

**Awareness of Oral Rehydration Salt (ORS)
among Mothers of Under-Five Children in
Kamala Village, West Bengal, India:
A Cross-Sectional Study**

Kaushik Chattopadhyay

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Kamala Village, West Bengal, India: A Cross-Sectional Study*

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Awareness of oral rehydration salt
(ORS) among mothers of under-five
children in Kamala village, West
Bengal, India: A cross-sectional study

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Kraków, May 2008

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among mothers of under-five children in
Kamala village, West Bengal, India: A cross-
sectional study**

**A dissertation submitted in partial fulfillment of
the requirements for the degree of European
Public Health Master**



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DECLARATION

I hereby declare that the present dissertation, "Awareness of oral rehydration salt (ORS) among mothers of under-five children in Kamala village, West Bengal, India: A cross-sectional study" is an original piece of work written by me. The works of other people are duly acknowledged using Harvard style of referencing in accordance to the European Public Health Master Academic Guidelines.

Dr. Kaushik Chattopadhyay

2nd May 2008

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Dr. Kaushik Chattopadhyay

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Background and aim of the study

One of the major causes of morbidity and mortality in developing countries is diarrhoea, especially in the case of under-five children (Prüss *et al.*, 2002 and Kosek *et al.*, 2003). Effective home management of acute childhood diarrhoea with oral rehydration salt (ORS) is the immediate and best applicable step under the local circumstances to minimize the morbidity and mortality associated with it, as prevention of diarrhoeal diseases are mostly long-term socio-economic development goals. The overall aim of the present study was to assess the awareness of ORS in order to compensate the dehydration associated with childhood diarrhoea among mothers of under five years old children in Kamala village, West Bengal, India. This in turn would evaluate the effectiveness of relevant national health promotion programmes in specific application to an average Indian society.

Materials and Methods

A descriptive and analytical cross-sectional study was conducted in a purposively selected village, Kamala. Ethical approval for the study was taken from the School of Health and Related Research (SchARR), the University of Sheffield's Research Ethics Committee; and study approval was taken from the Barjora Block Development Officer, India. A complete census of all the mothers of under-five children within this village was performed. Twenty-four mothers of under-five children were found eligible and were interviewed with a pre-designed, translated (into Bengali) and pre-tested quantitative (structured) questionnaire. The calculations of frequency distributions were performed for descriptive analyses. All socio-demographic variables were categorical. The association of awareness of ORS (dependent variable) with each of the four socio-demographic characteristics (independent variables) was performed with Fisher's exact test (two-sided). Unadjusted odds ratios (ORs) along with their respective 95% confidence intervals (CIs) were

calculated in order to determine the strength of the above mentioned associations.

Results

Eighteen (75%) mothers of under-five children were aware of ORS. Twelve (66.67%) of them knew that boiled water cooled in a clean pot should be used for preparing an ORS solution. Only two (11.11%) mothers knew that one liter of water should be added to a standard packet of ORS. Only four (22.22%) mothers knew that the ORS solution should be used within twenty-four hours of its preparation. Moreover, only four (22.22%) mothers knew that the solution should be administered till a child drinks it after an episode of acute diarrhoea and should not be administered if the child refuses it. Eleven (27%) mothers who were aware of ORS said medical doctors were their source of such information, whereas only six (14%) mothers indicated female health workers (Anganwadi workers) as their source of information. Television and radio as the sources of information were mentioned by eleven (26%) and nine (21%) mothers, respectively. Four (10%) mothers said friends and relatives were their source of information, whereas only one (2%) mother specified newspaper as her source of information.

In case of age, fifteen (78.9%) mothers among the "Below 30" group of respondents were aware of ORS compared to three (60%) mothers among the "30 and above" group of respondents. This difference was found to be statistically insignificant ($P = 0.57$, two-sided Fisher's exact test). In case of education, ten (76.9%) mothers among the "Literate" group of respondents were aware of ORS compared to eight (72.7%) mothers among the "Illiterate" group of respondents. However, the difference was found to be statistically insignificant ($P = 1$, two-sided Fisher's exact test). In case of occupation, seven (77.8%) mothers among the "Agriculture" group of respondents were aware of ORS compared to eleven (73.3%) mothers among the "Stays at home" group of respondents. This difference was again found to be statistically insignificant ($P = 1$, two-sided Fisher's exact test). In

case of economic status, eleven (78.6%) mothers among the "Not enough" group of respondents were aware of ORS compared to seven (70%) mothers among the "Enough" group of respondents, the difference was found to be statistically insignificant ($P = 0.67$, two-sided Fisher's exact test). None of the associations between awareness of ORS and four socio-demographic characteristics (age, education, occupation and economic status) were found statistically significant ($P > 0.05$, two-sided Fisher's exact test). None of the estimated unadjusted odds ratios (and the respective 95% confidence intervals) were found to be statistically significant and thus, there was no difference detected in the odds of awareness of ORS between the two groups of each variable. Hence, no association was detected between awareness of ORS and each of the four socio-demographic characteristics in the present study.

Conclusion

Many mothers of under-five children in Kamala village were aware of ORS but the exact knowledge of its solution preparation and administration was found unsatisfactory. This was evident in spite of the Government of India's vigorous efforts to reduce morbidity and mortality associated with childhood diarrhoea through various programmes, which have been in place for the last three decades. The findings of the present study questions the effectiveness of relevant national health promotion programmes (health education and health policies) and suggests reevaluation, implementation and strengthening of the content and method of imparting these programmes. Thus, effective home management of acute childhood diarrhoea lies in the hands of well informed mothers and health promotion programmes need to ensure that the mothers are well informed.

Keywords: Awareness, oral rehydration salt (ORS), mothers, under-five children, diarrhoea, India.

LIST OF ABBREVIATIONS

BCC	: Behaviour Change Communication
CI	: Confidence Intervals
CSSM	: Child Survival and Safe Motherhood
DALY	: Disability-Adjusted Life Year
HDI	: Human Development Index
ICDS	: Integrated Child Development Services
IEC	: Information, Education and Communication
IIPS	: International Institute for Population Sciences
IMNCI	: Integrated Management of Neonatal and Childhood Illnesses
MoHFW	: Ministry of Health and Family Welfare
NFHS-3	: National Family Health Survey-3
NICED	: National Institute of Cholera and Enteric Diseases
NRHM	: National Rural Health Mission
NSSO	: National Sample Survey Organization
ODs	: Odds Ratios
ORS	: Oral Rehydration Salt
ORT	: Oral Rehydration Therapy
PAPM	: Precaution Adoption Process Model
PHES	: Pakistan Health Education Survey
RCH	: Reproductive and Child Health
RCH-2	: Reproductive and Child Health Phase-2

RHF : Recommended Home Fluids

ScHARR : School of Health and Related Research

UNICEF : United Nations Children's Fund

WHO : World Health Organization

YLL : Years of Life Lost

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This is the introduction section of a primary research "Awareness of oral rehydration salt (ORS) among mothers of under-five children in Kamala village, West Bengal, India: A cross-sectional study". The oral administration of fluids in order to treat dehydration associated with diarrhoea is known as oral rehydration therapy (ORT). According to the latest definition of the World Health Organization (WHO) in 1993, ORT includes oral rehydration salt (ORS) solution, recommended home fluids (RHF) and breast feeding (Kinder, 2007). The best way to administer ORT is through standard pre-packed formula sachets of ORS to make one liter of solution (Rehydration Project, 2007), as serious errors can occur while preparing RHF (Meyers *et al.*, 1997). The introduction section of the present study is followed by sections on aim; materials and methods; results; discussion; and finally conclusion and recommendation. After a brief description of diarrhoea and dehydration, magnitude of the problem is documented in this introduction section. This is followed by an overview of ORT with special focus on its history, and related international and national programmes; its benefit in treating dehydration associated with acute diarrhoea; and preparation and administration procedures of ORS solution. Thereafter, the significance and theory involved in the present study is stated. Finally, available literature on the awareness of ORS in different parts of the globe is critically reviewed.

1.1) Diarrhoea and dehydration

The passage of three or more loose or liquid stools per day, or more frequent passage of stools than normal for the individual is known as diarrhoea. Diarrhoea is a symptom and not a disease. The term "diarrhoeal diseases" is used only for the sake of convenience where diarrhoea is the predominant symptom. The more deadly form is acute diarrhoea whose onset remains sudden and which generally lasts for three

to seven days, but may last up to ten to fourteen days. The term "gastroenteritis" is usually used to describe acute diarrhoea, which indicates infection of the bowel. A number of bacterial, viral and parasitic entero-pathogens can cause diarrhoea. The faecal-oral route is the main mode of their transmission. The risk factors include poor social and environmental conditions (Park, 2000). *Escherichia coli* and *Shigella* are the most widespread bacterial pathogens found in developing countries. Shigellosis is most commonly found among children of two to four years of age in developing countries. It is usually mild and so the treatment remains rehydration therapy. Viral diarrhoea is self-limiting and acute. Rotaviruses are most widespread in young children, which cause many serious sporadic outbreaks (Sastry *et al.*, 2001). The frequent or prolonged episode of diarrhoea may lead to malnutrition such as low weight-for-height or wasting in the short term, and low height-for-age or stunting in the long term (Chen *et al.*, 1983).

Dehydration means loss of fluids and electrolytes such as sodium, potassium, chloride and bicarbonate. This is the most severe consequence of diarrhoea, which may lead to death especially in children (WHO, 2008). Some of the symptoms of dehydration are thirst, sunken eyes, rapid breathing, restlessness, heart failure, bloated stomach, fainting and convulsions. Dehydration becomes fatal when the fluid loss reaches 10%. Even if dehydration does not become fatal, it makes the child more prone to infections. Therefore, timely and accurate restoration of fluid and electrolytes can save almost all children from dying from dehydration associated with diarrhoea (Kinder, 2007).

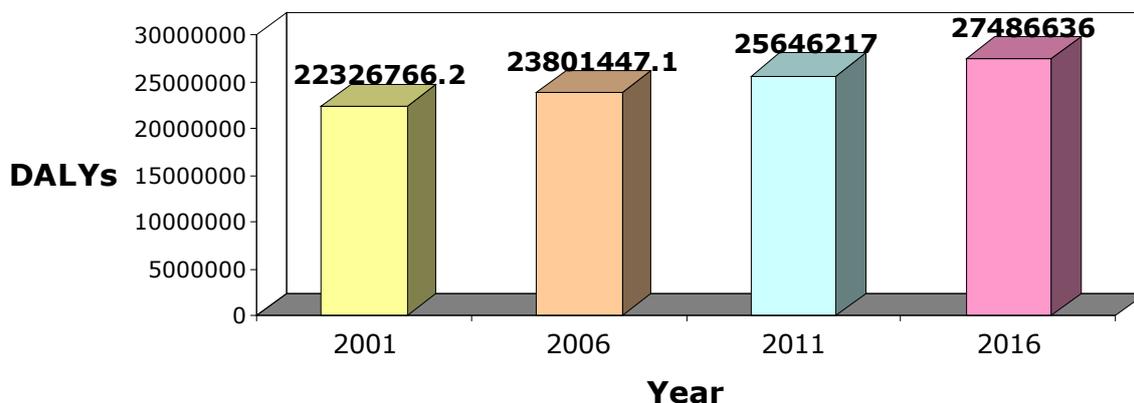
1.2) Magnitude of the problem

One of the major causes of morbidity and mortality in developing nations is diarrhoea, especially in the case of under-five children (Prüss *et al.*, 2002 and Kosek *et al.*, 2003). In developing countries, the annual incidence of diarrhoea in a child is around two to four episodes. Children with poor socio-economic status are more prone to diarrhoeal morbidity

and mortality (Enzley *et al.*, 1997). The annual deaths from diarrhoeal diseases are 1.8 million, 90% of these deaths occur in under-five children and are mostly from the developing nations (WHO, 2004c). In other words, one child dies every fifteen seconds or twenty jumbo jets full of children crash every day (WHO/UNICEF, 2000). In 2000-2003, diarrhoeal deaths contributed around 18% of all deaths in under-five children, making it the second killer disease after pneumonia (19%) (Bryce *et al.*, 2005). Disability-adjusted life year (DALY) is a measurement that combines both morbidity and mortality (USAID, 1999). Around sixty-two million DALYs are lost per year worldwide due to diarrhoeal diseases according to the Global Burden of Disease calculations. This has a significant socio-economic impact through absence from school, work and medical costs (WHO, 2004b). Therefore, D in diarrhoea stands for disaster, destruction, disability and death (Murphy, 1998).

In India, diarrhoeal diseases contribute to 9.1% of all deaths in children of zero to six years of age. The total diarrhoeal deaths in children of zero to six years of age are about 158,209 per year. In rural and urban areas of India, the average incidence (episodes per person per year) of diarrhoea in children of zero to six years of age is 1.71 and 1.09, respectively. The annual total number of episodes in children of zero to six years of age are 209,195,347 and 38,688,171 in rural and urban areas, respectively. Around ten million DALYs are lost due to diarrhoeal diseases in children of zero to six years of age. Around 98% of DALYs lost due to diarrhoeal diseases in children of zero to six years of age can be attributed to years of life lost (YLL). Unfortunately, this may possibly remain the same till 2016 as the National Diarrhoeal Diseases Control Programme has been only partly effective in decreasing the under-five child mortality due to diarrhoea. The DALYs lost due to diarrhoeal diseases in all age groups are increasing with the passage of time as shown in the figure 1.1 (NICED, 2005).

**Figure 1.1: DALYs lost due to diarrhoeal diseases in India
(current and projected)**



Source: NICED, 2005

In 2004, the human development index (HDI) value which includes health, education and income was only 0.52 for Bankura district, West Bengal, India. The HDI rank of this district is at a relatively lower level (eleventh rank among seventeen districts) within the West Bengal state. To be specific, diarrhoea is a major public health problem throughout the year in all the villages of this district. In 2005, 58,368 people were affected and 26 patients died due to diarrhoeal diseases. The whole district is very drought prone and during late summer, sporadic outbreaks of diarrhoea occur due to the scarcity of water. The same sources of water (such as ponds) are used for drinking as well as for other household purposes. Secondly, the early rain showers wash the night soil around the catchment area of dug-wells, used for the purpose of drinking water and the infected subsoil water drains into dug-wells (which is not concrete) and even tube-wells (Government of West Bengal, 2006).

1.3) ORT

1.3.1) ORT: From past to present

Since time immemorial, human beings have used oral fluids to restore perceived water losses either unconsciously or consciously as folk remedies. A 5000 years old medical science, Ayurveda (traditional Indian

medicine) mentioned the management of acute fluid losses. The treatment of cholera included administration (drinking) of plentiful quantity of tepid water mixed with rock salt and molasses, or clarified water mixed with rice gruel (Sushruta, 400-200 B.C.). The so called "ORT" was started by pediatricians in 1940 to treat mild dehydration due to childhood diarrhoea. In 1950s, research demonstrated that water absorption from the intestine is mediated by an active transport mechanism along with co-transportation of sodium and glucose. In 1964, ORT was used in Philippines after this scientific observation. In 1960s, research in Dhaka, Bangladesh and Calcutta, India showed that the sodium and glucose co-transport mechanism remains intact in cholera patients, and rehydration and maintenance of hydration can be achieved through ORT (da Cunha Ferreira *et al.*, 1990). In 1971, the war for an independent Bangladesh (then the Eastern Province of Pakistan) started, which provoked ten million refugees to escape to the West Bengal border of India. There was a massive cholera outbreak in these overcrowded refugee camps with a fatality rates approaching 30% due to the poor standards of living. It was not possible to provide intravenous rehydration therapy to every patient by the Central and State (West Bengal) Governments of India and by relief agencies, due to the limitations associated with intravenous rehydration therapy (Mahalanabis *et al.*, 1973). Doctor Dilip Mahalanabis, a cholera expert from the Johns Hopkins Centre for Medical Research and Training, Calcutta and head of a refugee camp's health center introduced the use of ORT to 350,000 patients. The table salt, baking soda, and glucose sachets used to be packed in Calcutta for distribution along with the instructions about its preparation. The cholera fatalities came down to less than 4% in camps using ORT, compared with 20-30% in camps using intravenous rehydration therapy. This discovery significantly reduced the mortality due to diarrhoeal diseases in the following decades (Fontaine *et al.*, 2001). The *Lancet* documented ORT as "potentially the most important medical discovery of the twentieth century" (Editorial, 1978).

Many trials were conducted in various parts of the world, which confirmed the effectiveness and safety of ORT in acute diarrhoea. In 1979, the WHO and the United Nations Children's Fund (UNICEF) introduced ORT as a standard treatment of dehydration associated with diarrhoea (Victora *et al.*, 2000). Now, this therapy is the backbone of various National Diarrhoeal Diseases Control Programmes (Santosham *et al.*, 1991). In the Global Diarrhoea Treatment Policy (2004), the widespread use of reduced-osmolarity ORS in acute childhood diarrhoeal diseases has been recommended as this is more effective than the previous one. Table 1.1 shows the composition of reduced-osmolarity ORS. The concentration of sodium as well as glucose in the new recommended ORS has been decreased to 75 millimoles per liter with a total osmolarity of 245 millimoles per liter (WHO/UNICEF, 2004).

Table 1.1: Composition of reduced-osmolarity ORS

Reduced-osmolarity ORS	Grams/liter
Sodium chloride	2.6
Glucose, anhydrous	13.5
Potassium chloride	1.5
Trisodium citrate, dehydrate	2.9
Total weight	20.5
Reduced-osmolarity ORS	Millimoles/liter
Sodium	75
Chloride	65
Glucose, anhydrous	75
Potassium	20
Citrate	10
Total osmolarity	245

Source: WHO/UNICEF (2004)

In 1978, the National Diarrhoeal Diseases Control Programme was initiated in India. In 1985-1986, this programme was merged with the National Oral Rehydration Therapy Programme. In 1992, the National Oral Rehydration Therapy Programme was integrated with the Child Survival and Safe Motherhood (CSSM) Programme. In 1997, this CSSM Programme was expanded to the Reproductive and Child Health (RCH) Programme. The National Population Policy, 2000 and the National Health

Policy, 2002 has emphasized the role of RCH Programme. In 2005, the Reproductive and Child Health Phase-2 (RCH-2) Programme has been initiated, which includes Integrated Management of Neonatal and Childhood Illnesses (IMNCI) as proposed by the WHO (Pandey *et al.*, 2005). A major reform is on going within the health policy of India under the National Rural Health Mission (NRHM), RCH-2 Programme and expansion of the Integrated Child Development Services (ICDS) (Gareth *et al.*, 2006). The enhancement of maternal awareness and knowledge regarding ORS in treating dehydration associated with diarrhoea, and preventing death especially in under-five children has remained a major goal of all these programmes. This enhancement is being performed through Information, Education and Communication (IEC) activities such as adult literacy classes, electronic and print media. Documentary films on ORS solution preparation and administration are being shown in cinema theatres. All India Radio and Doordarshan (India's national broadcaster) publicizes messages on ORS solution preparation and administration. Moreover, regional languages of the states are used to spread these messages (IIPS, 1995). The standard packets of ORS are freely available at all primary health centers, sub-centers and hospitals. In 1994, the Government of India prohibited the manufacture, distribution and sale of anti-diarrhoeal drugs in public interest, as they are not required in the treatment of diarrhoea. In specific conditions such as cholera and dysentery, antibiotics are recommended (MoHFW, 1999).

1.3.2) Benefits of ORT

Usually, management of diarrhoea begins at home in all cultures (Mull *et al.*, 1988). Dehydration can be prevented or reversed with ORT irrespective of the pathogen involved in diarrhoea (Goepf *et al.*, 1993). ORT does not stop diarrhoea, which stops by itself but the function of ORT is to rehydrate (Rehydration Project, 2007). This first-line and life-saving treatment usually requires no drug therapy in children without shock (Walker-Smith, 1988). In case of treatment of mild to moderate dehydration, this therapy is more effective; safe; not painful; cheap; and

does not involve the risk of hospital-acquired infections as in case of intravenous rehydration therapy (Santosham *et al.*, 1982; Tamer *et al.*, 1985; Listernick *et al.*, 1986; Vesikari *et al.*, 1987 and Mackenzie *et al.*, 1991). ORT gives parents an opportunity to take care of their child at home (Goepf *et al.*, 1993); in rural areas (Avery *et al.*, 1990); and does not require special equipment (Carpenter, 1982), professional knowledge and skills (Pizarro, 1988) as needed in intravenous rehydration therapy. Around 88% of diarrhoeal deaths can be prevented by the extensive use of ORS (Jones *et al.*, 2003). The 100% ORT coverage costs US Dollar two per episode, which is a cost-effective intervention in case of diarrhoea (US Dollar 800 per death averted and US Dollar 24 per DALY saved) (USAID, 1999). If ORS is readily available along with a person who has the knowledge about its solution preparation and administration, then almost nobody (infant or adult) will die due to diarrhoea (Neiberger *et al.*, 1992). Mothers usually remain busy with outdoor as well as indoor tasks and therefore, home management of acute childhood diarrhoea with ORT prevents death of their children. Moreover, this therapy saves money and time making visits to clinics and hospitalizations unnecessary.

1.3.3) Preparation and administration of ORS solution

A standard packet of ORS should be dissolved in one liter of drinking water. The water should be boiled and then cooled in a clean pot prior to the preparation of ORS solution. The ORS solution can be used till twenty-four hours after its preparation. After twenty-four hours, the solution should be discarded and a fresh solution should be prepared, if needed. The diarrhoea can become worse, if too little water is added to ORS or the solution is incorrectly prepared. On the other hand, adding too much water to ORS can make it less effective (Rehydration Project, 2007). Therefore, the correct dilution of ORS is essential for rehydration and for prevention of hyponatremia, hypernatremia or osmotic diarrhoea (Editorial, 1978; Santosham *et al.*, 1991; Meyers, 1995; Ireland, 1997; and Nazarian, 1997). The solution should be administered as long as a

child drinks it, as the child's thirst prevents him/her from being over-hydrated except in patients with shock (Avery, 1999).

1.4) Significance of the study

Central among the Millennium Development Goals is the aim to reduce child mortality, and Goal-4 focuses on the reduction of under-five child mortality rate by 66.67% between 1990 and 2015 (UN, 2000). Child survival programmes have been implemented in Kamala village with a special focus on diarrhoea. Secondly, provision of drinking water has been made in this remote village. In spite of all these vigorous efforts by the international and national organizations, the incidence and mortality cases from childhood diarrhoea are increasing steadily (Government of West Bengal, 2006). Thus, one of the major challenges is to decrease diarrhoea associated child mortality through identifying and taking effective measures against various contributing factors. One of the contributing factors may be ignorance of mothers regarding ORS in Kamala village.

Although after implementation of the National Oral Rehydration Therapy Programme in India, the diarrhoeal deaths have decreased from 1-1.5 million in 1985 to 0.6-0.7 million in 1996-1997, this is still a high level (MoHFW, 2000). The standard packets of ORS are freely available at all primary health centers, sub-centers and hospitals (MoHFW, 1999). However, the present use of ORS in diarrhoea of under-five children is only 26% in India as per the 2005-2006 National Family Health Survey-3 (NFHS-3) (IIPS, 2007b). This high diarrhoeal mortality and poor usage rate of ORS indicates that there may be a lack of awareness of ORS among people in spite of its wide availability. This doubt is strengthened by the WHO and the UNICEF, which has documented the decreasing awareness of ORS among parents in some countries (WHO/UNICEF, 2004). Therefore, all these facts make it imperative to evaluate the awareness of ORS among mothers in Kamala village which is a part of India.

In India, the study of the occurrence and transmission of diarrhoeal diseases in under-five children is very comprehensive. Many institution-based studies have been conducted to assess the awareness of ORT and ORS among mothers but community-based studies are lacking (Jain *et al.*, 2006). The present community-based study may help in designing a broad interventional programme, which would address the identified gaps in current community awareness and would ultimately reduce the diarrhoeal disease burden. Without adequate baseline data on the awareness of ORS among mothers of under-five children, it may be hard to motivate them to participate in interventional programmes started by governmental and non-governmental organizations. In other words, the present study would provide the baseline data on the awareness of ORS. Apart from initiating new interventional programmes with this data, the present study may provide information to improve the existing health promotion programmes.

Mothers are the main caretakers of under-five children. The awareness of ORS among mothers is essential to reduce the avoidable morbidity and mortality, and health and psychosocial impacts associated with diarrhoeal diseases in under-five children. The low awareness of ORS among mothers enhances the burden of diarrhoeal diseases (Khaled *et al.*, 2003). In spite of such a major role of mothers in managing diarrhoeal diseases in under-five children, it appears that no formal study on the awareness of ORS among mothers of under-five children in Kamala village has been performed.

1.5) Theory involved in the study

One of the possible reasons behind high diarrhoeal morbidity and mortality of under-five children may be a lack of awareness of ORS among mothers in Kamala village. The present study is based on the Explanatory Theory, which tries to explore the issue of the lack of awareness. The Explanatory theory is the basis of Precaution Adoption Process Model (PAPM). This study contributes to the first stage of PAPM. According to this model, there are seven distinct and obligatory stages in a person's