FACTORS INFLUENCING THE MATERNAL USE OF ORAL REHYDRATION SOLUTION IN THE HOME TREATEMENT OF CHILDHOOD DIARRHEA IN WEST JAVA, INDONESIA

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by

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Abstract

Diarrhea is the second leading cause of death of children under 5 years of age in many developing countries, including Indonesia. An estimated 300,000 Indonesian children die of diarrhea every year, primarily as a result of dehydration. Many of these deaths are unnecessary, as diarrhea-related dehydration can be prevented and treated with Oral Rehydration Solution (ORS). Studies of home care practices in Indonesia, however, have shown that many mothers are not using ORS to treat their children's diarrhea episodes. The purpose of this research study was to describe the home treatment of childhood diarrhea in a rural village of West Java, Indonesia, and to determine the factors that influenced maternal use of ORS. This study utilized a cross-sectional design to survey a sample of mothers of children under the age of 5 years. Data were collected using a structured questionnaire administered in an interview format to mothers in their homes. The Health Belief Model was the conceptual framework which guided development of the research questions and the interpretation of the study findings. The factors investigated in this study relate to: mothers' perception of the threat of diarrhea and dehydration, their expectations of achieving success with ORS treatment, their perception of the barriers to ORS use, various sociodemographic factors, and the influence of other individuals. The only factors found to have statistically significant associations with ORS use were mothers' knowledge of the signs of dehydration and their self-efficacy in ORS preparation and administration. While the remaining variables were found to be either not associated or lacking statistical significance, narrative data indicate that some of these factors were viewed as influential by mothers. It is believed that limited use of ORS may be strongly influenced by mothers' lack of knowledge of the link between diarrhea, dehydration, and the rehydrating function of ORS. This and other findings of the study lead to the development of recommendations for specific interventions to be addressed through nursing practice, education, and research, as well as recommendations to ORS manufacturers and government.

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Chapter 1

Chapter One provides an introduction to the research study, including a brief synopsis of the background to the problem, the rationale, and the purpose of the study. The study methodology, conceptual framework, and research questions are also introduced. Further detail about these aspects of the study will be presented in Chapters 2 and 3.

Background to the Problem

According to the World Health Organization (WHO), "every year some 12 million children in developing countries die before their fifth birthday" (WHO, 1997). Over 70% of these deaths are due to five common childhood illnesses, which include acute respiratory infections, diarrheal disease, measles, malaria, and malnutrition. WHO projects that, without improved intervention efforts, these conditions will remain the leading causes of childhood death through the year 2020.

Diarrheal disease is the second leading cause of illness and death for young children in the developing world. Among children under the age of 5 years, it is estimated to be responsible for 3.3 million deaths per year worldwide (Bern, Martines, deZoysa, & Glass, 1992). In the Southeast Asian country of Indonesia alone, it is estimated to be responsible for 300,000 deaths annually in this age group (Edmundson & Edmundson, 1989).

Infectious organisms, such as bacteria and viruses, are the predominant cause of diarrhea in the developing world. Diarrheal disease is especially prevalent in environments where over-crowding and poor sanitation promote rapid and efficient transmission of these organisms between individuals. Young children tend to be at highest risk for infection and mortality from diarrhea. The primary mechanism by which these deaths occur is through dehydration, which results from the loss of large quantities of fluid and essential salts from the body (WHO, 1993). These deaths are largely unnecessary, as dehydration resulting from diarrhea is both a preventable and a treatable condition.

The prevention and treatment of dehydration can be achieved through the ongoing administration of appropriate fluids in the home throughout the diarrhea episode. While such Oral Rehydration Therapy (ORT) encompasses treatment with prepackaged Oral

Rehydration Solution (ORS), home-made Sugar-Salt Solution (SSS), and other appropriate rehydration fluids, ORS is the treatment of choice for such fluid therapy. ORS is a commercially-prepared formulation of sugar, salts, and electrolytes which, when prepared and administered correctly, is effective regardless of the cause of the diarrhea (DuPont, 1995). WHO considers ORS to be a key component of the home management of childhood diarrhea (WHO, 1993), and provides packets of ORS free of charge to many developing countries (Martines, Phillips, & Feacham, 1993). ORS was first introduced to Indonesia in 1971, and has been promoted for use in home treatment of diarrhea since 1977 (Aulia et al., 1994).

Although ORS has been shown to be a safe and effective method of preventing and treating diarrhea-related dehydration, recent studies of home care practices have indicated that its use is not widespread in many developing countries, including Indonesia (Hirnshall & Hudelson, 1993; WHO, 1994b). In fact, researchers have found rates of maternal use of ORS in Indonesia ranging from only 48% up to 68% (CBS, 1998; Muninjaya, Widarsa, & Soetjiningsih, 1991; Pulungsih, Ittiravivongs, Sutoto, & Pattara-arechachai, 1992; Widarsa & Muninjaya, 1994).

The low rates of ORS use, combined with the potential for ORS to improve illness outcomes, clearly indicates the need for strategies to increase the frequency of its use. In order for such strategies to be effective, however, it is necessary to understand the various factors which may be influencing maternal use of ORS in diarrhea home treatment. As mothers are the primary care-givers in many developing countries, including Indonesia, they tend to be the focus of most studies into home treatment practices.

Improved home treatment of diarrheal disease is promoted by WHO through its "Integrated Management of Childhood Illness" (IMCI) strategy. This strategy seeks to improve child health by improving treatment of the five significant causes of morbidity and mortality, of which diarrhea is one, amongst children in the developing world (WHO, 1997). A key element of WHO's IMCI strategy is the improvement of family and community practices, including care of children at home during illness (WHO, 1998). The Indonesian Ministry of Health is attempting to introduce this strategy as part of their initiative to improve child health in Indonesia.

Study Rationale

While there is evidence to indicate that many women in Indonesia are choosing not to use ORS in the home treatment of childhood diarrhea, the reasons for their decisions are not well understood. Increased knowledge of the specific factors influencing these decisions is crucial for the development of effective strategies targeted at increasing the home use of ORS (Sutrisna et al., 1993). This knowledge would be enhanced by an awareness and understanding of mothers' knowledge, perceptions, and beliefs about diarrhea and its treatment, as well as appreciation of their cultural and physical environment (Mikhail, 1981; WHO, 1994b). These are all important considerations in determining both factors which may be limiting ORS usage, as well as factors which may promote its use in home treatment.

The need for research into this issue is recognized by WHO, which recommends that household surveys be used to identify local beliefs and behaviours which inhibit successful case management at home (WHO, 1995). Such studies have been carried out in numerous developing countries to investigate the influence of various factors on mothers' use of ORS. These studies suggest that use of ORS may be related to mothers' knowledge and beliefs about diarrhea and dehydration, their expectations of achieving success with ORS treatment, barriers to use of ORS, various demographic factors, and the influence of other individuals. In addition to identifying factors related to the limited use of ORS, the literature also identifies incorrect use of ORS as another significant problem in home treatment.

While research from other developing countries is relatively plentiful, research on this issue in Indonesia is limited, involving investigation of only a small number of possible factors (Grace, 1988; McDivitt, Hornick, & Carr, 1994; Muninjaya et al., 1991; Widarsa & Muninjaya, 1994). Since perceptions of illness and appropriate treatment strategies vary among different social and cultural contexts, factors found to be associated with ORS use in studies in other developing countries cannot be generalized to Indonesia (Weiss, 1988). These findings, while not being directly applicable within Indonesia, can, however, suggest factors worth investigating there.

The current study was undertaken to address the need for improved understanding of the factors influencing use of ORS among mothers in Indonesia. This research study was

part of a larger collaborative primary health care project, based in West Java, Indonesia, involving a partnership between the School of Nursing at Memorial University of Newfoundland (MUN) and the Faculty of Nursing, University of Indonesia (FONUI). The project is sponsored by the Association of Universities and Colleges of Canada (AUCC) and funded by the Canadian International Development Agency (CIDA) under the Partnerships in Cooperation and Development Program (UPCD). This project aims to develop a community health nursing model appropriate for implementation in Indonesia. A key component of this model is the performance of comprehensive community health needs assessments, including the identification of factors to be considered when planning community health nursing interventions. The findings of the current study will contribute data to the community health needs assessment for the project district, and enhance the development of community health and development strategies. The village of Waru Jaya, selected as the setting for the study, was one of four villages involved in the project.

This study is of particular interest and relevance to nursing, both in terms of nurses' ability to address the complex issue of maternal decision-making, as well as the need to promote evidence-based nursing practice. An essential component of nursing practice is an awareness of the multidimensional aspects of human health and health care decision-making, including the impact of physical, psychological, social, and spiritual factors. This awareness places nurses in a key position to explore, appreciate, and recognize the possible influences of mothers' knowledge and beliefs on their health care decisions. Studies such as this one, should therefore enable nurses to engage in evidence-based practice and contribute to the development, co-ordination, and/or provision of health education programs or other interventions which aim to support and encourage mothers in providing appropriate and effective care in the home. While nurses in Indonesia do not currently practice within a framework of community health nursing, this study will identify key roles and responsibilities to emphasize in the development of the community health nursing specialty in Indonesia.

Study Purpose

The purpose of this study was to describe the home treatment of diarrhea among children under the age of 5 years in a rural village of West Java, Indonesia, and to determine

the factors that influenced maternal use of ORS. The focus for this study was on use of ORS, as opposed to other forms of ORT, as ORS is the treatment most highly recommended by WHO due to its high degree of efficacy and limited risk of harm (Mandelbaum, 1992).

Study Methodology

This study utilized a cross-sectional design to survey a sample of mothers of children under the age of 5 years. Data were collected using a structured questionnaire, which was administered in an interview format to mothers in their homes. The use of household surveys is recommended by WHO as an effective means of exploring and describing home treatment practices and the knowledge and beliefs impacting on them (WHO, 1994a).

Conceptual Framework

The Health Belief Model (HBM) (Rosenstock, Strecher, & Becker, 1988) was chosen as the most appropriate framework for application in this study (see Appendix A). This model was developed to provide insight into the factors influencing individuals' health-related decision-making processes (Mikhail, 1981). The HBM suggests that the probability of an individual taking action to protect their health is influenced by:

1. The perceived threat of the illness, which includes the perceived susceptibility to, and severity of, the illness.

2. The expectation that the benefits of the proposed action outweigh the barriers, where lack of self-efficacy in performing the action is seen as a barrier.

3. Modifying factors, such as sociodemographic variables, which impact on the individual's perception of the threat and expectations of the desired action.

4. Cues to action that trigger or motivate the individual to act, including the influence of others.

The factors hypothesized to influence maternal use of ORS in West Java, Indonesia can be viewed within the framework of the HBM. For instance, mothers' belief in their children's susceptibility to dehydration may influence their perception of the threat of diarrheal disease. Mothers' expectation of benefit from administration of ORS may relate to her understanding of how ORS functions in the treatment of dehydration; while these expectations may be counteracted by perceived barriers, such as difficulty with access to ORS or with its administration. Modifying factors which may alter mothers' perception of

threat or benefit may include such variables as children's age, or level of maternal education. Cues to action that may motivate mothers' to provide treatment with ORS might include the influence of family members or health workers. Thus, this explanatory model may facilitate understanding and insight into the factors influencing mothers' decision-making processes regarding the use of ORS. The HBM also provides a structural framework by which to organize the factors to be investigated in this study, and guides the development of the research questions.

Research Questions

This study sought to answer the following research questions:

1. What type of home treatment do mothers provide for diarrhea?
2. How does the perceived threat of the diarrhea episode influence maternal use of ORS?
3. How does expectation of benefit influence maternal use of ORS?
4. What are the barriers to maternal use of ORS?
5. Which modifying factors are associated with maternal use of ORS?
6. What is the influence of other individuals on maternal use of ORS?

Chapter 2

Chapter 2 provides background information about the problem of diarrheal disease among young children in Indonesia and the treatment provided by care-givers in the home, with particular attention given to the use of Oral Rehydration Solution (ORS) in home treatment. Previous studies which have examined the influences on ORS use in home case management will be discussed, and the Health Belief Model (Rosenstock, Strecher, & Becker, 1988) will be utilized as a framework to organize and examine the findings of these studies. Evidence supporting the need for further investigation of the influences on ORS use in the home treatment of childhood diarrhea in Indonesia will be presented.

While some authors referenced in this literature review use the terms ORS and ORT (Oral Rehydration Therapy) interchangeably, ORT actually encompasses treatment with prepackaged ORS, home-made Sugar-Salt Solution (SSS), and other appropriate rehydration fluids. For the purposes of this review, the term ORS will refer only to the prepackaged dry salts; the term ORT will refer to the more inclusive category, or will be used when it is unclear whether the author of the study is referring to the prepackaged ORS salts or other oral rehydration fluids.

Pathophysiology and Etiology

Pathophysiology

Diarrhea, as defined by WHO, is three or more loose or watery stools in a 24 hour period. Diarrhea can be classified as acute, lasting less a than 14 days, or chronic, lasting 14 days or more (WHO, 1993).

Death from acute diarrhea is usually due to dehydration, resulting from the loss of large quantities of fluid and essential salts from the body. Young children suffering from dehydration exhibit a number of distinctive clinical signs. WHO guidelines for assessing a child for dehydration list these signs as: restlessness or irritability; lethargy, floppiness, or unconsciousness; sunken eyes; absent tears; dry mouth and tongue; thirst; poor drinking; and poor skin turgor (WHO, 1993).

In addition to death from dehydration, mortality and morbidity from acute diarrhea may also occur through other mechanisms. These include dysentery, which leads to damage

to the intestine, systemic infection, and malnutrition (Hirnshall & Hudelson, 1993; O'Brien & Santosham, 1996; WHO, 1993); renal failure; and the toxic effect of the specific enteropathogen responsible for the illness (DuPont, 1995).

Chronic diarrhea, or repeated episodes of acute diarrhea, may lead to malabsorption of nutrients and increased nutrient requirements due to the infection. The problem is often compounded by anorexia on the part of the child, or the withholding of food by the mother (DuPont, 1995). The resulting malnutrition leads to weight loss, decreased growth and development, and immune deficiency (WHO, 1993), potentiating a harmful cycle in which the malnourished child has an increased susceptibility to diarrhea and other infections such as pneumonia (DuPont; Edmundson & Edmundson, 1989; Jelliffe & Jelliffe, 1991). Death resulting through such indirect mechanisms has been referred to as "residual death" from diarrheal disease (Khin, as cited in Sunoto, 1987, p.150). In total, it has been estimated that 30% of all deaths among children less that 5 years of age are associated in some way with diarrheal disease (O'Brien & Santosham, 1996).

Etiology

A variety of viruses, bacteria, amoebae, and parasites are potential causative organisms of diarrhea. Rotavirus is the predominant cause of diarrheal illness in infants 6-12 months old, causing rapid dehydration, and possibly being responsible for 20-30% of fatalities (DuPont, 1995). Diarrhea can also be caused by allergies, such as lactose intolerance, and iatrogenic responses, such as the side effects of drug therapy (Edmundson & Edmundson, 1989). Infectious processes, however, remain the predominant cause of diarrhea in the developing world.

Infectious diarrhea occurs when disease-causing organisms gain entry to the human host through the oral route. Transmission is primarily due to contamination of hands, water sources, food, and domestic utensils (Martines, Phillips, & Feacham, 1993). Factors that may contribute to diarrheal infection include: poor personal, domestic, and public hygiene; lack of a protected water supply; inadequate sewage disposal; poor housing conditions and over-crowding; malnutrition, multiple infections, and immune deficiency; premature cessation of breast-feeding and early supplementation with contaminated foods; and the presence of flies

and other insects, which act as mechanical vectors in the transmission of the disease (Sunoto, 1982; Sunoto, Wiharta, & Saroso, 1978).

Diarrheal disease tends to be particularly prevalent in tropical developing countries, as diarrhea-causing organisms thrive in the warm moist conditions, and over-crowding and poor sanitation make transmission of the disease rapid and efficient (Edmundson & Edmundson, 1989). These problems are enhanced by the wet-dry seasonal cycle in which the monsoon rains of the wet season result in flooding, which leads to contamination of living quarters with water and sewage; and the scarcity of water during the dry season, which forces people to use contaminated sources for drinking water (Edmundson & Edmundson). In Indonesia and other parts of Southeast Asia, diarrheal disease occurs throughout the year, peaking at the end of the rainy season and in the very dry season (CBS, 1998; Sunoto, 1982).

Children under the age of 5 years are particularly vulnerable to diarrheal morbidity and mortality. Reasons proposed for why young children are most significantly affected include: early weaning, replacement of breast-feeding with bottle-feeding, mothers' resistance toward seeking modern health services for young children, unhygienic behaviours of children, and children's greater susceptibility to dehydration and electrolyte imbalance due to their high body surface area, high metabolism, and high body water content (Jelliffe & Jelliffe, 1991; Snyder & Merson, 1982; Sunoto, 1982).

The Global Problem of Diarrhea

In their landmark article, Snyder and Merson (1982) quantified the magnitude of the problem of acute diarrheal disease in the developing world through a review of active surveillance data. They estimated the annual morbidity from diarrheal disease in children under 5 years old in the developing world to be 744 - 1004 million episodes. The median incidence of diarrhea for children in the developing world was 2.2 episodes per child per year for children under 5 years, and 5 episodes per child per year for children less than 1 year. It should be noted that in some developing countries, the number ranged from 3-10 episodes per year for children under 5 years, while in the USA and Canada the number of episodes was only 1-2 per child per year (DuPont, 1995).

In 1982, diarrheal disease was estimated to be responsible for 4.6 million deaths per year worldwide in the under 5 year old age group (Snyder & Merson, 1982). An update of

this global estimate performed 10 years later (Bern, Martines, de Zoysa, & Glass, 1992) found that diarrhea incidence rates were virtually unchanged, although the global mortality rate had decreased to 3.3 million deaths per year in the under 5 year old age group. Bern et al. calculated the median mortality rate globally to be 19.6 deaths per 1,000 live births for infants less than 1 year; and 4.6 per 1,000 for children 1-4 years.

Direct estimates of case-fatality ratios (CFR) from diarrhea are difficult to determine, as few longitudinal studies report both morbidity and mortality rates from the same population. Calculations based on median morbidity and mortality rates from reviews of surveillance data indicate a CFR of between 0.3% and 0.6% for children under 5 years of age (Bern et al., 1992; Snyder & Merson, 1982). Although the CFR for diarrhea is relatively low compared to some other illnesses, when combined with the high incidence of diarrhea in the population, the impact on child mortality is significant.

The Problem of Diarrhea in Indonesia

Indonesia, with a total population of 206,338,000, has 21,967,000 children under 5 years of age, 11% of the total population (United Nations Children's Fund [UNICEF], 1999). Indonesia's infant mortality rate from all causes is 40 per 1,000 live births and the under 5 mortality rate is 56 per 1,000 live births. This compares to infant mortality rates of 6 in Canada and 7 in the USA, and under 5 mortality rates of 6 in Canada and 8 in the USA (UNICEF).

The annual morbidity from diarrheal disease in Indonesian children under 5 years of age has been estimated at 60 million cases (Sunoto, 1982), with the median annual incidence per child being 2.05 for children under 5 years old, and 2.81 for infants less than 1 year (Sunoto, 1987). No more current estimates were located.

The annual diarrhea-related mortality among Indonesian children under 5 years old was estimated to be 400,000 deaths in 1981 (Sunoto, 1982). Due mainly to improved treatment and home management, the number of diarrhea-related childhood deaths in 1988 was estimated to have decreased to 300,000 (Edmundson & Edmundson, 1989). In the USA in contrast, diarrheal disease was responsible for 500 deaths per year in the total population (Santosham & Greenough, 1990). Diarrheal disease mortality rates in Indonesia are

comparable to global rates, at 6 deaths per 1,000 for children under 5 years of age (Aulia et al., 1994).

Thus it is evident that diarrhea is one of the most common illnesses of Indonesian children and remains a significant cause of child mortality.

Recommended Prevention Strategies

Diarrheal disease is preventable to a large degree, as evidenced by the low morbidity and mortality rates in the developed world. Recommended strategies for preventing diarrheal disease include: improved access to safe water supply, sewage removal systems, and sanitation facilities; vector control; immunization coverage; food and nutrient supplementation; family-planning to increase birth-spacing and decrease crowding; improved personal and domestic hygiene; promotion of breast-feeding, and improved weaning foods; and elimination of the practice of using human excreta for fertilizing crops (Bern et al., 1992; DuPont, 1995; Edmundson & Edmundson, 1989).

While some of these strategies can be addressed through health promotion and education programs, others are dependent on significant improvements in socioeconomic conditions and substantial financial input for improved housing conditions and the development of safe water supplies and sanitation facilities. Many of these strategies are currently prohibitively expensive for developing countries. Therefore, while prevention of diarrheal disease is clearly the ultimate goal, effective treatment of diarrheal disease must also occur to minimize mortality and other impacts of the disease (Sunoto et al., 1978).

Recommended Treatment Strategies

Treatment efforts which could contribute to the decrease in morbidity and mortality from diarrheal disease include promotion of appropriate care-seeking, improved access to health services, and correct case management (Bern et al., 1992; DuPont, 1995). While care-seeking and availability and utilization of health services are important issues, "effective case management is the cornerstone of WHO's global strategy for the control of childhood diarrheal diseases" (WHO as cited in Naimoli et al., 1996, p. 161). The WHO case management strategy for childhood diarrhea includes selective use of antibiotics and non-use of anti-diarrheal drugs; continued feeding during, and increased feeding after, diarrheal episodes; prevention and early treatment of mild and moderate dehydration in the home by

administration of appropriate fluids; and treatment of severe dehydration with intravenous electrolyte solution (Richards, Claeson, & Pierce, 1993).

Most diarrheal episodes are self-limiting and much discretion is needed in the use of pharmaceuticals in treatment. Antibiotic drug therapy is indicated only for proven or suspected cases of infection by bacterial organisms, and inappropriate use has been shown to lead to development of resistant organisms. Antimotility, antisecretory, and adsorbent drugs are not recommended in the treatment of diarrhea in children, and can lead to worsening of symptoms and even death (Edmundson & Edmundson, 1989; Martines et al., 1993; Sunoto, 1987).

Given the self-limiting nature of most diarrhea episodes, the focus of case management lies in maintaining nutritional intake and providing fluid therapy. Continued feeding during diarrheal episodes has the potential to minimize the nutritional impact of the disease. Therefore, although children's desire to eat may be decreased, efforts to maintain food intake should continue through offering frequent small meals of high nutrient-containing foods. Continued breast-feeding is also encouraged (Martines et al., 1993).

The key to effective diarrhea case-management is appropriate fluid therapy. The goal of fluid therapy during a diarrheal episode is to prevent potentially fatal dehydration by correcting existing fluid and electrolyte deficits, replacing ongoing losses from stool and vomit, and supplying normal daily fluid requirements (Richards et al., 1993). While intravenous fluid has been used for the treatment of dehydration for many years, its use has been largely replaced by Oral Rehydration Therapy (ORT), except in the treatment of the most severe cases of dehydration (Samadi, Islam, & Huq, 1998; Santosham & Greenough, 1990). ORT may include various home-based fluids, Sugar-Salt-Solution (SSS), and ORS.

Home-based fluids, such as soups, gruels, and yoghurt drinks, can be useful in oral rehydration during a diarrhea episode. However, these fluids often lack the appropriate concentration of sugars and salts for safe and effective rehydration (Martines et al., 1993).

SSS, made from ingredients available in the home, has also been used to correct fluid volume deficits during diarrhea episodes. However, SSS lacks electrolytes such as potassium and bicarbonate and is therefore inadequate to correct hypokalemia and acidosis, which commonly occur in dehydration (Martines et al., 1993). In addition, the need to accurately

measure the numerous necessary ingredients presents the significant potential for error in preparation (Martines et al.). The resulting solution, which is either too dilute or too concentrated, can, in addition to being less effective, lead to dangerous osmotic diarrhea or hypernatremia (de Zoysa et al., 1984; Santosham & Greenough, 1990).

ORS is the treatment of choice for fluid therapy during diarrhea episodes. ORS refers to commercially prepared and packaged formulations of glucose, sodium, potassium chloride, and trisodium citrate or sodium bicarbonate in specific proportions. ORS prevents and treats dehydration by enabling "the coupled active transport of glucose and sodium in the small bowel, resulting in the passive absorption of water and other electrolytes, even during copious diarrhea" (Richards et al., 1993, p.5). ORS is available as a premixed solution or as dry salts that are mixed with water. The premixed ORS solution, commonly known as Pedialyte®, is prohibitively expensive for use in the developing world. However, WHO produces ORS salts at a cost of approximately 10 cents per packet, and distributes packets free of charge in many developing countries through UNICEF (Martines et al., 1993; O'Brien & Santosham, 1996). In addition to being inexpensive, ORS salts are easily transported and have a long shelf-life (Santosham & Greenough, 1990). The main disadvantage of packets of ORS salts is that they must be rehydrated with a specific amount of water. As with inappropriately prepared SSS, the result of incorrectly prepared ORS can be a potentially ineffective or harmful solution. Repeated studies, however, have shown that mothers more easily learn and retain information on the preparation of ORS than SSS (Mandelbaum, 1992). Therefore, WHO recommends the use of prepackaged ORS rather than home-made SSS.

ORS has become the cornerstone of efforts to decrease mortality from acute diarrheal disease (Richards et al., 1993). Appropriately prepared and administered ORS has been shown to effectively treat dehydration due to diarrhea in all age groups, at less risk and expense than intravenous fluid (Samadi et al., 1988). It is a simple, safe, and effective way of preventing and managing dehydration in the home and in health facilities (Richards et al.). There is overwhelming scientific support for the effectiveness and safety of ORS for the management of acute diarrhea, and its use is endorsed by UNICEF and WHO. Even in diarrhea accompanied by vomiting, studies show that more than 90% of infants will tolerate

ORS if it is given gradually and in small volumes; 5 to10 ml given every 5 minutes (Santosham & Greenough, 1990). Use of ORS is effective regardless of the cause of the diarrhea, and is effective in preventing dehydration in both acute and chronic diarrhea (DuPont, 1995). The more recent development of cereal and rice-based fluids provide much needed calories to improve nutrition (DuPont).

Diarrheal episodes are most successfully treated by immediate and continued administration of ORS and continued feeding (Mandelbaum, 1992). Therefore early initiation and continued treatment with ORS in the home are vital. Encouraging, supporting, and increasing the effectiveness of home case management is essential to decreasing the harmful sequella of diarrheal disease, such as dehydration and malnutrition.

Problems with Home Treatment

Effective home treatment is a critical part of diarrhea case management throughout the developing world. However, repeated surveys of home care practices for children with diarrheal illness conducted by WHO have revealed that few care-givers are following the recommended home therapies (Hirnshall & Hudelson, 1993; WHO, 1994b; WHO, 1995). As the principal care-givers in the home in developing countries are primarily mothers, the two terms will be used inter-changeably throughout this discussion.

Specific areas of concern in home case management include the inappropriate use of pharmaceuticals; withholding of food, fluids, or breast-milk during diarrheal episodes; and inadequate use of ORS and other appropriate fluids (Martines et al., 1993). A review of the literature indicates that these problems with home case management are evident in Indonesia. While all of these issues are worthy of further attention and investigation, it was decided that the focus of this study would be on ORS, "the mainstay of diarrhea treatment" in Indonesia (Lerman, Shepard, & Cash, 1985, p. 653). Again, it should be noted that much of the literature referenced in this discussion refers to ORT, which includes ORS as well as other fluids.

History of ORT Use in Indonesia

ORT was introduced to Indonesia in 1971, but was not used in practice in the treatment of diarrheal disease until 1974. The use of ORT in hospitals resulted in a significant reduction in mortality, decreasing the case fatality rate (CFR) from diarrhea in

hospitals from 10% in 1971 to 2.4% by 1981. A major initiative to improve diarrhea treatment in the community began in 1977 with the launch of the "Diarrhoea therapy begins at home" program. Indonesia's Control of Diarrheal Disease (CDD) program, launched in 1981, further emphasized improving case management (Aulia et al., 1994).

Problems with ORT Use

Although Indonesia's CDD program has facilitated a decrease in diarrhea mortality, a significant number of Indonesian children are still dying needlessly due to deficiencies in ORT use at home (Edmundson & Edmundson, 1989). There is evidence from studies performed in Indonesia to suggest that the frequency of ORT use in the home is well below acceptable levels.

One such Indonesian study assessed the use of ORT amongst mothers presenting at a Jakarta hospital with children suffering from acute watery diarrhea (Pulungsih, Ittiravivongs, Sutoto, & Pattara-arechachai, 1992). The purpose of the study was to evaluate the frequency and effectiveness of ORT in the treatment of severe diarrheal dehydration. As part of the study, the mothers of both the cases (59 children with severe dehydration) and the controls (143 children with non-severe dehydration) were asked about use of ORT at the onset of the diarrhea episode. Of the 202 subjects, 66.3% were found to have received ORT. This included 52.9% (107 of 202) that received only ORS, 9.9% (20) that received only SSS, and 3.5% (7) that received both. Thus 56.4% (114 of 202) received ORS, alone or in conjunction with SSS. While 56.4% is certainly well below ideal levels, Pulungsih et al. note that this frequency of use is actually higher than the that of 40% reported in other recent studies in Indonesia (Bunjamin, Saibi, & Sutanto, 1990, and Ismail & Nazir, 1990, as cited in Pulungsih et al.). They credit the difference to the fact that their study took place in the capital city, which they suggest resulted in increased access and availability to ORS packages. It is also possible that the higher reported rates of ORS use in this study are due to the fact that women being surveyed in hospital might be providing what they perceived as socially desirable responses.

Two Indonesian studies, which will be described in more detail later, found ORS rates comparable to the study by Pulungsih et al. (1992). One study in West Lombok, Indonesia (Widarsa & Muninjaya, 1994) found that 66% of 293 mothers reported using

ORT; 56% gave ORS while 10% gave SSS. Another study, performed in Bali, Indonesia, (Muninjaya et al., 1991) found that 68% of the 75 mothers in the study reported having given their child ORS or SSS before taking them to the health facility. Usage rates for ORS were not distinguished from SSS in this study.

Knowledge and use of ORS in the treatment of diarrhea were also assessed in the 1997 Indonesia Demographic Health Survey (CBS, 1998). In this national survey, 28,810 ever-married women between the ages of 15-49 years were interviewed about various health issues. As part of the survey, 13,170 mothers with children under 5 years of age were asked about their knowledge and practices regarding diarrhea care and treatment. While an impressive 94.4% of mothers in this survey had knowledge of ORS, defined as having heard about ORS or seen ORS packets, only 67.9% of mothers reported *ever* having used ORS to treat diarrhea in their children. Of the 1603 mothers whose child had an episode of diarrhea in the 2 weeks preceding the study, only 47.7% (765) treated the recent episode with ORS. The studies reviewed, therefore, indicate that ORT usage rates in Indonesia are well below ideal levels, ranging from a low of 48%, to a high of 68%.

Factors Affecting Use of ORT in Home Treatment

The low rates of ORT use in the home management of childhood diarrhea is clearly a very real problem in Indonesia, despite the fact that health education regarding ORT is said to be provided to mothers throughout the country (Muninjaya et al., 1991; Widarsa & Muninjaya, 1994). This finding suggests that either current health teaching is ineffective, or other factors are influencing mothers' choice of home treatment. Since the use of ORT in the home is dependent on the choice of mothers, it is vital to gain a better understanding of the factors that are influencing their decision-making processes.

Understanding of the influences on mothers' treatment decisions is enhanced by awareness of their knowledge, perceptions, beliefs, and attitudes regarding diarrhea and its treatment (Mikhail, 1981). Local conditions and constraints present in the cultural and physical environment may also affect mothers' decisions (WHO, 1994b). WHO recognizes that there is an "urgent need" to understand the influences on mothers' present attitudes, perceptions and practices regarding diarrhea, and the factors that prevent effective home management (WHO, 1985 as cited in Stapleton, 1989).

While research in Indonesia is limited, a number of studies have been carried out in other developing countries to investigate factors impacting on maternal use of ORT in the treatment of childhood diarrhea. However, knowledge gained from research in other countries has limited usefulness in determining relevant factors in Indonesia, as cultural influences affect the perceptions, attitudes, and health beliefs which are influencing mothers' decisions about the use of ORT (Kumar, Clements, Marwah, & Diwedi, 1985; Stapleton, 1989). Therefore, the WHO Division of Diarrhoeal Disease Control recommends that national Control of Diarrheal Disease (CDD) programs use household surveys in order to identify local beliefs and behavioural problems which inhibit successful case management at home (WHO, 1995). Household surveys can be used to identify the population's knowledge of the diseases and treatment practices, thus enabling effective program planning, management, and evaluation (WHO, 1994a).

Examination of the results of studies performed both in Indonesia and elsewhere can be useful in identifying possible influential factors. These findings can then be used to guide data collection in the present study. Factors identified in the literature were found to relate to mothers' knowledge and beliefs about diarrhea and dehydration, their expectations of achieving success with ORT treatment, the barriers to use of ORT, demographic factors which influence ORT use, and the influence of other individuals.

Mothers' Knowledge and Beliefs about Diarrhea and Dehydration

A number of studies, both in Indonesia and other developing countries, have assessed the influence of mothers' knowledge and beliefs about diarrhea and dehydration on their use of ORT in the home. Specific areas of inquiry included mothers' perception of the severity of diarrhea, the influence of specific characteristics of the episode on perception of severity and on ORT use, knowledge of the signs of dehydration, and the influence of perceived etiology on ORT use.

Two of the studies reviewed assessed mothers' view of the severity of diarrheal disease in children, although not assessing the influence of this perception on mothers' use of ORT. One of these was a qualitative study in East Lombok, Indonesia which explored mothers' knowledge and beliefs about diarrhea as part of its assessment of the treatment of infants and young children with respiratory tract infections and diarrhea (Grace, 1998). Data

were collected from 60 individual interviews and 34 focus groups with mothers of children 5 years or younger in three rural hamlets, as well as interviews with various modern and traditional health practitioners. In addition, a survey of pharmaceuticals available in the local kiosks was performed, and the treatment records of the modern practitioners were examined and their treatment practices observed. This study mainly focussed on factors impacting on treatment-seeking outside the home, but also discussed issues surrounding home treatment decisions, including the use of ORT. It concluded that the seriousness of diarrheal disease was recognized by most mothers, many of whom stated that children with diarrhea should be taken to the clinic, either immediately, or after treating with ORT.

Another study that looked at mothers' perception of severity was a descriptive survey carried out in northern India (Kumar et al., 1985). This study examined maternal beliefs and therapeutic preferences related to diarrheal disease, and the impact of interventions such as health education on these beliefs and treatment choices. The study involved a partly-structured questionnaire of care-givers of children less than 3 years old in both rural and urban settings, although the sampling technique and sample size were not clear from the report. When asked about the perceived severity of the diarrhea episode, 42.5% of mothers indicated that they were worried about the presence of blood in the stools, while significantly fewer were concerned about watery diarrhea (13.4%) and vomiting (16.7%). In terms of mothers' knowledge of the consequences of diarrhea, 68% recognized malnutrition as a complication of diarrhea, while only 17.4% were worried about dehydration. While this study assessed the influence of various other maternal beliefs on ORT use, they did not assess the association between these perceived signs of severity and mothers' use of ORT.

A number of studies looked at the influence of the perceived severity of the diarrhea episode on mothers' ORT use. The authors of one study in Honduras (DeClerque, Bailey, Janowitz, Dominik, & Fiallos, 1992) suggested that mothers' choice of treatment was often determined by their knowledge and beliefs about disease causation, and their perception of the severity of the disease. The purpose of this study was to assess the relative importance of maternal, child, and demographic determinants on treatment patterns, focussing on use of prepackaged ORS. The sample for this cross-sectional study was obtained from a subset of a multistage probability survey of households, and included 711 urban and rural children

who had diarrhea on the day of, or during the 2 days prior to, the survey. No information is provided about the type of measurement tool utilized.

In their descriptive analysis of diarrhea morbidity and ORS use DeClerque et al. (1992) identified a notable relationship between perceived severity of the disease and mothers' treatment choices. Specifically, they found that a significant percentage of diarrheal cases which were accompanied by vomiting, blood or mucus in the stool, or had a duration of three or more days, were treated with ORS ($p<0.05$). This study also used multi-variable logistic regression to determine the independent effects of specific factors on treatment with ORS. Use of ORS was found to be related to a diarrhea episode duration of three of more days (OR: 1.57; 95% CI: 1.07-2.3), the presence of vomiting (OR: 2.42; 95% CI: 1.64-3.59), and the presence of blood or mucus in stools (OR: 1.67; 95% CI: 1.17-2.38). No p-values were provided for this data, but the confidence intervals indicate that the findings were statistically significant. These results are supported by the findings of a study in Bangladesh (cited in WHO, 1994b), which indicated that the use of ORT for a particular episode of diarrhea was significantly associated with the mothers' perception of the severity of the episode, as indicated by their reports of weakness, vomiting, number of stools and stool volume.

The authors of the Honduran study (DeClerque et al., 1992) noted that there is a need to further investigate factors affecting mothers' choice of health care behaviours. They stated that the level of ORS use may not be an indicator of program failure or ineffective communication, but rather an indication of the complex nature of behaviour and the adoption of new health practices.

Another study, performed in Haiti (Coreil & Genece, 1988) also looked at attributes of specific diarrheal episodes which determined use of ORT, as well as the effect of other variables. This ethnographic and descriptive survey took place in one town and its surrounding rural villages. A random sample of care-takers of children less than 5 years was selected from the census records of the health program in the region. Twenty-two mothers of children <5 years old were interviewed in depth about home management of diarrhea, and a questionnaire was administered to 300 mothers of children less than 5 years old. In analysing the effect of the independent variables on ORT use, this study did not differentiate

between prepackaged ORS and home-made SSS. A number of dependent variables were measured, including knowledge of ORT, previous use of ORT, delay in initiating treatment, and recent ORT use. The variable "recent ORT use" was defined as use of ORT for the treatment of a diarrheal episode in the week preceding the survey. Of all the dependent variables, this was considered most predictive of actual use of ORT, and thus is the dependent variable discussed here. The findings of this study contrasted with the those in other studies, in that bivariate correlations between the dependent variable "use of ORT" and characteristics of the diarrhea episodes found that care-givers' use of ORT was not associated with episode severity, as measured by the number of stools per day, or with duration.

Another study, performed in Nigeria, examined the relationship between different culturally defined types of diarrhea and mothers' treatment responses (Okunribido, Brieger, Omotade, & Adeyemo, 1998). This descriptive-correlational study was a sub-project of a larger longitudinal study. The study took place in 5 rural communities selected on the basis of accessibility to researchers and the large number of under 5 year old children. All the mothers of children under 5 in the study area were visited until a sample of 235 children between 2-60 months old who had experienced a diarrhea episodes in the past 2 weeks were identified. A questionnaire about mothers' case management and perception of illness was administered in the home. This study did not evaluate pre-packaged ORS, but rather SSS and other forms of ORT. In analysis of the results, the frequencies of each type of case management strategy were correlated with the type of episode, as classified by the characteristics of the episode. The findings indicated that choice of treatment, drugs, herbs, or ORT, differed according to the type of diarrhea episode. Mothers were almost twice as likely to give ORT if they perceived their child as having watery diarrhea rather than dysentery (OR: 2.52; 95% CI: 1.34-4.77). The authors noted that the fact that mothers were less likely to use ORT for dysentery-type diarrhea was worrisome and needed to be addressed by educational efforts.

As part of one study in rural Ethiopia (Olango & Aboud, 1990), the investigators sought to determine the influence of mothers' knowledge about diarrhea and the severity of the episode on their treatment practices. They proposed that poor treatment choices by

mothers were associated with lack of knowledge about the severity and consequences of diarrhea. This cross-sectional survey took place in a rural district of southern Ethiopia. Female care-givers of children under 5 years of age with diarrhea in the past 2 weeks were identified from a census survey in 11 randomly selected rural communities and interviewed using a structured questionnaire. In analysing the results of the 619 interviews, composite scores were calculated to measure the appropriateness of mothers' home treatment, which included use of ORT, modern professional treatment, and traditional treatment. These variables were examined in relation to both a composite score of knowledge about diarrhea and the actual severity of the diarrheal episode. Knowledge was found to have a statistically significant positive association with adequate home treatment (OR=1.44, 95% CI=1.01-2.07). Since ORT use was grouped with other home treatments in analysing relationships with other variables, the implications of these results for the study of ORT use are difficult to interpret. The results of tests of association between severity and home treatment were not reported in this article.

Two studies addressed the issue of whether mothers' understanding of the severity of diarrhea, and use of ORT, was related to their knowledge of dehydration. One study, carried out in Bali, Indonesia (Muninjaya et al., 1991), sought to assess mothers' knowledge of the signs of dehydration. This study involved a survey of mothers' home management behaviours for their children's acute diarrhea episodes. The goal of the survey was to evaluate knowledge and use of ORT, feeding and drug use, and recognition of severity of illness. Seventy-five study subjects were selected from children with acute diarrhea who were admitted to two government hospitals, and who presented at two randomly chosen urban and two rural health centres. The mothers of every third child discharged from the hospitals and every child who attended the health centres in the study period were interviewed at home using a pretested questionnaire. In addition, 10 randomly selected mothers were interviewed in depth.

Mothers in this study were asked to identify which signs of dehydration concerned them. Only 9% and 3% of mothers reported concern about weakness and sunken eyes, respectively. None of the mothers reported being concerned about the other four listed signs of dehydration, which included sunken fontanelle, decreased urine output, dry mouth, and

thirst. Mothers' knowledge of the signs of dehydration in this study can be compared to a Nicaraguan study, to be described in detail later, in which 91% of mothers could name at least one of seven signs of dehydration (Hudelson, 1993). While Hudelson's study did not suggest any association between this knowledge and ORT use, Muninjaya et al. (1991) concluded that lack of knowledge of the signs of dehydration may be impacting on the use of ORT as a treatment to prevent dehydration. The relationship between recognized signs of dehydration and the use of ORT was inferred by these authors, but no statistical tests of the association were performed.

The authors of the Bali study (Muninjaya et al., 1991) recognized that a limitation of their study was the fact that they only sampled from mothers who presented at a health care facility. Therefore, the reported behaviours may not be representative of all mothers in the region, as only a fraction of the actual cases in the community are seen in health facilities (WHO, 1994a). It is conceivable that mothers who did not seek care outside the home, or who sought care from someplace other than a health facility, such as a traditional healer, may have differed in their knowledge and use of ORT.

In addition to the influence of the perceived severity of the episode, there is evidence from the literature to suggest that the perceived cause of the diarrheal episode can significantly affect mothers' treatment responses. Specifically, it has been suggested that certain cases of diarrhea are considered to be a normal part of growing up and are therefore tolerated rather than treated. As stated by one author, episodic diarrheal disease in small children may be considered "a rite of passage or a developmental stage" that every child must pass through (Mandelbaum, 1992). Other authors found that trying to treat diarrhea of this origin may actually be considered harmful to the child (Mull & Mull, 1988). Additionally, other cases of diarrhea might be classified as the result of folk illnesses, thus requiring folk treatments rather than treatment with ORT or other biomedical therapies (Mull & Mull). Coreil and Genece's study (1988) did not, however, find any association between care-givers' use of ORT and the perceived etiology of the episode, although when a concurrent illness was perceived to have caused the diarrhea there was a significant correlation with ORT use (Pearson's $r = 0.22$; $p<0.005$).

While there was not a total consensus among the studies, the bulk of the evidence suggests that mothers' choice of treatment behaviours, including use of ORT, may be influenced by their knowledge and beliefs about the disease, including their perception of the severity of specific characteristics of the episode. Mothers' knowledge of the signs of dehydration was suggested to have been an influence on ORT use, although untested statistically. The influence of mothers' perception of the cause of the illness, and their children's susceptibility to it, was suggested in a number of studies, but found to be unassociated in the one study that tested the relationship.

Mothers' Expectations of Achieving Success with ORS treatment

It has been said that care-givers' beliefs and expectations of achieving success in the treatment of diarrhea are essential to the successful use of ORS (O'Brien & Santosham, 1996). Such expectations relate to the perceived benefits of ORS, including beliefs about its effectiveness and about its mode of action. While many studies suggested the influence of these expectations on use of ORS, few actually tested the association.

The study in Bali by Muninjaya et al. (1991), suggested that the low reported use of ORS could be due to the fact that during diarrhea health teaching in that area mothers were told to use ORS, but were not told the rationale for its use. Although the study did not specifically investigate this connection, the authors speculated that mothers' perceptions of the function and effectiveness of ORS may have limited its use.

In Grace's qualitative study in East Lombok (1998), it was also suggested that mothers' treatment choices were affected by their understanding and experience of the appropriateness and effectiveness of the treatment. The author states that since health education in the region has received relatively little emphasis, most mothers do not have a valid understanding of the cause of illness or how treatment works. Grace therefore concluded that mothers "construct their understanding of modern forms of treatment within the framework of the local healing tradition" (p.1293). While mothers in this study appeared to have a good awareness of the effectiveness of ORT, and many reported using it as their first choice of treatment, Grace stated that it became apparent upon further questioning that ineffectively small volumes of ORS were administered, as mothers did not perceive ORT as part of the process of rehydration, but rather as a medicine.

Another study that investigated the impact of perceived benefits of ORS on mothers' decision-making was performed in Nicaragua (Hudelson, 1993). The purpose of this study was to examine mothers' use of ORS and to describe their beliefs and practices concerning childhood diarrhea and the factors that influence health care choices. This was a descriptive-exploratory study that took place in a low-income neighbourhood outside the city of Managua. One hundred and twenty households were randomly selected from vaccination campaign census data; from this sample eight key informants and 109 mothers of children less than 6 years old were obtained, including 44 cases of recent diarrhea (in the 2 weeks preceding survey). The key informants were asked about local perceptions and practices regarding diarrheal disease, while the 109 mothers were interviewed about household socio-economic status, health beliefs, previous experience with health providers, and diarrhea treatment practices. The 44 mothers of children with recent episodes of diarrhea were asked about symptoms, causes, and treatment.

This study found that although 45% of the 109 mothers stated that ORS was used to prevent or treat dehydration, 51% also attributed erroneous properties to ORS, such as cleaning/fixing the stomach, stopping diarrhea, or providing nutrients. ORS was perceived as having limited effectiveness as it did not *stop* the child's diarrhea. Hudelson (1993) suggests that this lack of understanding of the function and effects of ORS may be inhibiting mothers' willingness to use ORS. Unfortunately only qualitative and descriptive data were presented, and the relationships among the various factors were not tested.

The belief that lack of understanding of the function of ORS is inhibiting use is suggested, but not tested, by other studies. O'Brien and Santosham (1996) stated that parental goals and expectations for treatment of diarrhea typically included a decreased duration of illness, and cessation or decrease in the volume and frequency of loose stools and vomiting. Since ORT functions by preventing dehydration, not decreasing diarrhea symptoms, it will not achieve these goals. Touchette et al. (1994) agreed, suggesting that mothers may question the credibility of ORS, believing it to be just water and therefore not as effective as treatment with medication. Another study, in Bangladesh (cited in WHO, 1994b), suggested that mothers' perception of the mode of action of ORT was influential in determining their view of ORT following their initial trial of ORT.

Only a small number of studies actually tested the association between ORS use and understanding of its mode of action. Coreil and Genece's Haitian study (1988) examined the relationship between use of ORT and care-givers' understanding of its mode of action. Care-givers who described the effect of ORT as preventing dehydration or replacing water losses were significantly more likely to use ORT than those who described ORT as a "cure or fortifier for diarrhea" (p.92) (Pearson's $r = 0.23$, $p < 0.005$). These authors stated that beliefs about how ORT works and its relation to dehydration are important predictors of its use, and have influenced the acceptance of this treatment world-wide. They believe that program planners have ignored the importance of mothers' perceptions of the mechanism of effect of ORT. The authors also suggest that beliefs about effect of ORT are associated with differential exposure to information about rehydration treatment. The study by Kumar et al. (1985) in north India had similar conclusions. They stated that mothers who used ORT believed in its effectiveness, possessed adequate knowledge about its correct usage, and did not report any serious side effects. However, the data to support this conclusion were not presented in the article.

Another study, by McDivitt, Hornik, and Carr, (1994), examined the influence of mothers' understanding of the function of ORS on its use. This study attempted to assess the importance of various factors, in particular mothers' knowledge, in determining the volume and duration of ORS administered to children during diarrhea episodes. Data were collected over 3 month periods from seven sites throughout Africa, Asia, and Latin America, including West Java, Indonesia. The goal of the study was to carry out comparable analysis in each site and examine the results across the seven sites. However, there was a considerable amount of variation between sites in terms of the variables assessed, survey instruments, and the time period in which data collection occurred. Due to the difficulty in comparing the findings of the various countries' surveys, the authors primarily refer to the significant findings of each country separately. For this reason, only the findings of the study in West Java will be considered here. The study in West Java was a cross-sectional survey of 424 primary caretakers of children under the age of 5 years who had experienced an episode of diarrhea in the past 3 months. The subjects were sampled through a three-stage cluster procedure. The authors recognized the limitation of questioning mothers about episodes

occurring up to 3 months prior to the interview in terms of the questionable accuracy of their recall of events. Logistic regression analyses were utilized in order to determine the influence of the predictor variables on ORS use. The report of this study states that analysis of the findings indicate that mothers in West Java who knew that ORS replaced fluids were more likely to have used ORS during their children's recent episode. The actual data to support this finding were not presented.

Mothers' knowledge about hydration as an appropriate response to their children's diarrhea episodes can be further explored by examining their practices regarding breast-feeding and the offering of fluids. In the Indonesian study by Muninjaya et al. (1991), 71% of mothers stopped or decreased bottle-feeding during the episode of diarrhea, while 78% of breast-feeding mothers maintained or increased their usual amount of breast-feeding. These contradictory findings make it difficult to draw conclusions as to whether mothers are aware of the benefit of hydration during an episode of diarrhea. This study did not assess the relationship between ORS use and hydration from other fluids; therefore, it was unclear whether mothers were providing breast-milk in lieu of administering ORT.

The study by McDivitt et al. (1994) did, however, assess this relationship. They found that administration of ORS was linked to administration of other fluids, including breast-feeding. Specifically, they found that children who were not given ORS were significantly less likely than children who were given ORS to have received other fluids ($p<0.05$). While the authors do not draw any conclusions from this finding, it is possible that mothers who increased fluids as well as providing ORS had a better understanding of the necessity to hydrate their children during their diarrhea episodes.

While few of these studies actually assessed the influence of understanding of ORS function and effectiveness on its use, many suggest the relationship. Those that did test the relationship found a positive relationship between ORS use and correct knowledge of its role in hydration. It is suggested that correct knowledge of ORS function should increase belief in the effectiveness of ORS in the treatment of diarrhea, thereby increasing its use.

Barriers to Use of ORT

A review of the literature reveals that there are a number of possible barriers preventing mothers from using ORS in the home treatment of their children's diarrhea

episodes. These barriers relate to mothers' access to ORS packets; mothers' ability to obtain, prepare, and administer ORS; children's willingness to accept ORS; and other cultural beliefs that limit its use.

Some of these factors were identified in a study in Indonesia which sought to assess how often ORS was used by mothers in home case management of acute diarrhea, and what factors were associated with its use (Widarsa & Muninjaya, 1994). This study took place in 30 hamlets in a rural area of West Lombok, Indonesia. Over a period of 3 months, trained female field workers visited 600 mothers of children under the age of 2 years. They identified 300 mothers of children that had an episode of diarrhea in the past week who agreed to structured interviews. During the 293 interviews which were ultimately completed, mothers were asked questions related to the timing of ORS use; frequency of ORS use; preparation of ORS; interpretation of ORS instructions guidelines; availability of at least one packet present in the home; and accessibility of ORS, i.e. the ability to readily obtain ORS packets. Through logistic regression analysis, four of the five factors examined were determined to be significantly associated with the use of ORS. These factors included (a) watching a demonstration of how to mix ORS (OR: 6.25; 95% CI: 1.43-27.33; p=0.0149); (b) reading guidelines on ORS use (OR: 2.96; 95% CI: 1.43-6.10; p=0.0034); (c) ORS availability (OR: 2.32; 95% CI: 1.13-474; p=0.0206); and (d) ORS accessibility (OR: 3.51; 95% CI: 1.45-8.51; p=0.0053). While their study found that only 37% (108) of the 293 mothers interviewed prepared ORS correctly, the ability to prepare ORS correctly was not significantly associated with ORS use (OR: 1.16; 95% CI: 0.66-2.01; p=0.6024).

The influence of availability and access to ORS packets on mothers' use, which was found to be statistically significant in Widarsa and Muninjaya's study (1994) was also suggested as being an influence by McDivitt et al. (1994) and Grace (1998), although neither assessed the relationship.

Widarsa and Muninjaya's study (1994) contrasts with Mull and Mull's (1988) study in Pakistan which suggested that inadequate understanding of the correct preparation and administration of ORS may be a factor limiting its use, although this association was not tested. The study by Muninjaya et al. (1991) also assessed correct preparation and found that 60% of 75 mothers who were observed preparing ORS from a packet provided did so

correctly. However, they did not assess the association between correct preparation and the frequency of ORS use. While the influence of knowledge of correct preparation is uncertain, there is a clear indication that there is a deficiency in mothers' ability to prepare an effective and safe concentration of the solution. It is noteworthy that none of these studies assessed the mothers' knowledge or ability to correctly *administer* ORS.

Additional barriers to ORS use suggested in the literature include palatability of ORS and cultural conflicts. It has been proposed that mothers may have difficulty getting their children to take ORS, due to the taste of the solution. The study by Touchette et al. (1994) found that 60% of mothers interviewed stated that their children disliked the taste of ORS. The authors suggested that palatability exerted a major influence on the volume of ORS administered to the child. It has also been proposed that in some cultures treatment with ORT might be resisted if it is in conflict with the hot-cold belief of illness and treatment (Mull & Mull, 1988). While these factors were proposed to be associated with mothers' use of ORS, their actual influence on ORS use was never tested.

The findings of these studies indicate that mothers' decision-making about the feasability and appropriateness of ORS treatment might be affected by a variety of barriers including availability and access issues, knowledge of correct preparation and administration techniques, resistance by the child, and cultural belief systems.

Sociodemographic Factors Influencing Mothers' Use of ORS

It has been proposed that a number of maternal and child demographic factors may influence mothers' use of ORS. These include mothers' residency, parity, work status, education, and literacy; previous child loss; child's age; and the availability of household help.

The study by DeClerque et al. in Honduras (1992) focussed on the influence of various maternal and child demographic factors on mothers' treatment choices. They sought to examine whether patterns of health-care behaviours varied according to sociodemographic characteristics. The characteristics selected for analysis in their study included: residence, mothers' parity, previous child loss, mothers' work status, mothers' education, and child's age. In comparing the frequencies of ORT use for each variable in bivariate analysis, the only sociodemographic factor that was found to be significantly associated with ORT use

was the child's age. However, while the authors found that more children aged 6-23 months were treated with ORS than children in other age groups, this finding was not statistically significant ($p>0.05$). The relative importance of interrelated demographic factors in determining use of ORT was also assessed through multivariate logistic regression. The sociodemographic factors found to be associated with *lower* probability of ORT use were mothers with no primary education (OR: 0.36; 95% CI: 0.17-0.78), children 24-35 months (OR: 0.40; 95% CI: 0.24-0.69), and children 35-59 months (OR: 0.51; 95% CI: 0.31-0.83). No p-values were provided, but the odds ratios and confidence intervals indicate that older children and children whose mothers had less maternal education were significantly less likely to be treated with ORS.

Coreil and Genece's study in Haiti (1988) also looked at the impact of various sociodemographic characteristics on the use of ORT. Upon bivariate analysis, the variables found to have a significant association with ORT use were urban, rather than rural, setting (Pearson's $r= 0.23$; $p< 0.05$) and child's age (Pearson's $r=0.23$; $p<0.005$). Although the authors do not provide data indicating the ages analysed, they state that younger children and infants were more likely to be treated with ORT that older children. Variables not found to be significantly correlated with recent ORT use were ability to read, mothers' age, marital status, and material wealth. None of the variables were found to have independent effects in multiple regression analysis.

Grace's qualitative study in East Lombok, Indonesia (1998) also indicated that the age of the child affected the mothers' choice of treatment sought for both respiratory infections and diarrhea. She suggested that a difference existed in the type of treatment mothers sought for infants versus young children, with ORT use higher amongst infants.

In contrast to the studies that indicated that young children are more likely to receive ORT, there are two qualitative studies that suggest the opposite relationship. One such study looked at maternal health beliefs in East Java, Indonesia and found that adherence to traditional maternal health beliefs tended be strongest during the infancy period. One explanation proposed is that women perceive that infants are not mature enough to be subjected to modern medical or health interventions (Prajitno, et al., 1979). Another qualitative study in Indonesia, which looked at care-seeking for young children with

respiratory infections (Sutrisna et al., 1993), identified beliefs that might prevent use of western-style health care, such as ORS. These included the belief that it was not safe for a child to leave the house during the first 6-8 weeks of life, and the belief that it was dangerous for a young infant to receive western-style medicines by injection or by mouth. Neither of the two quantitative studies performed in Indonesia assessed the impact of the age of the children on treatment decisions of mothers.

The study by Kumar et al. in northern India (1985) suggests that other sociodemographic factors, such as literacy and place of residence affect treatment decisions. They stated that illiterate women and rural women were more likely to lack appropriate knowledge and have inappropriate therapeutic preferences. Specifically, mothers who were illiterate and lived in rural areas were less likely to recognize watery diarrhea or dehydration as a cause for concern than mothers who were literate or lived in urban areas ($p=0.01$).

McDivitt et al. (1994) have suggested that a combination of the factors "work status" and "availability of household help" may also be impacting on mothers' use of ORS. They referred to this composite factor as "time constraints" or "workload". While McDivitt et al. suggested this association, they did not find that the individual factors had any association with ORS use, and they did not test statistical interaction between the various factors. The authors suggested that more detailed investigation into constraints on mothers' time is warranted. Touchette et al. (1994) also suggested that ORS use may be prevented by time constraints imposed by competing responsibilities at home, but again, this was not specifically investigated.

These studies indicate that the demographic factor most consistently associated with ORT use is the age of the child with the diarrhea episode. The evidence for the association of other factors, such as mothers' literacy, education, and place of residence, is contradictory. Factors not associated with ORT use include mothers' age, marital status, parity, household help, work status, and previous child loss. The influence of workload and time availability is suggested, but has not been adequately assessed.

Individuals Influencing Mothers' ORS Use

It has been suggested that various individuals may be exerting a significant influence on mothers' home treatment decisions, and specifically their ORS use. These individuals

might include family members, friends, elders, and modern and traditional health care providers.

Studies performed within Indonesia and elsewhere suggest that family, friends, and community health workers may all play roles in influencing mothers' home treatment decisions. In the report of their study in West Lombok, Indonesia, Widarsa and Muninjaya (1994) noted that fathers and grandmothers played a strong role in health care decisions in the family. Grace's East Lombok, Indonesia study (1998) also concluded that mothers' choice of appropriate treatment was influenced by grandparents, friends, and various health workers. Studies in other developing countries also support the influence of various individuals on mothers' decision-making. In their 1998 study in Nigeria (Okunribido et al.), the investigators asked mothers about what influenced their choice of treatment for their child's diarrhea. Fifty-four percent of mothers stated that they used their own initiative, while 17% stated that they were influenced by their husbands, 8.5% by relatives, 6.4% by friends, 8.1% by nurses or voluntary health workers, and 0.9% by the village herbalist. In India, Kumar et al. (1985) found that mothers' beliefs surrounding diarrhea and its treatment were dependent on information passed on from generation to generation, and advice given by elders and health workers. None of these studies looked at the influence on ORS use specifically.

A number of studies investigated the influence of health workers on ORS use in particular. Hudelson's study in Nicaragua (1993) suggested that health workers did have an influence on use of ORS as health facility attendance was found to be directly related to ORS use ($p<0.001$). Of the 27 mothers who used ORS at sometime during their children's diarrhea episodes, only 3 had initiated its use prior to visiting a health facility. The study by DeClerque et al. in Honduras (1992) also identified utilization of preventive health care measures as predictive of use of ORS in home treatment. They stated that ORS use was significantly higher for mothers who sought medical advice. However, it is unclear from their results whether the child received ORS from health workers in the health facility, or from mothers at home. Kumar et al. (1985), in their study in India, found that mothers who lived in villages with a health centre that promoted ORT were significantly more likely ($p<0.01$) to be concerned about dehydration than mothers who lived in villages without a

health centre, or with a health centre that did not promote ORT. The authors concluded that ORT health education "leads to increased recognition of dehydration as a complication of diarrhea and the importance of fluid therapy" (p.111). They did not, however, actually test the association between health centre attendance and ORT use. In their study in Haiti, Coreil and Genece (1988), investigated the impact of various modern and traditional health workers on care-givers' decision to use ORT. In contrast to the other studies, they found that neither the use of traditional healers, nor clinic use, were significantly associated with recent use of ORT. The authors concluded that consultation with traditional healers does not impact on care-givers use of ORT. However, these authors do suggest that most mothers do not initiate ORT without first consulting with a physician.

Some of the studies specifically assessed the influence of health workers' own treatment practices on mothers' use of ORS. Grace's qualitative study in East Lombok (1998) suggested that the type of treatment provided by the various health practitioners impacted on mothers' beliefs about appropriate home treatment. Few of the health professionals in this study were found to treat diarrhea with ORS. For instance, the bidans (village midwives) were found to refer diarrheal cases to the clinic or to the "injection doctor", or to treat it with various liquid and herbal remedies. Review of clinic records also indicated that in almost every case, clinic nurses treated children's diarrhea episodes with antibiotics. The study by Muninjaya et al. in Bali (1991) concurred, finding that 50% of mothers were given drugs by health workers for the treatment of their child. They suggest that the perception that drugs are the appropriate treatment for diarrhea may be negatively impacting the adoption of ORS in the treatment of diarrhea. McDivitt et al. (1994) also recognized the potential impact of health workers' attitudes and practices on mothers' home treatment choices. They suggested that the use of treatments other than ORS by health workers may discourage mothers' own use of ORS at home. They also stated that when mothers do use ORS in home treatment, the inadequate volumes administered in most cases may be directly linked to the small number of packets provided to them by health workers; mothers may be presuming that adequate treatment can be achieved with the number of packets provided.

The influence of family and friends on mothers' home treatment choices is suggested, but not tested, in previous studies. There is stronger evidence for the association between ORS use and the advice of health workers, although the impact of health workers' own treatment practices on mothers' ORS use has been untested.

Summary of Studies

In summary, there is some degree of evidence to support the association of maternal ORT use with the perceived severity and cause of the diarrhea episode; belief in the effectiveness of ORT, and knowledge of its function; access and availability of ORS packets; correct preparation and administration techniques; the age of the child; the mothers' level of education or literacy; place of residence; the influence of family, friends, and community health workers; and care-seeking at health facilities. Of these factors, the only ones to have been tested in Indonesia are knowledge of correct preparation of ORT and access and availability of ORS packets.

The associations between ORT use and other factors have been hypothesized, but have been either untested or inadequately tested in previous studies. While mothers' knowledge of the signs and symptoms of dehydration have been assessed, the relationship between this knowledge and use of ORT has never been tested. Other factors potentially influencing ORT use are health workers' own treatment practices, family structure of the household, palatability of ORT, and conflict with cultural health belief systems, such as the hot-cold belief of illness and treatment. While the influence of mothers' employment status and previous child loss were not found to be influential in previous studies, they have not been tested in Indonesia.

Overall, the association between these various factors and the use of ORT has been hypothesized, and in some cases tested, in numerous studies. However, few of these factors have been tested in Indonesia. It cannot be presumed that the findings of studies carried out in other developing countries can be generalized to Indonesia, as perceptions of illness and appropriate treatment strategies are known to vary among different social and cultural contexts (Weiss, 1988). While the findings of studies performed outside Indonesia may not be directly applicable within Indonesia, they suggest factors worth investigating there.

Use of the Health Belief Model

These various studies have investigated maternal decision-making processes and the numerous potential influences on ORT use in the home treatment of childhood diarrhea. However, few of the studies specifically identify what process or framework guided the choice of factors being investigated. Coreil and Genece (1988) utilized the innovation theory and the decision theory to investigate this issue, and suggest that they are useful theories for future research into predictors of therapeutic treatment choices. Two other studies utilized a qualitative ethnomedical model to investigate the diarrheal disease behaviours of mothers (Kendall, Foote, & Martorell, 1984; Weiss, 1988), which is a suitable method for preliminary investigation of health beliefs and behaviours.

For the purpose of this study, the Health Belief Model (HBM) is believed to be the most appropriate model for explaining and predicting mothers' decision-making about use of ORS in the home treatment of diarrhea. The HBM, originally developed in the 1950's at the United States Public Health Service, provides insight into the decision-making processes leading to individuals' choice of health-related behaviours (Mikhail, 1981). The original version of the HBM has been modified based on subsequent research, resulting in a model with greater explanatory power and applicability to a wider range of disease prevention and health protection activities (Rosenstock, Strecher, & Becker, 1988; Janz & Becker, 1984). The modified version of the HBM (see Appendix A) suggests that the probability of an individual taking action to protect their health is influenced by:

1. The perceived threat of the illness, which includes the perceived susceptibility to, and severity of, the illness.

2. The expectation that the benefits of the proposed action outweigh the barriers, where lack of self-efficacy in performing the action is seen as a barrier.

3. Modifying factors, such as sociodemographic variables, which impact on the individual's perception of the threat and expectations of the desired action.

4. Cues to action that trigger or motivate the individual to act, including the influence of others.

According to the HBM, the threat of the illness is based on the individual's perception of both susceptibility to the illness and the serious repercussions of the illness.

The individual's expectation includes their perception of the benefits of the action, namely evaluation of the feasibility and effectiveness of the action in terms of its ability to reduce the threat to health (Goeppinger & Lorig, 1996; Mikhail, 1981; Redman, 1997). The barriers to action are seen as the individual's perception of the psychological, physical, financial, social, and other costs of taking action. The individual's perceived self-efficacy in performing the desired action is integrated into the perception of barriers to action. The concept of self-efficacy is the individual's belief or conviction that they can successfully perform the proposed action (Hayman, 1998; Mikhail). Modifying factors, often referred to as sociodemographic factors, include demographic variables, such as age, sex, and race; and socio-psychologic variables, such as personality, social class, and quality of patient-provider relationships (Mikhail; Pender, 1996). These factors can potentially modify the likelihood of taking action, through their influence on threats and expectations. The likelihood of the appropriate behaviour occurring is also affected by cues to action, which include internal or external factors that motivate the individual to act. They may include mass media campaigns or the advice of other individuals (Goeppinger & Lorig; Mikhail).

The HBM can facilitate understanding of individuals' decision-making processes in regards to health-protecting and disease-preventing behaviours (Janz & Becker,1984), and can provide a structure for organizing and relating the factors impacting on health-related decisions (Lancaster & Lancaster, 1981). There is empirical support for the theoretical formulation of the HBM (Mikhail, 1981) and for its use in understanding the determinants of health-protecting behaviours (Pender, 1996). Although the Health Promotion Model (HPM) is also applicable to understanding health-related decisions, it is primarily focussed on health promotion activities directed at increasing well-being and actualizing health potential (Hayman, 1998; Pender, 1996). Thus, while the complementary processes of the HBM and the HPM are both valid models for investigating health-related decisions-making (Pender, 1996), the HBM is considered to be more appropriate for the investigation of this particular phenomenon.

The HBM was therefore used in this investigation to facilitate understanding of mothers' health-protecting behaviour, namely their use of ORS in the prevention of diarrhea-

related dehydration in their children. The model also provided a framework by which to organize and summarize the factors investigated in this study, as seen in Table 1.

Table 1: Possible Factors Influencing Maternal Use of ORS to be Tested in Study

Perception of Threat	Expectation of Benefit	Barriers	Modifying Factors	Cues to Action
•Perceived severity of diarrhea episode •Knowledge of signs and symptoms of dehydration •Perceived cause of diarrhea episode •Loss of a previous child to diarrhea	•Belief in effectiveness of ORS •Understanding of function of ORS	•Lack of self-efficacy in preparation and administration of ORS •Lack of access to ORS packets •Difficulty with administration •Conflict with cultural health beliefs	•Child's age •Maternal education or literacy •Maternal employment status •Family structure and decision-making in the household	•Influence of family, friends, and health workers

Conclusion

Diarrheal disease has long been recognized as a leading cause of morbidity and mortality among young children throughout the world. It significantly impacts the health and survival of children in Indonesia despite the introduction of ORS, a safe, effective, and inexpensive means of preventing and treating diarrhea-related dehydration. The evidence from the literature suggests that lack of understanding of maternal health beliefs, perceptions, knowledge, and practices may be what is limiting the effectiveness of efforts to promote ORS in Indonesia. The influence of these and other factors has been investigated in various developing countries, with a small number of studies in Indonesia which addressed a limited range of factors.

The HBM can be used as a framework for organizing and examining the factors impacting on the use of ORS in the home treatment of childhood diarrhea. It is a useful model both for organizing the findings of earlier studies, as well as providing direction to

guide data collection for this study. The premise of the HBM is that understanding maternal perceptions of threat, expectations of benefit, perceived barriers, modifying factors, and cues to action are critical to understanding mothers' home treatment decisions.

It is evident that initiatives to promote ORS will be more effective if they are based on a realistic assessment of maternal beliefs and knowledge, existing health practices, and the practical constraints on mothers. In order to determine these potential influences, it is necessary to investigate mothers' practices and the reasons motivating their treatment decisions. It is imperative to gain a better understanding of the factors that affect the care of children at home, in order that the knowledge of diarrheal disease and its treatment gained thus far can be translated into actions that positively impacts child health.

Chapter 3

Chapter 3 describes the methods which guided this study. Issues discussed include the study design, definition of terminology, description of the study population and setting, sample size, communication issues, sample selection and recruitment, the data collection process and instruments, data management and analysis, and ethical considerations.

Design

This study utilized a cross-sectional design to survey a sample of mothers of children under the age of 5 years. Data collection took place between August 13thth and October 2nd, 2001.

Definitions

Diarrhea: As defined by the mothers interviewed. WHO defines diarrhea as "three or more loose or watery stools in a day (24 hours)" (WHO, 1993).

Dehydration: Loss of large amounts of water, salts, and electrolytes from the body.

Recent episode: An episode of diarrhea within the month prior to the interview.

Past episode: A previous episode of diarrhea which occurred more than one month prior to the interview.

Never used ORS: Mother had never used ORS to treat her child's diarrhea episodes.

Sometimes used ORS: Mother had used ORS to treat some of her child's past diarrhea episodes.

Always used ORS: Mother had used to ORS to treat every one of her child's past diarrhea episodes.

Ever used ORS: Combines the categories "sometimes" and "always" used ORS; i.e. mother had used ORS at some point in time for her child's diarrhea episodes.

Self-efficacy: Mother believed that she had adequate knowledge to correctly prepare and administer ORS.

Bidan: Midwife who has received formal training and works part-time in the community and part-time in the puskesmas (see "puskesmas" below).

Kadre: Volunteer community health worker who has no formal training, except for occasional education sessions provided by the puskesmas staff, and has minimal supervision from the bidan in the community.

Posyandu: Mobile health clinic held one day a month in each of the village neighbourhoods. Services are provided by the bidan and kadres to children under the age of 5 years, and include vaccinations, and height and weight measurement. UNICEF food supplements and ORS packets are usually available, although supply is not consistent.

Puskesmas: Permanent health centre located in each district. Services include consultations with a doctor, nurse, bidan, or nutritionist; pharmacy services; emergency services; and a small inpatient unit.

Puyer: Mixture of powdered medications, which may contain any combination of analgesics, antipyretics, antibiotics, antidiarrheals, or other medications.

Masuk angin: The belief that a "wind" enters the child or breast-feeding mother and causes an illness.

Grandmother: Refers to the child's grandmother, regardless of whether it is the mother's mother, or the mother's mother-in-law

Study Population and Setting

The target population for this study was mothers of children under 5 years of age in West Java, Indonesia. Women were chosen as the target population as they are the primary care-givers of children in Indonesia. The accessible population was residents of the village of Waru Jaya, West Java.

The report of a community health assessment performed in Waru Jaya (FONUI, 2000) provided information about the study setting. This village, located approximately 60 km from the capital city of Jakarta, has a population of 7,104 people, of which 838 are children under 5 years of age. It has a predominantly Moslem population, and the majority of the inhabitants have a low income, with most men working as labourers or tradesmen and the majority of women being unemployed outside the home.

Waru Jaya is divided into 6 administrative units or neighbourhoods, called "RW"s. Each RW is composed of a number of groups of households, called "RT"s. Some of the RWs are easily accessible by car or foot from the main road, while others can only

be accessed via dirt trails by motorbike or foot; the condition of these trails varies vastly between wet and dry seasons. The kelurahan, or town hall, for the village is located near the main road. The Lurah, or village administrative leader, is based at the kelurahan, along with other administrative personnel.

The houses in the village are supplied with water from wells, some of which are located within the house, while others are located outside. Few are equipped with electric pumps; most are accessed manually by a bucket. Of the wells located outside the home, the degree of protection from animal or sewage contamination varies. In terms of human waste disposal, some homes have toilets inside for liquid wastes, while others use outdoor facilities. Human excretion generally occurs into an "empang", which is a fishpond specially constructed for this purpose. The empang is usually located next to the house, and often within close proximity of the well.

The closest puskesmas is located 5 kilometres from Waru Jaya in the market town of Pasar Parung. Posyandus are held one day each month in each of the 6 RWs of the village. The bidan is available in the village when she is not working at the puskesmas. Between one and three kadres are available in each of the RWs.

Diarrhea is a common occurrence amongst children under 5 years old in Waru Jaya. Although the statistics of the local health clinic indicate that 289 cases of diarrhea in the under 5 year old age group were reported in the year 2000, it is presumed that cases presenting at health facilities represent only a proportion of actual cases (Muninjaya et al., 1991).

Sample Size

Determination of the sample size for this study was based on the frequency of home use of ORS by mothers in Indonesia, which ranged between 48% and 68% in various studies (CBS, 1998; Muninjaya et al., 1991; Pulungsih et al., 1992; Widarsa & Muninjaya, 1994), and the results of a study by Coreil and Genece (1988), which assessed the associations between mothers' use of ORS and a number of variables. Using a sample of 47 mothers who used ORS, Coreil and Genece's study found a statistically significant association between ORS use and such factors as urban residence ($p=0.003$) and correct knowledge of mode of action of ORS ($p=0.002$). It was assumed that the

maternal use of ORS in Waru Jaya would be comparable to the usage found in earlier studies in Indonesia, 48% to 68%, and that the magnitude of effect in Coreil and Genece's study would be comparable in this study. Based on these assumptions, and a power (ß) of 80%, it was determined that a sample size of 69 to 98 would be required to obtain a statistically significant association ($\propto$=0.05) between ORS use and the various influencing factors. The larger sample size of 98 was chosen for this study.

Communication

A number of measures were taken in order to facilitate communication between the researcher and study participants, local officials, and local health workers. The researcher had a short period of language training and thus had some limited knowledge of the Bahasa Indonesian language. A bilingual co-interviewer was critical to the performance of this study, and assisted with data collection and other communication with study subjects and village members. The co-interviewer was a faculty member from the Nursing Research and Development Unit at the Faculty of Nursing, University of Indonesia (FONUI). She had a community health nursing background, was fluent in both Indonesian and English, and was willing and available to participate in the study. She was financially compensated for her assistance.

The study materials, which included the questionnaire and consent form, were translated into Bahasa Indonesian. They were subsequently back-translated into English to ensure the accuracy of the translation. All information was presented to participants both in written form, as well as verbally, to ensure comprehension by any illiterate participants.

Sample Selection and Recruitment

Criteria for inclusion in the study were (a) being the primary care-giver for a child under 5 years of age, (b) being of the age of majority or having borne a child (thus making one emancipated and able to give consent), and (c) being mentally competent to give informed consent. Pregnant women were not excluded from the sample. No payment was provided to subjects for participation in the study.

The investigator and co-interviewer met with kadres and village officials to explain the study and the inclusion criteria for participants. The kadres selected and

contacted eligible women to inform them about the study, determined their willingness to participate, and, if willing, invited them to meet with the investigator. The kadres were asked to recruit mothers from opposite ends of each of the 6 RWs (neighbourhoods), in order to increase the variation in mothers' housing, income, and living situations. The study utilized a convenience sample. Random sampling was not possible, since a comprehensive list of mothers in the study area was not available.

Mothers who were eligible and willing to participate in the study met with the investigator and co-interviewer at one of three recruitment sessions. These sessions were held at locations central and easily accessible to the potential participants. During the recruitment sessions the investigator introduced herself and the purpose of the study in Bahasa Indonesian. The co-interviewer then explained the details of the study, the role of participants, the time commitment anticipated, and the possible risks and benefits to participants. While mothers were provided with a copy of the consent form, written in Bahasa Indonesia, to review, the content was also explained verbally by the co-interviewer for the benefit of any illiterate women. Mothers that agreed to participate in the study then signed the consent form in the presence of the investigator and co-interviewer. Mothers that were unable to sign their name provided a thumbprint to indicate their consent.

In total, 115 eligible women were recruited for the study. Eleven of these women were dropped from the study before being interviewed when it was determined that their children had never had episodes of diarrhea, making it impossible for them to answer the interview questions. Three mothers withdrew from the study after agreeing to participate. One of these changed her mind for unknown reasons, one had a death in the family on the scheduled day of the interview, and the other was absent from her home at the scheduled meeting time.

Of the 101 interviews completed, one was excluded from consideration due to concerns about the validity of the mother's responses. The concerns arose from the fact that the mother's sister, who was a kadre (unknown to the researcher at the time of the interview), participated extensively in the interview. It was thus questionable whether the mother's responses truly reflected her own actual beliefs and practices.

Data Collection Process and Instruments

Data were collected using a structured questionnaire (see Appendix B), which was administered in an interview format to mothers in their homes. In order to prepare the co-interviewer for data collection, the protocol for administration of the questionnaire was reviewed and practised with the researcher. The questionnaire was pilot tested with three women in a neighbourhood of Jakarta, resulting in a small number of alterations being made in the terminology and structure of the questionnaire in order to improve the clarity and flow of the interviews.

Data Collection Process

During data collection in Waru Jaya, interviews were performed by the Indonesian-speaking co-interviewer, and mothers' responses were recorded on the questionnaire. The investigator recorded the respondents' short-answer and multiple-choice responses on the questionnaire, while long-answer responses were either translated by the co-interviewer at the time of the interview, or were recorded by the co-interviewer on the questionnaire and translated after the interview was completed. The investigator was present for all of the interviews and was able to provide direction to the co-interviewer when necessary. Immediately following the completion of each day's interviews, the investigator and co-interviewer reviewed each of the questionnaires to ensure the completeness and accuracy of the translation and recording. Each questionnaire took approximately one-half hour to administer, and 5 to 8 interviews were completed each day.

The presence of a foreigner was of great interest to the villagers, and the children in particular, creating the potential for interruptions and distractions during the interviews. In order to minimize this potential problem, the interviews were held in the morning when school-aged children were in classes. It was determined that the presence of a few adults in the periphery did not unduly disrupt the interviews and did not appear to influence the mothers' responses so long as none of the spectators were village officials or health workers. Fortunately, these individuals were generally very understanding about their potential influence and were willing to maintain a distance from the interview locations.

Content of Questionnaire

The content of the questionnaires was based on a review of the literature and application of the principles of the Health Belief Model. The literature review identified possible factors influencing mothers' decisions regarding use of ORS. Both factors with demonstrated associations, as well as those with suggested associations and a logical rationale, were included in the questionnaire. In addition to providing a categorization scheme for these factors, the HBM suggested additional areas of inquiry to incorporate into the questionnaire. While the content of the questionnaire was guided by the HBM, the format of the questionnaire was based on a logical flow of questions exploring the mothers' knowledge, beliefs and practices about diarrhea, dehydration, home treatment, and use of ORS.

For the purpose of this study, ORS was seen as distinct from Pedialyte®, the commercially premixed oral rehydration solution, and home-made Sugar-Salt-Solution (SSS). Although Pedialyte and correctly prepared SSS are effective means of rehydration, ORS is the product promoted by the WHO, due to the fact that Pedialyte tends to be prohibitively expensive in developing countries, and serious problems exist with correct preparation of SSS. Thus, this study did not specifically question mothers about their use of Pedialyte or SSS, and their method of SSS preparation was not assessed.

The questionnaire collected demographic data on the mother and her household, including maternal age, parity, religion, cultural group, and literacy, as well as parental education level and employment status. Information about household structure included the number of children under 18 years in the home, and the relationship of adults living in the home. Information regarding the relationship of persons involved in caring for a sick child and making health-care decisions for the child was also gathered.

Mothers' knowledge and beliefs about diarrhea and dehydration were also assessed, including their beliefs about whether diarrhea was a serious illness, and their knowledge of the signs of dehydration. Mothers' experiences with diarrhea were also assessed, including whether they had ever had a child hospitalized due to diarrhea, and whether they knew of any children who had died as a result of diarrhea.

Mothers' responses to their children's diarrhea episodes were examined, including their treatment-seeking practices and their home treatment practices. As part of the discussion of home treatment practices, more detailed questions were asked about mothers' knowledge and practices regarding ORS use. This included assessment of the mothers' use of ORS, their beliefs about the effectiveness of ORS, and their understanding of how ORS functions in the treatment of diarrhea. Mothers were questioned about where they would obtain ORS packets, the ease or difficulty of doing so, and their belief in their own ability to prepare and administer ORS correctly. They were also asked to describe their actual preparation and administration techniques.

Mothers' preparation techniques were assessed by having them show the investigator the amount of water mixed with a packet of ORS, using the glass or container they would use for preparation. Although the volume of fluid was not actually measured by the investigator each time, the potential for error in measurement was minimized in a number of ways. Since most mothers used the identical type and size of glass, the investigator was able to compare the estimated volume to the actual volume at the beginning of data collection in order to determine the accuracy of the estimate. These comparisons showed that the estimate was accurate within plus or minus 25 ml each time. In addition, consistency of measurements was enhanced by the fact that the estimates were made by only one person consistently throughout the study.

The administration techniques of mothers were determined by having them describe the volume, frequency, and duration of ORS administered during a diarrhea episode. The ease or difficulty of administration was also determined.

The influence of other individuals on mothers' decision to use ORS was determined by asking about who advised them to use ORS, who taught them about ORS preparation and administration, and whether they knew anyone else who had used ORS.

Mothers' own views of the influences on their use ORS in home treatment were explored in further depth. The mothers who only used ORS for some of their children's diarrhea episodes were asked whether the seriousness or cause of the episode, or age of the child influenced their decision of whether to use ORS for a given episode. The influences of these three factors were questioned specifically as the literature suggested

them as possible influential factors. Mothers were also asked an open-ended question regarding what else would influence them to use or not use ORS for their children's episodes of diarrhea.

While knowledge, beliefs and practices were assessed for the total sample of 100 mothers, some of the questions differed somewhat depending on whether or not the child had experienced a *recent* episode of diarrhea. These questions differed in that the mothers of children with past episodes were asked about their *usual* response to their children's diarrhea episodes, whereas mothers of children with recent episodes were asked about their response to the *specific* recent episode. Due to this difference, the responses of mothers in the two groups cannot be pooled for the applicable questions. These instances will be apparent in the presentation of results in chapter 4. Mothers of children with recent episodes were also asked additional questions about the characteristics of the child and the signs observed with the recent episode, as well as about mothers' feeding practices during the episode. This information was only collected for recent episodes as, unlike descriptions of the mother's knowledge, beliefs, past experience, and usual practices, this information is dependant on memory of specific events. It has been shown that mothers' recall of specific recent episodes are more reliable, complete, and accurate than their memory of episodes in the more distant past (Boerma et al., 1991; McDivitt et al., 1994). The issue of recall bias will be presented in more detail in the discussion of limitations in chapter 5.

Data Management and Analysis

Data entry and analysis were performed by the researcher using the SPSS (1999) statistics program. Data analysis included descriptive statistics of mothers' demographic and household characteristics; knowledge, beliefs, and experience with diarrhea; treatment-seeking and home treatment practices; and ORS knowledge, beliefs, and practices. The cross-tab function in SPSS was used to assess for any associations between maternal use of ORS and the predictor variables hypothesized to be related to its use.

For the purpose of this analysis, ORS use was collapsed into two categories, "never used ORS" and "ever used ORS". "Ever used ORS" included both mothers who always and sometimes used ORS. The categories were collapsed in this way as it makes

sense conceptually that mothers who used ORS sometimes and always are more similar than mothers who never used ORS. This is reinforced by the finding that the knowledge, beliefs, and practices of mothers who sometimes used ORS were in fact more similar to those of mothers who always used it than to the responses of mothers who never used ORS.

Bivariate analysis using the backward logistic regression function of SPSS was used to determine the odds ratios for the associations between ORS use and the various proposed influential factors. The statistical analysis appropriate for this cross-sectional study was to look at the outcome and relate it to these influencing factors. It would be inappropriate to describe the findings in terms of the percentage of mothers with factor X who used ORS, as this may lead to conclusions drawn about outcomes resulting from factor X. Such conclusions would not be supportable by data collected in a cross-sectional study. Since the factors and outcome were collected at the same time, one cannot say that the factor led to the outcome. Therefore, in order to avoid drawing erroneous conclusions about causal associations, the appropriate analysis in this study was to compare the percentage of ORS users with the given factor.

Factors found to have a statistically significant association in bivariate analysis, and other factors of interest, were also tested in a multi-variate logistic regression model.

As described earlier, the mothers of children with recent episodes were asked additional questions about the specific recent episode. The data were also assessed using cross-tabs and backward logistic regression in order to determine any association between these factors and ORS use. For factors specific to the recent episode, the association tested was for ORS use in *that* episode.

Data analysis and the presentation of results in chapter 4 were organized according to the logical exploration of mothers' knowledge, beliefs and practices. The HBM, which was utilized to determine the content of the questionnaire, was then used to guide the interpretation of the study findings presented in chapter 5.

Ethical and Logistical Considerations

This study complied with the ethical standards for research involving human subjects, which include respecting the human dignity of participants. The researcher

respected the participants' rights to free and informed consent, protection of vulnerable persons, privacy and confidentiality, justice, beneficence, and non-maleficence. As previously discussed, informed consent was obtained from subjects prior to their participation in the study (see Appendix C), and individuals not competent to provide informed consent were excluded from the study. Participants were made aware of their right to refuse participation without any impact on their health care services. While anonymity was not possible in this study, confidentiality was maintained by the researcher and the co-interviewer. Numbers, rather than names, were placed on the questionnaires to ensure that individuals could not be identified from the data. The researcher was the only person with access to the key containing the names and identifying numbers of the subjects, which was recorded in a password-protected computer file. While there was no immediate benefits to participants in the study, the long-term benefits of the study include the potential to improve the treatment of a potentially life-threatening illness. Data collection for this study was not invasive in nature, consisting only of administration of a questionnaire. The subject matter discussed was not of an upsetting nature for the subjects, with the only inconvenience being the one hour period required to complete the questionnaire. Mothers who expressed any concerns about their children's health and any children recognized to have an acute illness were referred to a health worker. As a foreigner to the region, the researcher was very aware of the need to be sensitive to the social and cultural environment.

Ethical approval for this research study was obtained from the Human Investigation Committee at Memorial University of Newfoundland and the Indonesian Institute of Sciences (see Appendices D and E). The agreement of the appropriate government authorities in Indonesia was also obtained before initiation of the study.

Access to the study area was facilitated by the Dean of the Faculty of Nursing in Indonesia who had made preliminary contact with local officials, provided them with information about the research study, obtained official approval to carry out the study, and arranged for translation of the questionnaire and consent form. When the researcher was in Indonesia for the data collection phase of the study, practical support and guidance was provided by the Faculty of Nursing at the University of Indonesia. The

researcher was in regular contact with faculty at Memorial University who provided additional guidance. The budget for this study was financed through funds provided by CIDA under the University Partnerships in Cooperation and Development (UCPD) funding program.

Chapter 4

Chapter 4 describes the results of the home treatment survey, including description of maternal and household characteristics; maternal knowledge, beliefs, and experience regarding childhood diarrhea; and maternal responses to children's diarrhea episodes. Mothers' knowledge, beliefs and practices regarding ORS, and the influence of various factors on ORS use are described in detail. Additional data on the subset of mothers of children with recent episodes of diarrhea are also presented.

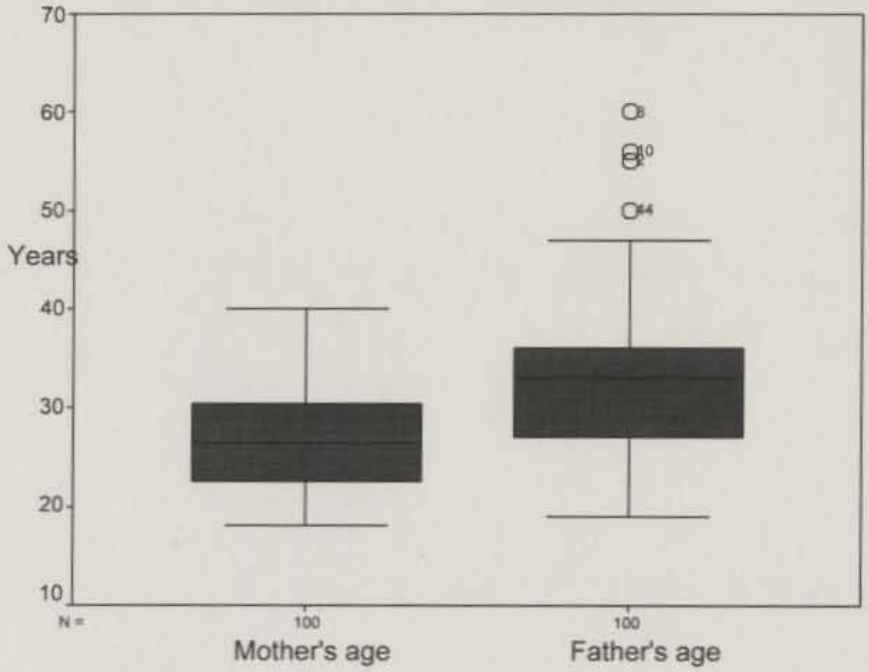
Maternal and Household Characteristics

Demographic data about maternal and household characteristics were collected from the 100 mothers that participated in the study. Of the 100 subjects interviewed, 99.0% (99) were birth mothers, while only one was an aunt who had cared for the child since the mother's death. Therefore, the term "mothers" will be used to refer to the subjects in this study.

Maternal Characteristics

As seen in Figure 1, the age distribution of mothers and fathers is slightly skewed, thus the median, rather than the mean, was used to describe their ages. The median age of mothers was 26.5 years (IQR 22.3-30.8), and the median age of fathers was 33.0 years (IQR 27.0-36.0).

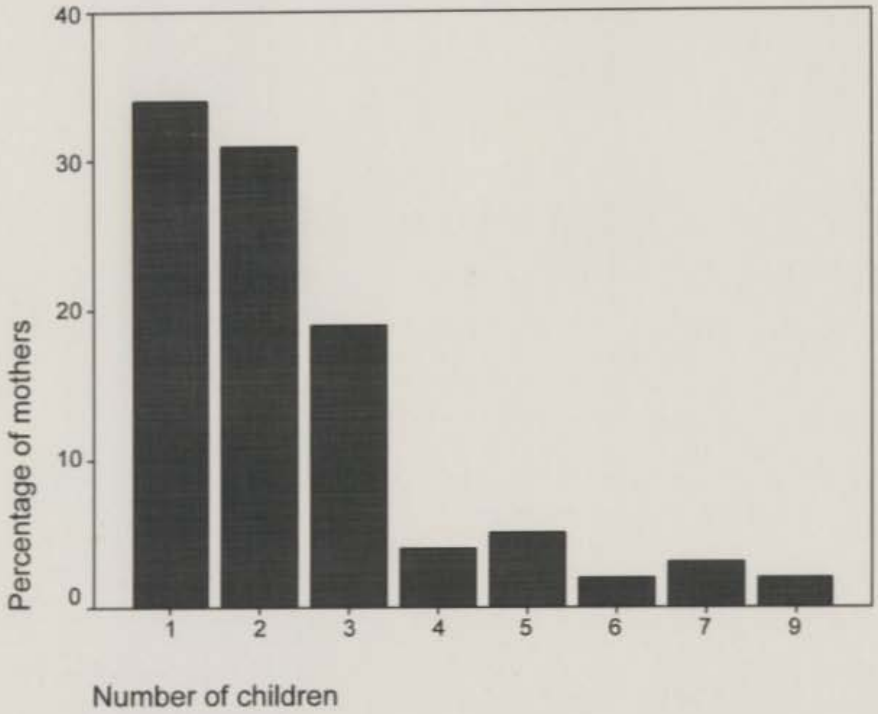
Figure 1: Age Distribution of Mothers and Fathers



Sixty-six percent (66) of the 100 mothers belonged to the Parung cultural group, with the remainder being Sundanese (15.0%, n=15), Betawi (11.0%, n=11), Javanese (6.0%, n=6), or members of other cultural groups (2.0%, n=2). Ninety-nine percent (99) of the mothers were Moslem; one was Christian.

The parity of mothers is shown in Figure 2. Thirty-four percent of the mothers were primiparous; 54.0% were multiparous, having 2 to 4 children; and 12.0% were grand-multiparous, having 5 to 9 children each.

Figure 2: Parity of Mothers



Ninety-nine percent (99) of the mothers stated that they could read. However, their level of literacy was not assessed, and it was noted that 13.0% (13) of mothers used a thumbprint rather than a signature on their consent form.

As seen in Table 1, mothers tended to have a lower level of education than fathers; 81.0% (81) of mothers had junior high education or lower, compared to 59.3% (59) of fathers.

Table 1: Mothers' and Fathers' Level of Education

Level of education in Canadian equivalents [1]	Percentage of mothers (n)	Percentage of fathers (n)
None	**2.0%** (2)	**1.0%** (1)
Elementary incomplete	**11.0%** (11)	**6.1%** (6)
Elementary complete	**38.0%** (38)	**25.3%** (25)
Junior high incomplete	**5.0%** (5)	**1.0%** (1)
Junior high complete	**25.0%** (25)	**26.3%** (26)
High school incomplete	**2.0%** (2)	**0.0%** (0)
High school complete	**15.0%** (15)	**35.4%** (35)
Education beyond high school	**2.0%** (2)	**5.1%** (5)
Total	**100.0%** (100)	**100.0%** (99) [2]

[1] Level of education in Canadian equivalents = the Canadian terms "elementary", "junior high", and "high school" are the equivalent of the Indonesian educational system's "SD", "SMP"and "SMA"

[2] Total number of fathers is 99 because one mother did not know the level of education her husband had achieved

Ninety-seven percent (97) of the 100 mothers were not employment outside the home, while 2.0% (2) had full-time employment, and 1.0% (1) had part-time employment. Five percent (5) of those not employed outside the home operated businesses in their homes (either a small shop, or the manufacturing of fire-works). In contrast, 98.0% (98) of the fathers were employed full-time outside the home, while 1.0% (1) had a home business, and 1.0% (1) was unemployed.

Household Characteristics

The mothers' households varied greatly in both size and composition. The median number of people in each home was 5.0 (IQR 4.0-7.0), and ranged from 3 to 15 individuals. Household members usually included the mother, her husband, and her children, and commonly included other relatives, such as the mother's or father's parents, or their siblings and their children. The median number of minor children (18 years or younger) living in the home was 2.0 per mother (IQR 1.0-3.0). Thirty four percent (34) of mothers in the study had only one minor child, while 51.0% had 2 to 3, and 9.0% had 5 to 7 minor children living in

the home. The breakdown of the children's ages can be seen in Table 2. All of the mothers had at least one child less than 5 years old living with them, as this was part of the selection criteria for the study.

Table 2: Number of Mothers Who Had Children in Each Age Group Living in the Home

# of children in each age group	≤5 years % (n) [1]	>5 years, but ≤12 years % (n) [1]	>12 years, but ≤18 years % (n) [1]
1	**79.0%** (79)	**41.0%** (41)	**9.0%** (9)
2	**19.0%** (19)	**16.0%** (16)	**5.0%** (5)
3	**2.0%** (2)	**2.0%** (2)	**4.0%** (4)
Total [2]	**100.0%** (100)	**64.0%** (64)	**18.0%** (18)

[1] % (n) = proportion and number of mothers with children of the indicated age group living in the home
[2] Total = proportion and number of 100 mothers with children in each age group living in the home

Table 3 shows the relationship of the adults in each household. Ninety-nine percent (99) of the homes had both the mother and father in residence; there was only one single mother in the sample. While 61.0% (61) of homes did not have any other relatives living in the home with the parents, 32.0% (32) had grandparents, and 21.0% (21) had other relatives living in the home.

Table 3: Relationship of Adult Household Members

Adults living in the home		% (n) [1]
Mother and father	**No others**	**61.0%** (61)
	Plus grandparent(s)	**18.0%** (18)
	Plus other relative(s)	**7.0%** (7)
	Plus grandparent(s) and other relative(s)	**13.0%** (13)
Single mother	**Plus grandparent(s) and other relative(s)**	**1.0%** (1)

[1] % (n) = proportion and number of mothers with the indicated adults living in the home

Regardless of whether grandparents or other relatives were resident in the home, these individuals often played a role in child care activities. Only 14.0% (14) of the mothers stated that help was never available when a child was ill, while 6.0% (6) said it was sometimes available, and 80.0% (80) said help was always available. As seen in Table 4, of

the 86 mothers who stated that help was sometimes or always available, the grandmother was the most commonly named helper (50.0%, n=43). The father was the next most commonly named person (32.6%, n=28), followed by another relative, a friend or neighbour, or another person.

Table 4: Person Available to Help with Sick Child

Person available to help	% (n) [1]
Grandmother	**50.0%** (43)
Father	**32.6%** (28)
Other relative	**22.1%** (19)
Friend/Neighbour	**5.8%** (5)
Other	**1.2%** (1)

[1] % (n) = proportion and number of persons available to help with sick children, as listed by the 86 mothers who said help was sometimes/always available, with some mothers giving more than one response (i.e. not mutually exclusive categories)

As seen in Table 5, 63.0% (63) of the mothers stated that they were the ones who made the health care decisions regarding their child, either alone or in conjunction with another person. Other people listed by the mother as being involved in health care decision-making included the father, grandmother, other family member(s), or a friend or neighbour.

Table 5: Person Making the Health Care Decisions for the Child

Person(s) who makes health care decisions	% (n) [1]
Mother	**35.0%** (35)
Mother and other person(s) together	**28.0%** (28)
Other person(s) only (i.e. not mother)	**37.0%** (37)

[1] % (n) = proportion and number of each person listed by the 100 mothers as making health care decisions for children, with some mothers giving more than one response (i.e. not mutually exclusive categories)

Knowledge and Beliefs Regarding Diarrhea

Data were collected about mothers' beliefs about the severity of diarrhea and their knowledge of the signs of dehydration.

Beliefs About the Severity of Diarrhea

Of the 100 mothers, 77.0% (77) stated that they believed diarrhea to be always a serious illness, while 18.0% (18) said that it was sometimes serious, and 5.0% (5) stated that diarrhea was never serious. Mothers were also asked to give the reason for believing diarrhea to be always, sometimes, or never serious, with some mothers giving more than one reason.

Of the 77 mothers who believed that diarrhea was always a serious illness, 75.3% (58) thought it was serious because diarrhea could cause deterioration in the children's physical condition or make them susceptible to other illnesses, 36.4% (28) believed that it could cause death, and 3.9% (3) had other reasons for believing it to be always serious.

Among the 18 mothers who thought diarrhea was only sometimes serious, 33.3% (6) of mothers felt that diarrhea was a common childhood illness or was just part of growing up, while 33.3% (6) recognized that diarrhea could lead to further illness, and 22.2% (4) recognized that diarrhea could lead to death. Other factors influencing mothers' perceptions of diarrhea as sometimes serious included the age of the child (1), the length of the episode (4), the frequency of the loose stools (2), the presence of other signs and symptoms (1), the child's physical condition prior to the episode (1), and whether the episode could be "cured" by home treatment (2).

All of the 5 mothers who felt that diarrhea was never serious stated that diarrhea was a common illness of childhood or was "part of growing up".

Knowledge of the Signs of Dehydration

Mothers were also questioned about their knowledge of the signs of dehydration. The signs listed by mothers were compared to the WHO guidelines for assessing a child for dehydration. The WHO indicators of dehydration in children with diarrhea include (a) restlessness or irritability, (b) lethargy, floppiness, or unconsciousness, (c) sunken eyes, (d) absent tears, (e) dry mouth and tongue, (f) thirst, (g) poor drinking, and (h) poor skin turgor (WHO, 1993). As seen in Table 6, the most common signs of dehydration known by mothers were lethargy, floppiness, or unconsciousness (78.0%, n=78). Mothers usually described this as the child being "weak", having "no energy", or "sleeping a lot". The next most commonly cited signs were restlessness or irritability (21.0%, n=21), described as the child being "irritable", "cries easy", or "cries a lot". Sunken eyes were mentioned next most frequently

(17.0%, n=17). Thirst or lack of thirst were mentioned by a small number of mothers, as were dry mouth, and poor skin turgor, described as "skin not elastic". None of the mothers identified "absent tears" as a sign of dehydration.

Table 6: WHO Signs of Dehydration Identified by Mothers

WHO signs of dehydration	% (n) [1]
Lethargic, Floppy, or Unconscious	**78.0%** (78)
Restless or Irritable	**21.0%** (21)
Sunken eyes	**17.0%** (17)
Not thirsty	**3.0%** (3)
Poor skin turgor	**2.0%** (2)
Thirsty	**1.0%** (1)
Dry mouth and tongue	**1.0%** (1)
Absent tears	**0.0%** (0)

[1] % (n) = proportion and number of 100 mothers who could identify any of the specified signs of dehydration as defined by WHO, with some mothers giving more than one response (i.e. not mutually exclusive categories)

As seen in Table 7, of the 8 WHO designated "correct" signs of dehydration, only 38.0% (38) of mothers could identify 2 or more correct signs.

Table 7: Number of Correct Signs of Dehydration Identified by Mothers

Number of correct signs identified	% (n) [1]
0	**17.0%** (17)
1	**45.0%** (45)
2	**36.0%** (36)
3	**2.0%** (2)
Total	**100.0%** (100)

[1] % (n) = proportion and number of 100 mothers who identified the specified number of 8 possible WHO defined signs of dehydration

Additional correct signs of dehydration, namely "not sweating" and "decreased urine output", were listed by one mother. Other signs listed by mothers were either incorrect, such as "pale, loss of appetite, thin, vomiting, stomach ache, cold sweat, pale nails, yellow, or

blue"; or ambiguous signs, such as "fever", which could be signs of dehydration, but were as likely to be signs of the underlying illness that caused the dehydration. As seen in Table 8, the majority of mothers (63.0%) identified both correct and incorrect (including ambiguous) signs.

Table 8: Correct and Incorrect Signs of Dehydration Identified by Mothers

Knowledge of correct and incorrect signs	% (n) [1]
None	**10.0%** (10)
Only correct [2]	**21.0%** (21)
Only incorrect [3]	**6.0%** (6)
Both correct & incorrect	**63.0%** (63)
Total % (n)	**100.0%** (100)

[1] % (n) = proportion and number of 100 mothers who identified any of the correct or incorrect signs of dehydration

[2] Only correct = mothers identified only correct signs of dehydration

[3] Only incorrect = mothers identified only incorrect or ambiguous signs of dehydration

Experience with Diarrhea

Mothers were asked about their experience with childhood diarrhea, including whether their child had a recent episode, whether their child had ever been hospitalized for diarrhea, and whether they knew of any diarrhea-related deaths in children.

Of the 100 mothers interviewed, 29 had a child with a "recent" episode of diarrhea, in the month prior to the interview. The remaining 71 mothers had a child with a "past" episode of diarrhea, more than a month prior to the interview.

Five percent (5) of the 100 mothers had a child hospitalized for diarrhea at some time in the past; and 51.0% (51) of mothers knew of a child who had died as a result of an episode of diarrhea, although none were the mothers' own child. One (2.0%) of the 51 known deaths was a child related to the mother, while 24 (47.1%) were the child of a friend or neighbour, 17 (33.3%) were heard of from a health worker or other person, and 9 (17.6%) were heard of from the media.

Mothers' Responses to Diarrhea Episodes

The mothers' responses to their children's diarrhea episodes were assessed, including their treatment-seeking practices outside the home and the type treatment provided within the home. The 71 mothers with children who did not have a recent episode of diarrhea were asked about their "usual" response to past episodes, whereas the 29 mothers of children with recent episodes were asked about their response to the specific recent episode. The responses of the 2 groups are therefore not directly comparable, and cannot be pooled. However, the data provide an indication of the range and frequency of the various treatment responses of mothers in the study. The issue of reliability and validity of data about past episodes versus recent episodes will be addressed in detail in chapter 5.

Table 9: Mothers' Responses to Diarrhea Episodes

Mothers' responses	Past episodes % (n) [1]	Recent episodes % (n) [2]
Both sought treatment and treated at home	**70.4%** (50)	**51.7%** (15)
Sought treatment only	**1.4%** (1)	**3.4%** (1)
Treated at home only	**26.8%** (19)	**37.9%** (11)
Neither sought treatment nor treated at home	**1.4%** (1)	**6.9%** (2)

[1] Past episodes % (n) = proportion and number of 71 mothers with the indicated usual response to their children's past diarrhea episodes

[2] Recent episodes % (n) = proportion and number of 29 mothers with the indicated response to the specific recent episode

Treatment-Seeking Practices

Treatment was sought outside the home by 71.8% (51) of mothers of children with past episodes and 55.1% (16) of those with recent episodes, either alone or in conjunction with home treatment (see Table 9). Nineteen mothers of children with past episodes did not seek treatment outside the home, although they provided treatment at home. Of these, 17 (89.5%) stated that their reason was because the home treatment stopped the diarrhea, while the remaining 2 (10.5%) said that the diarrhea stopped on its own. Of the 11 recent episodes for which treatment was not sought, all of the mothers stated their reason was that home treatment stopped the episode of diarrhea. Mothers who did seek treatment outside the home

were asked to describe the person or place from whom treatment was sought, the reasons prompting treatment-seeking, the person responsible for deciding to seek treatment, and the type of treatment and teaching provided at the source of treatment.

Table 10 shows that the puskesmas was the most common place for mothers of children with both past (52.9%, n=27) and recent (50.0%, n=8) episodes to seek treatment. This was followed by the doctor's clinic; 33.3% (17) of mothers of children with past episodes and 18.8% (3) of those with recent episodes. Other sources of treatment included the bidan, the hospital, the posyandu, and other health care providers.

Table 10: Where Treatment was Sought

Where treatment sought	Past episodes % (n)[1]	Recent episodes % (n) [2]
Puskesmas	**52.9%** (27)	**50%** (8)
Doctor's clinic	**33.3%** (17)	**18.8%** (3)
Bidan	**23.5%** (12)	**12.5%** (2)
Hospital	**3.9%** (2)	**12.5%** (2)
Posyandu	**0%** (0)	**6.3%** (1)
Other health care provider	**2.0%** (1)	**0%** (0)

[1] Past episodes % (n) = proportion and number of mothers who usually sought treatment for their children's past diarrhea episodes at the indicated source, of the 51 mothers that sought treatment; with some mothers giving more than one response (i.e. not mutually exclusive categories)

[2] Recent episodes % (n) = proportion and number of mothers who sought treatment for their children's recent episode at the indicated source, of the 16 mothers that sought treatment

As seen in Table 11, mothers who sought treatment outside the home for recent and past episodes had a variety of reasons for doing so. The most common reasons for seeking treatment for past episodes were the duration of the episode (43.1%, n=22), fear of death, or deterioration in the child's condition (25.5%, n=13), and the presence of specific characteristics of the episode (19.6%, n=10). Such characteristics included fever, weakness, sunken eyes, and high frequency of stool.

The reasons for seeking treatment for the recent episodes were similar to those for past episodes. The most common reason was fear of death or deterioration (43.8%, n=7), which was the second most common reason for treatment-seeking in past episodes. This was

followed by duration of the episode (12.5%, n=2), which was the most common reason for past episodes; and home treatment which was ineffective in resolving the episode (12.5%, n=2).

Other reasons for treatment-seeking named by mothers of both groups included the belief that it is appropriate to seek treatment whenever the child is ill, that treatment should be sought if money is available for treatment, and that treatment should be sought if advised by a family member or if ORS is not available in the home.

Table 11: What Prompted Treatment-Seeking

What prompted treatment-seeking	Past episodes % (n)[1]	Recent episodes % (n)[2]
Duration of episode	**43.1%** (22)	**12.5%** (2)
Fear of death or deterioration	**25.5%** (13)	**43.8%** (7)
Characteristics of episode	**19.6%** (10)	**6.3%** (1)
Home treatment ineffective	**11.8%** (6)	**12.5%** (2)
Usually seek treatment	**3.9%** (2)	**6.3%** (1)
Money available	**2.0%** (1)	**6.3%** (1)
Influence of family member	**0%** (0)	**6.3%** (1)
No ORS available	**0%** (0)	**6.3%** (1)

[1] Past episodes % (n) =proportion and number of mothers who were prompted to seek treatment for their children's past episode by the indicated reason, of the 51 mothers that usually seek treatment; with some mothers giving more than one response (i.e. not mutually exclusive categories)

[2] Recent episodes % (n) = proportion and number of mothers who were prompted to seek treatment for the children's recent episode by the indicated reason, of the 16 mothers that sought treatment

Mothers stated that the decision to seek treatment outside the home was sometimes made by family members other than themselves, with some mothers listing more than one person. Of the 51 mothers that sought treatment for the past episode, 68.6% (35) said that they were the one who decided to seek care, 37.3% (19) said the father decided to seek care, 5.9% (3) named the grandmother, 2% (1) named an aunt, and 3.9% (2) named other persons. Of the 16 mothers who sought treatment for the recent episode, 68.8% (11) said that they were the one who decided to seek care, 18.8% (3) named the father, and 12.5% (2) named the child's aunt.

Mothers of children who sought treatment for recent episodes were asked to describe the type of treatment provided for that specific recent episode, with some mothers listing more than one type. The question was not asked of mothers of children with past episodes. The type of care provided included administration of ORS (25%, 4 of 16), vitamins (6.3%, n=1), and various other medications (87.5%, n=14). Not all mothers were able to identify the specific type of medication administered to their child; those listed included antidiarrheals, antipyretics, and a "puyer", which is a mixture of medications. None of the children were reported to have received IV fluids.

The mothers of children with recent episodes also identified health teaching provided at the source of treatment, if any. Ten (62.5%) of the 16 mothers who sought treatment for a recent episode stated that they received teaching from the health care provider when they sought treatment for their child's diarrhea. Of these, 40% (4 of the 10) received teaching about prevention of diarrhea and 50% (5) about home treatment. One mother was told that diarrhea was a cause for concern, while 20% (2) were informed that diarrhea was not a cause for concern because it was "part of development" or because "it is a common disease".

Home Treatment Practices

Children received home treatment in 97.2% (69 of 71) of past episodes and 89.6% (26 of 29) of recent episodes, either alone or in conjunction with treatment-seeking (see Table 9). Two of the 100 mothers, one with a child with a past episode and one with a child with a recent episode, did not administer any home treatment to their child during their diarrhea episode, although they sought treatment outside the home. One mother's reason for not treating at home was that she felt that the diarrhea needed more expert care than she could provide, while the other mother felt initially that no treatment was necessary as diarrhea was a normal part of growing up, and upon seeking treatment was told by the bidan to "not worry".

As seen in Table 12, home treatments included remedies administered to the child, as well as those administered to the breast-feeding mother. The most common treatment received by the child varied somewhat between past and recent episodes. While 75.4% (52 of 69) of mothers who treated past episodes at home said that they usually administered ORS

to their child when they had diarrhea, only 34.6% (9 of 26) of mothers who treated children with recent episodes reported using ORS to treat the specific recent episode.

Oral herbal treatment was the most common remedy for recent episodes (46.2%, n=12), and the second most common for past episodes (59.4%, n=4). Oral herbal treatments included extract of guava leaf, handelum leaf, ginger, and lempunyang. Other herbal treatments, which were applied topically to the abdomen, were equally common amongst past (33.3%, n=23) and recent episodes (30.8%, n=8). Substances used in topical administration included onion with asem (a fruit), jarak leaf, and guava leaf. Similar proportions of past and recent episodes were also treated with various oral fluids, being administered in 31.9% (22) of past episodes and 30.8% (8) of recent episodes. These fluids included tea, water, coffee, and "tajin"(rice water).

In addition to ORS, the other "western" remedies administered to children included various medications, SSS, and Pedialyte. As seen in Table 12, medications were administered in 21.7% (15) of past episodes and 30.8% (8) of recent episodes. Of the various medications administered, some were prescribed by health workers, while others were obtained from shops or from neighbours. These medications were predominantly antidiarrheals, but also included antacids, and "puyers" (medication mixtures). According to the mothers, none of the children received antibiotics. SSS or Pedialyte were administered in 18.8% (13) of past episodes and 11.5% (3) of recent episodes. As described in chapter 3, ORS was distinguished from SSS and Pedialyte for the purposes of this study.

In addition to treatments administered to the child, some mothers administered the treatment to themselves, with the rationale that the effect would be passed to the child through their breast-milk. Substances ingested by mothers for treatment of their child's diarrhea included antidiarrheal medications, ORS, and oral herbal treatments.

Table 12: Type of Home Treatment Administered

Type of home treatment		Past episodes % (n)[1]	Recent episodes % (n)[2]
Child received...	Oral herbal treatment	59.4% (41)	46.2% (12)
	ORS	75.4% (52)	34.6% (9)
	Other herbal/ dietary fluid(s)	31.9% (22)	30.8% (8)
	Medication	21.7% (15)	30.8% (8)
	Topical treatment to stomach	33.3% (23)	30.8% (8)
	SSS or Pedialyte	18.8% (13)	11.5% (3)
	Other	4.3% (3)	0% (0)
Mother received...	Medication	2.9% (2)	19.2% (5)
	ORS	2.9% (2)	7.7% (2)
	Oral herbal treatment	0% (0)	3.8% (1)
	Other	2.9% (2)	0% (0)

[1] Past episodes % (n) = proportion and number of mothers who usually provided the indicated home treatment for their children's past diarrhea episodes, of the 69 mothers that provided home treatment; with some mothers giving more than one response (i.e. not mutually exclusive categories)

[2] Recent episodes % (n) = proportion and number of mothers who provided the indicated home treatment for the children's specific recent episode, of the 26 mothers that provided home treatment; with some mothers giving more than one response (i.e. not mutually exclusive categories)

ORS Knowledge, Beliefs, and Practices

As part of the exploration of home treatment practices, all the mothers were questioned about their ORS knowledge, beliefs, and practices. Although 100 mothers were interviewed, these questions were asked of only 97 of the mothers; three mothers were inadvertently excluded from this section of the questionnaire during administration.

Knowledge and Beliefs Regarding the Effectiveness and Function of ORS

Assessment of mothers' beliefs about ORS indicated that 74.2% (72 of 97) believed that ORS was an effective treatment for diarrhea, 15.5% (15) did not believe it to be effective, and 10.3% (10) were undecided about its effectiveness.

Although the majority of mothers believed in the effectiveness of ORS, their understanding of its function or mode of action was questionable. As seen in Table 13, only 33.0% (32) of mothers listed the correct function, i.e. retention or addition of fluid, while other common beliefs were that ORS functioned by stopping diarrhea or decreasing stool frequency (23.7%, n=23), or by giving energy or preventing weakness (15.5%, n=15). A number of mothers (7.2%, n=7) believed that ORS "fits" with diarrhea, making it an effective treatment for the illness. Eighteen (18.6%) of the mothers did not know how ORS functioned in the treatment of diarrhea.

Table 13: Mothers' Understanding of the Function of ORS

How ORS Functions	% (n)[1]
Adds or retains fluid	**33.0%** (32)
Stops diarrhea/Decreases stool frequency	**23.7%** (23)
Gives energy/Prevents weakness	**15.5%** (15)
"Fits" with diarrhea [2]	**7.2%** (7)
"Cleans stomach"/ "Cures digestion"	**5.2%** (5)
"Cools stomach"	**3.1%** (3)
"Makes stool more solid"	**2.1%** (2)
"Slows the bowels"	**2.1%** (2)
Helps traditional medicine work	**2.1%** (2)
Increases appetite	**1.0%** (1)
"Fills something in the child's body"	**1.0%** (1)
Kills germs	**1.0%** (1)
Don't know	**18.6%** (18)

[1] % (n) = proportion and number of 97 mothers who listed each function, with some mothers giving more than one response (i.e. not mutually exclusive categories)

[2] "Fits" with diarrhea = belief that there is some essential aspect of a treatment that makes it an appropriate and effective treatment for a particular illness

Although 32 mothers correctly identified the function of ORS as fluid retention or addition, 10 of these also listed other, incorrect, functions of ORS, as seen in Table 13. Thus, of the 97 mothers questioned, only 22 (22.7%) understood ORS' exclusive role in hydration; 10 (10.3%) partially understood its role in hydration; and the remaining 65 (67.0%) mothers appeared not to understand of the role of ORS in hydration.

Knowledge and Beliefs about the Acquisition, Preparation, and Administration of ORS

Mothers' knowledge of how or where to obtain, prepare, and administer ORS was assessed, as was the ease or difficulty of these actions.

Acquisition of ORS

As seen in Table 14, the most common person or place from which to obtain ORS was the posyandu (43.4%, n=42), followed by the puskesmas, and the kadre. Mothers also bought ORS at shops or pharmacies. Types of shops included stores in the nearby market town; medicine shops, which sell pharmaceuticals, but do not have pharmacist services; and "warungs" or kiosks located within the village. Mothers also listed the bidan, the doctor, and the hospital as sources of ORS packets.

Table 14: Where ORS Can Be Obtained by Mothers

Where ORS can be obtained	% (n) [1]
Posyandu	**43.3%** (42)
Puskesmas	**30.9%** (30)
Kadre in community	**21.7%** (21)
Shop/Pharmacy	**16.5%** (16)
Bidan in community	**9.3%** (9)
Doctor at private clinic	**6.2%** (6)
Hospital	**2.1%** (2)

[1] % (n) = proportion and number of sources of ORS packets listed by 97 mothers, with some mothers giving more than one response (i.e. not mutually exclusive categories)

When asked how difficult it was to obtain packets of ORS, 78.4% (76 of 97) of the mothers said they were easy to obtain, while 21.6% (21) said it was difficult. Reasons cited for the difficulty included distance to the source (12), shortage of supply of packets (6), cost

of packets (1), and other access issues (4). These other issues included the fact that the posyandu only operates once a month (2), or had not been operating in the mother's district (1), and the mother's statement that she did not know the kadre yet and thus did not feel comfortable approaching her to obtain ORS packets (1).

Preparation and administration of ORS

Mothers that had used ORS at any time in the past (n=73) were asked how easy or difficult they found administration. Of these, 60.3% (44 of 73) stated that it was easy, while 39.7% (29) found it difficult. Reasons for difficulty cited by mothers included the child's dislike of the taste (18), difficulty in administering any medicine to the child (6), and unexplained refusal by the child (5).

As a measure of self-efficacy, the mothers were asked if they believed that they knew enough to prepare and administer ORS correctly. Sixty-two (63.9%) of the 97 women interviewed believed that they were capable of correct preparation and administration.

Actual correct preparation and administration of ORS was determined by comparing the instructions on the ORS packet to the preparation and administration practices described by mothers. According to these instructions, one packet of ORS is to be mixed with 200 ml of water. Correct administration as described on the packet depends on the age of the child, but generally consists of administering a "loading dose" over the first 2 hours of the episode, followed by a certain volume after each loose stool.

While mothers were not asked to actually prepare the solution for the investigator, they were asked to show how much water would be used to mix with the ORS powder, using the container they would normally use to prepare ORS. Of the 97 mothers, only 23 (23.7%) indicated that 200 ml of water, the correct volume, would be mixed with one packet of ORS powder. An additional 30 (30.9%) mothers indicated that they would mix one packet with between 150 and 250 ml, and 34 (35.1%) mothers either significantly under or over-diluted the solution, mixing the packet with <150ml or >250ml of water. The remaining 10 (10.3%) mothers either did not know how to prepare the solution, or their description of preparation made it impossible to determine how the solution was mixed. An example of this was one mother who described her method of preparation as "2 spoonfuls of water with a sprinkle of Oralit".

Correct administration methods were difficult to determine without knowing the age of the child and frequency of the diarrhea in the episode the mother was describing. For instance, one mother described her administration technique as "3 glasses in one day, for 1 day", which would be correct if the child was under one year old and had an episode of 3 loose stools that lasted only one day. If the child was older, or the diarrhea more frequent, or of longer duration, such administration would be incorrect. Other administration practices were more clearly incorrect; for example, one mother described her administration technique as "one glass (of 250ml) given once, then returned to the kadre for another glass 2 days later".

Despite the difficulty of quantifying the percentage of mothers who correctly administered ORS, it was possible to identify certain correct and incorrect principles, practices, and beliefs from the mothers' responses.

The most common concept that arose from the responses of mothers was that ORS was to be administered according to a fixed dosage and frequency, like a medication. Thirty-five mothers described their administration of ORS in these terms. Examples include the mother who stated that she administered "2 tablespoons, 2 times a day for 2 days", and the mother who stated that she administered "3 spoonfuls in one day, morning, afternoon, and night, and threw away the rest".

Only one mother correctly identified the need to administer an initial large volume of ORS before then proceeding to administer smaller volumes throughout the day. She stated she would give "400 ml over 3 hours, then 200ml every hour until stool was firm". It should be noted however, that she did not believe that ORS should be administered after every stool, and that she had prepared the ORS incorrectly by mixing the packet of powder with 400 ml of water.

Few mothers (4) understood the principle of adjusting the volume of ORS to replace the volume lost through diarrhea, i.e. relating the volume of ORS to the frequency of loose stools. An example of correct understanding is illustrated in the response of one mother who stated she would give her child "1 glass (of 250 ml) every loose stool, and the amount per day depends on the number of loose stools".

The practice of administering ORS after every loose stool was noted by 21 mothers. However, the volume they would administer indicated that they still did not understand the concept of replacing volume lost, as 14 of the 21 (66.7%) mothers stated that they would administer "a sip" or "a spoonful or two" of ORS after every loose stool.

Fourteen mothers correctly stated that they would continue administration of ORS until the diarrhea resolved, rather than for a fixed period of time, e.g. 1 day.

In a number of cases (18) the mother left it up to the child to determine when and how much ORS was consumed, and in 2 cases the mothers took the ORS themselves, with the belief that the properties of the ORS would pass on to the child through the breast-milk. Five mothers determined the volume to be administered based on the number of packets provided to them by the health care provider; for instance, one mother stated that she gave "3 glasses a day because I only get 3 packets of Oralit". Ten mothers stated that they did not know how to administer ORS.

All of the mothers said that they boiled the water used for ORS preparation, as with all their drinking water; except for one mother who used bottled water, making boiling unnecessary. The mothers were not asked about the length of time and method of boiling, so actual water safety was not determined.

It should be noted that mothers were asked to describe their preparation and administration techniques from memory, without any reference to the ORS packet. Therefore, mothers' ability to correctly prepare and administer ORS may have been underestimated for mothers with an adequate level of literacy to follow the package instructions.

As seen in Table 15, mothers were taught about ORS preparation and administration from a number of people and sources. Health workers were named by 62.9% (61) of mothers as the source of teaching. Posyandu staff, which includes kadres and bidans, were the most common health workers, followed by kadres in the community. Puskesmas staff, doctors, bidans, and hospital staff, in decreasing frequency, were also named. Twelve of the 97 mothers (12.4%) learned from a family member or friend, with the grandmother being the most commonly cited of these. A considerable proportion of mothers (23.7%, n=23) learned

ORS preparation and administration techniques by reading the ORS package instructions, while others stated that the media or school had been their source of information.

Table 15: Person or Source Who Taught Mothers How to Prepare and Administer ORS

Who taught about ORS use?		% (n)[1]
Health worker	**Posyandu staff**	**22.7%** (22)
	Kadre in community	**20.6%** (20)
	Puskesmas staff	**10.3%** (10)
	Doctor in clinic	**4.1%** (4)
	Bidan in community	**3.1%** (3)
	Hospital staff	**2.1%** (2)
Relative or friend/neighbour	**Grandmother**	**6.2%** (6)
	Friend/Neighbour	**5.2%** (5)
	Father	**1.0%** (1)
Other source	**Package instructions**	**23.7%** (23)
	Media	**10.3%** (10)
	School	**1.0%** (1)
Don't remember		**2.1%** (2)

[1] % (n) = proportion and number of 97 mothers who were taught by the various people or sources, with some mothers giving more than one response (i.e. not mutually exclusive categories)

Use of ORS

When questioned about their usual use of ORS, 23% (23) of the 100 mothers stated that they used ORS to treat every one of their child's past diarrhea episodes, while 50% (50) only used it for some episodes, and 27% (27) had never used ORS to treat their child's diarrhea (see Table 16).

Table 16: Mothers' Usual Use of ORS During Diarrhea Episodes

ORS used	% (n) [1]
Never	**27.0%** (27)
Sometimes	**50.0%** (50)
Always	**23.0%** (23)
Total	**100.0%** (100)

[1] % (n) = proportion and number of 100 mothers who never, sometimes, or always used ORS

Influences on Use of ORS

The influence of the various factors on mothers' use of ORS was explored. This involved both assessing the mothers' own views of what influenced them, as well as cross-tabulating mothers' use of ORS with various predictive factors in order to identify any associations.

Mothers' Views of the Influences on ORS Use

Mothers' views of what influenced their use of ORS were assessed. Mothers who always used ORS were, however, not questioned about their motivation for using ORS every time. Mothers who sometimes or always used ORS were asked about who had advised them to use ORS. Mothers who sometimes used ORS were questioned regarding their view of what influenced them to use, or not use, ORS in a given situation. Mothers who never used ORS were questioned about their reasons for lack of use.

Who advised mothers who sometimes or always used ORS

As seen in Table 17, the 73 mothers who sometimes or always used ORS were asked who had advised them to use ORS. Six mothers (8.2%) said that no one advised them to use ORS, while the remainder named various individuals. Of these, 59 (80.8%) were advised by a health worker, with the most common health worker being the kadre (24.7%, n=18), followed by staff at the puskesmas or posyandu. Other health workers included the bidans in the community, doctors at clinics, and hospital staff. Thirteen mothers (17.8%) were advised by a relative or friend, the grandmother being the most common. Four mothers (5.5%) said that they were advised by the media, which included TV advertisements and instructions on their child's KMS (child health record brochure).

Table 17: Person or Source Who Advised Mothers to Use ORS

Who advised use of ORS?		% (n)[1]
No one (self)		**8.2%** (6)
Health worker	**Kadre in community**	**24.7%** (18)
	Puskesmas staff	**21.9%** (16)
	Posyandu staff	**12.3%** (9)
	Bidan in community	**11.0%** (8)
	Doctor in clinic	**8.2%** (6)
	Hospital staff	**2.7%** (2)
Relative or friend/neighbour	**Grandmother**	**8.2%** (6)
	Friend/Neighbour	**5.5%** (4)
	Father	**2.7%** (2)
	Other relative	**1.4%** (1)
Media		**5.5%** (4)

[1] % (n) = proportion and number of 73 mothers who sometimes or always used ORS that were advised by the specified person or source, with some mothers giving more than one response (i.e. not mutually exclusive categories)

Influences on mothers who sometimes used ORS

The 50 mothers who only sometimes used ORS to treat their children's diarrhea episodes were asked about the influence of the severity and cause of the episode, and the age of the child, on their use of ORS. Some mothers reported numerous influences, therefore categories are not mutually exclusive.

Thirty-eight (76.0%) of the 50 mothers said that the severity of the episode did in some way influence their decision regarding ORS use; 92.1% of these (35 of 38) indicated that more serious episodes were more likely to prompt use of ORS. Specific factors related to severity that they indicated would motivate them to use ORS included certain types of diarrhea, such as watery diarrhea or the presence of mucous or "bubbles" (20); high frequency of stools (15); associated signs, such as fever or vomiting (4); an episode of long duration (2); lack of response to other treatment (2); or worsening diarrhea (2). Only 7.9%

(3 of 38) of mothers indicated that severity would negatively influence their use of ORS, saying that they were more likely to immediately seek health care for a more serious episode.

Thirteen of the 50 mothers (26%) indicated that the cause of the diarrhea episode influenced their use of ORS, but differed on what causes prompted treatment with ORS. For instance, some mothers said that they were more likely to use ORS for diarrhea caused by "masuk angin" (3), inappropriate foods (5), and unknown causes (3); others said they were *less* likely to use ORS for diarrhea resulting from "masuk angin" (2) and inappropriate foods (2). Masuk angin is the belief that a "wind" enters the child or breast-feeding mother and causes the illness.

While 13 of the 50 mothers (26.0%) indicated that the age of the child influenced their use of ORS, there was little agreement on what age group should receive ORS, with some mothers stating that ORS was appropriate for younger children, while others saying that it was more suited to older children. The youngest age at which any mother said they would use ORS was 5 months, although 1 year was a more common cut-off. Mothers that said ORS use should stop at a certain upper age limit varied as to that limit, with the oldest age being 5 years old.

In addition to the influence of severity, cause, and age of the child, mothers who only sometimes used ORS listed other factors that influenced their use. Access to ORS packets were named by 11 mothers (22.0%) as influencing their use of ORS. Access issues included distance to the source of the packets, cost of packets, and lack of stock at home or at the source. Other factors mothers named as influencing ORS use included the advice of health workers or relatives (7); the willingness of the child to take the solution (4); and the effectiveness of other home treatments, i.e. the mother would use ORS if other treatments were ineffective (4). Additional factors included the mother's memory, i.e. the mother would use ORS if she "remembered" (2); and the adequacy of fluid intake, i.e. the mother would not give ORS if the child's intake of other fluids was adequate (1).

Influences on mothers who had never used ORS

The 27 mothers who had never used ORS had various reasons for their decision, many of which were similar to reasons cited by mothers who only sometimes used ORS. The majority of these reasons related to mothers' beliefs regarding home treatment and ORS.

Three mothers (11.1%) stated that they never used ORS because adequate intake of other fluids or breast-milk was sufficient treatment, four (14.8%) believed that other home treatments were more effective, and two (7.4%) felt that ORS was completely ineffective as a treatment for diarrhea. Five mothers (18.5%) stated that seeking treatment outside the home was preferable to the use of ORS. Other reasons for never using ORS included the belief that diarrhea was not a serious enough illness to warrant its use (7.4%, 2), that the child would not drink ORS due to its bad taste (29.6%, n=8), that ORS was unsuitable for young children (7.4%, n=2), and that the availability of ORS was limited (14.8%, n=4). Four mothers (14.8%) said that they had never used ORS because they forgot, panicked, or became confused when their child had an episode of diarrhea. One mother (3.7%) did not provide a reason.

Of the 27 mothers who had never used ORS, 19 (70.4%) said that they would consider using ORS. Many of these mothers stated that they would try ORS in the future because they have heard that it was an effective treatment for diarrhea (9). Others said they would consider trying ORS but they know that their child would not like the taste (4). Other mothers who had considered using ORS stated that they had been prevented from doing so because other treatments had been effective thus far (2), because ORS has been out of stock (2), or because they have concerns about its appropriateness for young children (2).

Eight of the 27 mothers (29.6%) who had never used ORS said that they knew someone else who had used ORS. Six of these said that another person informed them that ORS was effective, while the other two did not discuss it with the person who had used it.

Potential Influences on ORS Use

The possibility of statistical associations between ORS use and mothers' characteristics, beliefs, knowledge, and practices were assessed. For this purpose, mothers who had "ever" used ORS were compared to mothers who had "never" used ORS in order to determine how the two groups differed in relation to the various factors.

Influence of maternal and household characteristics on ORS use

As seen in Figure 3, the age distribution of mothers who had ever used ORS was very similar to those who had never used it, with approximately half of each group being less than the median age and half being greater than the median.

Figure 3: Age of Mothers Who Ever or Never Used ORS

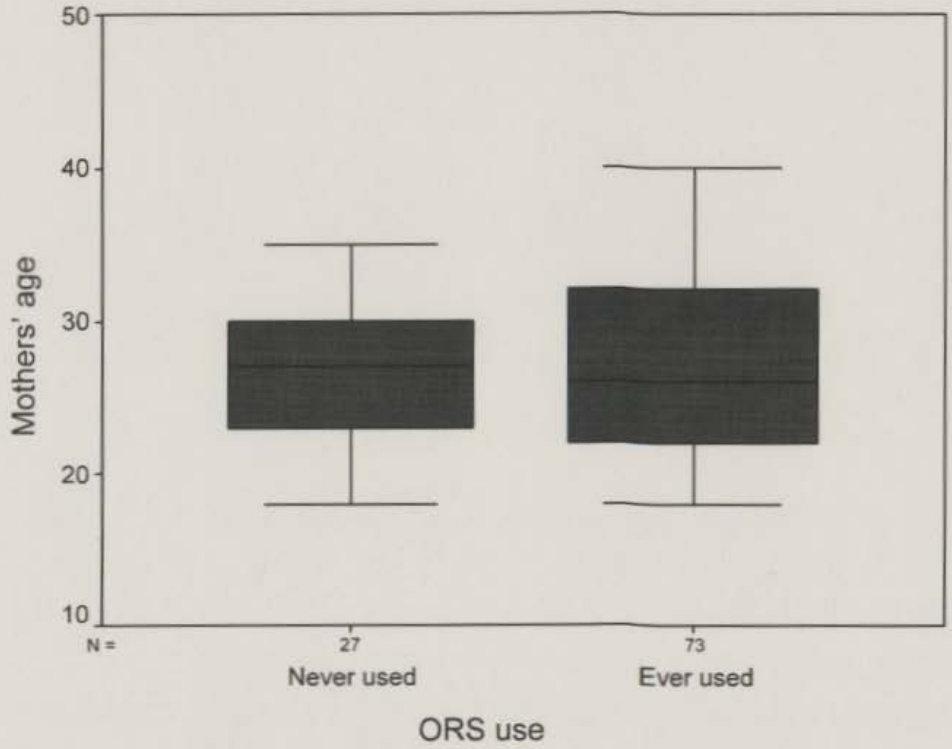


Table 18 shows that the distribution of cultural groups was similar between mothers who had ever or never used ORS. For instance, 65.8% (48 of 73) of mothers who had ever used ORS were from the Parung cultural group, compared to 66.7% (18 of 27) of mothers who had never used ORS.

Table 18: Cultural Group of Mothers Who Never or Ever Used ORS

Mother's cultural group	Never used ORS % (n) [1]	Ever used ORS % (n) [1]	Total % (n) [2]
Sunda	**14.8%** (4)	**15.1%** (11)	**15.0%** (15)
Parung	**66.7%** (18)	**65.8%** (48)	**66.0%** (66)
Java	**11.1%** (3)	**4.1%** (3)	**6.0%** (6)
Betawi	**7.4%** (2)	**12.3%** (9)	**11.0%** (11)
Other	**0.0%** (0)	**2.7%** (2)	**2.0%** (2)
Total % (n) [3]	**27.0%** (27)	**73.0%** (73)	**100.0%** (100)

[1] Never/Ever used ORS % (n) = proportion and number of mothers that never (n=27) or ever (n=73) used ORS in each cultural group
[2] Total % (n) = proportion and number of all 100 mothers in each cultural group
[3] Total % (n) = proportion and number of all 100 mothers who never or ever used ORS

As seen in Table 19, a higher proportion of mothers who had never used ORS had higher than junior high school education (25.9%, 7 of 27), compared to mothers who had ever used ORS (16.4%, 12 of 73), although the difference was not statistically significant (OR: 1.78; 95% CI: 0.62-5.14; p=0.287). It was not feasible to compare literacy in the groups who never and ever used ORS, as there was only one mother who indicated that she was illiterate.

Table 19: Education Level of Mothers Who Never or Ever Used ORS

Mother's level of education [1]	Never used ORS % (n) [2]	Ever used ORS % (n) [2]	Total % (n) [3]
None	**0.0%** (0)	**2.74%** (2)	**2.0%** (2)
Elementary incomplete	**11.1%** (3)	**11.0%** (8)	**11.0%** (11)
Elementary complete	**33.3%** (9)	**39.7%** (29)	**38.0%** (38)
Junior high incomplete	**3.7%** (1)	**5.5%** (4)	**5.0%** (5)
Junior high complete	**25.9%** (7)	**24.7%** (18)	**25.0%** (25)
High school incomplete	**3.7%** (1)	**1.4%** (1)	**2.0%** (2)
High school complete	**22.2%** (6)	**12.3%** (9)	**15.0%** (15)
Education beyond high school	**0.0%** (0)	**2.7%** (2)	**2.0%** (2)
Total % (n) [4]	**27.0%** (27)	**73.0%** (73)	**100.0%** (100)

[1] Mother's level of education = the Canadian terms "elementary, junior high", and "high school" are the equivalent of the Indonesian educational system's "SD, SMP"and "SMA"
[2] Never/Ever used ORS % (n) = proportion and number of mothers who never (n=27) or ever (n=73) used ORS at each level of education
[3] Total % (n) = proportion and number of all 100 mothers at each level of education
[4] Total % (n) = proportion and number of all 100 mothers who never or ever used ORS

Mothers who had never and ever used ORS were very similar in terms of employment status, with the vast majority of both groups having no employment outside the home, 92.6% versus 98.6% respectively. There was no statistically significant association between use of ORS and employment outside the home (OR: 0.174; 95% CI: 0.150-1.998; p=0.160).

As seen in Table 20, a higher proportion of mothers who had ever used ORS had more than two minor aged children in the home (37.0%, n=27), compared to mothers who had never used ORS (22.2%, n=6), although the difference was not statistically significant (OR: 2.05; 95% CI: 0.74-5.72; p=0.168).

Table 20: Number of Mothers' Children in the Home Among Mothers Who Never or Ever Used ORS

Number of mothers' children[1]	**Never used ORS** % (n)[2]	**Ever used ORS** % (n)[2]	**Total** % (n)[3]
1	**44.4%** (12)	**30.1%** (22)	**34%** (34)
2	**33.3%** (9)	**32.9%** (24)	**33%** (33)
3	**14.8%** (4)	**19.2%** (14)	**18%** (18)
4	**3.7%** (1)	**6.9%** (5)	**6%** (6)
5	**0%** (0)	**4.1%** (3)	**3%** (3)
6	**0%** (0)	**2.7%** (2)	**2%** (2)
7	**3.7%** (1)	**4.1%** (3)	**4%** (4)
Total % (n)[4]	**27.0%** (27)	**73.0%** (73)	**100.0%** (100)

[1] Number of mother's children = the number of mothers' own minor aged children (18 years old or younger) in the home

[2] Never/Ever used ORS % (n) = proportion and number of mothers who never (n=27) or ever (n=73) used ORS that had each number of minor aged children in the home

[3] Total % (n) = proportion and number of all 100 mothers with each number of children in the home

[4] Total % (n) = proportion and number of all 100 mothers who never or ever used ORS

The likelihood of ORS use was not influenced by the presence of other relatives in the home with the parents and children. Mothers who had ever used ORS were as likely to have other relatives in the home (39.7%, n=29) as mothers who had never used ORS (37.0%, n=10) (OR: 1.12; 95% CI: 0.45-2.79; p=0.807).

As seen in Table 21, a higher proportion of mothers who had ever used ORS had help available sometimes or always when a child was sick (89.0%, n=65), compared to mothers who had never used ORS (77.8%, n=21), although the difference was not statistically significant (OR: 2.32; 95% CI: 0.72-7.46; p=0.157).

Table 21: Help with a Sick Child Available to Mothers Who Never and Ever Used ORS

Help available	Never used ORS % (n) [1]	Ever used ORS % (n) [1]	Total % (n) [2]
Never	**22.2%** (6)	**11.0%** (8)	**14.0%** (14)
Sometimes	**0.0%** (0)	**8.2%** (6)	**6.0%** (6)
Always	**77.8%** (21)	**80.8%** (59)	**80.0%** (80)
Total % (n) [3]	**27.0%** (27)	**73.0%** (73)	**100.0%** (100)

[1] Never/Ever used ORS % (n) = proportion and number of mothers that never (n=27) or ever (n=73) used ORS that had help available never, sometimes, or always

[2] Total % (n) = proportion and number of all 100 mothers that had help available never, sometimes, or always

[3] Total % (n) = proportion and number of all 100 mothers who never or ever used ORS

There was no association between use of ORS and the relationship of the person who makes health care decisions for the child. Mothers who had ever used ORS were as likely to make their own decisions (34.2%, 25 of 73) as mothers who had never used ORS (37.0%, 10 of 27) (OR: 1.13; 95% CI: 0.45-2.83; p=0.795).

Influence of knowledge and beliefs regarding diarrhea on ORS use

Table 22 shows that similar proportions of mothers who had ever used ORS (95.9%, n=70) and who had never used ORS (92.6%, n=25) considered diarrhea to be sometimes or always serious, indicating that belief in the severity of the illness was not a factor in determining use of ORS (OR: 1.87; 95% CI: 0.30-11.83; p=0.508).

Table 22: Consideration of Diarrhea as a Serious Illness By Mothers Who Never or Ever Used ORS

Consider diarrhea a serious illness [1]	Never used ORS % (n) [2]	Ever used ORS % (n) [2]	Total % (n) [3]
Never	**7.4%** (2)	**4.1%** (3)	**5%** (5)
Sometimes	**11.1%** (3)	**20.6%** (15)	**18%** (18)
Always	**81.5%** (22)	**75.3%** (55)	**77%** (77)
Total % (n) [4]	**27%** (27)	**73%** (73)	**100%** (100)

[1] Consider diarrhea a serious illness = mothers' view of diarrhea as either never, sometimes, or always serious

[2] Never/Ever used ORS % (n) = proportion and number of mothers who never (n=27) or ever (n=73) used ORS that considered diarrhea as never, sometimes, or always serious

[3] Total % (n) = proportion and number of all 100 mothers who considered diarrhea as never, sometimes, or always serious

[4] Total % (n) = proportion and number of all 100 mothers who never or ever used ORS

Table 23 shows the number of correct signs and symptoms of dehydration that each mother could identify cross-tabulated with their use of ORS. The number of signs can be categorized as "little or no knowledge of signs" (0 or 1 sign) or "greater knowledge of signs" (2 or 3 signs). Mothers who had ever used ORS were 3.630 times more likely to have greater knowledge of signs of dehydration (45.2%, n=33) than mothers who had never used ORS (18.5%, n=5). This difference is statistically significant (OR: 3.360; 95% CI: 1.239-10.634; p= 0.019).

Table 23: Number of Correct Signs of Dehydration Identified by Mothers Who Never or Ever Used ORS

Number of correct signs identified [1]	**Never used ORS** % (n) [2]	**Ever used ORS** % (n) [2]	**Total** % (n) [3]
0	**25.9%** (7)	**13.7%** (10)	**17.0%** (17)
1	**55.6%** (15)	**41.1%** (30)	**45.0%** (45)
2	**14.8%** (4)	**43.8%** (32)	**36.0%** (36)
3	**3.7%** (1)	**1.4%** (1)	**2.0%** (2)
Total % (n) [4]	**27.0%** (27)	**73.0%** (73)	**100.0%** (100)

[1] Number of correct signs identified = the number of correct signs of dehydration that each mother identified
[2] Never/Ever used ORS % (n) = proportion and number of mothers that never (n=27) or ever (n=73) used ORS that were able to identify the specified number of correct signs of dehydration
[3] Total % (n) = proportion and number of all 100 mothers who were able to identify the specified number of correct signs of dehydration
[4] Total % (n) = proportion and number of all 100 mothers who never or ever used ORS

Influence of experience with diarrhea on ORS use

Only 1 of the 27 mothers of children who had never used ORS (3.7%), and 4 of the 73 (5.5%) who had ever used it had a child who had been hospitalized for diarrhea at some time in the past. However, of these 5 mothers, 80.0% (4 of 5) had ever used ORS, while only 20.0% (1 of 5) had never used ORS.

The likelihood of knowing a child who died from diarrhea was approximately equivalent amongst mothers who had never used ORS (48.2%, 13 of 27) and those who had ever used ORS (52.1%, 38 of 73) (OR 1.17, 95% CI: 0.48-2.83; p=0.729).

Influence of beliefs and knowledge regarding ORS on ORS use

Mothers who had ever or never used ORS were also compared on the basis of their beliefs and knowledge regarding ORS. As noted earlier, only 97 of the 100 mothers answered questions about ORS knowledge, beliefs, and practices.

No relationship existed between ORS use and correct understanding of the hydrating function of ORS. Mothers who had ever used ORS were as likely to know the correct function of ORS (34.2%, 25 of 73) as mothers who never used ORS (29.2%, 7 of 24) (OR: 1.27; 95% CI: 0.46-3.45; p=0.647).

Table 24 shows that there were similar proportions of mothers who had ever used ORS and those who never used ORS in terms of their belief in ORS as an effective treatment. The difference in proportions was not statistically significant (OR: 1.65; 95% CI: 0.60-4.51; p=0.332).

Table 24: Mother's Belief in the Effectiveness of ORS by Mothers Who Never or Ever Use ORS

Belief in the effectiveness of ORS?	**Never used ORS** % (n) [1]	**Ever used ORS** % (n) [1]	**Total** % (n) [2]
No	**33.3%** (8)	**23.3%** (17)	**25.8%** (25)
Yes	**66.7%** (16)	**76.7%** (56)	**74.2%** (72)
Total % (n) [3]	**24.7%** (24)	**68.0%** (73)	**100.0%** (97)

[1] Never/Ever used ORS % (n) = proportion and number of mothers who never (n=24) or ever (n=73) used ORS that did or did not believe in the effectiveness of ORS

[2] Total % (n) = proportion and number of 97 mothers who answered the question that did or did not believe in the effectiveness of ORS

[3] Total % (n) = proportion and number of 97 mothers who answered the question that never or ever used ORS

The ease or difficulty of obtaining packets of ORS was not related to mothers' use during a diarrhea episode (OR: 0.93; 95% CI: 0.30-2.92; p=0.902). It was not possible to compare mothers who had ever used ORS with those who had never used ORS in terms of the ease of administration, since mothers who had never used ORS would be unable to judge the ease or difficulty of administration. Therefore, ease of administration was cross-tabulated with "sometimes used" and "always used" ORS. As seen in Table 25 a slightly higher proportion of mothers who always used ORS found administration easy (73.9%, n=17),

compared to mothers who only sometimes used ORS (54.0%, n=27). However, this difference was not statistically significant (OR: 2.41; 95% CI: 0.82-7.14; p=0.111).

Table 25: Ease of Administration of ORS by Mothers Who Sometimes or Always Used ORS

Ease of administration	Sometimes used ORS % (n) [1]	Always used ORS % (n) [1]	Total % (n) [2]
Difficult	**46.0%** (23)	**26.1%** (6)	**39.7%** (29)
Easy	**54.0%** (27)	**73.9%** (17)	**60.3%** (44)
Total % (n) [3]	**68.5%** (50)	**31.5%** (23)	**100.0%** (73)

[1] Sometimes/Always used ORS % (n) = proportion and number of mothers who sometimes (n=50) or always (n=23) used ORS that found administration difficult or easy
[2] Total % (n) = proportion and number of the 73 mothers that sometimes or always used ORS who ranked administration as difficult or easy
[3] Total % (n) = proportion and number of 73 mothers who sometimes or always used ORS

As seen in Table 26, mothers who had ever used ORS were more likely (OR: 7.42) to have confidence, or self-efficacy, in their ability to correctly prepare and administer ORS (75.3%, n=55), compared to mothers who had never used ORS (29.2%, n=7). This difference was statistically significant (OR: 7.42; 95% CI: 2.65-20.76; p<0.005).

Table 26: Self-Efficacy in Ability to Prepare and Administer ORS Among Mothers Who Had Never and Ever Used ORS

Self-efficacy in ORS use [1]	Never used ORS % (n) [2]	Ever used ORS % (n) [2]	Total % (n) [3]
No	**70.8%** (17)	**24.7%** (18)	**36.1%** (35)
Yes	**29.2%** (7)	**75.3%** (55)	**63.9%** (62)
Total % (n) [4]	**24.7%** (24)	**75.3%** (73)	**100.0%** (97)

[1] Self-efficacy in ORS use = mother's confidence in own ability to correctly prepare and administer ORS
[2] Never/Ever used ORS % (n) = proportion and number of mothers who never (n=27) or ever (n=73) used ORS that did and did not have self-efficacy in ORS use
[3] Total % (n) = proportion and number of all 100 mothers who did or did not have self-efficacy in ORS use
[4] Total % (n) = proportion and number of all 100 mothers who never or ever used ORS

Description of Recent Episodes and Their Treatment

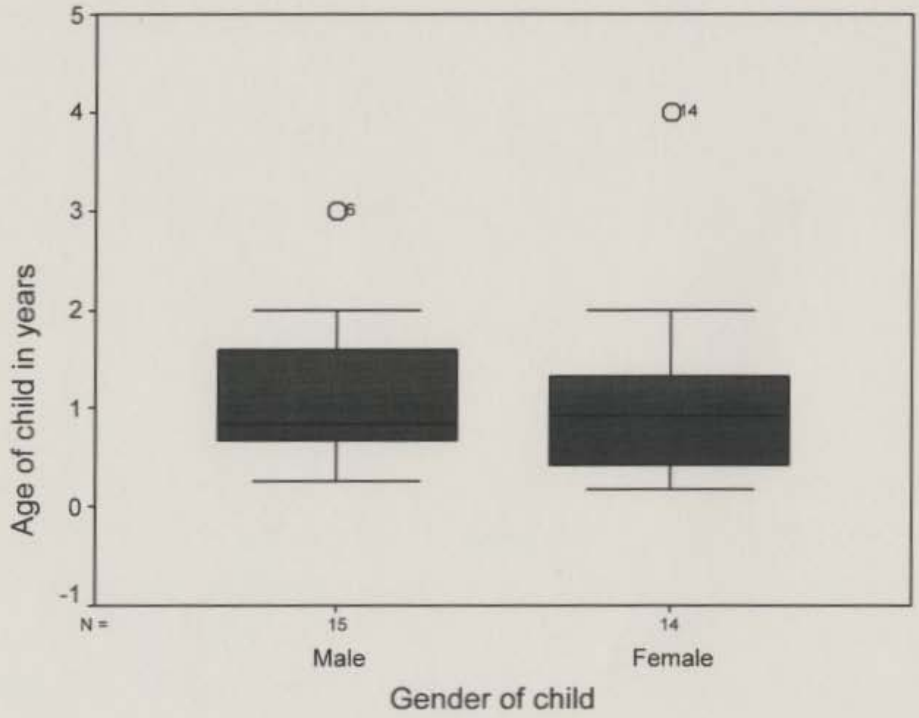
The 29 mothers of children who had an episode of diarrhea in the month prior to the interview were asked a number of additional questions about the specific recent episode and their response to it. Mothers were asked to describe the age and gender of the child with the

recent episode, the signs observed, the number of stools per day, the length of the episode, and the perceived cause and severity of the episode. These various factors were compared between the group of mothers who used ORS for the episode (31.0%, 9 of 29) and those who did not (69.0%, 20 of 29). The children's breast-feeding and drinking practices during the recent episode are also described. The influence of these additional factors on the use of ORS was determined.

Description of the Child and Characteristics of the Recent Episode

The proportions of males (57.1%, n=15) and females (48.3%, n=14) with recent episodes were comparable. As seen in Figure 4, the age distributions of each gender group were also quite similar. The median age of children with a recent episode was 10 months; the median age of boys was 10 months, and the median age of girls was 11 months. With the exception of extreme values and outliers, all children with recent episodes were under the age of 2 years.

Figure 4: Children with a Recent Episode by Age and Gender



As seen in Table 27, a relationship exists between the age of the child and mothers' use of ORS for the recent episode of diarrhea. A higher proportion of children who received ORS for the recent episode were 6 months old or less (44.4%, n=4), compared to children who were not treated with ORS (15.0%, n=3). However, this finding did not achieve statistical significance (OR: 4.53; 95% CI: 0.75-27.39; p=0.100).

Table 27: Age of Child with Recent Episode Among Mothers Who Did or Did Not Use ORS

Age of child with recent episode	ORS not used this episode % (n) [1]	ORS used this episode % (n) [1]	Total % (n) [2]
Birth to ≤6 months	**15.0%** (3)	**44.4%** (4)	**24.1%** (7)
>6 months to ≤1 year	**45.0%** (9)	**22.2%** (2)	**37.9%** (11)
>1 year to ≤2 years	**30.0%** (6)	**33.3%** (3)	**31.0%** (9)
>2 years to ≤5 years	**10.0%** (2)	**0%** (0)	**6.9%** (2)
Total % (n) [3]	**69.0%** (20)	**31.0%** (9)	**100.0%** (29)

[1] ORS used/not used this episode % (n) = proportion and number of mothers who used (n=9) or did not use ORS (n=20) for each age group of child

[2] Total % (n) = proportion and number of the 29 mothers who had a child in each age group with a recent episode

[3] Total % (n) = proportion and number of the 29 mothers who did or did not use ORS to treat the recent episode

The mothers were asked if certain signs were present during the recent episode. As seen in Table 28, the most common sign was watery stool, seen in 96.6% (28) of episodes. Mucous in the stool, vomiting, and fever were also noted, in decreasing frequency. None of the mothers noted blood in the stool, which would have been a sign of dysentery. Other than the signs mothers were specifically asked about, mothers noted other characteristics of the stool. The most commonly named other sign was "white seeds" in the stool (n=5). The presence of these "white seeds" is described by mothers as a sign that the diarrhea is a normal part of growing up and is not considered as serious as if the white seeds were absent.

Table 28: Signs Observed During Recent Episode

Signs in recent episode [1]	% (n) [2]
Watery stool	**96.6%** (28)
Mucous in stool	**58.6%** (17)
Vomiting	**37.9%** (11)
Fever	**34.5%** (10)
Blood in stool	**0.0%** (0)
Other	**27.6%** (8)

[1] Signs in recent episode = signs observed by mothers during the recent episode
[2] % (n) = proportion and number of the 29 mothers who observed the various signs, with some mothers giving more than one response (i.e. not mutually exclusive categories)

There was no relationship between the characteristics of the stool or other clinical manifestations of the episode and mothers' use of ORS. Mothers who did and did not use ORS were as likely to note the presence of watery stool (p=0.860), mucous in the stool (p=0.557), vomiting (p=0.732), and fever (p=0.358).

The number of stools each child had on the worst day of the recent diarrhea episode ranged from 1 to 15. Twenty-seven of the 29 (93.1%) children had 3 or more loose stools, which corresponds to the WHO definition of "diarrhea", being 3 or more loose stools in a 24 hour period (WHO, 1993). The majority of the episodes (69.0%, n=20) were characterized as having between 3 and 5 stools per day on the worst day, and 7 episodes (24.1%) had >5 stools per day. The 2 mothers that stated that their child had only 1 or 2 stools per day still considered their child to have an episode of diarrhea, although it would not be defined so according to WHO guidelines. These episodes were described by the mothers as watery stool, with, in one case, vomiting.

As seen in Table 29, a higher proportion of children who received ORS for the recent episode had more than 5 stools per day (66.7%, 6 of 9), compared to children who did not receive ORS (30.0%, 6 of 20). However, this relationship was not statistically significant (OR: 4.67; 95% CI: 0.87-25.13; p=0.073). While other cut-off points were tested, the association between ORS use and number of stools was strongest when using ≥5 stools versus <5 stools.

Table 29: Number of Stools per Day Among Mothers Who Did or Did Not Use ORS for the Recent Episode

# of stools per day on worst day	ORS not used this episode % (n) [1]	ORS used this episode % (n) [1]	Total % (n) [2]
<5 stools	**70.0%** (14)	**33.3%** (3)	**58.6%** (17)
≥5 stools	**30.0%** (6)	**66.7%** (6)	**41.4%** (12)
Total % (n) [3]	**69.0%** (20)	**31.0%** (9)	**100.0%** (29)

[1] ORS used/not used this episode % (n) = proportion and number of mothers who used (n=9) or did not use ORS (n=20) compared to the number of stools per day

[2] Total % (n) = proportion and number of the 29 children with the indicated number of stools

[3] Total % (n) = proportion and number of the 29 mothers who did or did not use ORS to treat the recent episode

The number of stools the child had during the worst day of the recent episode appeared to differ based on the mothers' view of the severity of the episode. A higher proportion of mothers who thought the episode was somewhat or very serious had a child with ≥5 loose stools/day (55.6%, n= 10), compared to mothers who viewed the episode as not serious (18.2%, n=2) . However, this finding was not statistically significant (OR: 5.62; 95% CI: 0.94-33.76; p=0.059).

The majority (96.6%, 28 of 29) of the recent episodes lasted less than 14 days, classifying them as "acute diarrhea" according to WHO guidelines. Seventeen (58.6%) of the 29 were episodes lasted 3 or fewer days, for which home treatment is recommended, while 11 (37.9%) were episodes lasting between 4 and 14 days, for which treatment by a health worker is advised (WHO, 1993). Only one episode (3.5%) was defined as "chronic diarrhea", lasting greater than 14 days.

There was a statistically significant association between mothers who used ORS and episodes that lasted only one day (OR: 7.20; 95% CI: 1.01-51.39; p=0.049). As seen in Table 30, 44.4% (4) of children who received ORS had episodes of only one day, compared to 10.0% (2) of children who did not receive ORS. This indicates that *prolonged* duration is clearly not a factor in prompting ORS use, and that another factor may be responsible for the apparent association between short duration and ORS use. This will be explored further in multivariate analysis.

Table 30: Length of Recent Episode Among Mothers Who Did or Did Not Use ORS

Length of episode	ORS not used this episode % (n) [1]	ORS used this episode % (n) [1]	Total % (n) [2]
1 day	**10.0%** (2)	**44.4%** (4)	**20.7%** (6)
>1 day	**90.0%** (18)	**55.6%** (5)	**79.3%** (23)
Total % (n) [3]	**69.0%** (20)	**31.0%** (9)	**100.0%** (29)

[1] ORS used/not used this episode % (n) = proportion and number of mothers who used (n=9) or did not use ORS (n=20) compared to the length of the episode
[2] Total % (n) = proportion and number of the 29 children who had an episode of the indicated length
[3] Total % (n) = proportion and number of the 29 mothers who did or did not use ORS to treat the recent episode

Mothers were asked what they perceived to be the cause of their children's recent episodes; the actual cause was not determined in this study. The most common cause cited by mothers was new or inappropriate dietary intake (34.5%, n=10). This included the introduction of new foods during weaning, the consumption of foods or drinks inappropriate for a young child, and the consumption of spicy foods by a breast-feeding mother. None of the mothers cited contaminated food or water as the cause of the diarrhea episode. A number of women (27.6%, n=8) stated that "masuk angin" was the cause of the episode. "Child development issues", cited by 24.1% (7) of mothers, refers to the belief that the diarrhea episode was either caused by a phase of child development, such as teething, or that the diarrhea episode would enable the child to achieve some developmental milestone, such as being able to sit-up or crawl. Other reasons given for the episode were "medicine given for vomiting" (1), and "because the child slept on the floor and got cold" (1). Two of the mothers had no opinion as to what had caused their child's diarrhea.

The perceived cause of the diarrhea episode amongst mothers who did and did not use ORS for the episode can be seen in Table 31. The proportions of both groups are comparable for most of the various perceived causes. While dietary causes were more common amongst mothers who used ORS (44.4%, n=4) than those who did not use it (30.0%, n=6), this difference was not statistically significant (OR: 1.87; 95% CI: 0.35-9.02; p=0.449).

Table 31: Causes of the Recent Episode as Perceived by Mothers Who Did or Did Not Use ORS to Treat the Given Episode

Cause of the episode [1]	ORS not used this episode % (n) [2]	ORS used this episode % (n) [2]	Total % (n) [3]
Dietary intake	**30.0%** (6)	**44.4%** (4)	**34.5%** (10)
Masuk angin	**30.0%** (6)	**22.2%** (2)	**27.6%** (8)
Child development	**25.0%** (5)	**22.2%** (2)	**24.1%** (7)
Other	**10.0%** (2)	**0%** (0)	**6.9%** (2)
Don't know	**5.0%** (1)	**11.1%** (1)	**6.9%** (2)
Total % (n) [4]	**69.0%** (20)	**31.0%** (9)	**100%** (29)

[1] Cause of the episode = Mother's belief about the cause of the episode
[2] ORS used/not used this episode % (n) = proportion and number of the mothers who used (n=9) or did not use ORS (n=20) to treat this episode that attributed the episode to the given cause
[3] Total % (n) = proportion and number of 29 mothers who attributed the recent episode to the given cause
[4] Total % (n) = proportion and number of 29 mothers who considered the recent episode to be not, somewhat, or very serious

Mothers were approximately evenly divided in terms of how serious they considered the specific recent episode of diarrhea. Eleven (37.9%) mothers did not consider the episode serious, 9 (31.03%) considered it somewhat serious, and 9 (31.0%) considered it very serious.

As seen in Table 32, a higher proportion of mothers who used ORS to treat the recent episode rated the episode somewhat or very serious (77.7%, n=7), compared to mothers who did not use ORS for the episode (55.0%, n=11). However, this finding was not statistically significant (OR: 2.87; 95% CI: 0.47-17.35, p=0.252).

Table 32: Rating of the Seriousness of the Recent Episode by Mothers Who Did or Did Not Use ORS to Treat the Episode

How serious was this episode? [1]	ORS not used this episode [2] % (n)	ORS used this episode [2] % (n)	Total [3] % (n)
Not	**45.0%** (9)	**22.2%** (2)	**38.0%** (11)
Somewhat	**25.0%** (5)	**44.4%** (4)	**31.0%** (9)
Very	**30.0%** (6)	**33.3%** (3)	**31.0%** (9)
Total [4] % (n)	**69.0%** (20)	**31.0%** (9)	**100.0%** (29)

[1] How serious was this episode = the mother's perception of the severity of the specific diarrhea episode
[2] ORS used/not used this episode % (n) = proportion and number of the mothers who used (n=9) or did not use ORS (n=20) for this episode that rated the severity of the episode
[3] Total % (n) = proportion and number of the 29 mothers who considered the recent episode to be not, somewhat, or very serious
[4] Total % (n) = proportion and number of the 29 mothers who did or did not use ORS to treat the recent episode

There was no statistically significant association between mothers' view of the episode as somewhat or very serious and their decision to seek treatment outside the home (OR: 1.89; 95% CI: 0.41-8.61; p=0.413).

Breast-Feeding and Drinking Practices During Recent Episodes

Data related to children's breast-feeding and drinking practices during recent episodes were collected, and the association between these practices and ORS use during the episode was tested.

As seen in Table 33, half of the mothers of children with recent episodes offered more breast-milk than usual (50.0%, n=11), while another 41.0% (9) offered the same amount as usual, and breast-feeding was reduced for 9.0% (2) of children with recent episodes.

Table 33: Changes in Breast-feeding Practices During Diarrhea Episodes

Changes in breast-feeding	Recent episodes % (n) [1]
Offered more than usual	**50.0%** (11)
Offered the same as usual	**41.0%** (9)
Offered less than usual	**4.5%** (1)
Child decreased own intake	**4.5%** (1)

[1] Recent episodes % (n) = proportion and number of mothers of children with the indicated breast-feeding practices for the specific recent episode, of the 22 mothers breast-feeding at the time of the episode

As seen in Table 34, a slightly higher proportion of mothers who used ORS to treat their children's recent episode increased their child's intake of breast-milk (57.1%, n=4), compared to mothers who did not use ORS (46.7%, n=7). However, this relationship was not statistically significant (OR: 1.52; 95% CI: 0.25-9.30, p=0.648).

Table 34: Changes in Breast-feeding Practices in Recent Episode Among Mothers Who Did or Did Not Use ORS

Changes in breast-feeding	ORS not used this episode % (n) [1]	ORS used this episode % (n) [1]	Total % (n) [2]
Not increased	**53.3%** (8)	**42.9%** (3)	**50.0%** (11)
Increased	**46.7%** (7)	**57.1%** (4)	**50.0%** (11)
Total % (n) [3]	**68.2%** (15)	**31.8%** (7)	**100.0%** (22)

[1] ORS used/not used this episode % (n) = proportion and number of mothers who used (n=7) or did not use ORS (n=15) compared to amount of breast-milk consumed

[2] Total % (n) = proportion and number of the 22 children who were being breast-fed at the time of the diarrhea episode whose breast-milk consumption did or did not increase

[3] Total % (n) = proportion and number of the 22 mothers who did or did not use ORS to treat the recent episode

Table 35 shows that the majority of mothers of children with recent episodes (64.3%, n=18) offered more fluids than usual. Fluid was reduced for 14.1% (4) of recent episodes.

Table 35: Changes in Fluid Consumption Practices During Diarrhea Episodes

Changes in fluid consumption	Recent episodes % (n) [1]
Offered more than usual	**64.3%** (18)
Offered the same as usual	**21.4%** (6)
Offered less than usual	**7.1%** (2)
Child decreased own intake	**7.1%** (2)

[1] Recent episodes % (n) = proportion and number of mothers of children with the indicated fluid consumption practices during the specific recent episode, of the 28 children taking fluids at the time of the episode

As seen in Table 36, a higher proportion of mothers who used ORS increased other fluids (75.0%, n=6), compared to mothers who did not give ORS (60.0%, n=12). This relationship was not, however, statistically significant (OR: 2.00; 95% CI: 0.32-12.51; p=0.459).

Table 36: Changes in Fluid Consumption Practices Among Mothers Who Did or Did Not Use ORS

Changes in fluid consumption	ORS not used this episode % (n) [1]	ORS used this episode % (n) [1]	Total % (n) [2]
Not increased	**40.0%** (8)	**25.0%** (2)	**35.7%** (10)
Increased	**60.0%** (12)	**75.0%** (6)	**64.3%** (18)
Total % (n) [3]	**71.4%** (20)	**28.6%** (8)	**100.0%** (28)

[1] ORS used/not used this episode % (n) = proportion and number of mothers who used (n=8) or did not use ORS (n=20) compared to amount of fluid consumed, of the 28 children who were receiving fluids at the time of the diarrhea episode

[2] Total % (n) = proportion and number of the 28 children who were receiving fluids at the time of the diarrhea episode whose fluid consumption did or did not increase

[3] Total % (n) = proportion and number of the 28 mothers who did or did not use ORS to treat the recent episode

Multivariate Analysis

Backward logistic regression was used to analyse the predictor variables suggested to influence use of ORS. The initial model included all factors applicable to the sample of 100 mothers that were shown to have a statistically significant association with "Ever use of ORS" in bivariate analysis, as well as those factors which were suggested by the literature as having an influence on ORS use. The only factors that remained in the final model were

knowledge of signs of dehydration and self-efficacy in ORS preparation and administration. This is consistent with the findings of the bivariate analysis, which indicated that knowledge of signs of dehydration and self-efficacy were statistically significant predictors of ORS use. Table 37 shows the odds ratios for these factors using both bivariate and multivariate analysis. The final model was: ln odds of ever/never used ORS = $B_0 + B_1$ (knewss) + B_2 (efficacy), in which "knewss" indicates knowledge of signs of dehydration and "efficacy" indicates self-efficacy in preparation and administration of ORS.

In comparison to the bivariate analysis, which assessed the association of ORS use to the categorical variable "knowledge of ≥2 signs of dehydration", the multivariate analysis model assessed the association between ORS use and the continuous variable "knowledge of signs of dehydration", which ranged from knowledge of 0 to 4 signs. As seen in Table 46, the change in the odds ratio for each additional sign known, calculated in the multivariate analysis, did not achieve statistical significance (OR:1.88; 95% CI: 0.94-3.78; p=0.076). However, the fact that there was a positive coefficient for this association (0.6316) indicated that, when self-efficacy was controlled for, ORS use increased as the number of signs known increased.

As seen in Table 37, self-efficacy in ORS preparation and administration maintained a statistically significant association with ORS use in multivariate analysis when knowledge of signs of dehydration was controlled for (OR: 7.65; 95% CI: 2.67-21.96; p<0.005).

Table 37: Comparison of Odds Ratios for "Ever Used ORS" Obtained from Bivariate and Multivariate Analysis

Predictor variable	OR from bivariate analysis	OR from multivariate logistic regression
Knowledge of signs of dehydration	**3.63** [1] (95% CI: 1.24-10.63), p=0.019	**1.88** [2] (95% CI: 0.94-3.78) p=0.076
Self-efficacy in ORS preparation and administration	**7.42** (95% CI: 2.65-20.76), p<0.005	**7.65** (95% CI: 2.67-21.96), p<0.005

[1] 3.63 = the odds ratio for ORS use amongst mothers who knew ≥2 signs of dehydration compared to mothers who knew 0 or 1 sign

[2] 1.88 = the change in the odds ratio for ORS use for each additional sign known by mothers

Bivariate analysis of the subset of 29 recent episodes indicated that there was a statistically significant association between diarrhea episodes of only one day in length and use of ORS for that episode (OR: 7.20; 95% CI: 1.01-51.39; p=0.049). This finding was confirmed in multivariate analysis. Since short duration is not a logical predictor of ORS use by mothers, multivariate analysis was used to identify what other factors might actually be influencing ORS use. Along with duration of the episode, a number of predictor variables were inserted into the model, including treatment-seeking, severity of the episode, and number of stools. The final model indicated that when the other variables were controlled for, the only factor showing a statistically significant association with ORS use was treatment-seeking (OR:10.72; 95% CI: 1.03-111.43; p=0.047).

Summary of Key Results

The key aspects of the findings are summarized below. The only factors with statistically significant associations with ORS use were mothers' knowledge of the signs of dehydration and mothers' self-efficacy in ORS preparation and administration. Interpretation of the findings will follow in chapter 5.

Maternal and Household Characteristics

•61.0% (61) of homes did not have any other relatives living in the home with the parents, 32.0% (32) had grandparents, and 21.0% (21) had other relatives (Table 3)

•14.0% (14) of mothers stated that help was never available when a child was ill, 6.0% (6) said it was sometimes available, and 80.0% (80) said it was always available

•63.0% (63) of mothers stated they made the health care decisions regarding their child, either alone or in conjunction with another person (Table 5)

Knowledge and Beliefs Regarding Diarrhea

•77.0% (77) of mothers stated they believed diarrhea to be always a serious illness, 18.0% (18) said it was sometimes serious, and 5.0% (5) stated it was never serious

•38.0% (38) of mothers could identify 2 or more correct signs of dehydration (Table 7)

•63.0% of mothers identified both correct and incorrect signs (Table 8)

Experience with Diarrhea

•29 (of 100) mothers had a child who had a "recent" episode of diarrhea; 71 had a child with a "past" episode

• 5.0% (5) of mothers had a child hospitalized for diarrhea

•51.0% (51) of mothers knew of a child who had died as a result of an episode of diarrhea

Mothers' Responses to Diarrhea Episodes

•71.8% (51) of mothers of children with past episodes and 55.1% (16) of those with recent episodes sought treatment outside the home by (see Table 9)

•97.2% (69) of mothers of children with past episodes and 89.6% (26 of 29) of those with recent episodes treated their child at home (Table 9)

ORS Knowledge, Beliefs, and Practices

•74.2% (72) of mothers believed that ORS was an effective treatment for diarrhea, 15.5% (15) did not believe it to be effective, and 10.3% (10) were undecided about its effectiveness

•33.0% (32) of mothers listed the correct function, i.e. retention or addition of fluid (Table 13)

•78.4% (76) of the mothers said that ORS packets were easy to obtain, 21.6% (21) said it was difficult

•60.3% (44) of mothers stated that ORS administration was easy, 39.7% (29) found it difficult

•63.9% (62) of mothers believed that they were capable of correct preparation and administration

•62.9% (61) of mothers stated they learned ORS preparation and administration techniques from a health workers, 12.4% (12) from a family member or friend 23.7%, (23) from ORS package instructions, and 111.3% (11) from the media or school (Table 15)

•23% (23) of mothers stated they used ORS to treat every diarrhea episodes, 50% (50) used it for only some episodes, and 27% (27) had never used ORS (Table 16)

Influences on Use of ORS

Mothers' view of the influences on ORS use

•80.8% (59 of the 73 who sometimes/always used ORS) said that a health worker advised them to use ORS, 17.8% (13) named a relative or friend, 5.5% (4) named the media, and 8.2% (6) said that no one advised them to use ORS (Table 17)

•76.0% (38) of the 50 mothers who sometimes used ORS said that the severity of the episode influenced their ORS use

•26.0% (13) of the 50 mothers who sometimes used ORS indicated that the cause of the diarrhea episode influenced their use of ORS

•26.0% (13) of the 50 mothers who sometimes used ORS indicated that the age of the child influenced their use of ORS

•22.0% (11) of the 50 mothers who sometimes used ORS indicated that access to and availability of ORS packets influenced their use of ORS

Potential influences on ORS use

•A higher proportion of mothers who had never used ORS had higher than junior high school education (25.9%, n=7), compared to mothers who had ever used ORS (16.4%, n=12); the difference was not statistically significant (OR: 1.78; 95% CI: 0.62-5.14; p=0.287) (Table 19)

•A higher proportion of mothers who had ever used ORS had more than two minor aged children in the home (37.0%, n=27), compared to mothers who had never used ORS (22.2%, n=6); the difference was not statistically significant (OR: 2.05; 95% CI: 0.74-5.72; p=0.168) (Table 20)

•A higher proportion of mothers who had ever used ORS had help available sometimes or always when a child was sick (89.0%, n=65), compared to mothers who had never used ORS (77.8%, n=21); the difference was not statistically significant (OR: 2.32; 95% CI: 0.72-7.46; p=0.157) (Table 21)

•Mothers who had ever used ORS were 3.630 times more likely to have greater knowledge of signs of dehydration (45.2%, n=33) than mothers who had never used ORS (18.5%, n=5); the difference was statistically significant (95% CI 1.239-10.634; p= 0.019) (Table 23)

•Five mothers had a child hospitalized for diarrhea. Of these, 4 had ever used ORS, while only 1 had never used ORS

•No relationship existed between ORS use and correct understanding of the hydrating function of ORS (p=0.647)

•Similar proportions of mothers who had ever used ORS (76.7%, n=56) and those who had never used ORS (66.7%, n=16) believed that ORS was an effective treatment; there was no statistically significant association (OR: 1.65; 95% CI: 0.60-4.51; p=0.332) (Table 24)

•A higher proportion of mothers who always used ORS found administration easy (73.9%, n=17), compared to mothers who only sometimes used ORS (54.0%, 27); this difference was not statistically significant (OR: 2.41; 95% CI: 0.82-7.14; p=0.111) (Table 25)

•Mothers who had ever used ORS were more likely (OR: 7.42) to have self-efficacy in their ability to correctly prepare and administer ORS (75.3%, n=55), compared to mothers who had never used ORS (29.2%, n=7). This difference was statistically significant (OR: 7.42; 95% CI: 2.65-20.76; p<0.005) (Table 26)

Description of Recent Episodes and Their Treatment

•A higher proportion of children who received ORS for the recent episode were 6 months old or less (44.4%, n=4), compared to children who were not treated with ORS (15.0%, n=3); this difference was not statistically significance (OR: 4.53; 95% CI: 0.75-27.39; p=0.100) (Table 27)

•A higher proportion of children who received ORS for the recent episode had more than 5 stools per day (66.7%, 6 of 9), compared to children who did not receive ORS (30.0%, 6 of 20); the difference was not statistically significant (OR: 4.67; 95% CI: 0.87-25.13; p=0.73) (Table 29)

•There was a statistically significant association between mothers who used ORS and episodes that lasted only one day (OR: 7.20; 95% CI: 1.01-51.39; p=0.049); 44.4% (4) of children who received ORS had episodes of only one day, compared to 10.0% (2) of children who did not receive ORS (Table 30)

•A higher proportion of mothers who used ORS to treat the recent episode rated the episode somewhat or very serious (77.8%, n=7), compared to mothers who did not use ORS for the episode (55.0%, n=11); this finding was not statistically significant (OR: 2.86; 95% CI: 0.47-17.35, p=0.252) (Table 32)

•50.0% of mothers (11 of the 22 that were breast-feeding at the time of the episode) offered more breast-milk than usual, 41.0% (9) offered the same amount as usual, and 9.0% (2) reduced breast-feeding (Table 33). A higher proportion of mothers who used ORS to treat their child's recent episode increased their child's intake of breast-milk (57.1%, n=4), compared to mothers who did not use ORS (46.7%, n=7); this relationship was not statistically significant (OR: 1.52; 95% CI: 0.25-9.30, p=0.648) (Table 34)

•64.3% (18) of mothers of children with recent episodes offered more fluids than usual, 14.1% (14) reduced fluids (Table 35). A higher proportion of mothers who used ORS increased other fluids (75.0%, n=6), compared to mothers who did not give ORS (60.0%, n=12); this relationship was also not statistically significant (OR: 2.00; 95% CI 0.32-12.51, p=0.459) (Table 36)

Multivariate Analysis

•The change in the odds ratio for each additional sign of dehydration known did not achieve statistical significance (OR:1.88; 95% CI: 0.94-3.78; p=0.076). However, the positive coefficient for this association (0.6316) indicated that, when self-efficacy was controlled for, ORS use increased as the number of signs known increased (Table 37)

•Self-efficacy in ORS preparation and administration maintained a statistically significant association with ORS use in multivariate analysis when knowledge of signs of dehydration was controlled for (OR: 7.65; 95% CI: 2.67-21.96; p<0.005) (Table 37)

Chapter 5

Chapter 5 discusses mothers' home treatment responses to their children's diarrhea episodes, including their use of ORS, as well as their perceptions, knowledge, and beliefs which influence those practices. These issues are discussed in relation to previously published studies on the topic. The strengths and limitations of the study are also presented.

This discussion is presented within the context of the Health Belief Model (HBM). As described earlier in detail, the HBM suggests that the probability of individuals taking action to protect their own, or their families' health is influenced by: (a) the perceived threat of the illness, (b) the expectation that the benefits of the proposed action outweigh the barriers, (c) modifying factors, such as sociodemographic variables, and (d) cues to action, such as the influence of others. The HBM is utilized throughout this discussion to provide a framework for organizing the various supportive and inhibitory factors influencing mothers' decision of whether or not to use ORS in home treatment. It is anticipated that improved understanding of these influences may lead to the development of more effective interventions to enhance mothers' home treatment practices and subsequently improve children's health outcomes.

Mothers' Responses to Children's Diarrhea Episodes

The vast majority of mothers in this study, 97.2% of mothers of children with past episodes and 89.6% of those with recent episodes, provided some form of home treatment for their children's diarrhea episodes. A significant proportion of mothers, 71.8% of those with children with past episodes and 55.1% of those with recent episodes, also sought treatment outside the home, either alone or in conjunction with, home treatment. Many of those who did not seek treatment (87.9% of 33 mothers) stated that their reason for not seeking treatment outside the home was a belief that home treatments were sufficient and effective in treating diarrhea. Thus, most mothers in this study had a strong belief in the usefulness and effectiveness of home treatment, and many felt that treatment outside the home was warranted in some cases. In fact, only 3 of the 100 mothers did neither, choosing to allow the episodes to resolve of their own accord without treatment. While home

treatment was mothers' primary response to their children's diarrhea episodes, their specific choice of treatment included a wide range of remedies, including use of ORS.

ORS Use

ORS usage rates in this study were slightly higher than those described in earlier Indonesian studies, which ranged from 48% to 68% of children's diarrhea episodes (Muninjaya et al., 1991; Pulungsih et al., 1992; Widarsa & Muninjaya, 1994). The current study found that 23.0% of the 100 mothers used ORS for every episode, and 50.0% for some episodes; thus a total of 73.0% of mothers can be said to have *ever* used ORS. However, when considering only the recent episodes, it was found that only 31.0% of the 29 recent episodes were treated with ORS. Similar results were seen in the Demographic and Health Survey for Indonesia (CBS, 1998), in which 67.9% of mothers reported ever having used ORS, while only 47.7% had used it for a recent episode. The authors of that study offer no explanation for the difference.

In terms of the current study, it is important to consider the relative reliability and usefulness of information about mothers' reported use of ORS in recent episodes, as compared to their usual use of ORS, i.e. whether they had "ever used" ORS. It is possible that the responses of the 29 mothers of children with recent episodes are more reliable due to the accuracy of recall, being less dependant on long-term memory (Boerma et al., 1991; McDivitt et al., 1994). Therefore, for a limited number of factors, in which the accuracy of mothers' memory is believed to be significantly influenced by the length of the recall period, only mothers of children with recent episodes were questioned. It should be noted however, that the small number of respondents with recent episodes may limit the strength of these findings.

In addition to the accuracy and reliability of the responses, the usefulness of the data must also be considered. While mothers' responses to recent episodes identify factors influencing that specific episode, they do not provide information about mothers' general use or the variability of their practices. In contrast, descriptions of mothers' usual use of ORS in the past makes it possible to gain understanding and knowledge of the range of influences which may determine whether mothers choose to use ORS in a given episode, and not in another. This information complements the data on recent use and provides a broader

understanding of potential influences. These various factors will be explored in greater detail throughout this discussion.

SSS and Pedialyte

SSS and Pedialyte, which were considered separately from ORS for the purposes of this study, were also used by mothers in home treatment; being used by 18.8% of mothers of children with past episodes and 11.5% of those with recent episodes. While it is recognized that Pedialyte is a safe and effective treatment for the prevention of dehydration, its high cost makes it essentially unavailable to most mothers in developing countries, and in fact, only one mother in this study used it in home treatment. SSS, if correctly prepared, can also be a useful treatment. However, frequent errors in preparation and the lack potassium and other electrolytes, which are present in ORS, make SSS less effective at preventing and treating dehydration. These problems have prompted WHO to focus their promotion efforts on prepackaged ORS (Mandelbaum, 1992; Martines et al., 1993). While mothers' SSS preparation techniques were not specifically assessed in this study, it is noteworthy that of the few mothers that were asked to describe their method of preparation, none were able to describe it correctly.

Excluding SSS and Pedialyte from consideration of the influences on ORS use is not believed to have any influence on the validity of the findings of this study. The one mother in this study that used Pedialyte in treating her child's diarrhea, and all but 2 of the 16 mothers that used SSS, also used ORS. Therefore, it was felt that these mothers could be considered on the basis of their use of ORS, irrespective of their use of SSS or Pedialyte, without any significant impact on the interpretation or conclusions of the study.

Other Home Treatments

Few mothers used ORS exclusively in home treatment; only 22.2% (2) of the 9 mothers who used ORS for the recent episode, and 1.9% (1) of the 52 mothers who used ORS for past episodes. The majority of mothers who used ORS did so in conjunction with other treatments. This finding might indicate that even mothers who used ORS did not have faith that it was an adequate, or complete, treatment for their children's diarrhea episodes.

The most commonly administered of these alternative home treatments were traditional remedies, which included oral and topical herbal treatments, and home-based

fluids, such as tea and rice water. Use of these various treatments ranged from 30.8% of past episodes to 59.4% of recent episodes. The herbal treatments were prepared from leaves or roots which grow locally in the village, while the fluids were produced from ingredients commonly available within the home. Grace's study (1998) in Indonesia also found that home-based fluids were commonly used in treatment, although herbal remedies were not identified in her study. These treatments are provided at minimal monetary cost to mothers, although some effort is required for acquisition and preparation of the ingredients. As it is believed that these traditional home remedies caused no apparent harm, it may not be necessary to dissuade mothers of their use, as long as they are encouraged to administer them in conjunction with ORS.

Other more "modern" or "western" treatments included various medications, which were provided in 21.7% of past episodes and 30.8% of recent episodes. In comparison to herbal remedies, use of medications was dependant on mothers having access to modern health services or having the monetary means to purchase the treatment commercially. Although not all mothers could identify the specific type of medication administered, those that could, primarily identified antidiarrheals. These were usually obtained by mothers from local stores, sometimes on the recommendation of community health workers. This is worrisome considering that antidiarrheal medications are not recommended for children due to their antimotility action which can prolong infectious diarrhea, and cause toxic megacolon or central nervous system toxicity (Martines et al., 1993). Both the study by Grace (1998) and that by Muninjaya et al. (1991) noted that administration of antidiarrheals in the treatment of childhood diarrhea was prevalent in Indonesia. These studies also identified antibiotics as being a common home treatment. While none of the mothers in the current study stated that their children received antibiotics for treatment of diarrhea, it is likely that antibiotics were administered in some cases, as the doctor at the local puskesmas stated that all cases presenting with diarrhea were prescribed oral antibiotics, along with ORS. In addition to the fact that antibiotics are ineffective against all but bacterial causes of diarrhea, the excessive use of antibiotics contributes to the development of resistant organisms. The use of antidiarrheals and antibiotics has implications for the education of health professionals, as well as mothers. There is an apparent need to re-educate health workers

about the need to limit prescription of antibiotics, and avoid use of antidiarrheals. Since both these medications can be obtained from stores without prescription from a health worker, mothers must also be cautioned about their use.

In addition to treatments administered to the child, a number of mothers (14) administered treatments to themselves, with the rationale that the effect would be passed to the child through their breast-milk. While it is true that many nutrients in the mothers' diet can provide the child with nutrients through breast-milk, and the effects of some medications may also be transferred to the child, mothers need to understand that the therapeutic effect is limited, and maternal hydration does not in turn hydrate the child suffering from diarrhea.

Summary: Mothers' Responses to Children's Diarrhea Episodes

The description of mothers' responses to children's diarrhea episodes clearly indicates that the vast majority of mothers do take some action, either through home treatment or through treatment-seeking. This has implications for the education of both mothers and the health workers from whom mothers seek care. Mothers' willingness to treat diarrhea is encouraging, as it indicates that they recognize that some response on their part is necessary to protect their children's health. With the exception of antidiarrheal medications, whose use should be discouraged, and antibiotic medications, whose use should be limited, the use of other home treatments is not seen as problematic, and can continue as an adjunct to ORS use. As with earlier studies, however, this study found that use of ORS was inadequate. Although 73.0% of mothers had ever used ORS, only 23.0% used it to treat every episode, and only 31.0% used it to treat the recent episode. The low number of mothers that consistently used ORS is a cause for concern, given that WHO recommends that ORS be the treatment of choice for the management of diarrhea and prevention of dehydration. Increased understanding of why mothers use ORS may allow development of interventions aimed at increasing consistent use of ORS in diarrhea home treatment. The remainder of this discussion will focus on the way in which various factors, viewed within the framework of the HBM, may influence mothers' use of ORS. It will also allow identification of interventions to improve mothers' and health workers' practices.

Perception of Threat

According to the HBM, the perceived threat of an illness is influential in determining whether the individual will practice the recommended health-protecting behaviour. Perception of threat is based on the individual's perception of both the severity of the illness and susceptibility to the illness. An essential element of understanding the seriousness of diarrheal disease is recognition of dehydration as a possible, and potentially dangerous, consequence of the illness. Mothers who are aware of their children's susceptibility to dehydration and its possible fatal effect would logically be more inclined to take action to counteract the threat. It would also seem logical that mothers who possessed this knowledge would be more likely to administer ORS, although this would be dependant on their understanding of the function of ORS as the prevention and/or treatment of dehydration. The following discussion will address mothers' perception of threat as it relates to their beliefs about the severity of their children's illness and their susceptibility to dehydration. Mothers' perception of the severity of diarrheal disease and its consequences will be discussed, followed by discussion of a number of factors proposed to influence mothers' perception of threat, including the hospitalization or death of a child due to a diarrheal illness, the cause of the illness, the characteristics of the episode, and knowledge of the signs of dehydration.

Perceived Severity

Mothers' perception of the severity of diarrhea is a key aspect of their perception of threat. Belief that the illness can have serious consequences, and knowledge of those consequences, has the potential to motivate protective action.

Mothers in this study believed that diarrheal disease was serious the majority of the time; 77.0% of the 100 mothers in this study viewed diarrhea as being always a serious illness and 18.0% perceived it as sometimes serious. When asked about the degree of severity of a recent episode, mothers also rated severity as high; of the 29 mothers of children with recent episodes, 31.0% considering the specific recent episode to be very serious and another 31.0% considering it somewhat serious. The belief that diarrhea is sometimes or always serious, and the belief that specific episodes were somewhat or very serious indicates mothers' recognition of the potential severity of the disease. This concurs

with Grace's study (1994) which also found that Indonesian mothers recognized the seriousness of diarrheal disease.

Mothers' reasons for viewing diarrhea as serious indicate that they have some understanding of the possible consequences of the illness. The majority (75.3%) of those who believed diarrhea to be always serious, and a number of those who believed it sometimes serious (33.3%), recognized that diarrhea could cause deterioration in the child's physical condition or make them susceptible to other illnesses. Many mothers also recognized that diarrhea could potentially lead to death; 36.4% of those who believed it always serious and 22.2% of those who believed it sometimes serious. None of the mothers, however, specifically identified dehydration as a potential consequence of the illness. This can be compared to the study by Kumar et al. (1985) in India, in which malnutrition and dehydration were the most commonly named consequences of diarrhea.

The influence of belief in severity on use of ORS is unclear from the findings of this study. Although 76.0% of the 50 mothers who "sometimes" used ORS said that the severity of the episode did influence their decision of whether to use ORS for a given episode, this association was contradicted by mothers' descriptions of their actual practices. When comparing the 73 mothers who had ever used ORS in treating their children's diarrhea with the 27 who never used ORS, it was found that the two groups did not differ statistically in terms of their view of diarrhea as a serious illness. The views of the subset of 29 mothers of children with recent episodes are more difficult to interpret. While it was found that 77.0% of those who used ORS for the recent episode thought the episode somewhat or very serious, compared to 55.0% of those who did not use ORS for the episode, this difference was not statistically significant ($p=0.252$). It is possible that the lack of a statistically significant association, where mothers indicated that an association did in fact exist, is a result of inadequate sample size. In fact, it was determined that this study had only a 9% power to detect a statistically significant difference given the proportions found. While the study by Kumar et al. (1985) did not assess the influence of perceived severity on ORS use, the study by McDivitt et al. (1994) supports the view that there is no link between severity and ORS use; they found that mothers did not base the likelihood of ORS administration on their judgement of the severity of the child's illness.

It is possible that the lack of influence of severity on ORS use in the current study was the result of mothers choosing to seek treatment outside the home as an alternative to treating at home. Specifically, mothers may have believed that the very seriousness of the illness warranted a more aggressive treatment response than ORS provided, and thus they may have been more likely to seek treatment from a health care provider. This suggestion has some support from the current study, in which one of the most common reasons for seeking treatment for both recent episodes (43.8%) and past episodes (25.5%) was fear of death or deterioration in the child's condition. However, the proposed link between perception of severity and treatment-seeking is not supported by bivariate analysis which indicated that no statistically significant relationship existed between the two factors ($p=0.413$). Grace's study (1994) supports the association between mothers' perception of severity and treatment-seeking, as she suggests that the seriousness of the diarrhea episodes often prompts mothers to seek care outside the home. However, as Grace's was a qualitative study, the statistical evidence for this association is still lacking. Clearly this is an area requiring further exploration, as a link between severity and treatment-seeking would have implications for the education of health workers who would be accessed by mothers for treatment of the episode.

Therefore, while the majority of mothers in this study suggested that severity influenced their use of ORS, no statistical association was identified between view of severity and use of ORS, given the sample size utilized. The possible link between severity and ORS was explored further by assessing the influence of factors hypothesized to influence mothers' perception of the severity of the illness; these included the hospitalization or death of a child, the perceived cause of the illness, the characteristics of the episode, and knowledge of the signs of dehydration.

Hospitalization or Death of a Child

It is logical that mothers who have experienced the hospitalization or death of a child due to diarrhea would be more aware of the potential seriousness, and thus the threat, of the illness. In this study, few mothers (5) had a child who had been hospitalized in the past as a result of a diarrheal illness. Four of the 5 mothers used ORS in the home treatment of subsequent episodes. While this indicates a difference in the behaviour of mothers who have

had a child hospitalized for diarrhea, the reason for the difference is uncertain. It is possible that the children's hospitalization made the mothers realize the seriousness of diarrheal illness, or it may be that these mothers received some teaching or advice regarding the administration of ORS while the children were hospitalized. No previous studies have examined the influence of this factor.

None of the mothers in this study experienced the death of their own children due to a diarrheal illness, although it is noteworthy that a high proportion of mothers (51.0%) knew of at least one diarrhea-related child death. Few of these deaths, however, were amongst children closely related or well known to the mothers; only 1 (2.0%) of the 51 known deaths was a child related to the mother, while 24 (47.1%) were the children of a friend or neighbour, and the remainder (51.0%) were heard of from either a health worker, another person, or the media. No association was found between knowledge of a diarrhea-related death and mothers' use of ORS in this study ($p=0.729$). It is possible that the reason for this lack of association was that many of the mothers did not have first-hand knowledge of the child that had died. The other possibility is that mothers did not recognize the link between dehydration, death, and the use of ORS in the treatment of dehydration.

The lack of influence of "previous child loss" on use of ORS was also found by DeClerque et al. (1992), although in that study the death was of the mothers' own child and was not necessarily associated with a diarrheal illness. The current study, in comparison, assessed mothers' knowledge of the diarrhea-related death of any child. Regardless, previous child death, whether from diarrhea or another illness, does not appear to be a factor in determining use of ORS.

Perceived Cause

Mothers' perception of the cause of the illness has the potential to affect their perception of the severity of the illness, as well as their perception of their children's susceptibility to the consequences of illness. Specifically, mothers who believe that diarrhea is a normal part of child development might be less likely to believe that their child is susceptible to the harmful consequences of the illness.

The belief that diarrhea is a common childhood illness or is "just part of growing up" was noted by all 5 of the mothers who indicated that diarrhea was never serious, and by

33.3% of the 18 mothers who thought diarrhea was only sometimes serious; while not being mentioned by any of the 77 mothers who saw diarrhea as always serious. The other commonly perceived causes listed by mothers included new or inappropriate dietary intake, and "masuk angin". None of the mothers cited a cause related to infectious organisms, such as contaminated food or water. The lack of accurate knowledge of the possible causes of diarrhea is a significant issue to address in health education.

The possible influence of the perceived cause of an episode on mothers' use of ORS was assessed in this study in order to determine if mothers who believed diarrhea to be a normal part of childhood were less likely to treat with ORS than those that had an accurate perception of the cause of the episode. The literature has suggested that episodes of diarrhea that are perceived to be part of growing up are less likely to be treated with ORT or other biomedical therapies (Mull & Mull, 1988) and more likely to be tolerated or to be treated with folk treatments. In the current study, 26.0% of the 50 mothers who sometimes used ORS indicated that the cause of the diarrhea episode influenced their use of ORS, although there was no agreement amongst mothers as to what particular causes might prompt use. Bivariate analysis indicated that the perceived cause of the episode did not have any influence on mothers' use of ORS, with the proportions of both groups, ever used ORS and never used ORS, being comparable for the various perceived causes. It was not possible to compare use of ORS for diarrhea of infectious causes versus causes with "cultural explanations", as none of the mothers recognized diarrhea as having an infectious cause. This lack of association concurs with the findings of the study by Coreil and Genece (1988), which also found no association between ORS use and the perceived etiology of the episode.

While perception of the cause of the episode does not appear to influence use of ORS, accurate knowledge that contaminated food or water are possible causes of diarrhea would be an essential element of any health education program provided to mothers. In addition to its potential influence on treatment strategies, understanding of the infectious processes that can lead to diarrhea would have a significant role in preventing diarrheal disease.

Characteristics of the Episode

The specific characteristics of an episode of diarrhea may be seen as indicators of the severity of the episode, and specifically may indicate a deterioration in the child's condition and including the development of dehydration. In this study, mothers were asked about how their use of ORS was influenced by certain clinical signs, including watery stool, mucous in the stool, vomiting, and fever; the frequency of the stools; and the duration of the episode. It would be logical that mothers who understood the potential for dehydration would be more likely to treat episodes of long duration that were characterized by frequent water stools. However, although many mothers in this study stated that watery stool, mucous, vomiting, or fever (24 mothers), high frequency (15 mothers), and long duration (2 mothers) would influence their use of ORS, bivariate analysis of these factors suggested otherwise. Neither the presence of mucous in the stool, watery stool, vomiting, or fever were found to have any statistically significant association with ORS use in this study. This finding differs from much of the evidence in the literature, as a number of studies (DeClerque et al., 1992; Okunribido et al., 1998; WHO 1994b) identified associations between ORS use and various clinical signs, including blood and mucous in the stool, watery stools, and vomiting. This discrepancy may be due to the small sample size in this study, as only mothers of recent episodes (N=29) were asked to recall the specific characteristics of their children's episodes.

The frequency of loose stools, however, did differ somewhat between mothers who did and did not use ORS; 66.7% of children who received ORS had more frequent stools, >5 stools/day, compared to 30.0% of those that did not receive ORS. While the difference was not statistically significant ($p=0.0730$), this study only had a 30% power to detect a significant difference, given the proportions found. The findings from the literature on this issue are inconsistent. The studies by DeClerque et al. (1992), Okunribido et al. (1998), and WHO (1994b) did find that associations existed between ORS use and frequent stools and stool volume. Coreil and Genece's (1988) study, however, found no association between ORS use and stool frequency.

The influence of a prolonged episode on ORS use also lacks consistent support from the literature. The study by DeClerque et al. (1992) found that ORS use was greater in prolonged episodes of > 3 days ($p<0.05$), while Coreil and Genece's (1988) study found no

association between ORS use and duration of the episode. The association between the duration of the episode and mothers' use of ORS in the current study had unexpected findings. Data analysis indicated that there was in fact a statistically significant association between mothers who used ORS and *shorter* episodes, specifically those that lasted only one day (OR: 7.20; 95% CI: 1.01-51.39; p=0.049). Multivariate analysis was performed in order to identify other possible factors that might explain this association between ORS use and episodes of short duration. It was hypothesized that a short episode might be associated with ORS use when the episode was of high perceived severity, was characterized by frequent stools, or if the high degree of severity prompted treatment-seeking and hence use of ORS. However, the only factor to maintain a statistically significant association with ORS use when duration, severity, and number of stools were controlled for in multivariate analysis was treatment-seeking (OR: 10.72; 95% CI: 1.03-111.43; p=0.047). The reason for the association between ORS use and treatment-seeking in this study is unknown as, statistically, duration and severity of the episodes were not influencing factors.

It would seem rational that the longer an episode progresses, the more concerned mothers would become about the illness. While the study by DeClerque et al. (1992) suggested that prolonged episodes prompt ORS use, the findings of this study indicate that mothers' responses to prolonged episodes may instead prompt treatment-seeking. If this is in fact the case, this has implications regarding the need to support mothers' recognition of threat while at the same time educating them that the appropriate response might involve home treatment with ORS rather than treatment-seeking.

Knowledge of Signs of Dehydration

Recognition of the signs of dehydration is a key element in an accurate assessment of the threat of diarrhea and its sequellae. The findings of this study indicate that mothers' knowledge of the signs of dehydration was limited. Only 38.0% of the 100 mothers were able to identify more than 1 correct sign, and the majority of mothers (63.0%) identified both correct and incorrect signs of dehydration.

The influence of correct knowledge of the signs of dehydration on mothers' use of ORS in home treatment of diarrhea has been suggested in the literature (Muninjaya et al., 1991), but never tested. In the present study, this knowledge was found to have a statistically

significant association with ORS use; mothers who had ever used ORS were 3.630 times more likely to have greater knowledge of signs of dehydration (knowledge of >1 correct sign) compared to mothers who had never used ORS (OR: 3.630; 95% CI: 1.239-10.634; p= 0.019). Multivariate logistic regression further revealed that mothers' use of ORS increased as the number of signs they could identify increased. In other words, there was a gradual increase in the odds of ORS use which corresponded to an increase in knowledge of signs.

The exact mechanism by which knowledge of signs of dehydration influenced mothers' choice to use ORS is uncertain. The two previous studies that assessed mothers' knowledge of dehydration (Hudelson, 1993; Muninjaya et al., 1991) did not assess the influence of such knowledge on ORS use, or propose any rationale for an association. It is possible that knowledge of the signs of dehydration is an indicator of knowledge of the process of dehydration, which would lead to increased use of ORS given a correct understanding of the hydrating function of ORS. This possibility will be explored further in the discussion about mothers' perception of the benefit of ORS.

Regardless of the reason for the association, the fact that so few mothers had correct knowledge of the signs of dehydration is a cause for concern. Since such knowledge is linked to increased use of ORS in diarrhea treatment, the education of mothers regarding recognition of correct signs has the potential to significantly impact on home treatment practices, and specifically the use of ORS. This is therefore a vital topic to address in health education programs targeted at mothers of young children.

Summary: Influence of Perceived Threat

This study sought to identify whether mothers' perception of the threat influenced their use of ORS. While the majority of mothers in this study did view diarrhea as a serious illness, and many recognized the potential risks associated with the illness, none recognized dehydration as one of the potential consequences. Mothers' views of the severity of the illness were found to be associated with treatment-seeking rather than ORS use. This same association was identified between treatment-seeking and the duration of the illness. While having a child hospitalized for diarrhea seemed to influence mothers' use of ORS, there was an inadequate sample size to explore this in further depth. Knowledge of the death of a child, the perceived cause of the episode, and clinical characteristics of the episode, with the

exception of duration, were not found to be influential on mothers' decisions about ORS use. The only factor found to have a statistically significant association with ORS use was knowledge of the signs of dehydration. This has obvious implications for health education, which should emphasize the link between diarrhea, dehydration, and treatment with ORS. While it is logical that the threat of the child's illness should prompt mothers to respond in such a way as to reduce that threat, it is necessary for mothers to have an accurate understanding of what constitutes the threat. If mothers are aware that dehydration is a significant, and potentially harmful, consequence of diarrhea, and that ORS is the appropriate prevention and treatment for dehydration, then they would be more likely to use ORS as part of their treatment strategy. Mothers' understanding of the mode of action and effectiveness of ORS in diarrhea treatment will be discussed in the following section.

Perception of Benefit

The perceived benefit of a proposed health-protecting action has the potential to influence the likelihood of that action. This, along with perceived barriers to the action, is one component of mothers' "Expectations", as outlined in the HBM. The perception of benefit relates to mothers' evaluation of the feasability and effectiveness of the action in terms of its ability to reduce the threat of the illness. In the context of the home treatment of childhood diarrhea, mothers' perception of benefit was measured through assessment of their understanding of the mode of action of ORS and their belief in its effectiveness. It is believed that mothers who understand the threat of diarrhea-related dehydration, and understand the hydrating effect of ORS, will be more likely to believe in its effectiveness and consequently use it in the treatment of their children's diarrhea episodes.

Understanding Mode of Action

While mothers are not expected to understand the biophysical processes by which ORS prevents dehydration, it is necessary for them to understand its role in rehydration, and thus in the prevention and treatment of diarrhea-related dehydration. In assessing mothers' knowledge of the mode of action of ORS, this study found that only 33.0% of mothers were aware of the role of ORS in hydration. The remainder of mothers viewed ORS as having a more "curative" function, believing that ORS functioned by stopping diarrhea or decreasing stool frequency (23 mothers), or by giving energy or preventing weakness (15 mothers). This

"medication model" of ORS was evident in that many mothers (35) were administering ORS according to a fixed dosage and frequency, like a medication. The conflicting concepts of ORS as a "medication" versus ORS as "hydration", has been seen in earlier studies. In describing mothers' understanding of how ORS works, Grace (1998) found that ineffectively small volumes were administered according to a medication model. McDivitt et al. (1994) also suggested that many mothers viewed ORS like any other medication, and thus administered it in small doses, rather than in the large volumes required to achieve hydration. They stated that health workers' "promotion of ORS as having a curative function has contributed to mothers' confusion about administration" (McDivitt et al., 1994, p.1222). Evidently lack of understanding of the mode of action of ORS is a common problem, and has the potential to limit its use.

In the current study, no relationship was found to exist between ORS use and correct understanding of its function, with mothers who had ever used ORS being as likely to know the correct function of ORS as mothers who had never used it ($p=0.647$). This finding conflicts with those of previous studies. The study by McDivitt et al. (1994) found that mothers who knew that ORS replaced fluids were more likely to use ORS in treating their children's diarrhea, although this knowledge did not have any impact on the volume of ORS administered. This is supported by Coreil and Genece's study (1988) which found that care-givers who described the effect of ORT as preventing dehydration or replacing water losses were significantly more likely to use ORT than those who ascribed other properties to ORT (Pearson's $r = 0.23$, $p<0.005$). The reason for the conflict between the current study and previous studies is uncertain, although it could be that the current study lacked adequate sample size to identify such an association.

In order to better comprehend the knowledge of mothers regarding dehydration and its treatment, mothers' understanding of the concept of hydration was also assessed by examining their children's breast-feeding and drinking practices during diarrhea episodes. The findings of this study indicate that at least half of the mothers increased their children's intake of breast-milk (50.0%) or other fluids (64.3%) during the recent episodes. This seems to indicate that mothers did have some understanding of the importance of hydration during a diarrhea episode. When mothers who did and did not use ORS for recent episodes in this

study were compared in terms of their breast-feeding and drinking practices it was found that 57.1% of mothers who used ORS also increased their children's intake of breast-milk, compared to 46.7% of mothers who did not use ORS, although this relationship was not statistically significant (p=0.648). Mothers who used ORS were also more likely to increase other fluids (75.0%), as compared to mothers who did not give ORS (60.0%), although again, this relationship was not statistically significant (p=0.459). The study by McDivitt et al. (1994) found such an association, in that children who received ORS were more likely to receive other fluids as well. A possible conclusion which can be drawn from the fact that mothers who increased breast-feeding and/or fluids also used ORS, is that these mothers recognized the need to hydrate the child with whatever fluids were available. Mothers who did not recognize the importance of hydration need to be taught the necessity of hydration throughout their children's diarrhea episodes. In contrast, mothers who did not increase their children's breast-feeding and fluid intake need to be targeted for education about the need to promote hydration throughout their children's diarrhea episodes.

Belief in Effectiveness

Belief in the effectiveness of ORS as a treatment for diarrhea is the logical outcome of correct understanding of its mode of action. However, despite limited knowledge of the mode of action amongst mothers in this study, the majority of them (76.7%) believed that ORS was an effective treatment for diarrhea. In addition, of the 27 mothers who had never used ORS, 33.3% said that they would consider using ORS in the future because they had heard that it was an effective treatment. This apparent belief in effectiveness did not, however, translate into action in terms of mothers' home treatment practices; there was no statistically significant difference in belief in effectiveness between mothers who had ever used and those who never used ORS (p=0.332). It is therefore questionable whether mothers truly had faith in ORS as an effective treatment for their children's diarrhea episodes, or whether they were merely providing the socially desirable response to the question.

In contrast to the findings of the current study, previous studies (Grace, 1998; Kumar et al., 1985; Muninjaya et al., 1991) have suggested that mothers' perception of the effectiveness of ORS does have an influence on ORS usage rates, although little statistical evidence is provided to support this association. The Indian study by Kumar et al. stated that

a statistical association was found between ORS use and belief in its effectiveness, although this data were not presented in their report of the study. Whether belief in the effectiveness of ORS was due to a correct understanding of ORS' mode of action is unclear from that study.

Summary: Influence of Perceived Benefit

It has been proposed that "disappointment with the curative efficacy of ORS" is instrumental in limiting compliance with treatment (McDivitt et al., 1994, p.1222). Such dissatisfaction with ORS appears to be related to parental expectations for the treatment of diarrhea to include a decreased duration of illness, or a decrease in the frequency of loose stools (O'Brien & Santosham, 1996). Although this study did not find that understanding of the mode of action of ORS was associated with its use, the evidence from previous studies strongly suggests that such an association exists.

If mothers' belief in the effectiveness of ORS is tied to their understanding of its mode of action, it seems logical that mothers who understand that ORS does not stop, or "cure" diarrhea, but rather prevents dehydration, would be more likely to administer ORS for their children's diarrhea episodes. Therefore, rather than directing health education strategies at telling mothers about the effectiveness of ORS, the focus ought to be on educating mothers about the dehydrating effect of diarrhea and the role of ORS in rehydration. Belief in the effectiveness of ORS should then logically evolve out of an increased understanding of the mode of action of ORS (Champion, 1984; Mikhail, 1981).

Perception of Barriers

In addition to an individual's perception of the threat of the illness and their perception of the benefit of the health-protecting action, the HBM proposes that the perceived barriers to performing the action influence the individual's decision. These barriers may include the individual's perception of the psychological, physical, financial, social, and other costs of taking action; the individual's perceived self-efficacy in performing the desired action is another component of the perceived barriers to action. Possible barriers identified in this study included access to ORS packets, self-efficacy in preparation and administration, and acceptability of ORS to the child.

Access

Access to ORS packets is one possible constraint on ORS use which has been suggested in the literature (Grace, 1998; McDivitt et al., 1994; Widarsa & Muninjaya, 1994). Widarsa and Muninjaya discuss access and availability as two separate factors, defining availability as at least one packet present in the home, while accessibility is defined as the ability to readily obtain ORS. For the purpose of this study, the two factors, access and availability, were merged under the one label "access", which was measured by mothers' statement as to the ease or difficulty of obtaining ORS packets. Mothers in this study identified their most common sources of ORS packets as the posyandu (43.4%), followed by the puskesmas, and the kadre. Mothers also bought ORS packets at shops and pharmacies, or obtained them from the bidan, the doctor, and the hospital. Although mothers cited various possible sources of ORS packets, the availability of stock was not specifically assessed.

The majority of mothers in this study (78.4%) found ORS packets easy to obtain. The ease or difficulty of obtaining ORS was not found to be statistically associated with mothers' use of ORS ($p=0.902$). While this seems to indicate that accessibility was not a significant barrier to ORS use in this study, mothers commonly identified access as a cause for concern and as a potential factor limiting their use of ORS. For instance, 22.0% of the 50 mothers who sometimes used ORS stated that access to ORS packets influenced their decision of whether to use ORS, and 14.8% of the 27 mothers who had never used ORS stated that they did not use ORS because of the belief that the availability of ORS was limited. This concurs with the findings of the study by Widarsa and Muninjaya (1994), in which access and availability were both associated with ORS use ($p<0.005$).

The specific access-related issues that mothers in this study identified included shortage of supply, distance to source, and financial cost. In terms of supply shortage, mothers referred to both lack of stock at home, as well as at the source. It is possible that having ORS packets on hand at home when an episode of childhood diarrhea occurs may increase the likelihood of its use in treatment. This possibility is supported by the findings of the study by Widarsa and Muninjaya (1994), which found that availability of ORS in the home was associated with ORS use ($p=0.0206$). Supply shortage at the source of ORS packets is another significant issue to address, and is connected to the issues of distance and

financial cost. Widarsa and Muninjaya found that ORS use was also associated with mothers' perception of access to packets (p=0.0053). As the puskesmas, posyandu, and kadre were the most common sources of ORS packets in the current study, it is essential that a consistent and reliable supply be available there. It is particularly noteworthy that the posyandu and kadre are both located within the community, and ORS packets are provided free of charge from both sources. Since these sources are easily accessed by mothers and provide ORS free of cost, it is essential that there be dependable distribution and supply of ORS packets in the community, rather than only to centralized health centres or commercial and retail sites.

Self-Efficacy in Preparation and Administration

According to the HBM, an individual's perceived self-efficacy in performing a desired health-protecting action is one component of the perception of barriers to action. Self-efficacy in this study refers to the mothers' belief or confidence in their ability to successfully and correctly prepare and administer ORS. This study sought to examine the possible association between self-efficacy and ORS use, a relationship which has not been assessed in any of the previous studies reviewed.

The findings of the current study indicate that 63.9% of mothers believed that they were capable of correct preparation and administration. This belief in self-efficacy was found to have a statistically significant association with ORS use; mothers who had ever used ORS were much more likely to have confidence in their ability to correctly prepare and administer ORS, compared to mothers who had never used ORS (OR: 7.42; 95% CI: 2.65-20.76; $p<0.005$). Self-efficacy maintained this statistically significant association with ORS use in multivariate analysis when the other statistically significant factor, knowledge of signs of dehydration, was controlled for (OR: 7.65; 95% CI: 2.67-21.96; $p<0.005$). Despite this strong association, it is not possible to conclude that mothers with greater self-efficacy were more likely to use ORS, as it is just as likely that the inverse was true, i.e. that the use of ORS increased mothers' self-efficacy in ORS preparation and administration. Either way, teaching mothers the knowledge and skills needed to administer ORS can only positively influence their home treatment practices, and potentially remove one possible barrier to action.

Acceptability by the Child

Another possible barrier to ORS use was its lack of acceptability to the child. Of the 73 mothers who had ever used ORS, 60.3% stated that they found administration easy, while 39.7% found it difficult. Reasons cited for difficulty included the fact that the child appeared to dislike the taste of the solution (18 mothers), that mothers had difficulty in administering any medicine to the child (6 mothers), and that administration was difficult due to unexplained refusal by the child (5 mothers). All of these reasons may relate to the taste of the solution, which children seemed to find objectionable. This theme recurred elsewhere in the interviews. Four of the 50 mothers who sometimes used ORS stated that the willingness of the child to take the solution influenced their decision to use it in treating a particular episode; 8 of the 27 (29.6%) mothers who never used ORS stated that the reason for never administering it was that they believed that the child would not drink ORS due to its bad taste; and another 4 mothers said that they would consider trying ORS but that they knew their child would not like the taste. While the issue of taste arose repeatedly during the interviews, unfortunately it was not specifically assessed in this study, so it was not possible to statistically test its influence on use of ORS. One other study suggested such an association, specifically that taste was influential in determining the volume of ORS the child consumed (Touchette et al., 1994). Further exploration of this issue is warranted in future studies, as it may be a significant barrier to ORS use given that a number of mothers (18) stated that they left it up to the child to determine when and how much ORS was consumed. The necessity for mothers to encourage children to consume ORS is one implication of this finding. The need to lobby manufacturers to develop an ORS solution which is more acceptable to children is another possible implication.

Summary: Influence of Perceived Barriers

Identifying and understanding the many real and perceived barriers which may be inhibiting use of ORS makes it possible to identify resources available and develop strategies to overcome these constraints (Champion, 1984; O'Brien & Santosham, 1996). Three possible barriers identified in this study included access, self-efficacy, and acceptability to the child. While there was no statistical association between ORS use and ease of obtaining packets, access was an issue mentioned repeatedly by mothers as a factor limiting their use

of ORS. Maintaining a reliable supply to the sources most easily accessed by mothers may therefore have the potential to significantly increase use. Self-efficacy was one factor found to have a statistically significant association with ORS use, although it is not possible to conclude that self-efficacy leads to ORS use. The influence of the taste of the ORS solution is a possible barrier which arose frequently in interviews with mothers, although its influence on ORS was never tested statistically. This has implications both in terms of education for mothers, as well as the development of a solution more palatable for children.

Modifying Factors

The HBM suggests that a number of sociodemographic factors, or "modifying factors", impact on an individual's health-related decisions through their influence on the individual's perception of the threat of the illness and the expectations of the desired intervention. The modifying factors assessed in this study included the mothers' age, culture, residency, education, time availability, and the age of the sick child. Many of these factors have been assessed in earlier studies.

Age, Residency, and Culture

The mothers' age, residency, and culture are all possible influences on their use of ORS. While urban residency was found to be associated with ORT use in the studies by Coreil and Genece (1988) and Kumar et al. (1985), it was not possible to assess the influence of residency in this study as the entire sample was selected from a rural setting.

The age of mothers in this study was not found to be associated with their use of ORS. While it might be expected that younger mothers would differ in their home treatment practices as compared to older more experienced mothers, Coreil and Genece (1988) also found no association between age and ORS use.

The current study also found no association between mothers' cultural group and their use of ORS, an association untested in earlier studies. It should be noted however, that although mothers in this study may have varied in their cultural group, they were all living in the same "cultural environment" at the time of the study. This common cultural environment was possibly more influential in determining the similarity of their treatment practices than was their varying cultural backgrounds. Thus it must be differentiated that

while mothers' practices did not vary based on cultural group, the culture in which they lived would clearly be influential in determining their home treatment practices.

The findings of this study suggest that there is no necessity to target mothers of a particular age range for health teaching. The influences of mothers' residency and culture require further investigation to determine whether there is a need to target particular population groups.

Education

It seems logical that mothers with a higher level of education would have an increased likelihood of comprehending the benefits of ORS, and thus an increased likelihood of using it in home treatment, while mothers with lower education would have lower use. This is supported by the findings of the study by DeClerque et al. (1992) which indicated that mothers with no primary education had a decreased use of ORS, when other factors were controlled for in multivariate analysis (OR: 0.36; 95% CI: 0.17-0.78; no p-value provided). The current study found no such association (p=0.287).

It seems logical that literacy would be associated with ORS use, but it was not possible to assess the influence of literacy on ORS use in the present study as only one mother indicated that she was illiterate. Evidence from the literature is mixed; while the study by Coreil and Genece in Haiti (1988) concluded that mothers' literacy was not associated with their use of ORS, the study by Kumar et al. in India (1985) found a positive association between literacy and "therapeutic preferences", although they did not specifically tie literacy to ORS use.

There is no evidence from this study that literacy, or a higher level of education, were associated with ORS use, although both have been suggested in earlier studies. Rather than merely asking mother about their literacy, it would perhaps be more valuable to assess mothers' comprehension of written literature about ORS use, including the instructions found on ORS packets.

Time Availability

It has been proposed that mothers' time or workload may be significant limiting factors in their decision of whether to use ORS in home treatment, as the preparation and administration of ORS can be inconvenient and time-consuming (McDivitt et al., 1994). It

is possible, however, that the increased time demands of using ORS may be counteracted by the potential availability of help with child care. Factors that may impact on the availability of such help include the mothers' employment status, the household structure, i.e. the number of adults and children in the home, and the mothers' perception of the availability of help with a sick child.

Mothers' employment status has been proposed as influencing use of ORS through its impact on mothers' availability of time for treatment. Employment status in this study was defined as working outside the home versus having a home-based business or being unemployed. Mothers in the current study were very similar in terms of employment status, with both mothers who never and ever used ORS being largely unemployed outside the home, 92.6% versus 98.6% respectively. Previous studies also found that ORS use was not associated with mothers' work status (DeClerque et al., 1992; McDivitt et al., 1994). It is possible that the issue of whether the mother is employed outside the home may not be relevant in situations in which adequate help is available with child care responsibilities.

The presence of a large number of children in the home might also increase mothers' workload, and thus potentially limit use of ORS. However, the results of this study indicate that the presence of more than 2 minor-aged children in the home actually increased use of ORS, with 37.0% of mothers who had ever used ORS having more than two minor-aged children in the home, as compared to 22.2% of mothers who had never used ORS; although the difference was not statistically significant ($p=0.168$). Although one might expect mothers with *fewer* children to have more time available for obtaining, preparing, and administering ORS, it is logical that the likelihood that a mother would have had the opportunity to use ORS at some point in the past would increase with the number of children she has.

It is possible that the increased workload resulting from maternal employment outside the home or having a larger number of children in the home may be mediated by the presence of other adults in the home who can share in child care duties. The majority (61.0%) of the homes in this study did not have any other relatives living in the home with the parents, while 39.0% had grandparents and/or other relatives living in the home. In comparing mothers who had ever and never used ORS, it was found that the presence of others relatives in the home was not influential in determining whether ORS was used in

home treatment (p=0.807). This concurs with the findings of McDivitt et al. (1994) who also found that the potential availability of household help, as measured by the ratio of adults to children under 5 years in the home, was not significantly associated with ORS administration. This lack of association may be related to whether mothers had help available from sources outside the home.

While the majority of homes did not have other relatives living in the home, most mothers (86.0%) stated that help was generally available when a child was ill. However, this factor was not found to be influential in determining ORS use (p=0.157), possibly due to the low power of the study (22%) to detect a difference between groups.

The findings of this study do not clearly indicate the influences of mothers' work status, household structure, and availability of help on use of ORS. However, it is possible that the availability of help with a sick child may effectively counteract the influence of employment and child care in terms of any increased workload or limits on mothers' time availability.

Age of Child

The modifying factor most frequently assessed in previous studies was the influence of the age of the child on mothers' use of ORS (Coreil & Genece, 1988; DeClerque et al., 1992; Grace, 1998; Prajitno et al., 1979; Sutrisna et al., 1993). In the current study, the age of children with recent episodes was compared between mothers who did (n=9) and did not (n=20) use ORS to treat the episode. Mothers' perception of the influence of the child's age on ORS use was also assessed.

The median age of children with recent episodes in this study was 10 months and, with the exception of extreme values and outliers, all children with recent episodes were under the age of 2 years. This is consistent with the literature, which states that children under 2 years of age tend to be the age group most affected by diarrheal illness, as well as being the age group at highest risk for dehydration and dehydration-related death.

The influence of age on ORS use in this study is unclear. A difference in the age of children who did and did not receive ORS was found, with 44.4% of the children who received ORS for the recent episode being 6 months old or less, compared to 15.0% of children who were not treated with ORS. While this finding did not achieve statistical

significance (p=0.100), the study only had a 25% power to detect such a difference given the proportions found. When mothers were asked about their perception of the influence of child's age on ORS use, 26.0% of the 50 mothers who sometimes used ORS indicated that the age of the child influenced their use. However, there was little agreement amongst these mothers about what age group should receive ORS; some indicated that ORS was appropriate for younger children, while others felt it was more appropriate for older children. One year of age was a commonly mentioned lower limit for the use of ORS. Other mothers stated that they believed ORS was inappropriate for young children; two of the 27 mothers who never used ORS said their reason was the belief that ORS was unsuitable for young children, and another two said that they had considered using ORS, but had been prevented from doing so because they had concerns about its appropriateness for young children. Thus, there is a possible difference in the treatment of children less than 6 months old compared to older children, although the difference does not achieve statistical significance, and mothers who said age influenced their use varied greatly in their views of what ages were appropriate for treatment.

This contradiction is echoed in the literature. Some qualitative studies performed in Indonesia (Prajitno et al., 1979; Sutrisna et al., 1993) have stated that western medicine is seen by mothers as inappropriate for infants. In contrast, one qualitative study in Indonesia (Grace, 1998) and two quantitative studies (Coreil & Genece, 1988; DeClerque et al., 1992) from other developing countries found that young children were *more* likely to be treated with ORS at home.

While the evidence from this study and from the literature is contradictory, what is clear is that mothers in this study lacked knowledge of the age for which ORS is appropriate. This points to the need for education to promote its use amongst children of all ages.

Summary: Influence of Modifying Factors

Identification of influential sociodemographic factors that limit use of ORS has importance for recognizing individuals or groups in the population that are in greatest need of intervention. This study, however, found that none of the modifying factors considered had a statistically significant association with ORS use.

Cues to Action

The HBM suggests that cues to action may trigger or motivate people to take action to protect their health. These cues often include mass media campaigns and advice from other individuals. Mothers in this study identified a variety of individuals and sources of influence on their use of ORS. These individuals exerted influence both through their effect on health care decision-making in general, as well as through their advice about ORS use, their teaching about ORS preparation and administration, and their own attitudes and treatment practices.

Health Care Decision-making

Decision-making regarding children's health care was made primarily by mothers (63.0%) in this study, either alone or in conjunction with another person. Other people named by the mother as being involved in health care decision-making included the child's father, grandmother, other family member(s), and friends or neighbours. This study found no association between use of ORS and the relationship of the person who made health care decisions for the child ($p=0.795$). This factor was not assessed in previous studies. Since a number of individuals were involved in health care decision-making, and the likelihood of ORS use did not vary depending on whether the mother was the health care decision-maker, versus another relative or friend, it seems important for health education programs to be available to any member of the community who has the potential to influence children's home treatment.

ORS Advice and Teaching

When asked who advised ORS use, or taught usage techniques, health care workers were the individuals most commonly named by mothers in this study. Of these, health workers based in the community, namely kadres and posyandu staff (kadres and bidans), were the most frequently named. Puskesmas staff (doctor, nurse, pharmacist) were less frequently identified; while other people identified by mothers included relatives and friends, with the grandmother being the most common of these. The important role of community health workers in advising and teaching about ORS use has serious implications for the level of training and education these workers should receive about the merits of ORS and its correct preparation and administration, as well as regarding teaching methods to best

communicate this information to mothers. There is one significant point of concern regarding the provision of teaching to mothers at the puskesmas. According to the doctor responsible for outpatient treatment at the puskesmas in the study area, it is not feasible for the limited number of doctors or nurses to provide teaching about ORS use to mothers when it is prescribed it for their children's diarrhea episodes. The doctor indicated that such teaching would instead be provided by the pharmacist that dispenses the ORS packets. Upon conferring with the dispensing pharmacist however, it was learned that this teaching is not in fact being provided, and that mothers are instead directed to refer to the instructions on the packet. This is obviously a major cause for concern, due to both the brevity of package instructions and the possibility that mothers may not have the reading skills necessary to comprehend the instructions.

Other sources of ORS advice and teaching identified by mothers included the media and school teachers. While access to TV and radios varied greatly in the study population, there is the potential for public service announcements about ORS use to positively influence mothers' practices.

A small number of mothers stated that no one had advised them to use ORS, nor taught them usage techniques. These mothers stated that they used ORS by their own initiative and learned about use by reading ORS package instructions. Considering the evidence of incorrect preparation and administration techniques it may be necessary to review the clarity and completeness of instructions provided on package labels.

Earlier studies, both in Indonesia and elsewhere (Grace, 1998; Kumar et al., 1985; Okunribido et al., 1998; Widarsa & Muninjaya, 1994), have also recognized the influence of health workers, relatives, and friends in ORS advice and teaching. However, in contrast to the current study, all of these studies found that relatives were more influential than health care workers, and none mention the possible influence of media or schools on mothers' use of ORS.

Health Workers' Attitudes and Practices

It has been suggested that even when health care workers are not specifically advising or teaching mothers about ORS use, they may influence mothers' treatment choices indirectly through their own attitudes and practices. Specifically, the way in which health

care workers treat diarrhea episodes when mothers seek treatment outside the home may have a significant influence on mothers' home use of ORS. In this study, treatment was sought outside the home by 71.8% of mothers of children with past episodes and 55.1% of those with recent episodes. The treatment provided by health workers was not assessed for past episodes, but mothers of children with recent episodes were asked about the treatment received. Only 4 of the 16 mothers that sought treatment for the recent episode said that ORS was the treatment provided by the health worker, suggesting that health workers need to be reminded of the appropriateness and effectiveness of ORS for the treatment of diarrhea. Of the four mothers whose children were given ORS by the health worker, all treated the episode with ORS at home. Although it is uncertain whether this was prior or subsequent to seeking treatment, this finding suggests the significant potential for health workers to influence mothers through their treatment practices. The influence of health workers' attitudes and practices on mothers' use of ORS has been discussed in other studies. The Indonesian studies by Grace (1998) and Muninjaya et al. (1991) found that few health workers treated the child's episode with ORS, favouring treatment with medications. McDivitt et al. (1994) also suggested that health workers' attitudes about ORS "may influence mothers' views of what is appropriate or good treatment for diarrhea"(p.1223). Hudelson's (1993) study in Nicaragua found that ORS use was directly related to health facility attendance ($p<0.001$), and the study in Honduras by DeClerque et al. (1992) also identified utilization of preventive health services as predictive of ORS use in home treatment. The exact mechanism by which health facility attendance influenced use was not described; it is uncertain if it was the result of teaching provided, access to ORS, or another factor.

The influence of health workers' practices on use of ORS was also notable in that a number of mothers (5) in this study were found to be determining the volume of ORS to be administered based on the number of packets of ORS provided to them by the health worker. This was also noted in the study by McDivitt et al. (1994) who stated that the inadequate volumes of ORS administered by mothers at home may be directly linked to the number of packets that are provided to her, regardless of what teaching is provided by the health worker.

While none of the mothers in this study stated that the health worker dispensed antibiotics, 10 of the mothers stated that they were given a "puyer" by the health worker. There is no way to confirm what the contents of the "puyer" were in each case, but it is known that puyers containing an antibiotic were prescribed to all children presenting at the puskesmas with a case of diarrhea. Grace (1998) suggests that the perception that drugs are the appropriate treatment for diarrhea may be negatively impacting mothers' adoption of ORS in the home treatment of diarrhea. These findings emphasize the need to ensure the appropriateness of health workers' treatment practices and clearly has implications for educating health workers regarding the need to limit antibiotics to only diarrhea cases of suspected bacterial origin.

Summary: Influence of Cues to Action

No associations were found between ORS use and the identity of the person who made health care decisions for the child. Mothers did however identify various individuals as influencing their use of ORS through provision of advice or teaching. In addition, there is the potential for the influence of health workers' own treatment strategies on mothers' use of ORS, although this possible association has not been tested. Recognition of the individuals who influence mothers' decision-making, whether they be members of the community or health workers, has implications for what groups are targeted with health teaching.

Widarsa and Muninjaya (1994) recommend community outreach activities for teaching mothers about ORS use, and specifically suggest that instruction occur in the home in order that "other influential persons", such as the father, grandmother, and other family members, can participate. In addition to providing education to community members, the training of health workers in appropriate treatment can have direct and indirect influences on mothers' views of what is appropriate treatment. Additional cues to action, such as media campaigns, could also be utilized to increase awareness of the problem of dehydration and the safety and efficacy of ORS in its prevention and treatment.

Preparation and Administration

The focus of this study has been on assessing whether mothers used ORS in the home treatment of their children's diarrhea, as well as identifying the factors that influenced their

use. However, as stated by McDivitt et al. (1994) "to improve programs in the future, we must go beyond assessing whether mothers use ORS at all to focus on *how* they use it" (p. 1221). While the assessment of correct technique was not central to the current study, an attempt was made to evaluate mothers' knowledge and practices regarding the preparation and administration of ORS.

Few mothers in this study exhibited correct preparation and administration technique. In fact, only 23.7% of mothers identified the correct amount of water (200 ml) to add to a packet of ORS. Another 30.9% of mothers added between 150 and 250 ml of water, while the remaining mothers either significantly under or over-diluted the solution (35.1%), or could not describe their preparation technique (10.3%). This compares to two earlier Indonesian studies in which the proportion of mothers who described correct preparation was 60% (Muninjaya et al., 1991) and 37% (Widarsa & Muninjaya, 1994). The evidence from the present study and the literature indicates that mothers' lack knowledge about the preparation of a solution with an effective and safe concentration. Widarsa and Muninjaya attribute this to the fact that current health teaching in Indonesia does not allow mothers the opportunity to prepare ORS themselves as part of the instruction process.

Mothers' administration technique was more difficult to determine and was not assessed in either of the two Indonesian studies (Muninjaya et al., 1991; Widarsa & Muninjaya, 1994). While it was not possible in this study to clearly categorize each mothers' administration technique as correct or incorrect, it was possible to identify some of the correct and incorrect elements of their techniques. It is concerning that all of the mothers that identified correct practices also had other, incorrect, practices. For instance, many of the mothers that stated ORS would be administered after every loose stool stated that they would only administer a "sip" or a "spoonful" of ORS each time. Thus, they clearly lacked understanding of the need to provide adequate volumes to achieve rehydration.

Another incorrect practice of mothers was the administration of ORS according to a fixed dosage and frequency like a medication, described by 35 mothers. McDivitt et al. (1994) also found that volumes administered were inadequate and stated that a common explanation for the low volumes of ORS administered is that mothers assume that ORS is like any other medication and should be administered in small doses. They stated that this

may occur if the distinction between ORS and other prescribed medications is not made clear by health workers.

Another error in the administration technique of a small number of mothers (5) was the practice of determining the volume of ORS to be administered based on the number of ORS packets provided to them by the health care provider. The tendency of mothers to administer a volume of ORS which corresponds to the number of packets provided by the health worker was also noted by McDivitt et al. (1994). They stated that administration "may be constrained by mothers not being given enough packets to allow them to give ORS every day of the episode" (p.1231). McDivitt et al. also suggest that the smaller volumes of ORS administered in West Java, as compared in some other countries, is due to the fact that ORS is provided in 200ml packets versus the 1 litre packets provided in other countries. These issues clearly have implications for both health education of mothers and health workers regarding the need to administer adequate volumes, based on the child's needs, rather than on the number of packets provided. It is also an issue to be considered by government and ORS manufacturers in terms of the provision of adequate supply and the reconsideration of package size.

Other problems with administration identified in this study included mothers allowing children to determine when and how much ORS was consumed (18 mothers), and mothers taking the ORS themselves (2 mothers). Neither of these issues were noted in the literature, but both indicate the need for further teaching of mothers regarding the need to encourage ORS consumption by the child.

It is worrisome that although most mothers in this study had problems with preparation and administration, 63.9% stated that they had confidence in their ability to do so correctly. Therefore, mothers' belief in their own self-efficacy in ORS preparation and administration should not be considered a valid measure of actual ability.

It should be noted that mothers in this study were asked to describe their preparation and administration techniques from memory. Mothers with an adequate level of literacy to consult the package instructions might, therefore, have better competency in preparation and administration than indicated in this study. The clarity of package instructions is an

important issue to address in order to enhance the competence of mothers of varying levels of literacy.

Because it was not possible to clearly categorize mothers as having correctly or incorrectly prepared and administered ORS, it was not possible to measure the association between correct technique and ORS use in the current study. The evidence for this association in the literature is mixed. While the study by Mull and Mull (1988) in Pakistan suggested that inadequate understanding of correct preparation and administration of ORS may be a factor limiting its use, they do not test this association. McDivitt et al. (1994) did not find any association between correct knowledge and ORS use. One study, performed in Indonesia (Widarsa & Muninjaya, 1994), did find that reading guidelines and watching a demonstration of ORS preparation were associated with ORS use ($p<0.005$), although actual ability to correctly prepare ORS was not associated with increased use.

While the ability of mothers to correctly prepare ORS was not associated with ORS use, Widarsa and Muninjaya (1994) suggest that giving mothers the opportunity to practice ORS preparation might increase efficacy. A similar recommendation was made in an earlier study by Muninjaya et al. (1991). Regardless of the influence of correct preparation and administration on increasing use of ORS, it is necessary for safe and effective treatment and thus should be an essential element of any health education programs for mothers.

Strengths and Limitations of the Study

There were a number of strengths and limitations identified in this study. Potential problems that were anticipated were addressed in the design of the study, while other issues arose and were addressed during data collection and analysis. The main limitations of the study were recall bias, social desirability, and small sample size. The key strength of the study was the effort to obtain valid and reliable data.

Recall Bias

One limitation of this study was the issue of recall bias. There is evidence in the literature that the responses of study subjects who are describing events that occurred in the more distant past are often not as reliable, accurate, and complete as those describing more recent events (Boerma et al., 1991; McDivitt et al., 1994). The study by Boerma et al. looked at the accuracy and completeness of mothers' recall of diarrhea occurrence and treatment

from the national demographic and health surveys in 19 developing countries. They compared retrospective and prospective data on diarrhea prevalence and treatment in order to determine the level of accuracy of various reporting periods. They found that the accuracy of data on diarrhea prevalence started to show a rapid decline for episodes occurring more than 2 to 3 days before the interview. Specifically, they indicate that there is under-reporting of diarrhea if the recall period is longer than 2 to 3 days, whereas there may be over-reporting of very recent or current episodes. In terms of recall of diarrhea treatment, they state that beyond a 24-hour recall period, which is the ideal, there are no major differences in reporting of treatment patterns within a 2 week recall period of recent episodes. They state that for surveys of diarrhea occurrence and treatment patterns, a recall period of 2 weeks is "considered to be the best balance between minimizing the problem of recall errors and a feasible sample size for household surveys"(p. 1073). McDivitt et al. (1994) also note that "there is some question as to mothers' ability to accurately recall details about (diarrhea) episodes occurring more than one month ago, or even 1-2 weeks ago" (p.1225), although they do not describe how this conclusion was arrived at.

The issue of recall bias is relevant to this study, as only 29 of the mothers reported about recent diarrhea episodes, while the remainder described episodes that occurred more than a month prior to the interview. While mothers' knowledge and beliefs about diarrhea and ORS are not believed to be dependent on recall, their memory of the specific characteristics of a recent episode and their specific treatment practices for that episode do have the potential to be affected by recall. Therefore, in an attempt to limit recall bias, certain questions were only asked of the 29 mothers of children with recent episodes. Thus, while all mothers were asked about their knowledge and beliefs, only the 29 mothers were asked about the specific signs observed during the recent episode, the duration of the episode, and the perceived cause and severity of the episode. In describing mothers' treatment responses, the 29 mothers were asked about their specific treatment for the recent episode, while the remaining mothers were questioned about their "usual" home treatment practices. It is believed that while the responses of the 29 mothers might provide a more accurate representation of mothers' actual practices in a specific episode, the responses of the other mothers provide valuable information about the wide range of possible treatment

responses. Therefore it is believed that the knowledge gained from the two groups of mothers are complementary, rather than contradictory, enhancing the understanding of the influences on mothers' practices.

In order to avoid the problem of recall bias, the ideal situation would have been to interview only mothers of children with recent episodes of diarrhea. However, as noted by Boerma et al. (1991), limiting health interview surveys to only current or more recent episodes has implications for sample size requirements. Time and resource limitations in the present study did not allow for the more extensive sampling required to identify 100 mothers of children with recent episodes.

Social Desirability

It is possible that mothers interviewed in this study were providing responses which they believed to be "correct", rather than answering according to their actual knowledge and practices. It is believed that such "socially desirable" responses were minimized by the fact that interview questions were asked in such a way as to be as non-directive as possible, and mothers were not judged or praised for describing certain beliefs or practices. The absence of health workers from the interviews also promoted mothers' honesty, as they would not be pressured to answer according to the health workers' previous advice on treatment.

Small Sample Size and Power

As identified in chapter 3, the sample size for this study, while based on previous studies, may have been inadequate to detect real differences between the groups. This might have been responsible for the inconsistencies in the findings of the study, or conflict between the findings of this study and the consensus from the literature. Power calculations performed support this possibility. In the instances where the power was calculated for non-statistically significant differences in proportions, it was found to range from only 9% to 30%. It is not possible to determine definitively whether non-statistically significant findings were due to inadequate power and sample size, or whether it was due to a true lack of difference between the groups. The possibility that the differences are hidden due to inadequate sample size makes it necessary to consider that inconsistencies in the findings must not merely be ignored, but should suggest areas to be explored further in future research.

Validity and Reliability of Data

A number of measures were taken to protect the validity and reliability of the data collected in this study. The issues addressed relate to both the data collection tool and the data collection process.

The questionnaire developed for use in this study enabled the collection of data about mothers' knowledge, beliefs, and practices. Although the questionnaire had not been tested in earlier studies, the content of the questionnaire was based on an extensive review of the literature. It incorporated numerous factors identified in previous studies as having possible influences on mothers' home treatment choices. With the exception of 3 questionnaires which had data missing due to the sequencing of questions, the remainder of the interviews were completed without difficulty.

A number of measures were taken to minimize potential problems associated with conducting the study in a language and culture foreign to the researcher. The issue of communication was addressed through providing language training for the investigator, conducting the interviews with a bilingual co-interviewer, and reviewing the questionnaires following the interviews to ensure their accuracy and completeness. The potential for interruptions and distractions resulting from the villagers' intense interest in the foreign researcher were minimized by the scheduling of interviews when disruptions were least likely, and by requesting the co-operation of village officials and health workers in maintaining a distance from interview sites.

Conclusion

The consideration of the findings of this study within the context of previous research on the topic makes it possible to gain a better understanding of mothers' home treatment choices for their children's diarrhea episodes in this areas of rural Indonesia. In spite of the limitations previously described, it is believed that efforts to promote the validity and reliability of the data obtained ensure that the findings of this study contribute valuable knowledge to the understanding of factors influencing mothers' use of ORS in home treatment.

The vast majority of mothers in this study provided home treatment, or sought treatment, for their children's diarrhea episodes. Mothers' willingness to respond to their

children's illness is encouraging, indicating that they recognized the necessity of taking some action to protect their children's health. However, the relatively small number of mothers who used ORS as their treatment of choice is discouraging.

The influence of a number of factors on mothers' use of ORS in Indonesia was explored in the present study. The HBM has provided a useful framework for organizing and understanding the interaction between these various factors. The key variables which were found to exert an influence on mothers' practices, and their role in decision-making as described in the HBM, are highlighted below. Although some variables were not found to have a statistically significant association with ORS in bivariate or multivariate analysis, their influence was often identified by mothers in narrative or anecdotal descriptions. Due to questions about the adequacy of the sample size in this study, factors identified in this way are considered to be worthy of attention in considering appropriate interventions. The variables found to be most influential in determining use of ORS can suggest the need for specific interventions to be addressed through nursing practice, education, and research, as well as recommendations to ORS manufacturers and government.

The factors related to mothers' perception of the threat of the illness suggest areas for intervention in terms of nursing practice, education of health workers, and research. While diarrhea was considered a serious illness by most mothers, and many recognized the potential risks associated with the illness, none recognized dehydration as one of those risks. The study found that despite mothers' recognition of diarrhea as a serious illness, severity tended to prompt treatment-seeking, rather than ORS use. The findings indicate that the previous hospitalization of a child due to diarrhea may be influential in prompting use of ORS, although there was inadequate sample size to explore this possibility in further depth. Both mothers' treatment-seeking, and the possible influence of hospitalization, suggest that health workers have the potential to impact on mothers' practices, necessitating targeting of health workers for ongoing education. The only factor found to have a statistically significant association with ORS use was knowledge of the signs of dehydration. This association, and the fact that only a small number of mothers had correct knowledge of these signs, has obvious implications for health education. Factors with no evidence of association with ORS use included knowledge of a diarrhea-related child death, perception of the cause

of the episodes, and clinical characteristics of the episode, with the exception of the duration of the episode. The nature of the influence of duration on ORS use is unclear, and warrants further research.

Factors related to mothers' perception of the potential benefits of ORS also suggest areas for intervention in relation to nursing practice, education of health workers, and research. Although this study did not find that understanding of the mode of action of ORS was associated with its use, the evidence from previous studies strongly suggests that such an association exists. Since mothers' belief in the effectiveness of ORS is logically tied to their understanding of its mode of action, it is likely that mothers who understand that ORS is not a cure for diarrhea, but rather prevents dehydration, would be more likely to administer ORS for their children's diarrhea episodes. This suggests the need to address this issue in health education for health workers and mothers, and the need to further explore this link in research.

The various factors related to mothers' perception of the barriers to ORS use suggest interventions related to nursing practice, education of health workers, research, recommendations to manufacturers of ORS, and government policy. Access to ORS was a factor which did not show a statistical association with ORS use, but was identified by mothers as being influential, suggesting that measures to ensure adequate access are necessary. While the majority of mothers believed that they had self-efficacy in ORS preparation and administration, and this factor was found to have a statistically significant relationship with ORS use, the evidence regarding their actual abilities in ORS use was less encouraging. The lack of ability of most mothers in this area suggests that instruction on ORS use should be an essential element of any health education programs for mothers, and should be a focus of health workers' training. The lack of palatability of the ORS solution was an issue which arose frequently in interviews with mothers, although its influence on ORS was never tested statistically. This has implications both in terms of education for mothers and research into the influence of this factor on ORS use, as well as recommendations to ORS manufacturers regarding the development of a solution more palatable for children.

Identification of influential sociodemographic factors that limit use of ORS has importance for identifying individuals or groups in the population that are in greatest need of intervention. In this study, however, none of the modifying factors considered were found to have a statistically significant association with ORS use.

The influence of other individuals on mothers' use of ORS suggests implications for nursing practice, education of health workers, research, and government policy. Mothers in this study identified various individuals as influencing their use of ORS through provision of advice or teaching. The use of ORS did not vary depending on the identity of the person providing advice or teaching, or making health care decisions for the child. This has implications regarding the potential influence of various community members and the need to target a broad audience in health education programs. The potential influence of health workers' own treatment strategies on mothers' use of ORS was not tested, but has been suggested in this study and others, as having both direct and indirect influences on mothers' views of what is appropriate treatment. This suggests that health worker education is a key strategy in increasing ORS use. Media campaigns were not frequently mentioned in this study, but are possibly an effective method to utilize in the promotion of ORS in the community.

The key variables found to be associated with mothers' use of ORS in this study were their knowledge of the signs of dehydration, and their belief in their own self-efficacy in ORS preparation and administration. While the remaining variables were found to be either not associated or lacking statistical significance, narrative data indicate that some of these factors were viewed as influential by mothers.

It is believed that the limited use of ORS may be strongly influenced by mothers' lack of knowledge of the link between diarrhea, dehydration, and the rehydrating function of ORS. An essential message that must be communicated to mothers, other community members, and health workers therefore, is that dehydration is a significant, and potentially harmful, consequence of diarrhea, and that ORS is the appropriate prevention and treatment for dehydration. It is anticipated that the development and implementation of appropriate interventions, to be described in chapter 6, will lead to the increased use of ORS in the home

treatment of childhood diarrhea in Indonesia, and contribute to the improvement of children's health.

Chapter 6

It has been said that successful rehydration therapy programs must recognize the social and cultural contexts that determine perceptions of illness, help-seeking, and treatment (Weiss, 1988), and that interventions based on investigation and utilization of the local norms and the population's cultural and lay health beliefs have an increased potential for influencing behaviour change (Ahmed et al., 1993; Pitts et al., 1996). It is believed that this study has contributed to such understanding in Indonesia and thus has provided the basis for the development of effective health education programs and other interventions to promote the use of ORS.

Improved understanding of the factors influencing the use of ORS in the home treatment of childhood diarrhea has a number of implications for practice, education, and research, as well as for manufacturing guidelines and government policy. It is believed that implementation of these recommendations has the potential to lead to the development of strategies to improve the promotion and subsequent use of ORS in the home.

It should be noted that due to the fact that this study did not utilize a random sample, the findings have limited generalizability. While the implications of the study may be relevant beyond the study setting, such application should be done so cautiously, with an awareness of the limited generalizability of the study.

Implications for Practice

A number of implications for practice have been identified as a result of this study. These include a role for community health nurses in supporting the use of ORS, the need for community education, and the need to improve access to ORS by community members.

Role for Community Health Nurses

At present in Indonesia, nurses do not play a significant role in community health care. Health teaching, promotion, and provision of care in the community are mainly the responsibility of kadres (community health volunteers), who have minimal training and supervision; a small number of bidans (midwives), who divide their time between their work in the community and in the district health centre, and whose training is not adequate to address many community health issues; and the even smaller number of physicians and

nurses who are based at the puskesmas (district health centres). While Community Health Nurses (CHNs) do not currently practice in Indonesia, the Faculty of Nursing at the University of Indonesia (FONUI) is in the process of developing an education program to prepare nurses to play such a role in community health.

The development of a CHN role has the potential to significantly impact numerous community health issues, including problems with the home treatment of childhood diarrhea. In reference to this one specific issue, the role of the CHN might include such responsibilities as: the development of community health education programs; taking measures to ensure more dependable access to ORS; providing education and supervision for community health workers; co-ordinating ongoing research into the problem of diarrhea treatment, and evaluation of the effectiveness of possible solutions or interventions; and lobbying government and ORS manufacturers for necessary changes in policy and/or in ORS production. Details of each of these activities will be discussed in further detail below.

Community Education

The findings of this study have clear implications for community health education. This study has indicated that mothers are willing to take the time, and exert the effort, to provide some form of home treatment for their children's diarrhea episodes, and/or to seek treatment outside the home. The focus of the recommended interventions, therefore, should be on supporting mothers' positive behaviours, while also providing accurate information, modifying those beliefs and behaviours which are ineffective, and encouraging the use of ORS as an essential and consistent element of mothers' home treatment practices.

Mothers' home treatment practices have been shown to be linked to their beliefs and knowledge about the concepts of diarrhea and dehydration, about treatment, and about the function and effectiveness of ORS. Thus, the improved understanding of mothers' knowledge, beliefs, and practices obtained from this study allows both identification of necessary teaching content, as well as recognition of current beliefs which may impact on mothers' acceptance of health teaching.

Health education strategies need to focus on educating mothers about the dehydrating effects of diarrhea and the hydrating effect of ORS. Key content areas to be addressed in health education to mothers should include:

•recognition of the signs of dehydration. This is particularly important given the suggested association with ORS use.

•the benefits of all forms of hydration. This includes the importance of maintaining, or preferably increasing, administration of home-based fluids, and particularly breast-feeding.

•the mode of action of ORS. Specifically, mothers need to be made aware of its role in hydration, as opposed to the common erroneous belief in the "medication" or curative effect of ORS. This has implications regarding increasing belief in its effectiveness, as well as increasing volumes administered.

•correct preparation and administration techniques and principles. It will also be necessary to address the fact that many mothers believed that they had "self-efficacy" in ORS use although their use was in fact incorrect. Content of such teaching should include, but not be limited to: replacing volume lost, administering ORS after every loose stool, administering adequate volume, encouraging children even if they resist treatment, the lack of usefulness of mothers consuming the ORS for the breast-feeding child, continuing treatment until diarrhea episode resolves, and obtaining more packets if the episode warrants continued treatment.

Other important content areas include:

•the seriousness and potential consequences of diarrheal disease

•appropriate situations in which to seek treatment from a health worker, eg. blood in stool, duration of >3 days, fever, signs of dehydration

•the causes of diarrhea. Identification of infectious causes has the potential to impact on prevention of diarrheal illness.

•where, or from whom, packets of ORS may be obtained

•the dangers of antidiarrheal medications and the need to limit antibiotic use

In addition to providing this information, it is recommended that there be emphasis placed on creating linkages between the various influential factors. As noted in chapter 5, it was not unusual for mothers to possess certain correct knowledge, but be unable to recognize the relationship between that knowledge and the resulting outcome or recommended response. For instance, although many mothers viewed diarrhea as serious, and recognized the potential risks of the illness, they did not respond by treating with ORS.

They seemed to lack sufficient knowledge to be able to draw the association between severity and ORS use. Teaching mothers to draw the link between diarrhea, dehydration, and the hydrating effect of ORS might be the key to prompting the use of ORS in home treatment.

It is important that community health education be provided in a variety of formats and settings. This would ensure that information be delivered to a wide audience and in a manner that would suit individuals of different backgrounds and educational levels. This is especially pertinent considering the relatively low level of literacy in a setting such as rural Indonesia. Health workers should also be encouraged to take advantage of both formal and informal teaching opportunities. While teaching should occur when mothers contact the formal health care system, at hospitals, puskesmas, doctors' clinics, etc, it should also take place within the community setting. Widarsa and Muninjaya (1994) suggest such community outreach activities, including the provision of instruction on ORS in the home in order that other influential persons, such as the father, grandmother, and other family members, can participate. While this method might be fairly labour intensive, the value of such programs can be seen in relation to this study in which it was found that a variety of relatives and friends were involved in health care decision-making, and thus had the potential to influence children's home treatment.

In addition to one-on-one and group education sessions, community education can be achieved through both mass media campaigns and teaching in the schools. Media campaigns might include public service announcements on TV and radio, as well as written information provided on brochures or posters. While these methods may be unable to provide the level of content of health education sessions, they can be useful in increasing awareness of the problem and the value of the appropriate treatment, and may encourage mothers to seek out further information. Teaching in schools may be a useful way of disseminating information to older female students who are nearing childbearing age, as well as to other children who often play a role in care of younger siblings in the home.

Nurses are in a key position to develop and co-ordinate programs to be delivered to mothers of young children in the community, as well as to the health workers who interact with this population. The revised version of the questionnaire developed for the current study

might be a useful assessment tool to be used by nurses in identifying specific beliefs, knowledge, and practices to be targeted in specific health education programs.

Access

In order for ORS promotion and education campaigns to be effective, it is also necessary for ORS packets to be readily accessible to community members. This encompasses both adequate and dependable availability of packets, as well as distribution to sites easily accessed by the public. The sources most commonly named by mothers in this study were the kadre, posyandu, and puskesmas. Of these, the kadre and posyandu are located within the village itself, and both provide ORS packets free of charge. Therefore, it is suggested that these be the focus of distribution efforts and that a dependable and consistent supply of packets be maintained by both.

One other important issue related to access is the possibility that maintaining a stock of ORS packets within the home has the potential to increase use during diarrhea episodes. This necessitates providing mothers with additional packets in order that they can keep stock available at home for use in future episodes.

Implications for Education

Both this study, as well as earlier studies, have identified the potential influence of health workers' beliefs, attitudes, knowledge, and own treatment practices on mothers' home treatment practices. It is therefore necessary to ensure that health workers are in fact providing the recommended health care for children's diarrhea episodes.

While some health workers, such as doctors and bidans, have received formal medical training, their views about diarrhea and its treatment may also be influenced by prevalent cultural beliefs. Kadres, who have little or no formal training, have been shown in this study to play an important role in advising and teaching mothers about ORS use. The development of education programs to refresh the knowledge and skills of health professionals, and the targeting of community health workers for education efforts, could have a significant impact on treatment of childhood diarrhea, both directly through health workers' treatment methods, and indirectly, through the education they can provide to mothers regarding home treatment. The content of education sessions for health workers should include many of the same elements as those directed at mothers, but should

emphasize the dangers of antidiarrheal medications and the need to limit prescription of antibiotics to suspected case of bacterial diarrhea. It would also be beneficial to provide guidance on the basic principles of teaching and learning in adult education.

Implications for Research

While this study, and others, shed some light on the factors influencing mothers' treatment practices, further research is necessary to expand on this knowledge. Specifically, factors for which there is ambiguous support, and other factors that have only been suggested but never investigated, require further exploration.

In addition, the fact that numerous factors in this study were shown to have no statistical association, although mothers identified them as being influential, suggests that the sample size of the current study may have been inadequate to identify real differences. A study conducted with a larger sample might have greater power to recognize such differences.

As noted in chapter 5, one limitation of the current study was the fact that the sample was not limited to mothers of children with recent episodes. In order to address the potential issue of recall bias, it is suggested that further research take place using a sample of mothers of children with only recent episodes. While it is recognized that this will necessitate more extensive sampling, it may provide additionally meaningful results.

Specific areas in which further study is recommended include:

•the possible link between duration, perception of severity, and treatment seeking

•the influence of age of the child, in order to clarify the ambiguous findings on this issue

•the influence of maintaining a stock of ORS packets in the home on ORS use

•assessment of the mothers' preparation and administration technique through actual observation of mothers' techniques

•the influence of the palatability of the solution on use

•mothers' comprehension of instructions on package labelling

•the influence of understanding of ORS function on volume of solution administered

In addition to descriptive and exploratory studies into these issues, intervention studies may also be called for. Specifically, investigation of the impact of the recommended

health education programs on mothers' treatment practices would be an important area of inquiry.

Implications for ORS Manufacturers

This study identified ORS package labelling and the palatability of the ORS solution as possible factors limiting use. Both of these are issues best addressed by ORS manufacturers. Efforts should be made to lobby these manufacturers to ensure that the labelling of packets is clear, legible, and comprehensible to ORS users. In terms of the palatability of the solution, it may be necessary to focus efforts on the development of an ORS solution which is more acceptable to children. Improvements in both these areas may be influential in improving the accuracy of preparation and administration techniques and increasing the use of the solution and the volumes consumed.

Implications for Government Policy

The primary implication for government policy is the funding of CHN positions within Indonesia. The previously discussed recommendations are all activities that could be facilitated and co-ordinated by nurses trained in the principles and practices of community health. The potential impact on child morbidity and mortality should make the funding of such positions and training programs a logical and financially responsible action for government health policy.

Conclusion

The recommendations outlined in this chapter have the potential to have a significantly positive impact on child morbidity and mortality through an improvement in the home treatment of childhood diarrhea. This impact can be further intensified through effective dissemination of these findings. Communication of the study findings and implications through publication in academic and professional journals will allow transferability of methods, findings, and recommendations to other research projects or health education programs in the developing world. These findings and recommendations will also be provided to the Indonesian partners in the primary health care project with the intention that they will form the basis for future research and/or the implementation of ORS promotion and education strategies. Dissemination and application of the findings of this

study are vital to achieving the ultimate goal of increasing the use of ORS in the home treatment of children with diarrhea and thereby decreasing child morbidity and mortality.

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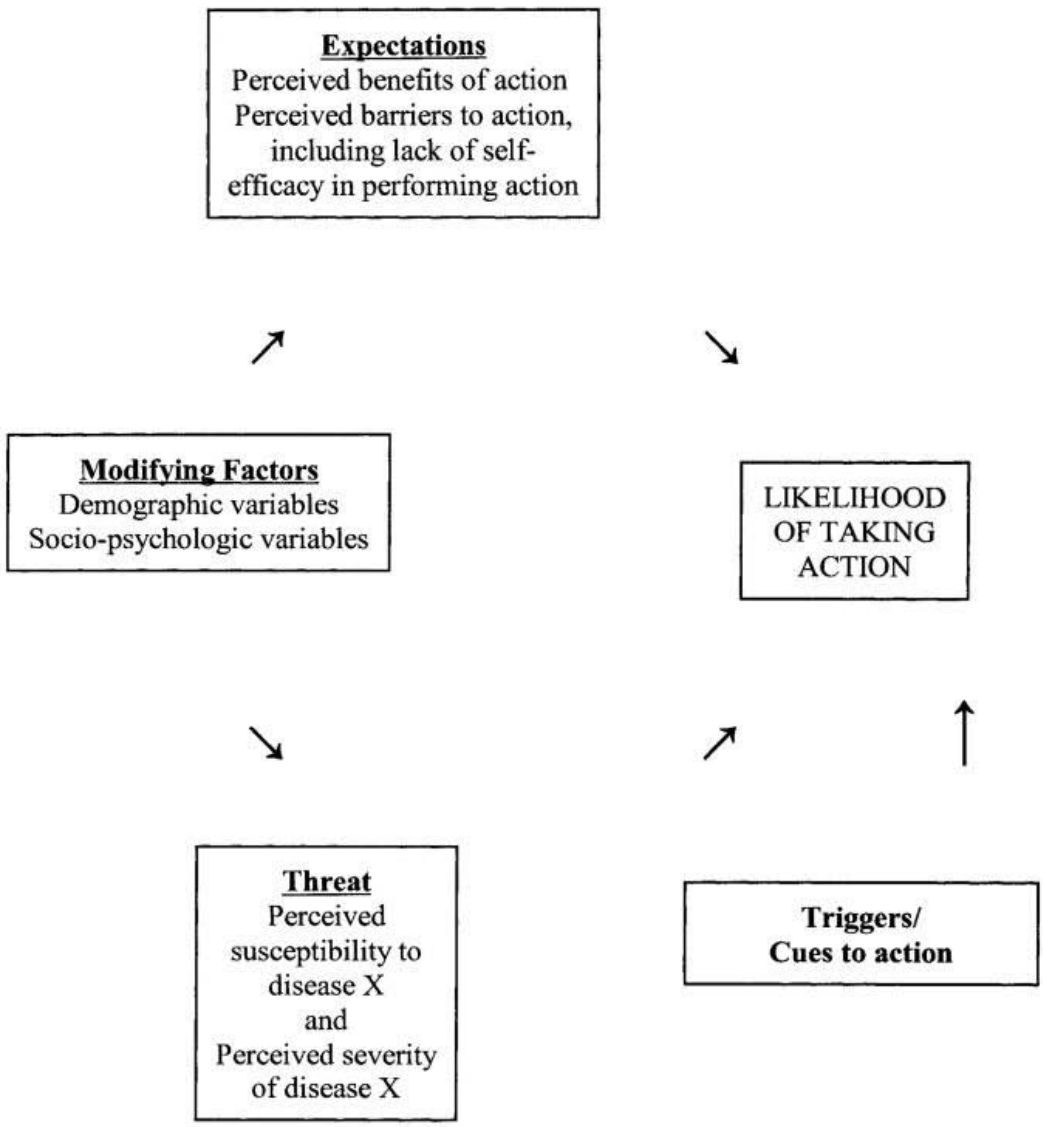
Appendix A

Schematic Diagram of Health Belief Model
(Rosenstock, Strecher, & Becker, 1988)



Appendix B

(translated into Bahasa Indonesian)

Diarrhea Home Treatment Questionnaire

Background Data on All Mothers

Circle correct answer or fill in the blank.

1. Relationship of primary caregiver to child: _____
2. Caregiver's age ____
3. Mother's age (if not primary caregiver): ____
4. Father's age: ____
5. Cultural group: Sunda Java Other _____
6. Religion: Moslem Christian Other _____
7. Highest education level completed by mother: None Elem. HSc(Jr) HSc(Sr)
8. Mother able to read? Yes No
9. Highest education level completed by father: None Elem. HSc(Jr) HSc(Sr)
10. Mother employed outside the home? No Full-time Part-time
11. Father employed outside the home? No Full-time Part-time
12. Ages of children in the home: ____ ____ ____ ____ ____ ____
13. Who else lives in the home? _____
14. Is there any help available from family or friends when a child is sick?
    Always Sometimes Never
    If so, from whom? _____
15. Who makes health care decisions regarding the children? _____
16. A common illness among children is diarrhea. Do your children ever get diarrhea? Yes No
17. Do you consider diarrhea to be a serious illness?
    Always Sometimes Never

18. What makes it serious? _____
_____

19. Children sometimes get dehydrated (dry) from diarrhea. Do you know any signs that tell you that your child may be dehydrated? Yes No
If yes, list: _____
_____

20. Have any of your children been hospitalized for diarrhea? Yes No
If yes, how many? ____ What age(s)? ____ ____ ____

21. Do you know of any child that has died as a result of diarrhea? Yes No
If yes, how many? ____ What age(s)? ____ ____ ____
Relationship to mother _____

22. Have any of your children had an episode of diarrhea in the past month?
Yes No
If yes → Recent Episode questionnaire (p. 3)
If no → Past Episode questionnaire (p. 11)

Recent Episode of Diarrhea

For mothers of children who have had an episode of diarrhea in the past month.

Circle correct answer or fill in the blank.
(Prompts are in brackets)
Notes to interviewer are in italics

1. What is the age and gender of the child who had a recent episode of diarrhea?
   Age____ Male Female

2. What signs and symptoms did this episode of diarrhea have?
   (Can you describe the diarrhea?)
   Watery Blood Mucous Vomiting Fever
   Other _____
   # stools per day on worst day _____

3. How long did this episode last (in days)? _____

4. How serious was this episode? Very Somewhat Not
   If serious, what made it serious? _____

5. What caused this episode? _____

6. Is this child being breast-fed? Yes No
   If yes, during this episode, did you reduce the number of feedings, feed the same amount, or increase the number of feedings?
   Increase Same Decrease Child refused

7. During this episode, was your child given less to drink than before the diarrhea, the same amount, or more? More Same Less Child refused

8. During this episode, was your child given less food to eat than before the diarrhea, the same amount, or more?
   More Same Less Child refused

9. What did you do for this episode of diarrhea?
   Treated at home Sought treatment outside the home Nothing
   If treated at home, go to # 10
   If sought treatment outside the home, go to #60
   If both, go to #10
   If nothing, go to #67

10. What type of treatment did you give at home? _____
If they say Oralit, go to #11
If they don't say Oralit, go to #27

11. Why did you choose to use Oralit? _____

12. Did anyone advise you to use Oralit? Yes No
If yes, who? _____

13. Do you believe that Oralit successfully treated this episode of diarrhea? Yes No
Explain: _____

14. Where or whom did you learn about Oralit from? _____

15. Where did you get Oralit packets from? _____

16. Was it easy or difficult to get Oralit packets? Easy Difficult
If difficult, explain _____

17. Can you tell me how Oralit works? _____

18. Can you tell me how you prepared Oralit? _____
_____

18a. Can you show me the container and how much water you mix with a packet of Oralit? _____

18b. Where did you get the water?_____

18c. Did you boil the water? _____

19. Can you tell me how you administered Oralit? _____

19a. How much did you give? _____

19b. How often? (How many times in a day? After every loose stool?) _____

19c. How long did you continue? _____

20. Was it easy or difficult to administer Oralit to your child? Easy Difficult
If difficult, describe: _____

21. Do you think that you know enough about Oralit to prepare and administer it correctly? (Do you have any concerns about your ability to prepare and administer it?) Yes No

22. Do you use Oralit to treat every episode? Yes No
If yes, go to #25
If no, go to #23

23. What was it that made you choose to treat this episode of diarrhea with Oralit? __
_____

23a. Was it the severity of the episode? Yes No

23b. Was it the cause of the episode? Yes No

23c. Was it the age of the child? Yes No

24. Did previous experience with diarrhea or Oralit influence your choice? Yes No
If yes, explain _____

25. *Omit #25 if home treatments have already been discussed.*
Did you use any other home treatments? Yes No
If yes,
25a. What other home treatments did you try? _____
_____

25b. What made you choose to treat it that way? _____
_____

25c. Did you treat with Oralit at the same time, before, or after?
Before Same time After

25d. If treatment changed, what made you change treatment? _____
_____

26. *Omit #26 if treatment outside the home has already been discussed.*
Did you also seek treatment outside the home? Yes No
If yes, before or after treating at home? Before After
Go to #60
If no, what was the reason why not? _____
Interview is finished

27. What made you choose to treat it this way? _____
_____

28. Did you use any other home treatments? Yes No
If yes,
28a. What other home treatments did you try? _____
_____

28b. What influenced you to change treatment? _____
_____

29. Did you also use Oralit? Yes No
If yes, go to #11
If no, go to #30

30. Have you **ever** used Oralit to treat your child's diarrhea? Yes No
If yes, go to #46
If no, go to #31

31. Have you ever heard of Oralit? Yes No
If yes, go to #33
If no, go to #32

32. Did you also seek treatment outside the home? Yes No
If yes, before or after treating at home? Before After
Go to #60
If no, what is the reason why not? _____
_____
Interview is finished

33. Where or whom did you hear about Oralit from? _____

34. Are there any reasons why you do not use Oralit? (Any reasons that would prevent you from using it? Any special beliefs?) _____
_____

35. Do you know where you could get Oralit packets from? Yes No
If yes,
35a. Where? _____
35b. Would be easy or difficult to get Oralit? Easy Difficult
If difficult, explain: _____

36. Have you ever considered using Oralit? Yes No
Explain: _____

37. Did anyone advise you to not use Oralit? Yes No
If yes, who? _____

38. Can you tell me how Oralit works? _____
_____

39. Can you tell me when Oralit could be used? _____
_____

40. Can you tell me how to prepare Oralit? _____
_____

40a. Can you show me the container and how much water you mix with a packet of Oralit? _____

40b. Where would you get the water from? _____

40c. Would you boil the water? _____

41. Can you tell me how to administer Oralit? _____
_____

41a. How much would you give? _____

41b. How often? (How many times in a day? After every loose stool?) _____

41c. How long would you continue treating with Oralit? _____

42. Do you think that you know enough about Oralit to prepare and administer it correctly? (Do you have any concerns about your ability to prepare and administer it?) Yes No

43. Do you know anyone who has ever used Oralit? Yes No
If yes, what was their experience with it? (What did they tell you about using it? Did they have any trouble with it? Did they find it worked?) _____
_____

44. Do you believe that Oralit works? Yes No
Explain: _____

45. *Omit #45 if treatment outside the home has already been discussed.*
Did you also seek treatment outside the home? Yes No
If yes, before or after treating at home? Before After
Go to #60
If no, what is the reason why not? _____
Interview is finished

46. What was it that made you choose to **not** use Oralit to treat **this** episode of diarrhea? _____

46a. Was it the severity of the episode? Yes No

46b. Was it the cause of the episode? Yes No

46c. Was it the age of the child? Yes No

47. Did anyone advise you about using Oralit? Yes No
If yes, who? _____

48. Did previous experience with diarrhea or Oralit influence your choice? Yes No
If yes, explain _____

49. When you have used Oralit, have you found that it works? Yes No
Explain: _____

50. Where or whom did you learn about Oralit from? _____

51. Where can you get Oralit packets from? _____

52. Is it easy of difficult to get Oralit packets? Easy Difficult
If difficult, explain: _____

53. Can you tell me how Oralit works? _____

54. Can you tell me when Oralit could be used? _____

55. Can you tell me how you would prepare Oralit? _____
_____

55a. Can you show me the container and how much water you mix with a packet of Oralit? _____

55b. Where would you get the water from? _____

55c. Would you boil the water? _____

56. Can you tell me how to administer Oralit? _____
_____

56a. How much would you give? _____

56b. How often? (How many times in a day? After every loose stool?) _____

56c. How long would you continue treating with Oralit? _____

57. Do you think that you know enough about Oralit to prepare and administer it correctly? (Do you have any concerns about your ability to prepare and administer it?) Yes No

58. When you have used Oralit have you found it easy or difficult to administer?
Easy Difficult
If difficult, explain: _____

59. *Omit #59 if treatment outside the home has already been discussed.*
Did you also seek treatment outside the home? Yes No
If yes, before or after treating at home? Before After
Go to #60
If no, what is the reason why not? _____
Interview is finished

60. Where or whom did you seek treatment from? _____

61. What type of treatment was given? _____

62. Was any teaching given? Yes No
If yes, describe (Teaching regarding diarrhea or treatment?) _____
_____

63. Was the child hospitalized? Yes No

64. What prompted you to seek treatment outside the home? _____
_____

65. Did anyone advise you to seek care outside the home? Yes No
If yes, who? _____

66. *Omit #66 if home treatment has already been discussed. If so, Interview is finished.*
Did you also treat the child at home? Yes No
If yes, before or after seeking care? Before After
Go to #10
If no, what is the reason why not? _____
Interview is finished

67. Do you **ever** treat your child for diarrhea? Yes No
If yes, go to #69
If no, go to #68

68. Why do you choose not to treat your child's diarrhea episodes? (Any special beliefs that prevent you?) _____
Interview is finished.

69. Have you ever used Oralit? Yes No
If yes, go to #46
If no, go to #70

70. Have you ever **heard** of Oralit? Yes No
If yes, go to #33
If no, interview is finished

Past Episode Questions

For mothers of children who have not had an episode of diarrhea in the past month

Circle correct answer or fill in the blank.
(Prompts are in brackets)
Notes to interviewer are in italics

1. Have you ever breastfed any of your children? Yes No
   If yes, during an episode of diarrhea, do you usually reduce the number of feedings, feed the same amount, or increase the number of feedings?
   Increase Same amount Decrease Child refuses

2. During an episode of diarrhea, is your child given less to drink than before the diarrhea, the same amount, or more?
   More Same amount Less Child refuses

3. During an episode of diarrhea, is your child given less food to eat than before the diarrhea, the same amount, or more?
   More Same amount Less Child refuses

4. What do you usually do when one of your children has diarrhea?
   Treat at home Seek treatment outside the home Nothing
   If treats at home, go to #5
   If seeks care outside the home, go to #51
   If both, go to #5
   If nothing, go to #55

5. What type of treatment do you give at home? _____
   If they say Oralit, go to #6
   If they don't say Oralit, go to #24

6. Do you use Oralit to treat **every** episode of diarrhea? Yes No
   If yes, go to #8
   If no, go to #7

7. In what situations would you use Oralit?_____
_____

7a. Does the severity of the episode affect your choice? Yes No
If yes, what type of diarrhea do you treat with Oralit? (What signs and symptoms?) _____

7b. Does the cause of the episode affect your choice? Yes No
If yes, what causes do you treat with Oralit? _____
This is the mother's belief of what caused the diarrhea, not necessarily the actual cause.

7c. Does your use of Oralit depend on the age of the child? Yes No
If yes, what ages do you treat with Oralit? _____

8. Has anyone advised you about using Oralit? Yes No
If yes, who? _____

9. When you have used Oralit, have you found that it works? Yes No
Explain: _____

10. Where or whom did you learn about Oralit from? _____

11. Where can you usually get the Oralit packets? _____

12. Is it easy or difficult to get Oralit packets? Easy Difficult
If difficult, explain _____

13. Can you tell me how Oralit works? _____

14. Can you tell me how you prepare Oralit? _____
_____

14a. Can you show me the container and how much water you mix with a packet of Oralit? _____

14b. Where do you get the water from? _____

14c. Do you boil the water? _____

15. Can you tell me how you administer Oralit? _____
_____

15a. How much do you give? _____

15b. How often? (How many times in a day? After every loose stool?) _____

15c. How long do you continue treating with Oralit? _____

16. Is it easy or difficult to administer Oralit? Easy Difficult
If difficult, describe: _____

17. Do you think that you know enough about Oralit to prepare and administer it correctly? (Do you have any concerns about your ability to prepare and administer it?) Yes No

18. *Omit #18 if you have already discussed other treatments*
Do you use any other home treatments? Yes No
If yes,
18a. What other home treatments would you use? _____
_____

18b. What would make you choose to treat it that way? _____
_____

18c. What would influence you to change treatments? _____
_____

19. *Omit #19 if treatment outside the home has already been discussed.*
Would you also seek treatment outside the home? Yes No
If yes, go to #20
If no, why not? _____
Interview is finished.

---

20. Would you seek treatment before or after treating at home? Before After

21. Where or whom would you seek care from? _____

22. What would prompt you to seek treatment outside the home? _____
_____

23. Who decides when to seek treatment outside the home?
_____
Interview is finished.

24. Why would you choose to treat it this way? _____

25. What other home treatments would you try? _____

26. What would influence you to change treatment? _____

27. Have you **ever** used Oralit to treat your child's diarrhea? Yes No
If yes, go to #6
If no, go to #28

28. Have you ever heard of Oralit? Yes No
If yes, go to #34
If no, go to #29

29. Would you also seek treatment outside the home?
If yes, go to #30
If no, why not? _____
Interview is finished.

---

30. Would you seek treatment before or after treating at home? Before After

31. Where or whom would you seek treatment from? _____

32. What would prompt you to seek treatment outside the home? _____

33. Who decides to seek treatment outside the home? _____
Interview is finished.

---

34. Where or whom did you hear about Oralit from? _____

35. Are there any reasons why you do not use Oralit? (Any reasons that would prevent you from using it? Any special beliefs?) _____
_____

36. Do you know where you could get Oralit packets from? Yes No
If yes,
36a. Where? _____
36b. Would it be easy or difficult to get Oralit packets? Easy Difficult
If difficult, explain: _____

37. Did you ever consider using Oralit? Yes No
Explain: _____

38. Did anyone advise you to not use Oralit? Yes No
If yes, who? _____

39. Can you tell me how Oralit works? _____
_____

40. Can you tell me when Oralit could be used? _____

41. Can you tell me how to prepare Oralit? _____
_____

41a. Can you show me the container and how much water you mix with a packet of Oralit? _____

41b. Where would you get the water from? _____

41c. Would you boil the water? _____

42. Can you tell me how to administer Oralit? _____
_____

42a. How much would you give? _____

42b. How often? (How many times in a day? After every loose stool?) _____

42c. How long would you continue treating with Oralit? _____

43. Do you think that you know enough about Oralit to prepare and administer it correctly? (Do you have any concerns about your ability to prepare and administer it?) Yes No

44. Do you know anyone who has ever used Oralit? Yes No
If yes, what was their experience with it? (What did they tell you about using it? Did they have any trouble with it? Did they find it worked?) _____
_____

45. Do you believe that Oralit works? Yes No
Explain: _____

46. Would you also seek treatment outside the home? Yes No
If yes, go to #47
If no, why not? _____
Interview is finished

47. Would you seek treatment before or after treating at home? Before After

48. Where or whom would you seek treatment from? _____

49. What would prompt you to seek treatment outside the home? _____

50. Who decides when to seek treatment outside the home? _____
Interview is finished.

51. Where or whom would you seek treatment from? _____

52. What would prompt you to seek treatment outside the home? _____
_____

53. Who decides when to seek treatment outside the home? _____

54. Do you also treat diarrhea at home? Yes No
If yes, go to #5
If no, why not? _____
Interview is finished.

55. Why do you choose not to treat your child's diarrhea episodes? (Any special beliefs that prevent you?) _____
Interview is finished.

Appendix C
(translated into Bahasa Indonesian)

SCHOOL OF NURSING - MEMORIAL UNIVERSITY OF NEWFOUNDLAND

Consent To Participate In Nursing Research

TITLE: The Home Treatment of Childhood Diarrhea by Mothers in West Java, Indonesia

INVESTIGATOR: Shannon Muir, BN, BSc

SPONSOR: Memorial University of Newfoundland School of Nursing, University of Indonesia Faculty of Nursing, and Canadian International Development Agency

You have been asked to participate in a research study. You may choose whether you would like to participate in this study or not. If you choose not to participate, or to leave the study, it will not affect your health care in any way.

Your name and any other information that could identify you will be kept confidential by the investigator. The investigator will be available at any time during the study if you have any problems or questions about the study.

1. Purpose of study:
Many children under 5 years of age in Indonesia become ill, and sometimes die, because of diarrhea. This study will assess the type of home treatment given to children under 5 years of age when they have diarrhea, including the use of Oral Rehydration Solution. This information can be used to develop community health programmes that can make home treatment better, and thereby decrease the number of children that die from diarrhea.

2. Description and duration of participant's involvement in study:
The investigator will meet with you in your home to ask you some questions about the type of care that you give your children when they have diarrhea. A co-interviewer who speaks Indonesian will translate for the investigator. The questions will take approximately 45 minutes to an hour to answer.

3. Possible risks and inconveniences:
Your participation in this study will not cause you any harm. The only inconvenience will be the time needed to answer the questions. If you have any concerns about the study, the investigator is available to talk to you about them. If there are any concerns about your child's health, the investigator will refer you to a local health worker.

4. Benefits which the participant may receive:

It is hoped that the results of this study will improve the home treatment of children with diarrhea in your community. There are not any direct benefits to you from participating in this study.

5. Liability statement:

Your signature or thumbprint indicates that you agree to participate in this study, and that you have understood the information regarding the research study. You do not give up your legal rights by agreeing to participate, and the investigators and involved agencies will still maintain their legal and professional responsibilities.

6. Contact Information:

If you have any questions or concerns about the study, you can contact the investigator at the Nursing Research and Development Unit, University of Indonesia at Ph: (021) 3154091.

Signature Page

Title of Project: The Home Treatment of Childhood Diarrhea by Mothers in West Java, Indonesia

Name of Principal Investigator: Shannon Muir, BN, BSc

To be signed by participant

I understand what is involved in the study and any questions have been answered. I realise that it is my choice whether I participate in the study or not, and that there is no guarantee that I will benefit from my involvement.
I agree to my participation in the research study described above.
I acknowledge that a copy of this form has been given to me.

_____
Name of Participant

_____ _____
Signature or Thumbprint of Participant Date

_____ _____
Signature of Witness (Co-interviewer) Date

To be signed by investigator

To the best of my ability I have fully explained the nature of this research study. I have invited questions and provided answers. I believe that the participant fully understands the implications and voluntary nature of the study.

_____ _____
Signature of Investigator Date

Appendix D

Ethical Approval From Human Investigation Committee

Memorial
University of Newfoundland

Human Investigation Committee
Research and Graduate Studies
Faculty of Medicine
The Health Sciences Centre

June 29, 2001

Reference #01.102

Ms. Shannon Muir
School of Nursing
Memorial University of Newfoundland

Dear Ms. Muir:

This will acknowledge your correspondence dated June 20, 2001, which you clarify issues and provide a copy of the revised questionnaire, for your research study entitled **"Factors influencing the maternal use of oral rehydration solution in the home treatment of childhood diarrhea in West Java, Indonesia"**.

At a meeting held on **June 28, 2001**, the Human Investigation Committee ratified the Chairs' decision to approve revised questionnaire and granted full approval of your research study

We wish you success with your study.

Sincerely,

Sharon K. Buehler, PhD
Co-Chair
Human Investigation Committee

Catherine Popadiuk, M.D., F.R.C.S.(C)
Co-Chair
Human Investigation Committee

SKB\CP:jjm

C Dr. C. Loomis, Acting Vice-President (Research)
Dr. R. Williams, Vice-President, Medical Affairs, HCC
Ms. K. Matthews, Co-Supervisor
Dr. D. Moralejo, Co-Supervisor

Appendix E

Ethical Approval From Indonesian Institute of Sciences

LEMBAGA ILMU PENGETAHUAN INDONESIA
(Indonesian Institute of Sciences)

SASANA WIDYA SARWONO
Jl. Jenderal Gatot Subroto No. 10, Jakarta 12710
Telp. 5251542, 5225711

Tromol Pos : 1250 / Jakarta 10012
4324 / Jakarta 12190

Alamat kawat : LIPI
Telex : 62554 IA
Fax : 5225640

No. : 3513 /I.3/KS/2001

Lampiran / Encls. :

Perihal / Subj. Matter : Research visa

Jakarta, June 19 2001

Ms. Shannon Elizabeth Muir
50 King's Road
St. John's Newfoundland
A1C 3P6, Canada

Dear Ms. Muir,

With reference to your letter dated March 18th, 2001, concerning your request permission to carry out research in Indonesia, we would like to inform you that your research application has been approved by Coordinating Team. Following the approval, we will arrange to request Director General of Immigration, Jakarta in order to issue visa authorization numbers for you.

It is estimated for about 14 days in processing your visa. As soon as your visa is issued by Director General of Immigration, we will inform you to collect visa in Indonesian Representative in Ottawa, Canada.

Thank you very much for your attention.

With best regards,

Yours Sincerely,

Mrs. Sophie Muzwardi
Head, Bureau of S & T Cooperation

CC : Dra. Elly Nurachmah, DNSc., Dean, Faculty of Nursing, University of Indonesia

Surat/DH/wh