Research Article

Food and Personal Hygiene Perceptions and Practices among Caregivers Whose Children Have Diarrhea: A Qualitative Study of Urban Mothers in Tangerang, Indonesia

Avita A. Usfar, DrScHum[1]; Dwi N. Iswarawanti, MSc[2]; Devy Davelyna, MSc[3]; Drupadi Dillon, PhD[2]

ABSTRACT

Objective: To examine caregivers' perceptions and practices related to food and personal hygiene and its association with diarrhea in children 6 to 36 months of age who suffered recurrent diarrhea.

Design: This qualitative study, conducted in March and April 2006, used both in-depth interviews and direct observation data.

Setting: Urban Tangerang, near Jakarta, Indonesia.

Participants: Twenty-four mothers whose monthly household income was less than $160 US and had latrines in their homes.

Phenomenon of Interest: To examine the relationship between mothers' perceptions and behaviors related to diarrhea, food hygiene, and personal hygiene.

Analysis: Interview transcripts were analyzed based on the phenomenon of interest and coded for common themes.

Results: Mothers differentiated diarrhea episodes as either disease or nondisease. Most mothers associated the importance of food hygiene with disease prevention, contaminating agents, and health. Mothers commonly wiped cutting boards with a kitchen towel after slicing vegetables, whereas they washed the board with soap and water after cutting raw meat. Mothers perceived that the importance of personal hygiene was for maintaining health and cleanliness. The majority of mothers washed their hands without soap after performing housework and cooking.

Conclusions and Implications: Improving mothers' knowledge while incorporating existing perceptions might lead to positive changes.

Key Words: hygiene, perception, practice, diarrhea, mothers (*J Nutr Educ Behav*. 2010;42:33-40.)

INTRODUCTION

Diarrhea is the second leading cause of child mortality worldwide. Each year more than 1.5 million children under the age of 5 die of acute diarrhea,[1] which translates to 18% of deaths of children under the age of 5 between 2000-2003.[2] In Indonesia, the situation is similar. Diarrhea contributed to 18% of the mortality rate in 2006[3] and is the second-leading cause of death, after respiratory infections, for children under the age of 5.[4] The prevalence of diarrhea among 12- to 23-month-old children in rural Banten province, Indonesia was 19%, with a higher prevalence in urban areas.[5] Seventy percent of all cases of diarrhea in children may be attributed to food contamination.[6] The incidence of diarrhea increases after the introduction of complementary food due to the unhygienic preparation of weaning food,[6-8] especially in children aged 6 to 24 months.[1] The combined effects of inadequate sanitation, unsafe water supplies, and poor personal hygiene are responsible for 88% of childhood deaths from diarrhea.[9] As a consequence of poor feeding and repeated infections, one-third of children under the age of 5 in developing countries were estimated to be stunted in 2005.[10] Due to its overwhelming long-term consequences, which affect not only physical growth, but also cognitive ability, productivity, and economic return, tackling diarrhea should be prioritized. Hence, factors contributing to diarrhea among children in the community should be identified.

Several studies have presented the actual causes versus the perceived causes of diarrhea. Three risk factors of diarrhea have been identified: unclean water and food, unhygienic

[1]Danone Institute Indonesia, Jakarta, Indonesia
[2]Southeast Asian Ministers of Education Organization (SEAMEO) Tropical Medicine and Public Health (TROPMED) Regional Center for Community Nutrition, Universitas Indonesia, Jakarta, Indonesia
[3]Currently self-employed
Address for correspondence: Avita A. Usfar, Dr.sc.hum, Danone Institute Indonesia, Cawang Kencana Bldg, 4th fl, Jl. Mayjen Sutoyo Kav. 22, Jakarta 13630, Indonesia; Phone: +(62-21) 80888123; Fax +(62-21) 8011335; E-mail: avita.usfar@danone.com or ausfar@cbn.net.id

doi:10.1016/j.jneb.2009.03.003

practices of caregivers, and poor domestic hygiene.[11-16] Furthermore, perceived causes of diarrhea were thought to be spicy or bad food or water; worms, flies, and germs; child's developmental milestones; and natural causes.[17-22] The knowledge and perception of caregivers guide their food and hygiene practices and their choice of treatment for diarrhea cases. Even then, accurate knowledge may not result in good practice, as in the case of negligence of hand washing in Nicaragua,[16,23] underestimating the importance of hand washing before handling food in Bangladesh and Botswana,[22,24] or the different handwashing practices depending on beliefs about dirtiness in Peru.[25] In spite of the many-faceted problems surrounding diarrhea, improving food and personal hygiene practices is obviously one of the most effective ways of reducing the burden of diarrhea in children.[26-28] Improved sanitation has reduced diarrheal disease by more than a third in 1 study.[9] Washing hands with soap can reduce the risk of diarrheal diseases by 42%-47%.[29] However, this strategy can be successful only if it is based on current levels of knowledge and perception.[11,19,22,30,31]

Because of limited publications and lack of understanding among the public regarding food and personal hygiene, this study was expected to provide information on why some persons exhibit poor hygiene practices. Understanding why individuals behave in a particular way is very important, as this allows a more effective design and delivery of health intervention messages.

METHODS

Study Design and Sampling

The study was conducted in Neglasari subdistrict, Tangerang municipality, Banten province, approximately 20 km south of Jakarta. This subdistrict was chosen based on its high prevalence of diarrhea (20%) among children.[32] Data collection took place during March and April 2006, at the end of the rainy season. A list of households with children aged 6 to 36 months was obtained from the local Integrated Health Post (locally called *Posyandu*). During initial screening, 62 children suffered diarrhea. However, only 24 children suffered recurrent diarrhea 3 to 4 weeks after the initial screening. Samples were households with monthly income of less than 1,500,000 Rupiah (approximately $160 US; based on local household minimum wage) and had latrines. Mothers or the main caregivers were the subjects of this study because they could answer questions relating to food hygiene.[24]

Information Gathering

This qualitative study employed a combination of direct observation and in-depth interviewing to explore each mother's perceptions and practices. The interview and observation guides were tested on 8 households. Saturation of answers was achieved, and guides were revised accordingly. The direct observations were conducted prior to the interviews at each mother's home and focused on food and personal hygiene practices. Observations lasting for 40 to 60 minutes were conducted between 7 and 10 AM and 1 and 3 PM. Observation of food hygiene practices included assessing cleanliness of utensils, food storage, habits of purchasing ready-to-eat food, and food preparation of homemade food and ready-to-eat complementary food. Observation of personal hygiene focused on hand-washing practices during food preparation. The in-depth interviews conducted at each mother's home lasted for 45 to 75 minutes and focused on diarrhea, food, and personal hygiene. First, mothers were asked whether they were familiar with the term diarrhea and its causes. Then, the concept of diarrhea was developed based on the mother's perception. The interviews focused on practices, perception, and knowledge of food and personal hygiene. The study protocol was approved by the Ethical Committee, Faculty of Medicine, Universitas Indonesia, Jakarta.

Data Analysis

All interviews were audiotaped and transcribed verbatim. Transcripts were analyzed systematically by coding responses and examining for common themes according to content analysis procedures.[33] The transcripts were analyzed based on 3 major topics: diarrhea, food hygiene, and personal hygiene. A matrix of themes and notable quotations for each interview question was simultaneously developed.

RESULTS

Description of Study Participants

The total number of mothers included in this study was 24. The median age of mothers was 20, with a range of 14-40 years. The median age of the children was 16 months, with a range of 7-33 months. Eleven children were boys. Most of the mothers (n = 19) had less than 9 years of schooling and did not work outside of the home (n = 23). Most of the mothers (n = 22) owned private latrines. The 3 main ethnic groups were Betawi (native Jakarta people), Sundanese, and Betawi Benteng (minority group, a mixture of Chinese-Jakarta ancestors) (M. Aruan, oral communication, 2008). Islam is the main religion in the area. Mothers were able to speak the national language, Indonesian.

Concept, Cause, and Transmission of Diarrhea as Perceived by Mothers

Most mothers (n = 15; 63%) recognized that their children had diarrhea based on stool consistency (liquid stool), whereas a few others (n = 9; 38%) identified diarrhea by combining stool consistency and frequency (more than 3 times a day). Food items that were believed to cause diarrhea included peas, ice, spicy and sour food, candy, snacks, and coffee (total n = 13; 50%). Some mothers (n = 9; 38%) believed that the cause of diarrhea was a cold, exposure to dirty environments, or improper food handling. Most mothers (n = 19; 80%), however, perceived that diarrhea is also related to a child's physical and motor development milestones, such as crawling, walking, growing, talking, and teething. The concept of diarrhea transmission through unclean hands or child-to-child transmission was recognized by 9 mothers (38%).

Food Hygiene

Most mothers (n = 19; 80%) related the importance of food hygiene with disease prevention, contaminating agents (eg, dirt and flies), and health. Examples presented here are cleanliness of utensils, food storage, and food preparation.

Cleanliness of utensils. Cutting boards were rarely washed, since they were considered not dirty and did not give off any bad odors. Mothers (n = 19; 80%) commonly wiped wooden cutting boards with a kitchen towel after slicing chilies, onions, or vegetables. Washing the board with soap and water was done after cutting meat, fish, chicken, or when something left a bad odor (n = 16; 67%). Eleven mothers used the same cutting board for meat and vegetables. A few mothers (n = 3) washed the board after every use.

> *"After using it for slicing onion or chili, I usually just wipe it with a cloth and put it back in its place because it was not a dirty thing and does not have a stinky smell as if we used it for fish." (18 years)*

Although most mothers (n = 16; 67%) recognized the importance of clean equipment to ensure the cleanliness of food, personal health, and prevention of disease, some (n = 10; 42%) cleaned equipment to avoid odor transmission from raw food and to make them feel comfortable.

The practice of washing and boiling plastic feeding bottles was less often performed. Based on observation, 5 mothers washed their bottles with soap before and after using them. Four mothers then soaked or rinsed them in hot water. One mother cleaned the bottle using a small brush to reach the bottom of the bottle. One mother boiled the bottle. Two mothers did not use soap, as they believed soap would leave a bad smell. With regard to boiling or soaking feeding bottles in hot water, killing germs (n = 2) and removal of odor and white sediment (n = 2) were mentioned as reasons to do so. During the interview, 5 mothers claimed that the practice of boiling bottles demanded too much time.

> *"To clean the bottle, I usually just shake it with hot water after washing it because it takes too long to boil and I have so many other things to do." (21 years)*

Bottles were usually left uncovered and given to the children after 15-20 minutes.

Food storage. All mothers used some kind of storage system for cooked food. Most of them (n = 20; 83%) considered the food cabinet (a storage cabinet made of wood or plastic that keeps cooked food at ambient temperature) as the most favorable place to store food, since it could prevent flies, geckos, cats, chickens, and dust from contaminating the food. Some mothers (n = 11; 46%) left cooked food on the table and covered it with plates, food covers (a wooden, bamboo, or plastic cover with holes, purposely made to cover food), or another type of lid. Two mothers mentioned that covering food was unnecessary. During the observations, it was noticed that food cabinets were improperly closed. Because they considered this practice safe, mothers usually left the cabinet door ajar to release hot air, thus making it possible for flies to enter.

> *"If the door is closed, hot air will be captured inside the cabinet and it makes the cabinet damp, so I think it is fine to leave it to open a little bit." (31 years)*

Leftover children's food was usually discarded (n = 15; 63%) or reheated in the afternoon (n = 10; 42%). The importance of storing raw food in the refrigerator was recognized by 6 mothers (25%). Approximately two-thirds of households in Tangerang own a refrigerator (M. Aruan, oral communication, 2008).

Food preparation: purchase of ready-to-eat food. Purchasing cooked food is a common practice in the subject community. Although most mothers (n = 19) considered the habits of buying ready-to-eat food uneconomical, purchasing chicken porridge from a street vendor for the children's breakfast was very common. Among 13 mothers who bought cooked food, buying frequencies ranged from once a month to 3 times a week. Mothers expressed that their workload, financial condition, and children were reasons for buying ready-to-eat-food. Although a few mothers (n = 5) thought that ready-to-eat food was unhygienically prepared, others had the opinion that it depended on the vendor and the habit of the buyer. One mother said,

> *"I think the cleanliness of the food vendor is not a problem as long as we pay attention to our own cleanliness; if we do not wash hands before eating then it could cause stomach pain." (26 years)*

Food for children. Most of the children (n = 13; 54%) in the study already consumed family food, whereas 10 others (42%) still consumed rice porridge. To save time and work, children's food was usually prepared at the same time that mothers prepared the family meal. This practice was consistently found during the interviews and observations.

> *"I usually make the rice porridge when I cook food for the other family members; it is much easier so that I do not have to cook twice." (32 years)*

Children were given food while it was hot or warm (within 15 minutes after cooking) (n = 12; 50%) or when it was cold (within 30 minutes after cooking) (n = 11; 46%).

Fruits and vegetables. Fruit commonly consumed by the children included oranges (n = 15; 63%) and papaya (n = 6; 25%). Most mothers (n = 18; 75%) agreed that washing fruits and vegetables before consumption was an important practice to remove dirt and pesticides. However, only some practiced it. Fruit wrapped in plastic and bought from mobile vendors was not necessarily washed and was given directly to the children (n = 14; 58%). Whole fruit bought from traditional markets was commonly washed before peeling. The traditional market is considered a dirty place, since many people have touched the commodities there. Vegetables such as potatoes and carrots were usually washed only after they were peeled.

Separation of raw and cooked food. Most mothers (n = 19; 79%) pointed

out the importance of separating raw from cooked food to prevent cross-contamination. However, during observations, few mothers (n = 3) used separate utensils for handling raw and cooked food. A few mothers (n = 2) used a spoon that was previously used for raw vegetables for tasting. Raw food was bought and cooked on the same day. Ready-to-eat complementary food items were usually made directly before consumption because preparation time was much shorter.

Personal Hygiene

Hand washing and drying. Three aspects of personal hygiene presented here are hand washing, hand drying, and cutting nails. Mothers perceived that the importance of personal hygiene was for maintaining health (n = 13; 54%) and cleanliness (n = 9; 38%). The important times to wash hands were after defecating or cleaning a child's feces (n = 14; 58%), before eating (n = 14; 58%), and before feeding children (n = 12; 50%). Hand washing was performed with or without soap. More mothers washed their hands without soap after performing housework (n = 8 compared to n = 5) and cooking (n = 9 compared to n = 6), whereas most mothers (n = 17; 71%) washed their hands with soap after handling raw meat (eg, beef, fish, and chicken).

> *"I need to wash my hands with soap after scaling the fish due to its smell, but not after washing vegetables." (32 years)*

All mothers stated that washing hands after cleaning children's feces has the purpose of removing odor. Two mothers mentioned that soap is important to remove germs. Most mothers (n = 16; 67%) associated hand washing before feeding children with disease prevention and health, whereas the other 8 mothers associated it with the removal of dirt.

Six mothers (25%) stated the importance of drying hands because they felt uncomfortable with wet hands. Some (n = 5) mothers mentioned that drying hands was one of the ways to remove dust from the hands. The majority of mothers (n = 19; 79%) claimed that the proper way to dry hands was using a hand towel specifically used for drying hands. During observation, however, only a few mothers (n = 4) kept a hand towel next to the washing area. Some mothers (n = 10; 42%) dried their hands on their dresses or let them air-dry for practical reasons.

Cutting nails. Mothers reported nail cutting as a means of preventing dust, soil, or dirt from collecting beneath the nail (n = 11; 46%) or for aesthetic reasons (n = 8; 33%). Some mothers acknowledged the possibility of contamination by germs or worms and of getting diarrhea by having long nails (n = 11; 46%). Two mothers believed that keeping children's nails short was necessary to prevent them from hurting themselves. However, mothers were not allowed to cut their children's nails when they were sick because the illness could persist. This belief was passed from generation to generation.

> *"According to my mother, when my child is ill, I'm not allowed to cut her nails because it will prevent her from getting well." (33 years, less than 9 years of schooling)*

DISCUSSION

This study sheds light on hygiene perceptions and practices of urban mothers from low socioeconomic class. It is clear that mothers' perceptions play an important role in determining hygiene practices, as has been demonstrated in several prior studies.[30,34] Furthermore, perceptions are shaped by existing culture and norms within the community.

Diarrhea

This study demonstrated that the way a mother conceptualizes diarrhea can determine her actions when her children get diarrhea. In this study, mothers differentiated diarrheal episodes as either disease or nondisease. As a disease, mothers related diarrhea to unhygienic environments and food handling practices. This concept is similar to findings in Nigeria, Papua New Guinea, and Pakistan.[11-14] As a nondisease, mothers related diarrhea to a child's developmental milestones. This conceptualization has been reported in several studies.[6,30,34] Such a perception has serious implications with respect to attitudes of mothers toward the management of diarrhea. When a diarrheal episode is regarded as a normal phenomenon accompanying a major milestone, it results in "ignorance" of treatment.[35] A study in Tangerang subdistrict showed that during diarrhea, 23% of children were given smaller amounts of liquids, whereas 59% were given smaller amounts of food. Additionally, most children (69%) were not given oral rehydration solution (ORS).[32] The World Health Organization (WHO) and the United Nations Children's Fund recommend the use of newly formulated oral rehydration salts, which contain lower concentrations of glucose and salt as well as zinc supplementation, for a period of 14 days in the clinical management of diarrhea.[1] In addition, treatment of dehydration with appropriate fluids, breast-feeding, continued feeding, and selective use of antibiotics can reduce the duration, severity, and frequency of diarrheal episodes.

Despite the prevalence of improper home management of diarrhea, some mothers were already practicing correct treatment, namely, increasing fluids and food during illness. One reason might be that they seek advice from a health professional living in the neighborhood. A study in Tangerang subdistrict noted that in 73% of diarrhea cases, mothers sought advice from Cadres or health personnel at the village Integrated Health Post.[32]

Another important perception regarding the causes of diarrhea was that when mothers ate sour or spicy food or drank iced drinks, their breast milk would cause diarrhea in their children. This perception is similar to a study in Orissa, India.[34] However, the Tangerang study found that mothers developed this concept after using breast-feeding as a method of treating diarrhea, which was not described in the Orissa study. Further investigation is needed on this particular topic.

Mothers stated that an external cause of diarrhea was food bought outside the home (eg, purchased in the market). A similar study found that the public thinks that the greatest risk of diarrhea infection is from food prepared outside home,[36] which

presents a challenge for mothers who are unaware that poor hygiene practices, particularly food and personal hygiene performed at home, can also contribute to the incidence of diarrhea. This perception could be used as a starting point to introduce health messages aimed at improving hygiene habits.

Food Hygiene

Although mothers recognized the importance of proper food hygiene as a preventive measure for diarrhea and as a method of maintaining good health, few practiced proper cleaning of food items. Vegetables and fruits should be washed before preparation or consumption, either with or without peel,[37] because fresh fruits and vegetables can occasionally become contaminated with harmful pathogens at any point, from the field to serving time.[38] The perception that it is unnecessary to clean or that it is safe to consume ready-to-eat food is a barrier between what should be done according to scientific knowledge and what actually becomes the practice within the household. The lack of awareness by mothers about the risk of illness caused by fresh produce might be related to their concept of dirtiness. Mothers' perception of "dirty" is that it is something visible rather than invisible,[25] or that it smells bad, as found in this study.

According to WHO, food for infants and young children should be prepared near serving time and kept at a safe temperature, that is, below 5°C (cold) or maintained at 60°C (hot).[37] Food should be stored at these hot or cold temperatures or should be thoroughly reheated (reaching 100°C) before giving it to children.[37,39] However, the inconvenience of having to cook twice and the belief that it is safe to leave food at ambient temperature appear to be reasons for mothers' observed practices. These common practices provide an environment that allows bacteria to multiply.[6,8] Similar practices were found in a study in eastern Nigeria, where food was typically stored either in cupboards or covered pots for an average of 6 hours and often overnight. The practice of preparing food several hours before consumption and poor storage practices were recognized as 2 main areas of concern in food preparation.[38] In addition, many mothers were still unaware of the importance of properly reheating. The process of reheating was done primarily to make the food warm and for taste, and not to destroy pathogens.[8] Therefore, stressing to mothers the importance of serving and keeping food at safe temperatures to prevent diarrheal infections becomes critical. The cost per case of neglecting this practice is very high, especially for young children.[36]

Avoiding cross-contamination is 1 of the 5 major control factors for pathogens and the most critical of the violations performed at home (76%), because it leads to foodborne illness.[8,36] The World Health Organization stresses the importance of clean equipment for food preparation to prevent the transfer of pathogens into food.[10,39] Moreover, utensils used for raw food should be separated from utensils for cooked food and should be washed after use.[37] However, in this study, the use of unwashed cutting boards and knives was common (79%). A board used to cut raw vegetables was considered harmless and washing was considered important only when the utensils had a bad smell. Odor was an important aspect of equipment cleanliness for these mothers. This concept was also raised in another study, where the authors related odor with dirtiness of hands.[25] It is important to communicate to mothers that "harmful things do not always smell bad." Warm, moist conditions provide a supportive environment for mold and bacteria to grow.[40]

The World Health Organization discourages the use of bottles for child feeding because they are difficult to clean. Instead, WHO recommends using glass dishes and spoons,[10,37] both thought to be microbiologically safer than feeding with bottles and nipples.[10] A study in Thailand showed that weanling diarrhea is significantly associated with washing feeding utensils without dishwashing detergent.[41] Using the reasons mothers brought up in this study (soap left a bad smell in bottles), they should be encouraged to use a cup and spoon to feed their children.[37]

Purchasing food from outside the home might pose considerable health risks, not only because of the lack of facilities for food protection, but also from unwashed hands of vendors and the material used for wrapping.[8] Although most mothers perceived buying cooked food from outside the home as more expensive, they continued to purchase it for 3 main reasons, namely, work overload, their condition, and their children's condition. Thus, to diagnose the contribution of this activity to childhood diarrhea, it is necessary to assess the safety of food vendors to gather comprehensive information on the condition of the food and habits of the sellers.

Personal Hygiene

Hand washing is considered to be the primary control for disease transmission during food preparation[36] and as one of the most effective ways to reduce the risk of diarrhea.[29] Thus, this practice should become the first priority to be introduced to the community.

According to mothers, 2 critical times for washing hands were before touching food and after defecation. This opinion was similar to a WHO recommendation, which states that hands should be washed before handling food, often during food preparation, after defecation, and after attending children who have defecated.[37] However, mothers' perception of the importance of hand washing appeared to be related to the concept of dirtiness rather than with germ theory. A study in Bangladesh revealed that cleanliness generally was not based on germ theory but was viewed as a larger, socioreligious context of purity versus impurity. Soap was regarded as a cosmetic, not an agent for removal of microorganisms.[42] In this study, soap was considered to be important for removing odors, thus it was more about aesthetics than cleanliness. The nutrition survey in Tangerang supports this finding, because 36% (from a total of N = 944) of mothers did not wash their hands using soap.[32] Essentially, the mothers would wash their hands when they felt uncomfortable. Another study yielded similar findings, that is, hands are washed when visibly dirty or smelly.[29,34] In this study, raw vegetables were considered not dirty

since they do not leave odors behind on hands. Thus, washing hands with water only was perceived to be enough. This practice, however, differs from standard recommendations that hands should be washed under warm running water using soap, with hands rubbing together for at least 20 seconds, rinsed, and dried with a clean towel.[42,43] Furthermore, fingernails should be scrubbed with nail brushes, especially after visiting the toilet or when heavily soiled.[43] The nutrition survey in Tangerang noted that diarrhea in children was statistically significantly associated with improper hand-washing techniques.[32] The association of hand-washing practices and the occurrence of diarrhea was also noted in studies in other countries.[11,12,14-16] Intervention messages should provide correct hand-washing techniques and include the recommendation to provide nail brushes.

Although hand washing should be done using warm running water and soap, one might face problems when trying to apply this method in developing countries due to the lack of clean water and soap in houses. A prior study in Tangerang showed that 68% of water sources were contaminated with coliform and *E. coli*.[32] There is a need to modify health messages to include the necessary perceptions about the use of soap, namely, that soap is effective to remove not only odors, but also microorganisms.

Some mothers knew the importance of drying hands, although they still used their clothes or air dried their hands. This finding was similar to a study in Peru, in which mothers usually dried their hands with their dresses or any "reasonably" clean cloth.[25] It is conceivable that this method provides the risk of contamination, though according to current knowledge, studies of effects of improper hand drying on diarrhea incidence, especially in young children, are limited. This study was unable to provide information on ethnicity, culture, and norms to possibly explain mothers' behaviors.

Some mothers realized the importance of clean fingernails. Intervention messages should reinforce hand cleanliness, especially related to safe food preparation for children. Although it was not possible to collect data related to children's hand-washing behavior, the same concepts of personal hygiene and food safety can be relayed to children. The belief that persists about the relationship between cutting nails and illness in children should be explored first before correct intervention messages can be designed.

IMPLICATIONS FOR RESEARCH AND PRACTICE

This study describes perceptions that may influence mothers' food practices and personal hygiene. The information could be used as a starting point to introduce food and personal hygiene education intervention by incorporating perceptions into health messages. This approach might have a small impact on diarrhea reduction until such time that improvements to infrastructure can be made to provide households with access to safe water and sanitation. An integrated intervention plan combining behavior messages with improved infrastructure could have a greater impact on reduction of diarrhea prevalence. To successfully intervene to improve hygiene practices, factors that should be considered include how people recognize problems in their own area and how they manage to overcome these problems. These become crucial factors in identifying important issues from the community point of view. Other determining factors include availability, affordability, and accessibility of hygiene facilities (eg, the latrine, clean water, and public garbage disposal). If an education intervention was designed without considering these facilities, it is less likely that people will adopt the practices.

The limitation of this study was the inclusion criteria of only households with children suffering from diarrhea; therefore, perceptions of mothers whose children did not suffer from diarrhea cannot be distinguished. The small number of participants and the nature of the study made it impossible to conduct statistical analysis to explain causal relationships between factors. However, insights gained through this study provide valuable information about relationships between these factors and can be used to guide future research and intervention activities.

Mothers in the area of study had several perceptions regarding food and personal hygiene practices. The perception of food hygiene was primarily related to efficiency, mothers' time availability, and lack of understanding in terms of causes of food contamination. The perception about personal hygiene, on the other hand, was due to comfort. The perception was derived either from experience, formal knowledge, or the influence of other people. Knowledge does not necessarily lead to action, because people interpret new information in light of their own meanings, perceptions, and backgrounds. Health messages, especially those delivered by cadres or midwives, had succeeded in influencing community knowledge because they were delivered according to the existing beliefs, norms, and culture.[44]

Several practices (purchase of prepared food and not using soap to wash hands) and perceptions (belief that utensils without odors are safe and that boiling a bottle takes too long) might increase the risk of childhood diarrhea. This information could be the basis of modified health messages aimed at improving unhygienic behaviors. Further study is necessary to explore home management treatment of diarrhea, habits and safety of food vendors, and the effect of improper hand drying on diarrheal incidence in young children.

ACKNOWLEDGMENTS

This study is part of a larger nutritional survey conducted by the Southeast Asian Ministers of Education Organization (SEAMEO) Tropical Medicine and Public Health (TROPMED) Regional Center for Community Nutrition (RCCN), Universitas Indonesia, and CARE International Indonesia, Tangerang. Data for this manuscript are partly taken from the thesis work of Ms. Devy Davelyna. We thank Mr. Frank Page and his staff for their great support, Dr. Anita Shankar, all the Posyandu (Integrated Health Post) cadres, and the mothers who participated in the study.

REFERENCES

1. United States Agency for International Development, The United Nations

Children's Fund, The World Health Organization. *Diarrhoea Treatment Guidelines—including new recommendations for the use of ORS and zinc supplementation—for Clinic-Based Healthcare Workers*. Arlington, VA: The MOST Project; 2005.
2. Bryce J, Boschi-Pinto C, Shibuya, Black RE, WHO Child Health Epidemiology Reference Group. WHO estimates of the causes of death in children. *Lancet*. 2005;365:1147-1152.
3. World Health Organization. *Mortality Country Fact Sheet 2006*. Available at: http://www.who.int/whosis/mort/profiles/mort_searo_idn_indonesia.pdf. Accessed September 30, 2009.
4. Ministry of Health [Departemen Kesehatan Republik Indonesia]. *Indonesia Health Profile 2001*. Jakarta; Ministry of Health, Indonesia; 2002.
5. Helen Keller International (HKI). Nutrition and health surveillance in rural Banten: key results for the period Feb 1999-Jul 2001. *Indonesia Crisis Bulletins*. 2002;4(8).
6. Motarjemi Y, Kaeferstein F, Moy G, Quevedo F. Contaminated weaning food: a major risk factor for diarrhea and associated malnutrition. *Bull World Health Organ*. 1993;71:79-92.
7. Cameron M, Hofvander Y. *Manual on Feeding Infants and Young Children, 3rd ed*. Oxford, United Kingdom: Oxford University Press; 1983.
8. Ehiri JE, Azubuike MC, Ubbaonu CN, Anyanwu EC, Ibe KM, Ogbonna MO. Critical control points of complementary food preparation and handling in Eastern Nigeria. *Bull World Health Organ*. 2001;79:423-433.
9. The United Nations Children's Fund, World Health Organization. *Progress on Drinking Water and Sanitation: special focus on sanitation*. Geneva, Switzerland: World Health Organization; 2008. Available at: http://www.wssinfo.org/en/40_MDG2008.html. Accessed September 30, 2009.
10. World Health Organization. Global strategy for infant and young child feeding. Geneva, Switzerland: World Health Organization; 2003.
11. Oyemade A, Omokhodion FO, Olawuyi JF, Sridhar MKC, Olaseha IO. Environmental and personal hygiene practices: Risk factors for diarrhea among children of Nigerian market women. *J Diarrhoeal Dis Res*. 1998;16:241-247.
12. Bukenya GB, Kaser R, Nwokolo N. The relationship of mothers' perception of babies' faeces and other factors to childhood diarrhea in an urban settlement of Papua New Guinea. *Ann Trop Paediatr*. 1990;10:185-189.
13. Huttly SRA, Blum D, Kirkwood BR, Emeh RN, Feachem RG. The epidemiology of acute diarrhea in a rural community in Imo State, Nigeria. *Trans R Soc Trop Med Hyg*. 1987;81:865-870.
14. Halvorson SJ. Women's management of the household health environment: responding to childhood diarrhea in the northern areas. *Pakistan. Health Place*. 2004;10:43-58.
15. Scott BE, Lawson DW, Curtis V. Hard to handle: understanding mothers' hand washing behavior in Ghana. *Health Policy Plan*. 2007;22:216-224.
16. Gorter AC, Sandiford P, Pauw J, Morales P, Perez RM, Albert H. Hygiene behaviors in rural Nicaragua in relation to diarrhea. *Int J Epidemiol*. 1998;27:1090-1100.
17. Choprapawon C, Chunsutiwat S, Kachondham Y, Weiss MG. Cultural study of diarrheal illnesses in central Thailand and its practical implications. *J Diarrhoeal Dis Res*. 1991;9:204-212.
18. Ahmed IS, Eltom AR, Karrar ZA, Gibril AR. Knowledge, attitudes, and practices of mothers regarding diarrhea among children in a Sudanese rural community. *East Afr Med J*. 1994;71:716-719.
19. Kauchali S, Rollins N, Van den Broeck J, Child Health Group. Local beliefs about childhood diarrhea: importance for healthcare and research. *J Trop Pediatr*. 2004;50:82-89.
20. Kapoor P, Rajput VJ. Maternal knowledge, attitudes, and practice in diarrhea. *Indian Pediatr*. 1993;30:85-88.
21. Sodemann M, Jakobsen MS, Mølbak K, Martins C, Aaby P. Management of childhood diarrhea and use of oral rehydration salts in a suburban West African community. *Am J Trop Med Hyg*. 1999;60:167-171.
22. Kaltenthaler EC, Drasar BS. Understanding of hygiene behavior and diarrhea in two villages in Botswana. *J Diarrhoeal Dis Res*. 1996;14:75-80.
23. Hurtado E. Rapid assessment procedures in formative research for a community intervention on water related hygiene behavior. *Food Nutr Bull*. 1994;15:71-76.
24. Ahmed A, Khan MS, Alam MM. KAP study on hygiene, sanitation and safe water use. Paper presented at: 27th WEDC International Conference; 2001; Lusaka, Zambia.
25. Fukumoto M, Del Aguila R. Why mothers wash their hands. *Dialogue Diarrhoea*. 1989;39:1-8.
26. Curtis V, Cairncross S, Yonli R. Review: Domestic hygiene and diarrhea—pinpointing the problem. *Trop Med Int Health*. 2000;5:22-32.
27. Luby SP, Agboatwalla M, Feikin DR, et al. Effect of hand washing on child health: a randomized controlled trial. *Lancet*. 2005;366:225-233.
28. Bhutta ZA, Ahmed T, Black RE, et al. What works? Interventions for maternal and child undernutrition and survival. *Lancet*. 2008;371:417-440.
29. Curtis V, Cairncross S. Effect of washing hands with soap on diarrhoea risk in the community: a systematic review. *Lancet Infect Dis*. 2003;3:275-281.
30. Nielsen M, Hoogvorst A, Konradsen F, Mudasser M, Van der Hoek W. Childhood diarrhea and hygiene: mothers' perception and practices in the Punjab, Pakistan Available at: http://www.iwmi.cgiar.org/Publications/Working_Papers/working/WOR25.pdf. International Water Management Institute working paper 25. Published 2001. Accessed September 30, 2009.
31. Kusumaningrum H. Food Hygiene Scenario in Indonesia. Paper presented at: Roundtable Discussion between International Scientific Forum on Home Hygiene; 2004; Jakarta, Indonesia.
32. Usfar A, Wirawan N. Baseline Survey Report: Assessment of Nutritional Status and Morbidity of Infants and Children, Households Food Consumption, Personal and Environmental Hygiene. Jakarta, Indonesia: SEAMEO-TROPMED Regional Center for Community Nutrition, Universitas Indonesia and CARE International Indonesia; 2006.
33. Miles MB, Huberman AM. *Qualitative Data Analysis*. Thousand Oaks, CA: SAGE Publications; 1994.
34. Mohaputra SS. Beliefs of rural mothers about diarrhea in Orrisa India. *Dialogue Diarrhoea*. 1989;39:7.
35. Ene-Obong HN, Iroegbu CU, Uwaegbute AC. Perceived causes and management of diarrhoea in young children by market women in Enugu State Nigeria. *J Health Popul Nutr*. 2000;18:97-102.
36. Medeiros LC, Hillers VN, Kendall PA, Mason A. Food safety education: What should be teaching to consumers? *J Nutr Educ*. 2001;33:108-113.

37. World Health Organization. *Basic Principles for the Preparation of Safe Food for Infants and Young Children*. Geneva, Switzerland: World Health Organization; 1996.
38. Van Laanen P, Scott A. *Washing Fresh Fruit and Vegetables*. College Station, TX: Texas Cooperative Extension, The Texas A&M University System; 2004. Available at: www.fruitandvegetablesafety.tamu.edu/consumers/washing_FV.pdf. Accessed September 30, 2009.
39. Kaeferstein FK. Food safety: the fourth pillar in the strategy to prevent infant diarrhoea. *Bull World Health Organ*. 2003;81:842-843.
40. Cotruvo JA, Dufour A, Rees G, et al, eds. *Waterborne Zoonoses: Identification, Causes and Control*. London, United Kingdom: IWA Publishing; 2004.
41. Cao X, Rawalai K, Thompson AJ, et al. Relationship between feeding practices and weanling diarrhea in Northeast Thailand. *J Health Popul Nutr*. 2000;18:85-92.
42. Zeitlyn S, Islam F. The use of soap and water in two Bangladeshi communities: implication for the transmission of diarrhea. *Rev Infect Dis*. 1999;3(suppl 4):S259-S264.
43. Hayes PR. *Food Microbiology and Hygiene*. *2nd* ed. London, United Kingdom and New York, NY: Elsevier Applied Science; 1992.
44. Ahmed NU, Zeitlin MF, Beiser AS, Super CM, Gweshoff SN, Ahmed MA. Assessment of the impact of hygiene intervention on environmental sanitation, childhood diarrhea and the growth of children in rural Bangladesh. *Food Nutr Bull*. 1994.15:40-52.