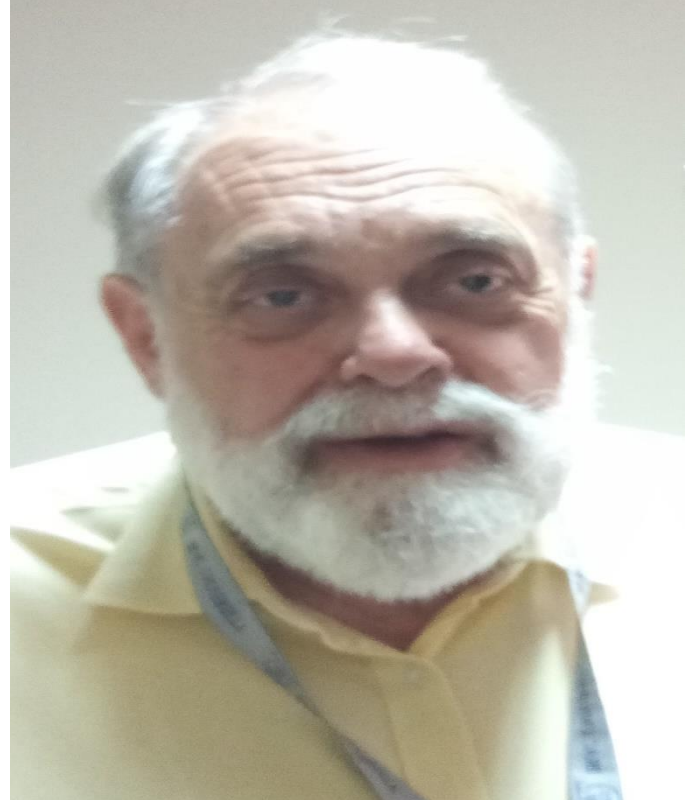
1. Monitoring:
  - Compare rough list with final form
  - Sample vial checking
  - 4-5 interviewed women follow-up
  - Physical observation or minimum 2 monitoring of individual P.O.
2. Reinforcement:
  - To discuss with 5-6 core participants of seminar already conducted
  - To attend at least one seminar
  - Interview with 4 points of ORW team follow-up by reinforcement team
  - To attend one demonstration meeting
3. Usage Survey:
  - To check survey register
  - Attend physically 3 users & 3 non-users of LGS
  - Physical presence during survey for 1 day at least.
4. Management, Administration & Accounts:
  - Daily Roster, Diary, Files & Registers, Stock & Accounts
  - Discussion with all members of the team.

**CSP:**

1. Diarrhoea Control Committee:
  - To meet with Upazila Chairman/UNO and UHFPO
  - To meet with 4-5 members of the committee
2. Health Committee:
  - To meet with all Committee Heads
  - Arrange meeting
3. Male Contact:
  - To meet with first 5 people of any village
  - Attend at least one meeting
  - Follow-up 5 persons attended meeting earlier.

4. Dai:
  - Attending one Trg. for last 2 days
  - 5% visit to trained Dai
  - To meet with some pregnant and lactating mothers
  - To meet with Pt. treated by Dai
5. Gram Shebika:
  - Attend one Trg. from 3rd days
  - To meet with 5% trained Shebika
  - To meet with Pt. treated by Shebika
  - Checking of LGS use
  - Checking of other jobs performing by Shebika
6. Immunisation:
  - Client selection, Spot checking, Use of instruments of materials
7. Pt. Care & Follow-Up:
  - Interview with 2-3 pts. already cared
8. School Forum:
  - Base village school visit, Furthest school visit
  - Attend school forum
9. Other Forum:
  - To meet with Imam of base village mosque and village doctors
10. Supervision:
  - Dairy check-up, Direct field supervision, Meeting with workers
11. Management, Administration and Accounts:
  - Daily Roster, Files, registers, records, Stock & accounts
  - Discussion with all workers.

**Appendix 5: Photographs of the inventors of ORS**



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*David Nalin and Richard Cash*

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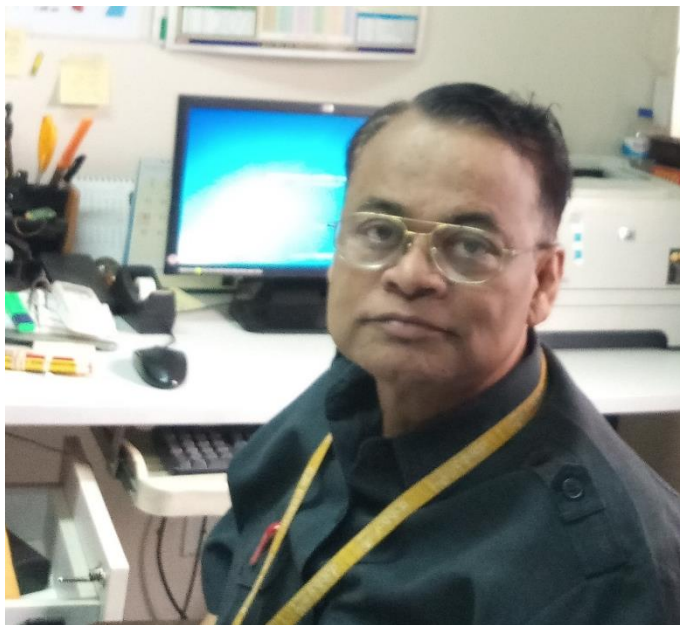
*Rafiqul Islam and Majid Molla*

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**Appendix 6: Some important personalities of ICDDR,B and BRAC who had significant contributions in the development of ORS formula and its application.**



Emeritus scientist of ICDDR,B, Dr. Mohammad Yunus



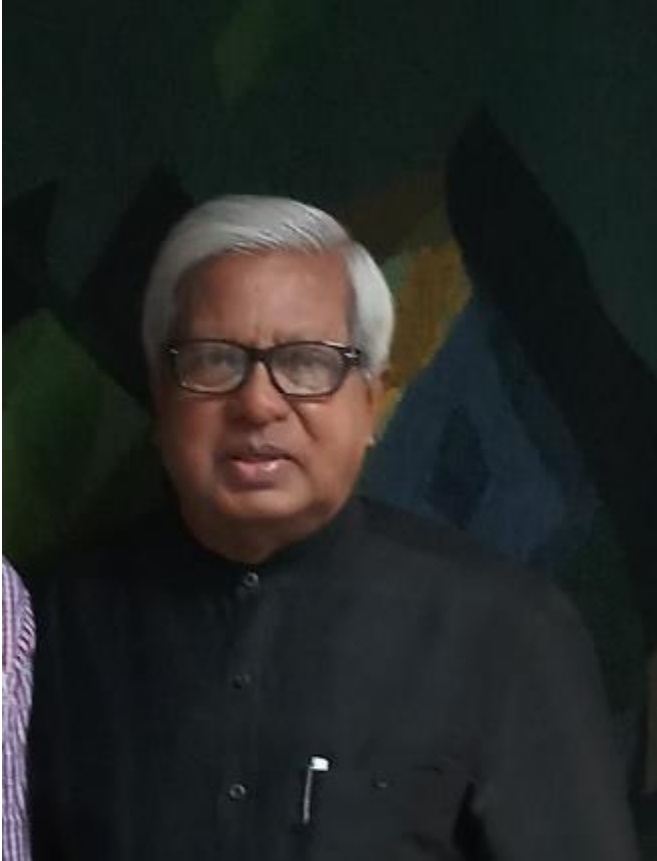
Environmental microbiologist and head of the environmental microbiology laboratory of ICDDR,B



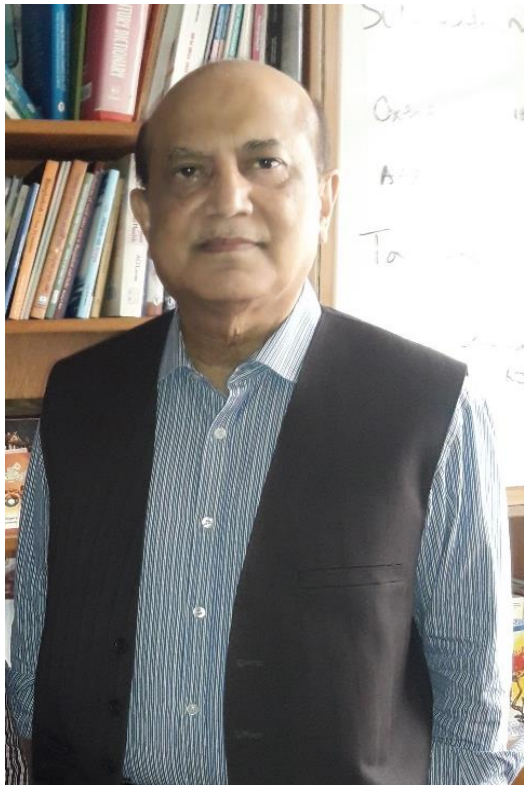
M. A. Wahed, retired scientist of ICDDR,B and consultant of the field laboratory of BRAC for the measurement of ORS ingredients.



Dr. Masood-ul-Haque Munshi, retired director of ICDDR,B, Teknaf Project

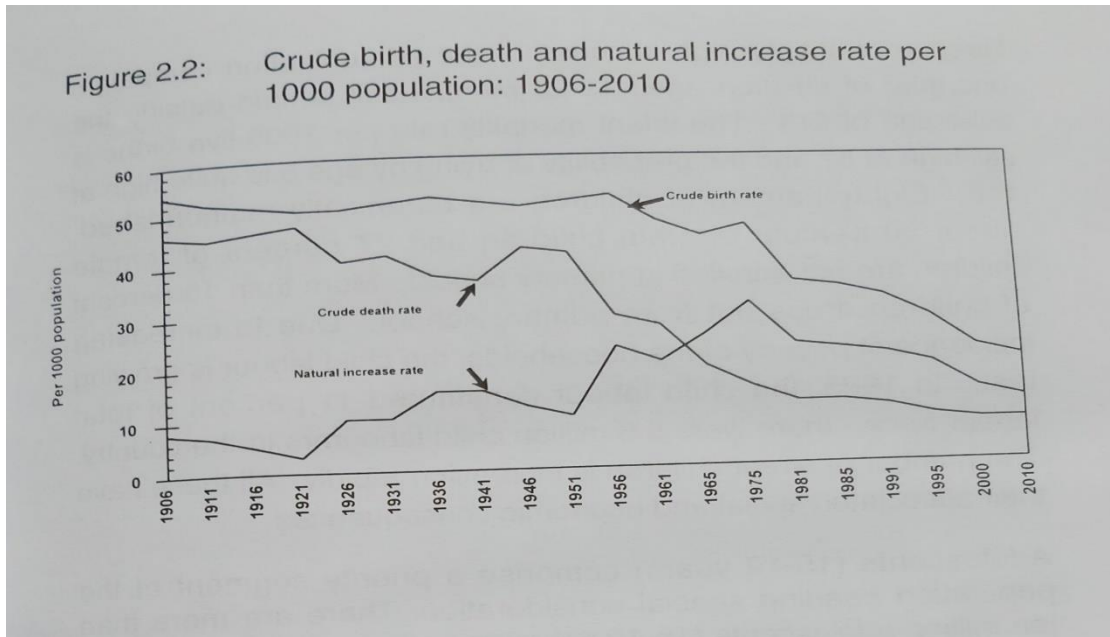


Sir Fazle Hasan Abed, founder and Chair of BRAC.



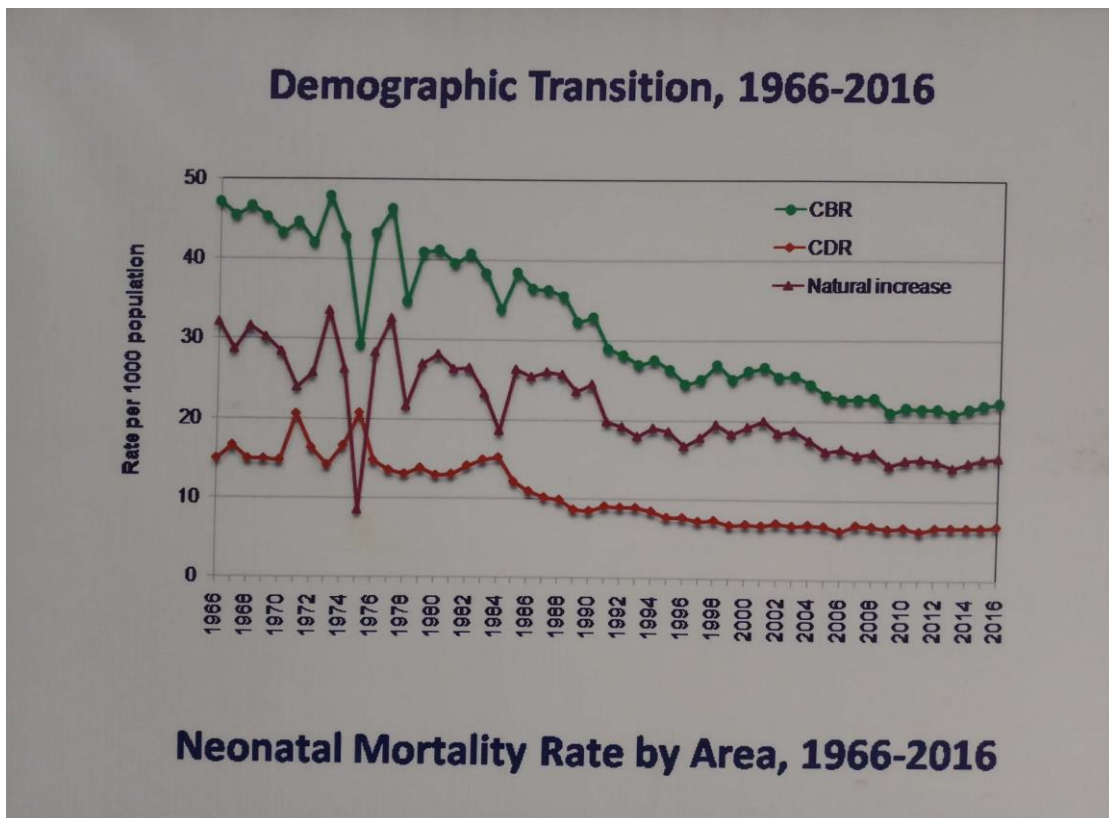
Professor Mushtaque Chowdhury, Vice Chair of BRAC.

**Appendix 7: Crude birth, death and natural increase rate per 1000 population in Bangladesh: 1906-2010**

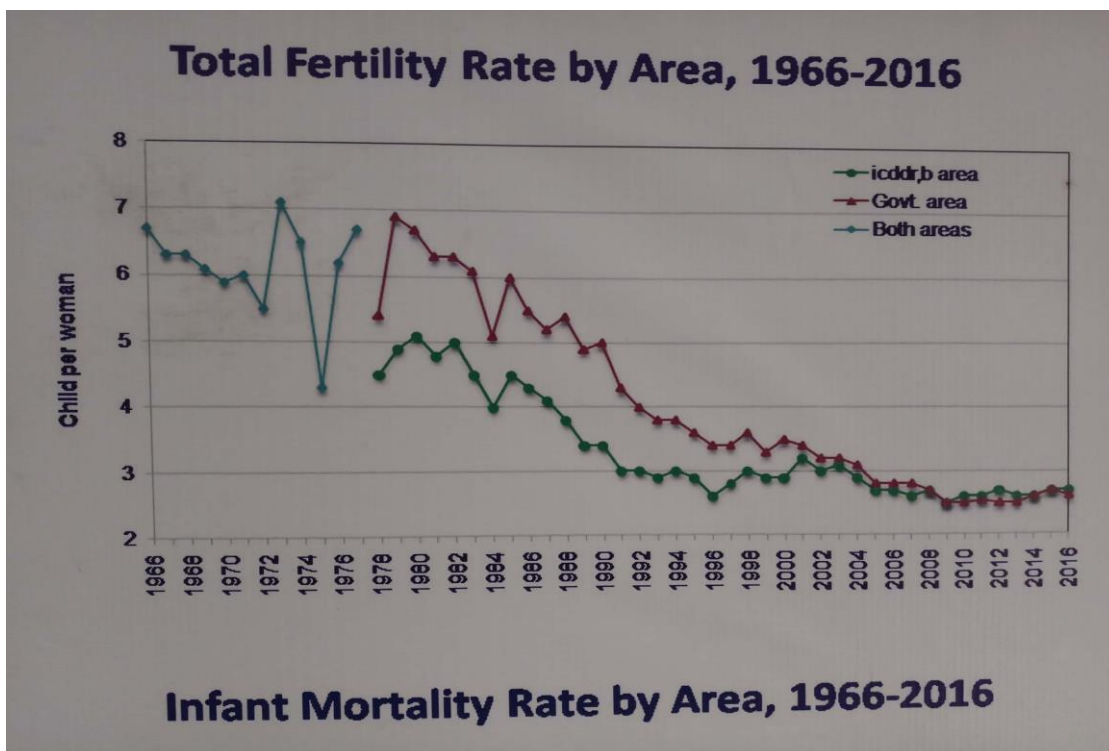


Crude birth, death and natural increase rate per 1000 population: 1906-2010 in Bangladesh. Source: Ministry of Health & Family Welfare. (1999). Population, Size, Structure and Features: Human Developmental Imperative. In *Population and Development, Post ICPD: Achievements and Challenges in Bangladesh* (pp. 31–44). Dhaka: Ministry of Health and Family Welfare, Government of Bangladesh.

Appendix 8: Some graphs collected from ICDDR,B, Matlab

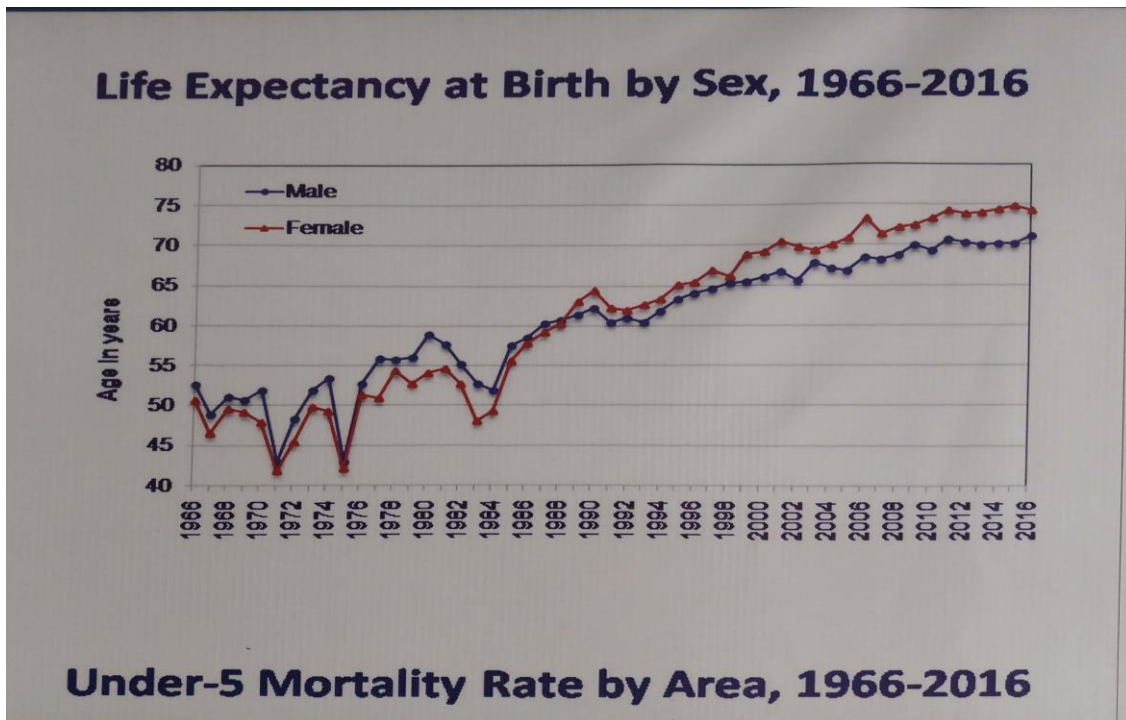


Demographic transition from 1966 to 2016 in Bangladesh. Collected from ICDDR,B Matlab Hospital

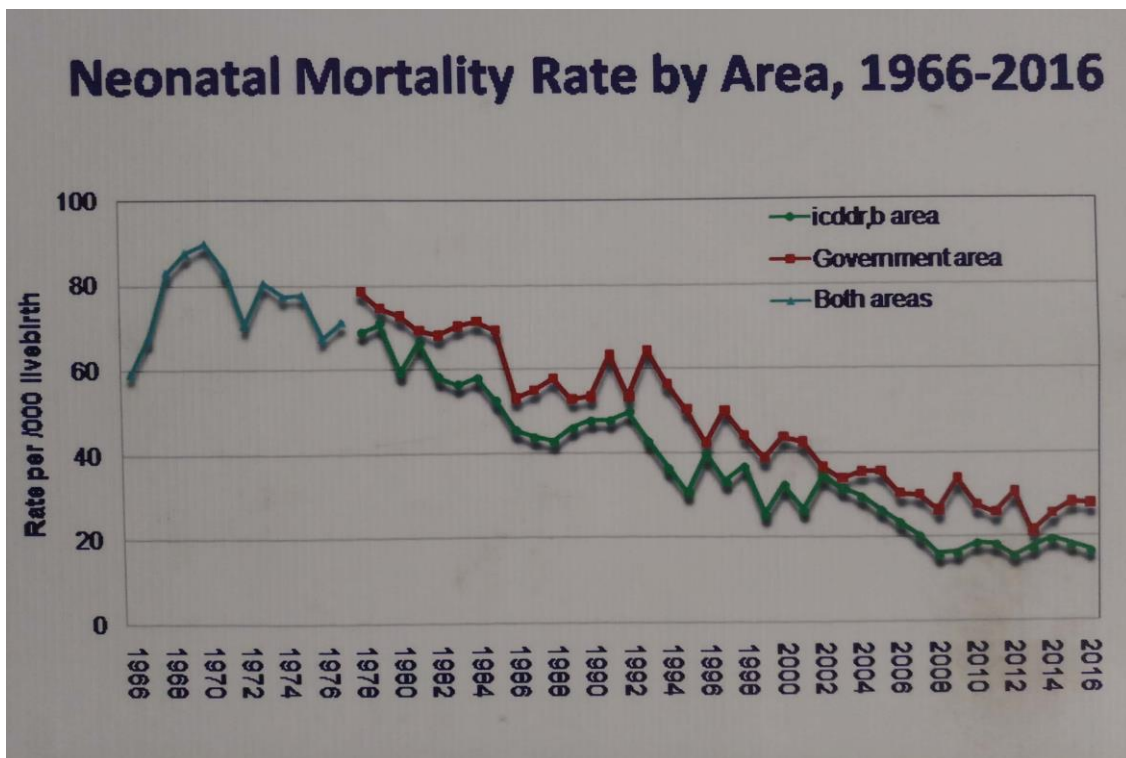


Trend of fertility rate in Bangladesh from 1966 to 2016. Collected from ICDDR,B Matlab Hospital

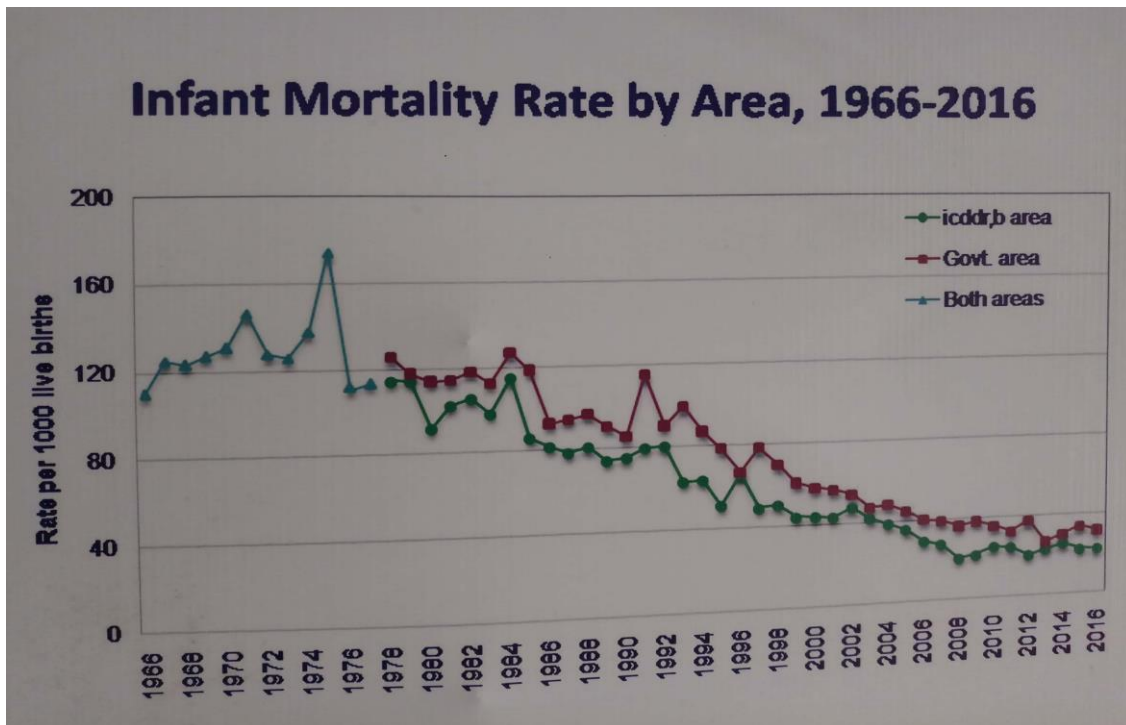




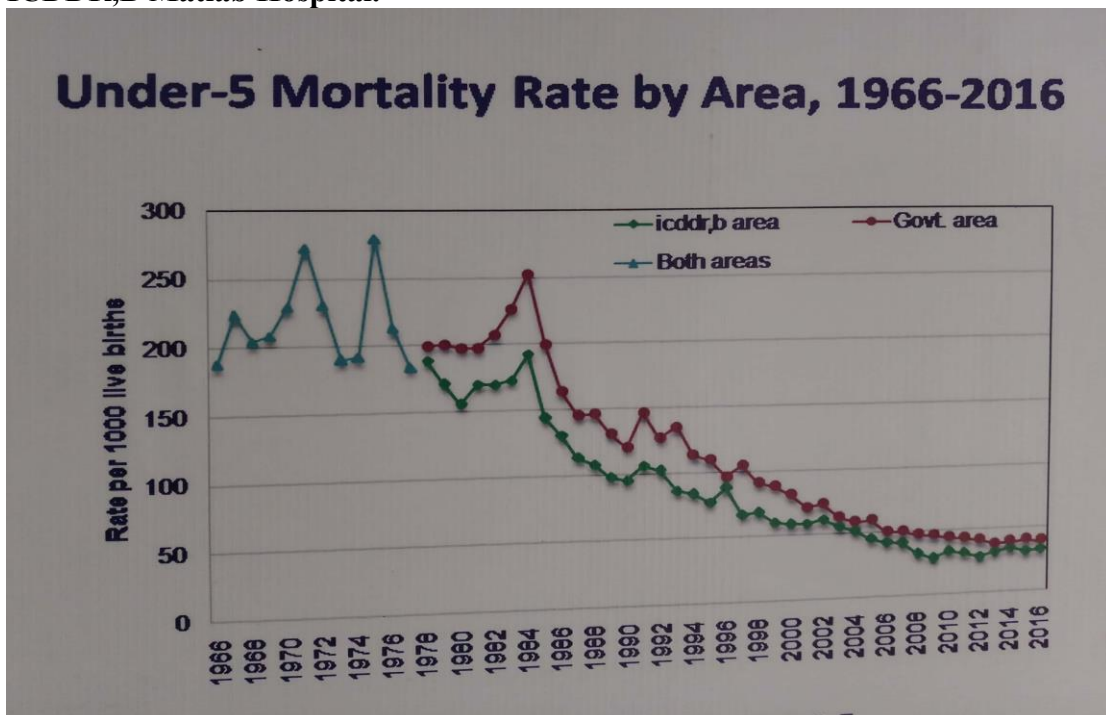
Life expectancy at birth by sex in Bangladesh from 1966 to 2016. Collected from ICDDR,B Matlab Hospital



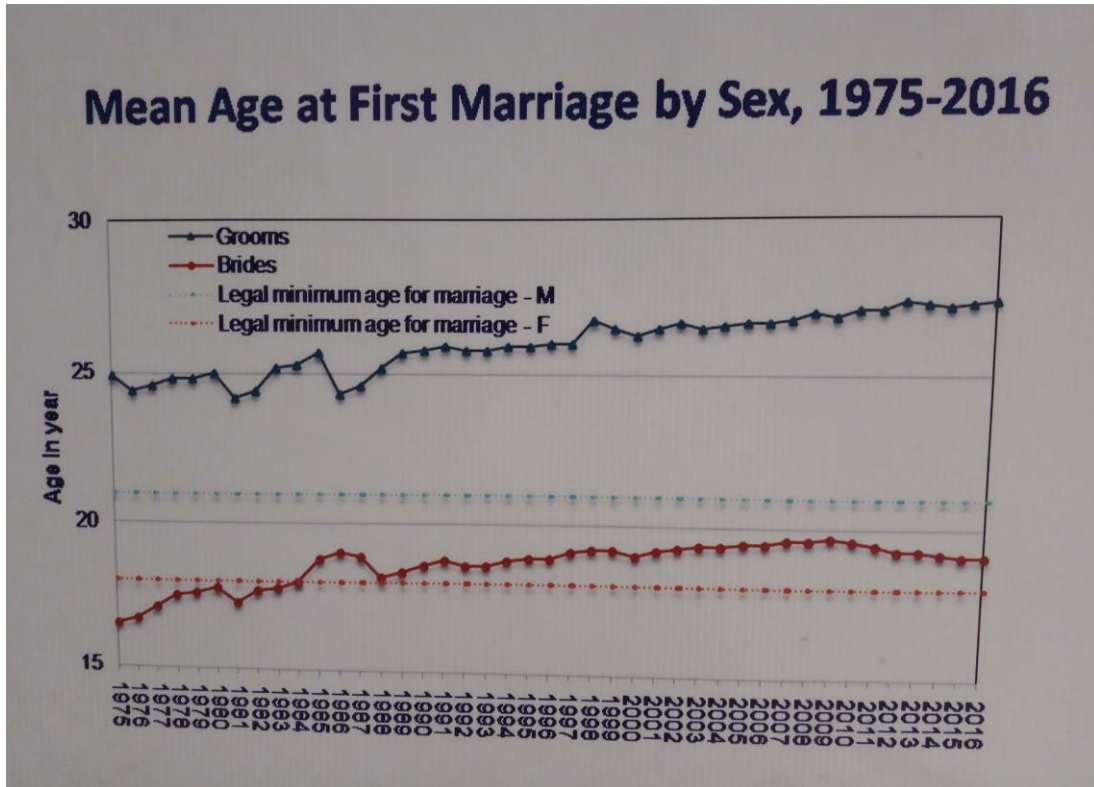
Neonatal mortality rate in Bangladesh from 1966 to 2016, comparison between government area and ICDDR,B surveillance area in Matlab. Collected from ICDDR,B Matlab Hospital.



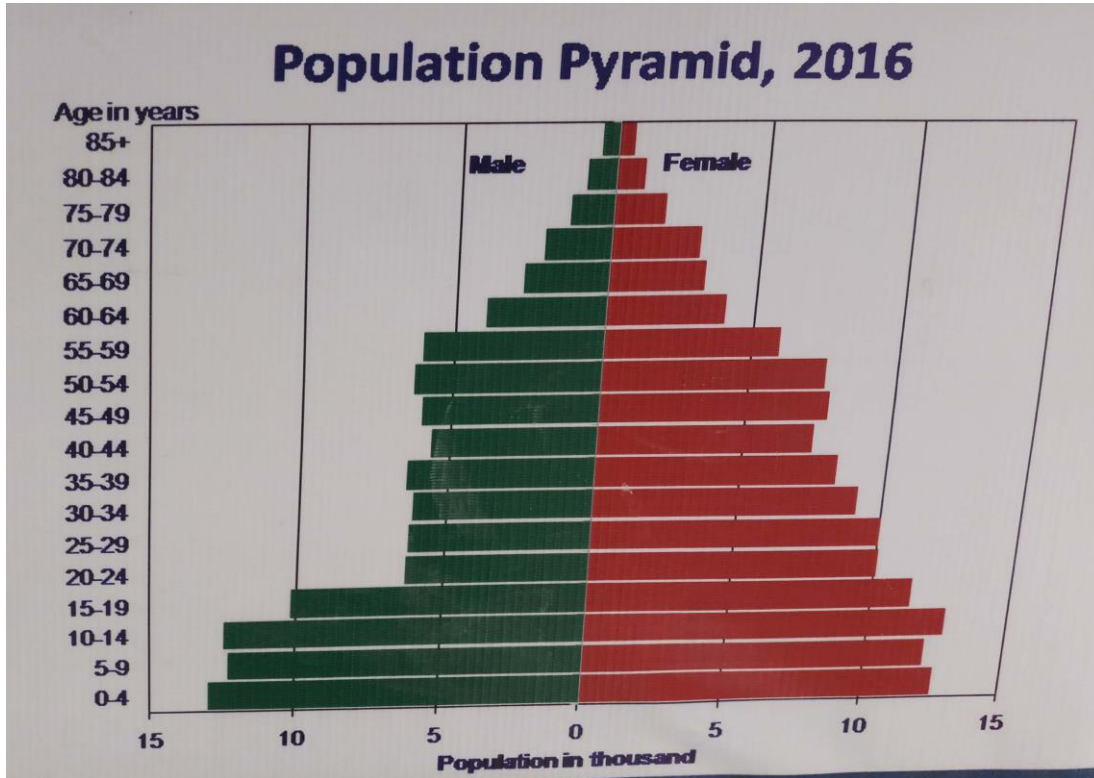
Infant mortality rate in Bangladesh from 1966 to 2016, comparison between government area and ICDDR,B surveillance area in Matlab. Collected from ICDDR,B Matlab Hospital.



Under-5 mortality rate in Bangladesh from 1966 to 2016, comparison between government area and ICDDR,B surveillance area in Matlab. Collected from ICDDR,B Matlab Hospital.



Mean age at first marriage by sex in Bangladesh from 1975 to 2016. Collected from ICDDR,B Matlab Hospital



Population pyramid of Bangladesh in the year of 2016. Collected from ICDDR,B Matlab

রেজিষ্টার্ড নং সি এ-১

বাংলাদেশ গেজেট

গণপ্রজাতন্ত্রী বাংলাদেশ  
সরকার

অতিরিক্ত সংখ্যা  
কর্তৃপক্ষ কর্তৃক প্রকাশিত

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বুধবার, এপ্রিল ২২, ১৯৯৮

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বাংলাদেশ জাতীয় সংসদ  
ঢাকা, ২২শে এপ্রিল, ১৯৯৮/৯ই বৈশাখ, ১৪০৫

সংসদ কর্তৃক গৃহীত নিম্নলিখিত আইনগুণি ২২শে এপ্রিল, ১৯৯৮ (৯ই বৈশাখ, ১৪০৫) তারিখে রাষ্ট্রপতির সম্মতি লাভ করিয়াছে এবং এতদ্বারা এই আইনগুণি সর্বসাধারণের অবগতির জন্য প্রকাশ করা যাইতেছে :-

১৯৯৮ সনের ৫ নং আইন

**International Centre for Diarrhoeal Disease Research, Bangladesh Ordinance, 1978 (LI of 1978)** এর অধিকতর সংশোধনকল্পে প্রণীত আইন

সেহেতু নিম্নবর্ণিত উদ্দেশ্য পূরণকল্পে International Centre for Diarrhoeal Disease Research, Bangladesh Ordinance, 1978-এর অধিকতর সংশোধন সমীচীন ও প্রয়োজনীয়;

সেহেতু এতদ্বারা নিম্নরূপ আইন করা হইল :-

১। সংক্ষিপ্ত শিরোনাম।—এই আইন International Centre for Diarrhoeal Disease Research, Bangladesh (Amendment) Act, 1998 নামে অভিহিত হইবে।

২। Ordinance LI of 1978-এর section 1-এর সংশোধন।—International Centre for Diarrhoeal Disease Research, Bangladesh Ordinance, 1978 (LI of 1978)-এর section 1-এর sub-section (2)-এর পরিবর্তে নিম্নরূপ sub-section (2) প্রতিস্থাপিত হইবে, যথা :

"(2) It shall continue in force for a period of 50 years with effect from 9th December 1978."

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(৫৭২১)  
মূল্য : টাকা ১.০০

*[Published in the Bangladesh Gazette, Extraordinary, dated the 9th December 1978.]*

GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH  
MINISTRY OF LAW AND PARLIAMENTARY AFFAIRS

NOTIFICATION

Dacca, the 9th December, 1978.

No. 920-Pub.—The following Ordinance made by the President of the People's Republic of Bangladesh, on the 6th December, 1978, is hereby published for general information:—

**INTERNATIONAL CENTRE FOR DIARRHOEAL DISEASE RESEARCH,  
BANGLADESH ORDINANCE, 1978.**

**Ordinance No. LI of 1978.**

AN

ORDINANCE

*to provide for the establishment of an International Centre for Diarrhoeal Disease Research, Bangladesh.*

WHEREAS it is expedient to provide for the establishment of an international centre for diarrhoeal research in Bangladesh with multinational scientific collaboration and financial contributions to conduct research on diarrhoeal diseases and directly related subjects of nutrition and fertility with special relevance to developing countries and for matters ancillary thereto;

Now, THEREFORE, in pursuance of the Proclamations of the 20th August, 1975, and the 8th November, 1975, and in exercise of all powers enabling him in that behalf, the President is pleased to make and promulgate the following Ordinance:—

1. **Short title and Duration.**—(1) This Ordinance may be called the international Centre for Diarrhoeal Disease Research, Bangladesh.

(2) It shall continue in force for a period of 25 years.

Price: 35 paise.

2. **Definitions.**—In this Ordinance, unless there is anything repugnant in the subject or context,—

- (a) "Board" means the Board of Trustees for the Centre constituted under section 8;
- (b) "Centre" means the International Centre for Diarrhoeal Disease Research, Bangladesh established under section 3;
- (c) "Chairman" means the Chairman of the Board;
- (d) "Cholera Research Laboratory" means the Cholera Research Laboratory established in Bangladesh under an agreement executed on 15th May, 1974, between the Government of the People's Republic of Bangladesh and the Government of the United States of America and others;
- (e) "developing countries" mean those countries who have been put under this classification by the United Nations;
- (f) "Director" means Director of the Centre;
- (g) "donor" means an agency, organization, or government which contributes in cash or kind to the Centre;
- (h) "employee" includes regular, contractual and probationers employed by the Centre;
- (i) "member" means a member of the Board;
- (j) "officer" includes advisor, consultant and expert employed by the Centre;
- (k) "prescribed" means prescribed by by-laws made under this Ordinance.

3. **Establishment and Incorporation of the Centre.**—(1) There shall be an international centre to be called the "International Centre for Diarrhoeal Disease Research, Bangladesh" for carrying out the purposes of this Ordinance.

(2) The Centre shall be a body corporate having perpetual succession and common seal with power, subject to the provisions of this Ordinance, to acquire, hold and dispose of property, both movable and immovable, and shall by the said name sue and be sued.

(3) The Centre shall be an autonomous, international, philanthropic, and non-profit centre for research, education and training as well as clinical service.

4. **Headquarters of the Centre.**—(1) The Headquarters of the Centre shall be at Dacca.

(2) The Centre may establish such subsidiary offices of research stations as may be decided by the Board as being necessary for effective conduct of its programme subject to the approval of the respective governments.

5. **Aims and objectives of the Centre.**—(1) The aims and objectives of the Centre shall be:

- (a) To function as an institution to undertake and promote study, research and dissemination of knowledge in diarrhoeal diseases and directly related subjects of nutrition and fertility with a view to developing improved methods of health care and for the prevention and control of diarrhoeal diseases and improvement of public health programmes with special relevance to developing countries.
- (b) To provide facilities for training to Bangladeshi and other nationals in areas of the Centre's competence in collaboration with national and international institutions, but not to include conferring of academic degrees.

(2) In fulfilling the above aims and objectives, the Centre shall have responsibilities:

- (a) To conduct clinical research, laboratory and animal experiments, epidemiological and survey research, field investigations, demonstration projects, within the applicable laws and regulations, or concurrence where necessary, of the Government and other countries where it may be appropriate; to hold meetings and to arrange lectures, seminars, discussions and conferences, both international and national, on clinical medicine, epidemiology, basic medical sciences, bio-statistics, demography, fertility and other social sciences relating to studies of diarrhoeal disease control and public health, in this section referred to as the studies.
- (b) To publish books, periodicals, reports and research and working papers on the studies.
- (c) To establish and maintain contact with scholars and their work on the studies through collaborative studies, seminars, exchange of visits or otherwise.
- (d) To undertake studies on behalf of or in collaboration with other institutions.
- (e) To maintain hospitals, clinics, laboratories, animal research facilities, libraries, reading rooms, scientific equipment and instruments, as well as vehicles, boats and other transport for its proper functioning.
- (f) To ensure the rights and opportunities of Bangladesh scientific personnel to participate in the programme and activities of the Centre.
- (g) To undertake a systematic staff development programme.
- (h) To institute fellowships for different categories of professional workers on the studies.
- (i) To create within itself, from time to time, branches, divisions, sections and other units for proper and efficient conduct of the activities of the Centre in different fields of the studies.
- (j) To accept endowments, gifts, donations, grants, other funds, payments for services and to earn income.
- (k) To take such other actions as may further the aims and objectives of the Centre.

**6. Interim International Committee.**—(1) There shall be an Interim International Committee for the purpose of assisting in the establishment of the Centre. The Interim Committee shall consist of the United Nations Development Programme which shall be its Chairman and the following initial members, namely:—

- (a) the Government of Australia;
- (b) the Government of Bangladesh;
- (c) the Government of the United Kingdom;
- (d) the Government of the United States of America;
- (e) the Ford Foundation;
- (f) the International Development Research Centre;
- (g) the United Nations Fund for Population Activities;
- (h) the United Nations Children Fund; and
- (i) the World Health Organisation.

(2) The Chairman of the Interim Committee may invite any other Government or Organisation to become members of the Interim Committee or to attend its meeting as observers.

(3) The Interim Committee shall function through the representatives of its members. It shall meet at the call of the Chairman and shall conduct its business at such meeting. The decision of a meeting shall be taken either by consensus or by a majority of votes of the members present and voting, including the Chairman, each member having one vote. Majority of the members of the Interim Committee including its Chairman shall constitute a quorum. Subject to these provisions, the business of the Interim Committee shall be regulated by the rules of procedure adopted by it.

(4) Unless otherwise decided by the Interim Committee the Secretariat of the Interim Committee shall be located in the premises of the Cholera Research Laboratory.

(5) The Interim Committee shall take steps for the establishment of the Board. For this purpose it shall elect not less than seven nor more than eleven members for the first Board to be constituted under this Ordinance. It shall also specify the date on which the first Board shall assume its functions under this Ordinance.

(6) The Interim Committee shall stand dissolved on the day on which the Board holds its first meeting, unless the Board by a Resolution continues the existence of the Interim Committee for such period and for the purpose as may be specified in the Resolution.

**7. Powers and Functions of the Board.**—(1) The general direction, management and administration of the affairs of the Centre shall vest in the Board which shall have full authority to determine and execute the policies and undertakings of the Centre within the framework of this Ordinance.



(2) Without prejudice to the generality of the foregoing provisions, the Board shall, in particular, have power—

- (a) to exercise general supervision over the affairs of the Centre;
- (b) to approve courses of studies and research work and other related activities to be conducted in the Centre in broad outlines;
- (c) to approve the plan, programme and organisation of the Centre;
- (d) to authorize the Centre to request and receive grants-in-aid from aid-giving agencies, Governments and other institutions; with intimation of such receipts to appropriate governmental agencies;
- (e) to authorize the Centre, if and when necessary, to borrow money or raise loans in accordance with the applicable laws and regulations of the countries in which the funds are being sought;
- (f) to select and appoint the Director and terminate his services;
- (g) to approve establishment of all international level positions in the Centre and approve the appointments of persons to these positions, and in its description, delegate to the Director authority to appoint persons to other staff positions;
- (h) to determine employment policies and practices of the Centre;
- (i) to examine and approve the budget for the Centre; and
- (j) to do and perform all other acts that may be considered necessary, suitable and proper for the attainment of any or all of the purposes, activities and objectives for which the Centre is established.

8. **Constitution of the Board.**—(1) The Board shall consist of sixteen members who shall serve in their individual capacity as follows:—

- (a) three members nominated by the Government;
- (b) a member nominated by the Director-General of the World Health Organisation;
- (c) the Director of the Centre; and
- (d) eleven members at large, who shall be chosen initially by the Interim Committee, comprising as members of the Interim Committee those governments and organizations under sub-sections (1) and (2) of section 6;

(2) At any given time, no country shall have more than two members except for Bangladesh under sub-section (1).

(3) At any given time, the Board shall be so composed that, not counting the members nominated by the World Health Organisation, more than 50% must come from the developing countries, including the members nominated by Bangladesh, and not less than one-third from developed countries. The Director shall be counted as coming from the developed or developing countries depending upon nationality.

(4) The members shall be individuals qualified to serve by reason of scientific, research, administrative or other appropriate experience.

(5) Except for the Director, all members shall be appointed to fill three-year terms, except for members of the initial Board. In the initial Board, all members except the Director shall be divided into three classes of approximately equal numbers, these classes serving terms of one, two and three years respectively. The Board shall decide how many members shall be in each class, and the members of each class shall be chosen by lot.

(6) Vacancies in seats of members at large shall be filled by the Board. A member appointed to a vacancy arising from a cause other than the normal expiration of a term shall serve for the remainder of the term of the member being replaced. No member may serve more than two consecutive three-year terms or portion thereof, except that a member serving a term of less than three years on the initial Board may serve two consecutive three-year terms immediately thereafter.

9. **The Chairman.**—(1) The members shall elect one of them except the Director as Chairman for a term to be determined by the Board.

(2) The Chairman shall preside over the Board meetings.

(3) In the absence of the Chairman, the members present may appoint one of them as the Chairman for that meeting.

10. **Meetings of the Board.**—(1) The meetings of the Board shall be held at such time, place and manner as may be prescribed. A majority of the sitting membership shall constitute a quorum.

(2) Except for the first year, at least two meetings of the Board shall be held in one calendar year.

(3) In the meeting of the Board, each member shall have one vote, but in the event of equality of votes, the Chairman shall have the second or casting vote.

11. **Validity of Proceedings.**—(1) No act or proceedings of the Board shall be invalid merely on the grounds of the existence of any vacancy in or defect in the constitution of the Board. A vacancy in the Board or a temporary absence of a member for any reason shall not impair the right of the remaining members to act.

(2) All acts done by a person acting in good faith as the Chairman or member shall be valid, notwithstanding that it may afterwards be discovered that his appointment was invalid by reason of any defect or disqualification or had terminated by virtue of any provision of law for the same being in force; but nothing in this section shall be deemed to give validity to any act of the Chairman, member or Director after his appointment has been shown to be invalid or to have been terminated.

12. **Committees.**—(1) The Board may designate an Executive Committee of its members who shall have the power to act for the Board in the interim between Board meetings on all matters which the Board delegates to it. The Director and at least one of the Bangladeshi members shall serve as members of the Executive Committee.

(2) All interim actions of the Executive Committee shall be reported to the Board at its next subsequent meeting.

(3) The Board shall convene, at least once in two years, an external Scientific Review Committee from developing and developed countries of such numbers as the Board may decide for the purpose of carrying out a technical review of the scientific programmes of the Centre.

(4) The Board shall create a Programme Co-ordination Committee for the purpose of co-ordination of research in Bangladesh and may create such other standing committees or *ad hoc* committees as may be deemed necessary for carrying out the responsibilities of the Centre. The Centre shall be supportive of, and avoid actions prejudicial to, the interest of research in similar fields carried out by other organizations in Bangladesh. A standing committee with representatives from the Government shall be set up for the purpose of co-ordinating research by the Centre with that of other organizations specifically in fertility and related fields in Bangladesh.

(5) The Board shall authorize the creation of an Ethical Review Committee with representation from the Bangladesh Medical Research Council.

(6) The Board may delegate its functions and powers to such committees as may be prescribed.

(7) The powers, functions and duties of different committees shall be such as may be prescribed.

13. **Director.**—(1) The Centre shall be administered by a Director who shall be selected and appointed by the Board for a term of three years which may be renewable for another term.

(2) The Director shall be the Chief executive of the Centre and subject to the provisions of this Ordinance, and the by-laws made thereunder, he shall administer and manage the affairs and funds of the Centre.

(3) The Director shall be responsible for implementation of the decisions of the Board in directing, conducting and carrying out research and other activities of the Centre.

(4) The Director may be assisted by a Deputy Director who shall be selected and appointed by the Board, in all matters assigned to him by the Director and shall act as the Director during the Director's absence, serving as a member of the Executive Committee but not assuming the seat of the Director on the Board.

14. **Salaries, etc.**—(1) Persons including Bangladeshi nationals appointed to the international level positions of the Centre by the Board shall receive the same privileges and salaries for equivalent positions; restrictions on pay and allowances imposed by the Government upon its nationals shall not be applicable.

(2) Salaries and emoluments of non-international level positions should be comparable to those paid by the United Nations organizations in Bangladesh.

15. **Indemnity.**—The Chairman, members, Director, officers and employees shall be indemnified by the Centre against all losses and expenses incurred by them in or in relation to the discharge of their duties, except such as have been caused by their wilful act of default or negligence.

16. **Public Servant.**—The Chairman, members, Director, officers and employees shall while acting or purporting to act in pursuance of any provision of this Ordinance or by-laws made thereunder, be deemed to be a public servant within the meaning of section 21 of the Penal Code (Act XLV of 1860).

17. **Fund.**—(1) The Centre shall have its own fund which shall consist of—

- (a) grants made by the Government;
- (b) grants and contributions from other governments and their agencies, international organizations and private organizations;
- (c) gifts and endowments;
- (d) sale proceeds and royalties of publications;
- (e) income from research and contractual undertakings; and
- (f) other sources.

(2) All funds of the Centre shall ordinarily be kept in any nationalized Bank or Banks in Bangladesh as approved by the Board.

18. **Accounts of Receipts and Expenditure.**—(1) The Director shall maintain the accounts of all receipts and expenditures of the Centre in the manner as may be prescribed and such accounts shall be audited annually by Chartered Accountants as may be appointed by the Board in this behalf, a report of which shall be submitted to the Board.

(2) Copies of such audited reports shall be supplied to the donors.

19. **Annual Report and Statement of Accounts.**—The Director shall, as soon after the end of every financial year as may be directed by the Board, prepare for the Board an annual report of the working of the Centre and a statement of receipts and expenditure of the Centre. Following the approval by the Board it shall be circulated to the donors.

20. **Exemption from Labour Laws.**—(1) The Centre shall be exempted from the labour laws in force in the country. It shall be governed by its own by-laws as may be prescribed.

(2) The Centre shall not be construed as a “shop”, “commercial establishment”, “industrial establishment”, “factory” or “industry” within the meaning of the Shops and Establishment Act, 1965 (VII of 1965), the Factories Act, 1965 (IV of 1965) or the Industrial Relations Ordinance, 1969 (XXIII of 1969).

21. **Exemption from tax, rate and duty.**—(1) Notwithstanding anything contained in any law for the time being in force relating to any tax, rate or duty, the Centre shall not be liable to pay any tax, rate or duty other than those paid by any other person in respect of any movable or immovable property which the Centre purchases or otherwise acquires from such person and other than those payable in respect of public utilities like water, gas, electricity, telephone and municipal rates.

(2) All non-Bangladeshi experts, technicians and research scholars employed by the Centre and working in Bangladesh for the furtherance of the objectives of the Centre shall be exempt, notwithstanding the provisions of the Income Tax Act, 1922 (XI of 1922), from payment of income tax in respect of any salary or other remuneration received or deemed to be received by them or accruing or arising, or deemed to accrue or arise in Bangladesh to them; if such salary or other remuneration of the person is also exempt from the payment of tax in the country of his domicile or permanent residence and evidence in respect of the said exemption is produced to the income tax authority concerned in Bangladesh. Such person shall also be accorded privileges for importation of personal and household effects and articles for consumption free of customs duty and sales tax as are accorded, under laws and regulation in force from time to time, to the expatriate experts, technicians and consultants working in Bangladesh under international agreements.

**22. Immunities and privileges of officers and employees.**—The Chairman, Trustee, Director, Officers, and employees—

- (a) shall be immune from any legal process with respect to any acts performed by them in their official capacity except when the Board or the Director waives their immunity, which should be reported to the Board; and
- (b) those who are nationals of countries other than Bangladesh, and their spouses and dependents, shall be free from immigration restrictions, other than normal visa requirements, and alien registration requirements in accordance with the laws and regulations of the Government.

**23. Immunities and privileges.**—(1) The Centre, its property and assets wherever located and by whomsoever held, shall enjoy immunity from every form of judicial process except for criminal offences for which the Board or the Director expressly waives its immunity for the purpose of any proceeding. Such action shall be reported to the Board.

(2) All property and assets of the Centre shall be free from any restrictions, regulations, controls and moratoria of any nature to the extent it is necessary to carry out the objectives and functions of the Centre effectively.

(3) Subject to national and international laws and regulations, the Centre shall be entitled to movement of biological materials in and out of the country.

**24. Waiver or Immunity, Exemption and Privileges.**—The Board may waive any of the privileges, immunities, and exemptions granted under this Ordinance in any particular case or instance, in such a manner and upon such conditions as it may determine to be appropriate in the best interest of the Centre.

**25. Free publication and dissemination of research.**—(1) The Centre shall enjoy the privilege of free publication and dissemination of its research and other scientific work.

(2) All research materials and scientific results shall be treated as property of the Centre and shall not be used, published, duplicated or transferred for private advancements or other material gains or used by any other institution without express approval of the Centre.

26. **Patents and Copyrights.**—(1) The Centre shall enjoy full rights of patents and copyrights with respect thereto under Bangladesh and foreign laws.

(2) It shall be the responsibility of the Board to ensure that appropriate arrangements are made concerning the public availability of patents, licences, copyrights and the like arising from the Centre's scientific results and discoveries.

27. **Benevolent fund.**—The Centre may establish benevolent fund for its officers and employees for the purpose of providing welfare amenities and facilities for their betterment and development, and the same shall be regulated in the manner as may be prescribed.

28. **Power to make by-laws.**—The Board may make by-laws for carrying out the purposes and provisions of this Ordinance.

29. **Government support for facilities.**—The Government may provide facilities and privileges to the Centre for its proper development and expansion including lease of land at nominal or no rent.

30. **Dissolution of the Cholera Research Laboratory.**—On the commencement of this Ordinance, the Cholera Research Laboratory, in this section referred to as the CRL, shall notwithstanding anything contained in any other law for the time being in force, or in any other instrument or in the agreement under which it was established, stand dissolved and upon the such dissolution—

(a) all assets and liabilities of the CRL shall stand transferred to, and vested in, the Centre.

*Explanation.*—(i) The term "assets" includes all rights, powers, authorities and privileges, cash and bank balances, grants and all other interests and rights, in or arising out of, such property and all books of accounts, registers, records and all other documents or whatever nature relating thereto; and all properties, movable and immovable which were owned, used and or possessed by the CRL other than land and buildings thereupon wherever they may be situated.

(ii) The term "liabilities" shall be limited to all obligations to claims on behalf of ex-employees of the CRL at the time of dissolution for compensation or under existing employment agreements or other contractual arrangements and vendors of goods and services to the CRL.

(b) all officers, employees, consultants, advisors, and other staff of the CRL shall hold their respective offices on the same terms and conditions and with the same rights and privileges which were enjoyed by them immediately before the commencement of this Ordinance and shall continue to do so until the same are duly altered by the Board.

31. **Valiation, etc.**—Notwithstanding the dissolution of the Cholera Research Laboratory, anything done or action taken in good faith in or in relation to the Cholera Research Laboratory before the commencement of this Ordinance shall be deemed to have been validly done or taken, and shall have and shall be deemed always to have had effect accordingly, and shall not be called in question in any court, except those currently under adjudication.

32. **Dissolution.**—(1) At any time that the Board may determine by vote of not less than three-fourths of its sitting members, whether or not present and voting, that the Centre is no longer able to function effectively or is no longer required, the Board may recommend to the Government the dissolution of the Centre.

(2) In the event of dissolution, any land or other assets made available to the Centre by the Government, and permanent fixed capital improvements thereon, shall revert to the Government. The other assets of the Centre shall be retained by the Government and by other governments where assets distributed to institutions having purposes similar to Government or other governments where appropriate, and the Board.

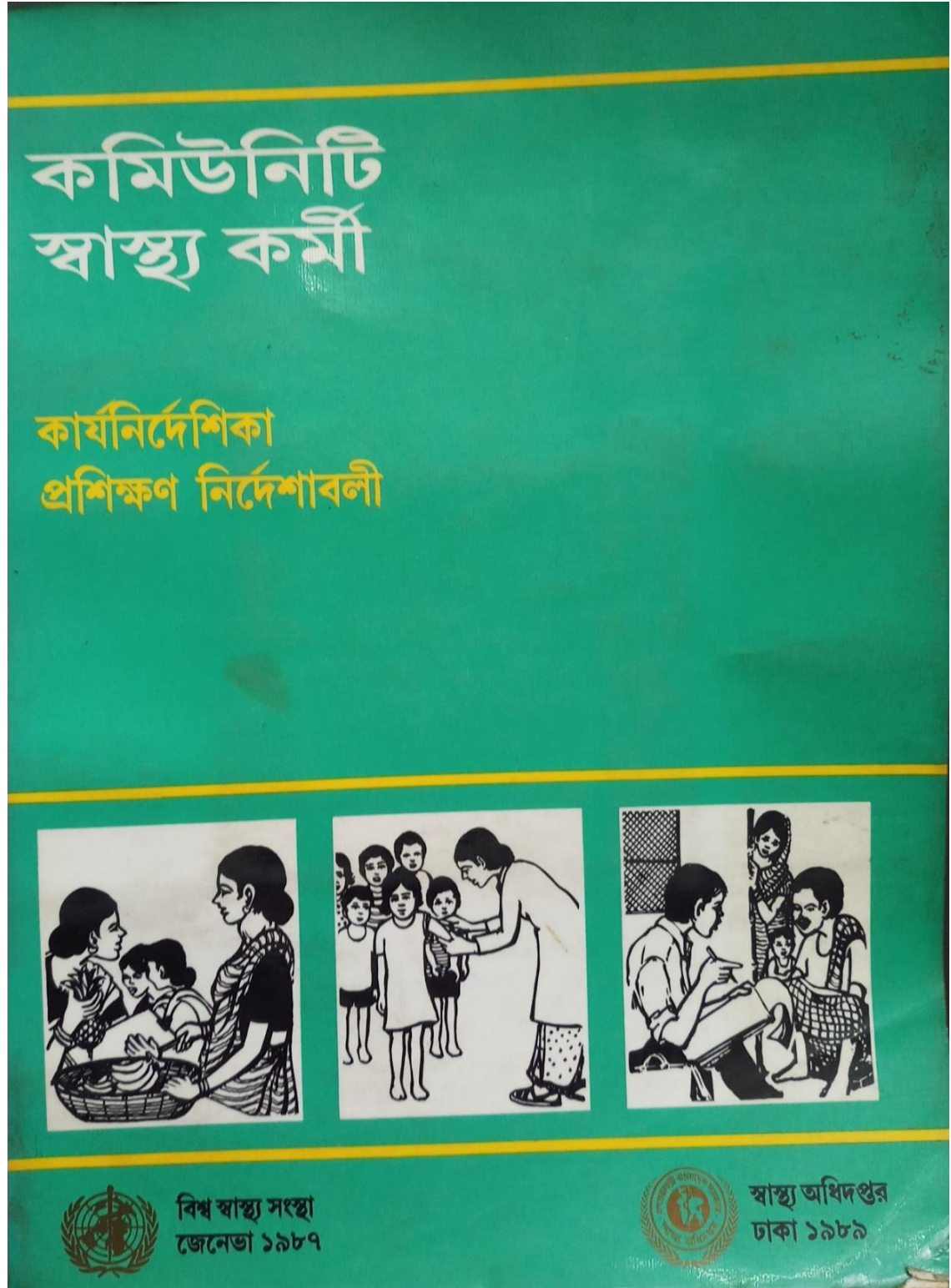
DACCA;  
The 6th December, 1978.

ZIAUR RAHMAN, BU  
MAJOR GENERAL,  
President.

A. K. TALUKDAR  
Deputy Secretary.

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Appendix 10: Instruction of health department of Bangladesh (1989) to the Community Health Workers about dairrhea.





WORLD HEALTH ORGANIZATION  
SOUTH EAST ASIA REGION



ORGANISATION MONDIALE DE LA SANTE  
REGION DE L'ASIE DU SUD-EST

OFFICE OF THE WHO REPRESENTATIVE FOR BANGLADESH  
Tel.: 504622 - 504523 - 503713

### VIEWS

I am glad that the Bengali version of "The Community Health Worker", one of the key publications of WHO is being published by the Directorate General of Health Services of the People's Republic of Bangladesh, with WHO assistance. I believe that the translation has been comprehensively accomplished and in keeping with the need for adapting it to the Bangladesh context. The book would surely be of use to health workers, their trainers and even the primary health care managers.

I must congratulate the Director General of Health Services, the Director, Primary Health Care and the Translators for accomplishing this difficult task and publishing the book in Bengali.

I am certain, this book will be extensively used in all the primary health care training programmes.

*A. N. A. Abeyesundere*

(DR. A. N. A. ABEYESUNDERE)  
WHO Representative in  
Bangladesh.

House-12, Road-7 D. R. A.  
Dhaka-1205, Bangladesh.

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ইউনিট ২৬

## ডায়রিয়া

কারো যদি দিনে অন্ততঃ ৩ বার পাতলা পায়খানা হয়, তাহলে তার ডায়রিয়া হয়েছে বলে মনে করতে হবে।

ডায়রিয়া হলে রোগীর শরীর থেকে পানি ও লবণ বেরিয়ে যায়, শরীরে পানি কমে যাওয়ায় রোগী খুব দুর্বল হতে পারে, এমন কি চিকিৎসা না হলে মারাও যেতে পারে।

চিকিৎসার জন্য রোগীকে খাবার স্যালাইন (লবণ, চিনি ও পানির শরবত) খেতে হবে। রোগী যাতে দুর্বল না হয় সে জন্য স্বাভাবিক খাবার খেতে হবে।

ডায়রিয়া শিশুদের জন্য বেশী বিপজ্জনক, কারণ সহজেই শিশুদের শরীরে পানি ঘাটতি দেখা দেয়। এই বিপদের কথা সব মায়েদের জানা উচিত।

### শিক্ষণ উদ্দেশ্য

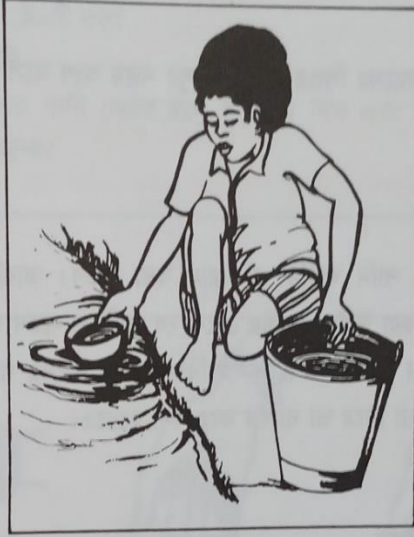
এই ইউনিট অধ্যয়নের পর আপনি সক্ষম হবেন :

- ১। কারো ডায়রিয়া হয়েছে কিনা বলতে।
- ২। যে চার উপায়ে ডায়রিয়া হতে পারে জনসাধারণের কাছে তা বর্ণনা করতে।
- ৩। যার ডায়রিয়া হয়েছে তার শরীরে পানি ঘাটতি হয়েছে কিনা তা নির্ণয় করতে।
- ৪। ডায়রিয়া রোগীর পানি ঘাটতি প্রতিরোধ করার জন্য প্রয়োজনীয় শরবত তৈরী করতে।
- ৫। ডায়রিয়া রোগীর পানি ঘাটতি দূর করার জন্য খাবার সেলাইন তৈরী করতে।
- ৬। ডায়রিয়া হলে কি করতে হবে, তা স্থির করতে, যখন ডায়রিয়ার সাথে :
  - ০ অন্য কোন উপসর্গ বা লক্ষণ নেই,
  - ০ অন্যান্য উপসর্গ ও লক্ষণ আছে।
- ৭। কিভাবে ডায়রিয়া প্রতিরোধ করতে হয়, সে সম্পর্কে জনগণকে পরামর্শ দিতে।

### কিভাবে ডায়রিয়া হয়

ডায়রিয়া রোগ জীবাণু দ্বারা সংঘটিত হয়, এসব জীবাণু শরীরে ঢুকে

- ০ ময়লা খাবার পানি- উদাহরণ স্বরূপ, পুকুর বা নদীর পানি, অরক্ষিত কুমার পানি অথবা ময়লা পাত্রে রক্ষিত পানি (ইউনিট ৪ দেখুন)।



- ০ নোংরা খাবার - যথাঃ ভালভাবে না ধোয়া খাবার, বাইরে অথবা গরম স্থানে অনেকক্ষণ ধরে রাখা রান্না করা খাবার, ময়লা, মাছি ও পশু থেকে অরক্ষিত খাবার।
- ০ নিরাপদ নয় এমন খাবার- রান্নার আগে দীর্ঘ সময় ফেলে রাখা কাঁচা খাবার যেমন মাছ, মাংস।
- ০ অপরিষ্কার হাত যথাঃ খাওয়ার আগে অথবা মল ত্যাগ বা কাজ করার পর হাত না ধোয়া।

ডায়রিয়া রোগীর পানি ঘাটতি হয়েছে কিনা তা কি করে বুঝতে হয়

ডায়রিয়া হলে শরীর থেকে পানি ও লবণ বেরিয়ে যায়। শরীরের জন্য ঐ লবণ ও পানি খুব প্রয়োজন, এর ফলে শরীর তাড়াতাড়ি দুর্বল হয়ে পড়ে। পানি ও লবণ শীঘ্র পূরন করা প্রয়োজন। যাদের শরীর থেকে বেশী লবণ ও পানি বেড়িয়ে গেছে তাদের পানি ঘাটতি দেখা দেয়।

তীব্র পানি ঘাটতির লক্ষণ গুলো হচ্ছেঃ

- ০ রোগী খুব তৃষ্ণার্ত,

অসুস্থ লোকের চিকিৎসা

- চোখ বসে যায়,
- মুখ ও জিহ্বা শুকিয়ে যায়,
- চামড়ায় চিমটি দিলে কুচকানো চামড়া পূর্ব অবস্থায় ফিরে আসবার পরিবর্তে কয়েক সেকেন্ড ঐ ভাবে থেকে যায়,
- নাড়ীর গতি দ্রুত,
- আঠারো মাসের কম বয়সের শিশুর মাথার তালুর নরম অংশ বসে যায়।

### পানি ঘাটতিতে প্রতিরোধ

সচরাচর ডায়রিয়া রোগীর পানি ঘাটতি প্রতিরোধ করা সম্ভব। ডায়রিয়া শুরু হওয়া মাত্রই রোগীর পর্যাপ্ত পানি পান করা উচিত। শরীর থেকে যে পানি ও লবন বের হয়ে যায়, তা পূরণ করার জন্যই ইহা প্রয়োজন। লবণ ও চিনি সহ বিশুদ্ধ পানি তাদের পান করা উচিত। কিভাবে এই পানীয় তৈরী করতে হয় নিম্নে তা ব্যাখ্যা করে বলা হয়েছে।

### ছোট বাচ্চাদের পানি ঘাটতি

রোগী যদি শিশু হয়, আপনাকে খুব সতর্ক হতে হবে। ডায়রিয়া হলে বাচ্চাদের খুব তাড়াতাড়ি পানি ঘাটতি হয় এবং কয়েক ঘন্টার মধ্যে মৃত্যু হতে পারে। শিশুকে তৎক্ষণাতঃ পানীয় দেওয়া শুরু করতে হবে। (এমনকি পানি ঘাটতি দেখা দেওয়ার পূর্বেই)। প্রতিবার মল ত্যাগের পর ১ কাপ (২০০মিঃলিঃ) পানীয় পান করতে দেওয়া উচিত।

### কি করে খাবার স্যালাইন তৈরী করতে হয়

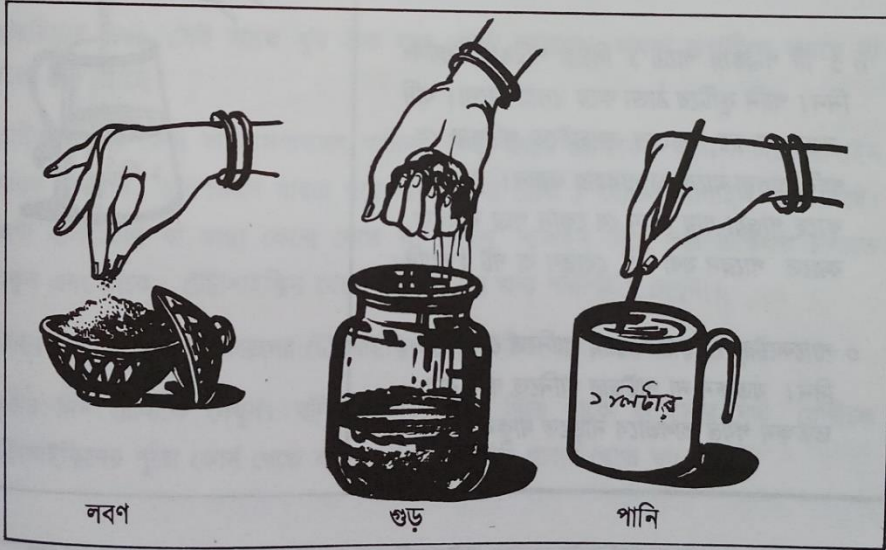
মা যদি খাবার স্যালাইন তৈরী করতে না জানেন, তাকে বা শিশুর পরিচর্যাকারী মহিলাকে তা শিখিয়ে দিন।

শিশুকে যদি পর্যাপ্ত খাবার স্যালাইন দেওয়া হয়, তাহলে তার পানি ঘাটতি হবে না। বেশীর ভাগ ক্ষেত্রে অন্য কোন চিকিৎসা ছাড়াই ডায়রিয়া শিঘ্রই ভাল হয়ে যাবে।

### খাবার স্যালাইন তৈরী পদ্ধতি

সাবান ও পানি দিয়ে আপনার হাত ধুয়ে নিন। ১টি পরিষ্কার বোতলে :

- ১) তিন আঙ্গুলের ১ চিমটি লবণ
- ২) ১ মুঠো গুড়/চিনি
- ৩) আধাসের পরিষ্কার পানি (সম্ভব হলে ফুটানো) নিন এবং ভালভাবে ঝাকিয়ে শরবত তৈরী করুন।



### প্রাপ্ত বয়স্কদের পানি ঘাটতি

রোগী যদি প্রাপ্ত বয়স্ক হয়, কিভাবে খাবার স্যালাইন তৈরী করতে হয় তাকে দেখিয়ে দিন। সব মাকে খাবার স্যালাইন তৈরী করার পদ্ধতি শিখিয়ে দিন। শিশুর ডায়রিয়া হওয়া পর্যন্ত অপেক্ষা না করে মায়েদের উচিত - কি ভাবে খাবার স্যালাইন তৈরী করতে হয় তা শিখে নেয়া। ডায়রিয়া শুরু হওয়ার সাথে সাথে করে খাবার স্যালাইন দিন এবং ডায়রিয়া বন্ধ না হওয়া পর্যন্ত খাবার স্যালাইন দিতে থাকুন।

### পানি ঘাটতির চিকিৎসা

রোগীর পানি ঘাটতি দেখা দিলে নিম্ন বর্ণিত উপায়ে তার চিকিৎসা করুন :

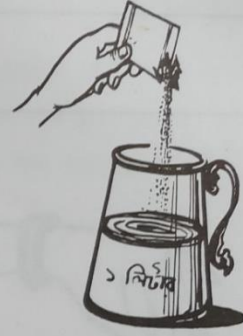
পানি ঘাটতি লক্ষনের জন্য পৃষ্ঠা ২১৮-২১৯ দেখুন।

- ০ মায়েদের উচিত কি ভাবে খাবার স্যালাইন তৈরী করতে হয় তা শিখে নেওয়া।
- ১) আপনার কাছে রাখা খাবার স্যালাইনের প্যাকেট একটি নিয়ে সরবৎ তৈরী করে তৎক্ষণাৎ খেতে দিন।

### পদ্ধতি

#### ০ হাত ধুয়ে নিন

- ০ ১ টি পরিষ্কার পাত্রে ১ লিটার পরিষ্কার পানি নিন। পানি ফুটিয়ে ঠান্ডা করে নেয়া ভালো। যদি সঞ্জর না হয়, তাহলে সবচাইতে পরিষ্কার যে পানি পাওয়া যাবে তা ব্যবহার করুন। হাতের কাছে পাওয়া যায় এমন যে কোন পাত্র ব্যবহার করতে পারেন যথা জগ, বোতল বা পট ইত্যাদি।
- ০ প্যাকেটের পাউডার পাত্রের পানিতে ঢেলে দিন। যতক্ষন না পাউডার পানিতে গলে যায় ততক্ষন পর্যন্ত ভালভাবে নাড়তে থাকুন।



০রোগীকে তৎক্ষণাৎ খানিকটা শরবত খাইয়ে দিন। যতবার এবং যতটুকু পান করতে রোগীর ইচ্ছা হয়, ততবার ও ততটুকু তার পান করা উচিত। (ডায়রিয়া না থামা পর্যন্ত ২৪ ঘন্টায় অন্ততঃ ১ লিটার)।

প্রতিদিন পরিষ্কার পাত্রে নুতন করে খাবার স্যালাইন তৈরী করতে হবে। পাত্রটিকে ঢেকে রাখা উচিত। আগের দিন তৈরী স্যালাইন ফেলে দিন।

- ২) আপনার কাছে খাবার স্যালাইনের প্যাকেট না থাকলে নিজেই খাবার স্যালাইন তৈরী করুন। আগের পৃষ্ঠায় বর্ণিত উপায়ে আপনি নিজে খাবার স্যালাইন তৈরী করুন।

ডায়রিয়া হলে যে সব লক্ষণ পর্যবেক্ষণ করতে হবে  
রোগীর ডায়রিয়া আছে কিন্তু অন্য কোন উপসর্গ নেই:

যে সকল রোগীর ডায়রিয়া আছে কিন্তু জ্বর নেই, পায়খানার সঙ্গে রক্ত যাচ্ছে না বা অন্য কোন গুরুতর উপসর্গ নেই, তাদের বেলায় :

- পূর্বের নির্দেশ অনুযায়ী খাবার স্যালাইন খেতে বলুন।
- স্বাভাবিক খাবার খাওয়া বন্ধ করা উচিত নয়।
- শ্রীঘ্রই ডায়রিয়া বন্ধ হয়ে যাবে অথবা ৩৬ ঘন্টার মধ্যে কমে যাবে। যদি না কমে, রোগীকে স্বাস্থ্য কেন্দ্রে পাঠান।

ডায়রিয়ার এবং সেই সাথে খুব উচ্চ জ্বর (৩৯° সেঃগ্রেঃ), অথবা অপুষ্টিতে ভুগছে বা মলে রক্ত আছে।

রোগীকে স্বাস্থ্য কেন্দ্রে বা হাসপাতালে পাঠান। কিন্তু প্রথমে রোগীকে আধা লিটার স্যালাইন শরবত খাওয়ান। হাসপাতালে যাবার পথে খাবার জন্য রোগী ১ বোতল স্যালাইন সঙ্গে নিবে। রোগী হাসপাতাল বা স্বাস্থ্য কেন্দ্রে যেতে না পারলে, স্যালাইন দিয়ে তার চিকিৎসা চালাতে থাকুন এবং তাকে টেট্রাসাইক্লিন খেতে দিন (মাত্রার জন্য পরিশিষ্ট ১ দেখুন)।

দ্রষ্টব্যঃ শিশু ও গর্ভবতী মায়েদের টেট্রাসাইক্লিন দেয়া উচিত নয় ( পরিশিষ্ট ১ দেখুন)।

তৃতীয় দিন রোগীকে দেখুন। যদি ডায়রিয়া কমে গিয়ে থাকে বা সেরে যায়, রোগীকে টেট্রাসাইক্লিনের পুরো কোর্স খেতে বলুন এবং স্বাভাবিক খাবার খেতে বলুন।

#### সাবধান হোন!

যে কোন সময়ে যদি স্বাভাবিক অবস্থার চেয়ে বেশী লোক (বিশেষ করে প্রাপ্ত বয়স্ক) পর পর ডায়রিয়ার আক্রান্ত হয়, অথবা ডায়রিয়া কারণে মারা যায় তাহলে সম্ভবতঃ এটা মহামারী (ইউনিট ২ দেখুন)। তৎক্ষণাতঃ সুপারভাইজারকে বা স্বাস্থ্য কেন্দ্রে সংবাদ দিন।

কিভাবে ডায়রিয়া প্রতিরোধ করতে হয়

কি কারণে ডায়রিয়া হয় এবং এই কারণ সমূহ দূর করার জন্য তারা কি করতে পারে— জনগন যদি তা জানে তাহলে তাদের পক্ষে ডায়রিয়ার প্রতিরোধ করা সম্ভব।

কিভাবে ডায়রিয়ার চিকিৎসা করতে হয় তারা যদি আপনার কাছ থেকে তা শিখে, তাহলে তারা ডায়রিয়া বন্ধ করতে পারবে এবং ডায়রিয়া জনিত মৃত্যুর হাত থেকে শিশুদের বাঁচাতে পারবে। ডায়রিয়া প্রতিরোধের জন্য জনসাধারণকে, বিশেষ করে ছোট বাচ্চা আছে এমন পরিবারের কাছে বুমিয়ে বলুনঃ কি করতে হবে এবং কিভাবে করতে হবে।

জন সাধারণের জানা উচিত, যে সকল খাল বিল কূয়া, পুকুর বা নদীর পানি মানুষ বা প্রাণী দ্বারা দূষিত হয়েছে, সেই পানিতে ডায়রিয়ার জীবানু থাকে।

এরূপ পানি সম্ভব হলে খাবার ও রান্নার করার আগে ফুটিয়ে নেওয়া।

কিভাবে পানি দূষন প্রতিরোধ করা যায় সে বিষয়ে নেতা ও জনগোষ্ঠীর সাথে আলোচনা করুন (ইউনিট ৪ দেখুন)। পান করা ও রান্নার জন্য এলাকায় যাতে নিরাপদ পানির উৎস থাকে— তা নিশ্চিত করার জন্য নেতৃত্বস্থানীয় ব্যক্তি, জনসাধারণ ও অন্যান্যদের সাথে একত্রে কাজ করুন।

জানা— খাদ্যে ডায়রিয়ার জীবানু থাকে, যখনঃ

- ইহা টাটকা নয়,
- ইহা গরম স্থানে রাখা হয়,
- মাছি, কীট পতঙ্গ, ইদুর এবং অন্য প্রাণীদের কাছে ইহা অনাবৃত থাকে।

করুন— এরূপ খাদ্য রান্না করবেন না অথবা খাবেন না, দূষন থেকে সব খাদ্য রক্ষা করুন। (ইউনিট ৫ দেখুন)

জানুন— ভালভাবে রান্না করা না হলে খাদ্যে ডায়রিয়ার জীবানু থাকতে পারে।

করুন— সর্বদা সঠিকভাবে খাদ্য রান্না করুন এবং রান্নার পর পর খেয়ে নিন।

জানুন— মলত্যাগ অথবা কাজের পর পর ভালোভাবে না ধুইলে হাতে ডায়রিয়ার জীবানু থাকতে পারে।

করুন— সব সময় হাত ভালোভাবে ধুয়ে ( সম্ভব হলে সাবান ও পানি দিয়ে) নিনঃ

- মল ত্যাগের এবং কাজ করার পরে।
- রান্না, পরিবেশন করা এবং আহারের আগে।
- বাচ্চাদের খাওয়ানোর আগে।