HEALTH EDUCATIONAL INTERVENTION TO PREVENT DIARRHEAL DISEASE IN CAREGIVERS OF CHILDREN UNDER FIVE YEARS OLD: EVIDENCE-BASED NURSING

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ABSTRACT

Diarrhea is a leading cause of death of children under-five years 'age in low to middle income countries such as Bangladesh. The purpose of this study is to analyze and synthesis current evidence related to health education intervention for caregivers regarding the prevention of diarrheal disease in children under five years old and established pliable recommendations from the evidence. The related pieces of evidence published in english were acquired from materials published from 2000 to 2014 available via electronic data based. Evidence collection was conducted using PICO (population, intervention, comparison) framework. One randomized control trial, two quasi–experimental and two systematic reviews were included in this study. The health education intervention regarding diarrheal prevention frequently delivered throughout the community. The teaching activities of the education programs were lectures, group discussions, demonstrations and home visits. The types of media utilized for the education intervention included video tapes, powerpoint presentation, flipcharts and leaflets in order to increasing mothers' knowledge and practice. The factors influencing diarrhea prevention intervention consist of environmental sanitation, uncontaminated food, purified water and personal hygiene. The research instruments included structured questionnaire, site observation and weekly home visits to count the number of diarrhea incidences that occurred amongst children. The findings from the evidence support the idea of diarrhea prevention education intervention as an effective practice for caregivers of under-five year's children in order to reduce the incidences of diarrhea in the community.

It is suggested that diarrhea prevention education program should be developed and implemented to suit the community setting in the context of Bangladesh. Further research to evaluate the effectiveness of education intervention is recommended.

KEY WORDS:CAREGIVERS / PARENTS / HEALTH EDUCATION INTERVENTION / DIARRHEA PREVENTION

39 pages

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CHAPTER I
INTRODUCTION

1.1 Background and significance of the problem

Diarrhea is a significant health problem in much of the world, particularly in developing nations where the effects are greatest among children under five years old. A water and food borne disease, diarrhea is mainly transmitted by the fecal-oral route. Worldwide, there are nearly 1.7 billion cases of diarrheal diseases affecting children under five years of age each year with approximately 760 thousand deaths among children aged less than five years (WHO, 2013). The survey study shows that regionally1.3 thousand million episodes of diarrhea occur among children less than five years of age, including children in Asia, Africa and Latin America. Approximately four million children in this group die from diarrhea annually, and 80% of those deaths occur during the first two years of life (Ara, Alam, & Momen, 2011).

Bangladesh has a high incidence of diarrheal disease due to its geographical characteristics, climate conditions and unsafe disposal of excreta. The disease is endemic throughout the year in all parts of the country. The highest prevalence is reported between pre-monsoon from April to May and post-monsoon from September to October. There is no updated official record on the number of diarrhea episodes. Bangladesh ranks seventh for annual deaths among children under five years of age for a total of 50,800 diarrhea-related deaths (WHO/UNICEF, 2009). In 2012, approximately 36,055 children under five years of age were admitted to fourteen Upa-zila health complexes (rural areas) in the Chittagong district where 20,969 children suffered from diarrhea. Seven of these died as a result of diarrhea (Ministry of Health and Family Welfare, 2013).

Diarrhea is defined as having loose or watery stools at least three times per day or more frequently than normal for an individual. Although most episodes of childhood diarrhea are mild, acute cases can lead to significant fluid loss and

dehydration, which may result in death or other serious consequences if fluids are not replaced at the first sign of dehydration (WHO, 2009).

The most common life-threatening complication of diarrhea is dehydration which is caused by loss of body fluids. When sick children have diarrhea and vomiting, they can lose huge amounts of salt and water as their bodies become rapidly dehydrated. Even hospitalized patients can become dehydrated without prompt treatment. The other early complications are (1) decreased appetite (2) infection (3) hypoglycemia (4) weight loss (5) renal failure (Datta, 2009).

The negative effects of childhood diarrhea on families include extra costs for medicine, extra traveling costs, increased family expenditures and decreased family income. Mast, Mercon, Kelly, Floyd and Walter (2009) asserted that household family members were worried about the severity of diarrhea among children. Family life was affected in various ways, including missed work, loss of sleep and inability to perform normal activities in the family. Another author conducted a cross-sectional study of expenses incurred and awareness of costs among Bolivian families and the burden of pediatric diarrhea. According to the findings, the costs incurred were also significantly higher for inpatients than outpatients. Consultant fees totaled 30% of the incurred costs, while indirect costs accounted for another 29% and direct non-medical costs constituted 21%. These results indicated that consultation fees and indirect costs were a large relative burden upon families and caregivers compared to other costs associated with diarrheal episodes. On the whole, 68.5% of caregivers felt that diarrheal costs affected their families financially (Bark et al., 2013).

The three factors causing diarrhea are agent, host and environment. For agents, diarrhea mostly infects a large number of organisms responsible for acute diarrhea in which the infectious agents cause diarrhea with enteric infection. The most common causative agents of diarrhea are viral and bacterial. Viral diarrhea, especially rota virus, is found in winter, and bacterial diarrhea more frequently occurs in the summer and rainy seasons (Datta, 2009).

Children are the vulnerable host for diarrhea, especially children aged from 6 months to 2 years. The incidence is highest during the weaning period of 6 to 11 months of age when diarrhea occurs as a result of the combined effects of reduced maternal antibodies, absence of active immunity and introduction of contaminated

foods or direct spread through children's hands. Diarrhea is most common in formula feeding, especially with contaminated cow's milk or unhygienic preparation of infant formula (Datta, 2009).

Children in Bangladesh are at greater risk for diarrhea because most of the caregivers in the community have insufficient knowledge about the prevention of childhood diarrhea in the community. Some caregivers do not maintain personal hygiene and food hygiene. They do not wash their hands with soap, detergent or antiseptic solution after defecating, changing diapers, touching any object or before preparing food. Others use unclean and unboiled feeding bottles after feeding their babies (Datta, 2009).

Diarrheal disease is commonly seen in unhygienic environments such as settings with poor water supply, poor sanitation practices and open defecation. In Bangladesh, 18 million people use open defecation (WHO, 2009). From the author's experience, caregivers in the community sometimes use open defecation and uncovered food. Consequently, flies contact the stool and food; children eat the food and soon become affected by diarrhea. If caregivers would be concerned about the problem, it would be unlikely to occur. Hence, parents and caregivers play an important role in preventing diarrhea in families and communities. Many family members live in the same house. The surrounding families are unclean and caregivers are not aware about environmental hygiene practice. Primary caregivers in the family are the persons responsible for younger children. In Dhaka, Bangladesh, a study was conducted in an urban community from December 2010 to 2011. The Study showed diarrhea to have a significant ($p < 0.05$) relationship with the participants' knowledge, occupation and monthly incomes. In knowledge scores, less than half of the participants had good knowledge while approximately fifty-four percent of the participants had poor knowledge about cholera (Wahed et al, 2013). Other important causes of diarrhea are related to dietary or nutritional factors, e.g. overfeeding, underfeeding, or malnutrition, stunting, food allergies, food poisoning and some drugs (Datta, 2009).

Diarrhea prevention is defined as avoiding the spread of infections that cause diarrhea. These infections can be spread by contaminated food or water, dirty hands and direct contact with fecal matter. Diarrhea can be prevented through the use

of safe household water in cooking, drinking and utensils with the use of proper sanitation, food hygiene, personal hygiene and proper hand washing with soap. These are the comprehensive approaches aimed at preventing childhood diarrhea (Kleinau, Post, & Rosensweing, 2004).

Diarrhea prevention programs are essential to reducing the incidence rate of diarrhea in rural communities. Diarrhea prevention programs refer methods for performing diarrhea prevention activities. The programs provide health education for caregivers. Health education intervention is part of diarrhea prevention programs.
Health education provides information about healthy behaviors and caregivers eventually gain knowledge and practice as behavior is modified and healthy lifestyles are created for children.

According to the World Health Organization (WHO), health education as a learning action plans to increase the knowledge of the people concerning healthy lifestyles while building personal principles and skills to promote health. Education programs can modify attitudes and practices. Another study conducted in a community in Colombia aimed to prevent diarrheal disease by providing educational intervention to caregivers of children less than five years of age. After applying the educational program, the participants changed with sufficiently improved knowledge, adequate practice, reduced severity of disease, perceived susceptibility and knowledge of the consequences of non-prevention with habits and practice that were statistically significant (Villareal et al., 2011). Hence, the incidence rate of diarrhea can be reduced by providing health educational intervention to caregivers in community settings.

1.2 Clinical problem of the study

Childhood diarrhea is a leading cause of childhood morbidity and mortality in middle and low income countries. The same is also true for the conditions in Bangladesh. In the author’s clinical setting at the government medical college hospital in Chittagong from January to December of 2013, a total of 10,433 children less than five years of age were admitted to the pediatric department and 12.27% of these children were suffering diarrhea. Most of the patients came from urban slums and rural communities in the district (Data were collected from the admission registry

of the ward). The clinical problem of the study is insufficient knowledge and a general absence of good hygienic practice in taking care of children in households where children are easily affected. The population requires better knowledge about how to prevent diarrhea with good hand hygiene, food safety and the use of pure drinking and household water in order to ensure that the incidence of diarrhea episodes is reduced, etc. In the author's clinical setting, insufficient education is provided to caregivers for the prevention of diarrheal disease. Evidence from many studies has indicated that educational intervention can prevent and reduce the incidence of diarrheal disease. Nurses have no guidelines for providing educational intervention in community settings.

In the context of Bangladesh, most of the people are living in rural and urban slum areas. The quality of life for the residents of rural and urban slum areas is poor. Many people live in the same house in overcrowded conditions. They do not keep their surroundings clean. Many people use the same toilet and open defecation is sometimes used. People cook and eat food in the same place. The routine practice of the caregivers in the communities is to use water from ponds and rivers for preparing and cooking food. Caregivers do not properly wash and boil the bottles before and after feeding children. The caregivers of children in the rural communities do not wash their hands properly before the preparation food or after cleaning children's defecation. Caregivers do not take proper care of the children in the household because, they do not have sufficient knowledge about diarrhea prevention practices.

In Bangladesh, insufficient community-based health education for rural and community people is a serious issue. In community settings, nurses do not teach caregivers about the prevention of diarrhea because there is a shortage of community nurses and health care personnel in general. There is not sufficient time or proper practice guidelines to support practice in the community.

In the health care system of Bangladesh, only one district public health nurse monitors the entire district. Sometimes, the public health nurse visits the rural hospitals and contacts local nurses and health administrators. Health workers conduct immunization programs and provide vaccines in the community and rural health centers. Recently, the government has recruited some health care providers to the community clinics with 6,000 people who work as providers of first aid, not

preventive care. In the author's practical experience, the problem of the caregivers in communities is a dearth of knowledge, inadequate awareness and improper hygienic practice in the household. Caregivers do not wash their hands before eating, preparing food, going to the bathroom or cleaning children's defecation. They forget the proper health behaviors and practices during their routine household care. There are not enough guidelines for practice among community residents, nor is evidence used to guide the practice. There is a need for evidence to support the work of nurses and health care workers in implementing proper practice in community settings.

Children are the future of the nation. The author believes that this type of strategy would be helpful if used in the author's community, because most of the people in Bangladesh are living in rural and urban slum areas where some people know about the disease, but do not apply proper practice and hygiene to their daily lives. Some people do not practice preventive measures and are not aware of their habits and practice. If the author provides a health education program in his community, most of the caregivers would gain more knowledge and be able to modify their behaviors. Consequently, the prevalence and susceptibility of the disease will be reduced with prevention of diarrheal episodes and decreased mortality nationwide to increase the life expectancies of children less than five years of age with decreased burdens related to family expenditures.

1.3 Purpose of the study

To analyze and synthesize current evidence-based practice in regard to health education programs for preventing diarrheal disease involving caregivers of children under five years of age.

1.4 Expected benefits of the study

The recommendations from the evidence-based practice can be used to provide educational programs for preventing diarrheal disease in caregivers of children under five years of age.

CHAPTER II
METHODOLOGY

The study aim to analyze and synthesis current evidence in regard to health educational interventions for caregivers to prevent diarrheal disease in children under five years old. The review was based on the related evidence available at the Mahidol University electronic databases. Each sample of related evidence was appraised for its quality and feasibility by considering the setting and circumstances, health care resources, and caregiver's preferences and values. Next, the author extracted data from the evidences and the evidence-based intervention were summarized. In this chapter, the author describes search strategy eg. search framework and scope.

2.1 Search strategy

2.1.1 Search framework: The author searched and selected the evidence for health educational interventions for caregivers in the prevention of diarrheal disease among children under five years old by using the PICO Framework (Melnyk & Fineout-Overholt, 2005) with the following details:

P (population) = caregivers/parents/mothers of under five years children

I (Intervention) = health education intervention/education intervention

C (Comparison) = Usual care/ usual activities

O (Outcome) = diarrhea prevention

2.1.2 Scope of the search: Health educational interventions for caregivers to prevent diarrheal disease in children under five years old with community-based care based on validated evidence-based practice was searched from the following scope:

1) The following keywords were used in the search according to the PICO framework**:**

P **(**population)	= “Caregiver” or “Parents” or “Mothers” of under-five years children.
I (Intervention)	= “Health education” or “education intervention”
C (Comparison)	= “Usual activities” or “usual care”
O (Outcome)	= “Incidence rate of diarrhea” or “occurrence of diarrhea” or “episode of diarrhea”

The search used a Boolean operator. For each PICO element, the author collected any synonyms by linking terms with “OR”, then located citations that are relevant to all the PICO elements by linking with “AND”.

2) Databases /sources use for the search**:** The author used electronic databases/sources of the Mahidol University library system. The author searched for systematic reviews from the Cochrane Database of Systematic Reviews and Joanna Briggs Institute Systematic Reviews Database. The Cumulative Index to Nursing and Allied Health (CINAHL), Ovid Full Text, Pro-Quest nursing, Pub Med, Science Direct, Clinical Key and Springer Link were used to search for single research studies, with a manual search and tracing of references from the papers; the author then searched further from libraries, Google scholar and electronic databases. For guidelines, the authors searched from the National Institute for Health, clearing house guideline and Care Excellence websites.

3) Type of evidence: The author searched for guidelines, systematic reviews of randomized controlled trials (RCTs) or quasi-experimental studies, single randomized controlled trial, and single quasi-experimental studies acquired from full text studies published in English from 2000 to 2014**.**

2.2 Appraisal methods and levels of evidence

The author used empirical evidence from evidence-based nursing. The author assessed the different types of evidence and levels of evidence according to the evidence categorization criteria and checked data validity with the author’s advisory professors**.** The author appraised the data with three questions.

2.2.1 Appraisal methods: The author searched for articles by considering the PICO format and followings the guidelines of Melnyk and Fineout-Overholt (2011) to ensure the validity, reliability and applicability of the research articles capable of providing empirical data related to the purpose of the current study**.**

1) Validity: The validity of the study refers to whether the research findings were obtained through sound scientific methods and capable of answering the research questions. The findings proposed to answer the clinical question and solve the problem. Some factors included bias influence on the results. The researcher should take steps toward randomly assigning the procedure in order to avoid confounding variables that would easily compromise the findings and eliminate bias. Randomization is essential to experimental studies such as randomize control trials because; randomization can yield accurate results after analysis. Different outcomes are expected from two groups involved in intervention and control groups. The researcher should also conceal the intervention and control groups in order to reduce bias; resulting from the participants' familiarity with one another as well as familiarity with those evaluating the outcomes of the study. Validity is significant for research because it helps measure the types of tests. The author ensured that the methods used were not only ethical and cost effective, but also yielded true measurement of the ability to meet all of the requirements and solve the clinical problems.

2) Reliability: The studies were assessed for appropriateness and reliability in relation to the research design throughout the studies in the area of subject matter, variables, research hypotheses, objectives, data collection, data analysis, sample group and instrument reliability. The author kept in mind the effect size of the outcome differences between the intervention and comparison groups. Furthermore, the author considered the *p* value and confidence interval when the research revealed data from the analysis. The large effect size and wide confidence interval were analyzed for application to the author's own practical setting for the study. The findings were accepted when the findings were revealed by trials and reported to confirm statistically significant differences between the intervention and

comparison groups. If the findings are consistent across different settings, the author can be more confident that the findings are reliable.

3) Applicability:

Transferability of the Findings: All of the evidence was evaluated by the author for possibility of submission in the clinical setting such as the similarities of service users in the organization with the sample group caregivers of children under five with diarrhea, correct methods for situations in the organization in terms of readiness, values of care, models for application at the institute and the number of service recipients involving caregivers of children under five with diarrhea in the community requiring improved knowledge and preventive behaviors to be benefitted by the program.

Feasibility of implementation: This type of experimentation will be supported by the ability of society and measured by the support received from the authority of the organizations with measurement and encouragement in terms of personnel, equipment, tools and instruments in addition to any complexity of methods.

Cost/benefit ratio: Through applying this evidence, more effective benefits can be gained than regular practice and with decreased risk for unpleasant incidents with patients. There is no need for extra expenses, but the equipment used is simple and available in the community with the result of reducing episodes of diarrhea, lowering medical expenses, increasing client satisfaction and decreasing family burdens in addition to saving money and time.

2.2.2 Level of evidence: The studies were assessed for practicality in clinical settings. Furthermore, the researcher searched and selected empirical evidence by applying the principles of Melnyk and Fineout- Overholt (2011). The criteria are as follows:

Table 2.1 Levels of evidences

Level of evidence	Source of empirical evidence
Level I	Evidence from a systematic review or meta-analysis of all relevant randomize control trials (RCT's)
Level II	Evidence obtained from well-designed RCTs
Level III	Evidence obtained from well-designed controlled trails without randomization
Level IV	Evidence from well design case-control and cohort studies
Level V	Evidence from systematic reviews of descriptive and qualitative studies
Level VI	Evidence from a single descriptive or qualitative study
Level VII	Evidence from the opinion of authorities and/or reports of expert committees

CHAPTER III
FINDINGS

The author followed the steps and scope of the search for evidence-based practice from available different related articles on the prevention of diarrheal diseases in children under-five years of age by providing a health education program among caregivers.

3.1 Search results

The author searched the electronic databases, Pro Quest Nursing, Cochran Database, Science Direct, Pub Med, CINAHL, Bio Med Central, Springer Link, Hand search and Google scholar of the Mahidol University Library system for evidence of a health education intervention for caregivers of children under five years of age with prevention of diarrheal disease in a community setting. After completion of the search for evidence-based nursing, the author obtained different types of evidence including research articles and systematic reviews. Firstly, the author collected 49 samples of evidence with relevant titles. Then the author read the titles to determine relevance in terms of population, intervention and outcome of the studies. If a title was relevant, the author read the abstract for the article to determine whether or not the article fit the PICO framework. Next, the author read the introduction, methodology, results, discussion, limitations and conclusion. Lastly, the author selected only five samples of evidence (1 RCT, 2 quasi-experimental, and 2 systematic reviews) according to the PICO framework because the remaining 44 articles did not support the criteria and were not relevant to the PICO framework. Some studies were not conducted with interventions and did not match specific populations. Hence, the author excluded these articles from the study.

Type of evidence: The author searched for guidelines and systematic reviews of randomized controlled trials (RCTs) with a quasi-experimental study and

single randomized controlled trials acquired from full text studies published in English from 2000 to 2014. The information and levels of the selected evidence are as follows:

Table 3.1 Selected evidences, research design, and strength of the evidences:

No	Title	Authors / year	Source of publication	Study design	Strength of evidence
1	Effects of intensive hand washing promotion on childhood diarrhea in high-risk communities in Pakistan –a randomized control trail	Luby, S. P., Agboatwalla, M., Painter, J., Altaf, A., Billhimer, W. L. & Hoekstra, R.M., 2004.	Journal of American Medical Association	RCT	Level II
2	Long-term impact of community-based information, education and food safety hygiene behaviors in Vietnam: a longitudinal study.	Takanashi, K., Quyen, D. T., Hoa, N. T., Nguyen, C. K., Yasuoka, J., & Jimba, M., 2013.	Plos one	Quasi – experimental study	Level III
3	Diarrhea prevention through food safety education.	Sheth, M. & Obrah. M., 2004.	Indian journal of pediatric	Quasi-experimental study	Level III

Table 3.1 Selected evidences, research design, and strength of the evidences (cont.)

No	Title	Authors / Year	Source of publication	Study design	Strength of evidence
4	Are hygiene and public health interventions likely to improve outcomes for Australian aboriginal children living in remote communities? A systemic review of the literature.	McDonald, E., Baile, R., Brewster. D. & Morris. P., 2008.	Bio med central public health	Systematic review	Level I
5	Hand washing for preventing diarrhea (review)	Ejemot-Nwadiaro, R. I., Ethiri, J. E., Meremikwu, M. & Critchley, J. A., 2008.	Cochrane collaboration and published in the cochrane library	Systematic review	Level I

Summarization of each sample of evidence: Every sample of evidence was read and the contents related to education intervention about diarrhea prevention were extracted and briefly presented.

Evidence number 1

Title: Effects of intensive hand-washing, promotion on childhood diarrhea in high-risk communities in Pakistan - a randomized controlled trial

Authors / year: Luby, S. P., Agboatwalla, M., Painter, J., Altaf, A., Billhimer, W. L. & Hoekstra, R. M., 2004.

Publication source: Journal of American Medical Association.

The objective of this study was to evaluate the effects of promoting household hand washing with soap among children at high risk for death from diarrhea. The study design was a cluster randomized control trial. The study was conducted in central Karachi Bilal, Hazara, Manzoor and Mujahid colonies at urban squatter settlements in Pakistan. The population of the study was composed of caregivers in families with two children younger than 15 years or 1 child younger than 5 years. The total sample comprised 906 subjects divided into an experimental group of 600 households and a control group of 306 households. Experimental group 300 households were randomized to receive antibacterial soap and 300 households were received plain soap. The intervention program was hand washing promotion. In this program, the fieldworker first conducted a neighborhood meeting about hand washing. Each field worker spoke the first language of the study household they visits. The field worker taught the caregivers in the families about hand washing, the definition of diarrheal disease, spreading diarrheal germs, contaminating food and other materials by germs and hand washing practice. The fieldworker also encouraged the participants to wash their hands after defecation, before eating, preparing food and feeding infants, explaining the importance of hand washing, adapting to regular hand washing practice and rubbing the hands together for 45 seconds with soap. The program provided using slide shows, videotapes, pamphlets, discussions, demonstrations and soap for the families as needed. The fieldworker visited the families in the intervention area at least once weekly. Naturally, the fieldworker sometimes visited the intervention households twice during the week to check on diarrheal episodes. Supervisors revisited 40% of the families each week and reviewed the history of diarrhea among family members. History recorded by the field worker was compared with the history recorded by the supervisor and, if there was a discrepancy, the field worker and supervisor revisited the house to clarify the difference. At the baseline and every fourth month, the fieldworker weighed participating children younger than 5 years. According to the findings, the prevalence of diarrhea was 39% lower in the households receiving plain soap (95% CI, –61% to –16%) vs. the control group. Plain soap had 42% fewer days

with diarrhea and severely malnourished children (95% CI, –69% to –16%) vs. the control group.

Evaluation of the evidence

Validity: The intervention was an intensive hand washing promotion at the community level. The study objective was clearly identified. The households were randomly assigned into intervention and control groups. The intervention group was not blind. The control group was not provided the same information as the intervention group. The subjects in each group were similar in terms of demographic data and baseline survey. The outcome was measured by the number of children with diarrhea during the weekly visits and the history of diarrhea reviewed among family members was collected by a trained health worker.

Reliability: The primary outcome of the study was a reduction in the incidence of diarrhea after the intervention featuring the hand washing promotion activities. The outcome was statistically significant between the intervention and control groups**.**

Applicability: The study was conducted as a community-based educational intervention for a household of caregivers of children under five. The hand washing procedure can be performed very easily. According to the results, hand washing with soap is very effective in preventing diarrhea. The evidence strongly supports that the program is low-cost and highly beneficial for caregivers in the community setting.

Evidence number 2

Title: Long-term impact of community-based information, education and food safety hygiene behaviors in Vietnam: A longitudinal study.

Authors / year: Takanashi, K., Quyen, D. T., Hoa, N. T., Nguyen, C. K., Yasuoka, J., & Jimba, M., 2013.

Publication source: PloS one

The aim of the longitudinal study was to examine the long-term impact of community–based information, education and communication (IEC) activities on food hygiene and food safety behaviors. The research was conducted at Huynh Cung

Village, Tam Heip Commune, Thanh Tri District and Hanoi in Vietnam. The study population was composed of caregivers and their children aged six months to four years. The study enrolled 220 subjects in the baseline survey, 208 subjects in the first evaluation and 274 caregiver-child pairs at the second evaluation.

The baseline interview was conducted in January 2006 with the first evaluation in January 2007 and the second evaluation in January 2008 by eight to ten qualified health workers. During data collection, the researchers explained the details of each question to the interviewer, establishing a structured questionnaire for this study and combining ideas during the group discussion with caregivers. Socio-demographic characteristics were covered in the final questionnaire with water use, prevalence of babyhood diarrhea, food hygiene and food safety (FHFS) behaviors. Questions were added about information, education and communication (IEC) channels to both first and second evaluation surveys. The questionnaire was primarily developed in English and translated into Vietnamese by local experts. This version was translated back to English. Finally, the researchers tested the local language (Vietnamese) questionnaire by using 25 caregivers from different villages in the same district.

Participatory program: At first, scholars supported the establishment of a water management unit (WMU) to lead the information, education and communication activities. Ten community members were involved in the water management unit (WMU): community leaders, operators, main secretaries of the village communist party, sub-group leaders, leaders of the health organization and village health employees. The results of the baseline survey selected behaviors related to food safety and food hygiene based on group discussion with caregivers. Five types of information, education and communication channels were also nominated through group discussions. The IEC intervention program promotes behavior modification by educational messages linking diarrhea to FHFS behaviors. The principle message was “both proper food hygiene practice and hand washing with soap contribute to protecting your child from developing diarrhea.” They also provided twenty pieces of practical information about such concepts as “wash your child’s hands with soap before eating”, “wash hands with soap after going to the toilet” and “separate utensils for raw and cooked foods in the instructions to present a clear direction”. The method

and media included workshops, community announcements, newsletters, flip charts and bulletins. Firstly, the researchers prepared 240 caregivers to attend each workshop devoted to FHFS. Secondly, the project team and authorities selected important topics, a Vietnamese journalist interviewed caregivers and three newsletters were issued. Thirdly, the health workers wrote three articles about the issue and broadcast their message though community announcements. Fourthly, the researchers posted a notice board in front of the village cultural center. Finally, different flipcharts related to FHFS and water borne diseases were improved. The researchers conducted a two-day training session. The water management unit learned how to deliver the main message successfully by using the flipcharts and exercising the necessary communication skills through role play. The Self-sustaining IEC program was designed to maintain WMU and IEC activities. Caregivers followed the program period on FHFS behaviors. The health workers replaced the material post on the bulletin board occasionally. Nine pairs of flipcharts were used to communicate with caregivers during the home visits and village gatherings held in the community cultural center. Every month, the WMU communicated with 35 households regularly. They exposed the caregivers to flipchart communication twice during this period. The village health worker provided monthly monitoring reports about all of the activities. Moreover, researchers visited the village every 2-3 months to observe ongoing activities.

For overall evaluation of the behaviors, the researchers developed a scoring system on every item to measure the FHFS behaviors in which 1 point was given for good behavior and 0 points for wrong behavior. Total scores ranged from 0 to 14. One point was given for each item and those who reported “not receiving IEC related to FHFS” received 0 points. Possible scores ranged from 0 to 5. In the statistical analysis, categorical variables were assessed by using Chi-square test or Fisher’s exact test while the continuous variables were assessed by using the student t-test. The researchers’ performed logistic regression analysis to adjust for confounding factors and hierarchical multiple regression analysis. Diarrhea was reduced from 21.6% at the baseline to 7.6 at the first post-intervention evaluation ($p = 002$) and 5.9% at the second evaluation. Among, 17 foods safety and food hygiene behaviors measured 11 behaviors as being improved; hand washing after using the toilet was improved with significance for both evaluation points. Overall, seven food hygiene

behaviors and three food safety behaviors were significantly improved at the first and second evaluations, respectively. Flipchart communication was administrated by community groups who identified the most effective IEC channels for affecting behavior modification (p = 018). The author clearly states that flipchart communication is effective for use in disseminating the information to caregivers.

Evaluation of the evidence

Validity: The purpose of the study was clear on the long-term effect of community-based activities on food hygiene and food safety behaviors. The study intervention was community–based information, education and communication (IEC). The participants of the study increase from base line through second evaluation it might be some error. But, the contents, method and materials were appropriate based on population and setting. The outcome was measured by close-ended questionnaires at the baseline and evaluation phase. The results of the IEC intervention on food hygiene and food safety behaviors were clear and statistically significant from the baseline to the evaluation phase.

Reliability: The outcome of the study, childhood diarrhea was reduced after the intervention of community–based information, education and communication on food hygiene and food safety behaviors. The outcome of the IEC intervention on food hygiene and food safety behaviors was statistically significant from the baseline between the first and second evaluation phase. The P value of < .05 was considered to indicate statistical significance. The improvement of the food hygiene and food safety behaviors was clearly identified.

Applicability: The clinically important outcome was measured based on the evidence from the information, education and communication intervention on food hygiene and food safety behaviors. The education program is highly supported and beneficial for community residents, but it is costly to perform all of the activities. Tremendous financial support from government or non-government organizations is required.

Evidence number 3

Title: Diarrhea prevention through food safety education

Authors / year: Sheth, M. & Obrah, M., 2004.

Publication source: Indian Journal of Pediatric

The ultimate objective of the study was to reduce the prevalence of diarrhea in children and improve the knowledge, attitudes and practice of mothers regarding safe feeding by providing food safety education intervention. The study was one group pre-post test design. The study was conducted in urban slums in Baroda, Gujarat, India. The population of the study was composed of 200 mothers of the underprivileged children age from 6-24 months. In this education intervention, the information about the disease was collected with respect to the mothers' knowledge, practice and attitude regarding childhood diarrheal disease in terms of environmental sanitation, feeding practices and personal hygiene using a pretest structure questionnaire and spot observation. Then following three important messages were included in the food safety education program such as "wash hands with soap and water", "avoid feeding leftover food" and "keep surroundings clean". The presence of enterococci in the hand rinsed sample of 50 mothers and 50 children was done using a hi-media enterococci kit. During the kit trial use in water, the water changed in color from yellow to dark green to indicate the presence of enterococci. However, after the intervention, the enterococci decreased both in mothers and children.

The contents of the education agenda were definition, etiology, signs and symptoms of dehydration and consequences of diarrheal disease. In the program, the researchers taught about clean surroundings, personal hygiene practice, food hygiene and food preparation, practice and identifying micro bacterial agents in the water. This program was imported by using lectures, slogans, posters, charts, flash cards and role play. The materials for the program were the enterococci kit, education materials, a calendar and leaflets. The education program data were collected after a period of two months from the households pre-measured at baseline. The effects of the intervention concerning the etiology of diarrhea, safe feeding practices, personal hygiene and environmental sanitation were studied using the student's-test. The incidence of diarrhea among the children was reduced to 39.5% from the baseline of 92% after the food safety education intervention. The severity of diarrhea declined from 24% to 19%. The total decrease in the incidence of diarrhea was 52%. Scores and ratings of

environmental sanitation of households and personal hygiene of mothers before and after the food safety education intervention were statistically significant at ($p < .001$). Knowledge, attitude and practice (KAP) of mothers with regard to diarrhea, environmental sanitation, personal hygiene and feeding practices before and after food safety education intervention were statistically significant at ($p < .001$).

Evaluation of the evidence

Validity: The purpose of the study was clear. Examinations were done before and after the intervention. Pretests and posttests involved completely structured questionnaires and site observation. The researchers used the McNemar test. The outcome of the study was statistically significant.

Reliability: The primary outcome of the study was the incidence of diarrhea. The secondary outcomes of the study were mother's knowledge, attitude and practice (KAP) with regard to diarrhea, safe feeding practices, personal hygiene and environmental sanitation. The difference between the pre- and post-test scores was statistically significant**.**

Applicability: The study population and expected outcome based on community level of food safety education intervention was possible. Researchers train the health worker before conducting the study and after that, health worker teaches each mother regarding safe feeding practice and consequences of severe diarrhea. The program can be implemented and beneficial in the authors' community setting. However, the personnel resource and materials need to provide.

Evidence number 4

Title: Are hygiene and public health interventions likely to improve outcomes for Australian aboriginal children living in remote communities? A systemic review of the literature**.**

Authors / year: McDonald, E., Baile, R., Brewster, & Morris, P., 2008.

Publication source: Biomed central public health

The objective of the study was to determine what intervention might most effectively reduce the incidence of skin, diarrheal and infectious disease experience in children living in remote indigenous communities. The study design was a systematic

review of literature. The setting was in the Adelaide, South Australia. Only 19 studies were considered by reviewers to meet the review eligibility and quality inclusion criteria. The review data source used different key-words and search strategy; studies were identified through searching electronic databases, including CINAHL, EBMBASE, Medline, DARE, Cochrane Library and SCI up to 31 December 2003.

The study inclusion criteria were randomized control trials (RCT), clinical control trials (CCT) and control before and after (CBA). The study exclusion criteria were not selected by the specific risk factors or the presence of specific illnesses. The types of participant in the study were appropriate for the study included indigenous populations and populations of developing countries. The types of intervention were education/health promotion with the introduction of hygiene; housing infrastructure; the introduction of new behaviors, or the use of methods to modify behavior with the introduction of hygiene aids. The outcome measure was the rate of diarrheal disease and illness; child growth parameters; and the level of adoption of promoting behaviors. Outcomes were categories measured by time. The outcome measured initiation of intervention in published and unpublished studies in the English language with eligibility for inclusion. The review process included two reviewers independently scanning the initial search results by title. Copies of the articles were obtained and four reviewers checked eligibility criteria. The reviewers assessed the quality of the studies. The extracted data using the guidelines and the data extraction tools were adapted from the cochrane collaboration on effective practice and organization of care review groups (EPOC). The results of the reviews showed that hand washing with soap in preventing diarrheal disease among children yields clear and strong evidence of the consequences of education intervention (effects in four studies). The most important well-designed study supported hand-washing. Children living in the families that received plain soap had 53% lower prevalence of diarrhea. There was some evidence on the effects of education and other hygiene behaviors, changes in intervention (6 studies) as well as the provision of water supply, sanitation and hygiene education (2 studies), and insecticide spraying for fly control (2 studies) on reducing rates of diarrheal disease.

Evaluation of the evidence

Validity: The objectives of the systematic literature review were clear. Study design, data source, sampling criteria, selection criteria and types of study, type of intervention, results, outcome evaluation and discussion were also clear. The primary outcome of the review was determined accurately.

Reliability: In the systematic review, fourteen of the nineteen studies included rates of diarrhea as primary outcomes. The evidence showed that there is clear and strong evidence of the effects of education and hand washing with soap in preventing diarrheal disease among children**.**

Applicability: The population of the review and author's clinical setting are similar. For the most part, the outcome of the reviews was diarrhea in children. These types of review are very effective for the community setting.

Evidence number 5

Title: Hand washing for preventing diarrhea.

Authors / year: Ejemot-Nwadiaro, R. I., Ethiri, J.E., Meremikwu, M. M., & Critchley, J. A., 2008.

Publication source: The Cochrane Collaboration.

The objective of the study was to evaluate the effects of interventions to promote hand washing on diarrheal episodes in children and adults. The study design was a systematic review. The sample in this review was fourteen randomized control trials that met the inclusion criteria. In this review, the researchers searched the cochrane infectious disease group specialized register, Central (Cochrane libibrary2007 issue 2), EBASE, MEDLINE, Psye INFO, LILACS, Science Citation Index, and Social Science Citation Index, ERIC,SPECTR, Bibliomap and RoRe. The gray literature and reference list of articles were also searched. The authors also contracted researchers and organization in the field. The selection criteria and types of studies were randomized control trials where the unit of randomization was households, institutions or communities in which the effects of the intervention were compared between promoting hand washing and hygiene promotion including hand washing and no intervention to promote hand washing. The types of participants were individuals in an institutional setting and communities or households.

Intervention and contents: The activities of this review articles promoted hand washing after defecation, disposal of children's feces and before preparing or handling food. For example, the small group discussions and large meetings, multimedia, communication, poster campaigns, radio, /TV, campaigns, leaflets, comic books, songs, slide shows, T-shirts, badges and illustrated stories used with the promotion of hand washing as part of a broader package of hygiene promotion interventions were eligible if they undertook analyses of the effects of hand washing or diarrhea. Control: no hand washing promotion.

In this review, fourteen randomized control trials met the inclusion criteria. Eight trials were institution-based in high income countries, five were community-based in low and middle income countries and one was based in high risk groups. The primary outcome was reduced incidence of childhood diarrhea and the secondary outcome was changes in knowledge, attitudes, and beliefs about hand washing. Considering only trial results adjusted for cluster randomization, the intervention promoting hand washing resulted in a 39% reduction in diarrheal episodes in children in the institutions in high income countries, (IRR 0.61, 90% CI 0.40 to 0.92; 2 trial) with a 32% reduction in such episodes in children living in communities in low and middle income countries (IRR 0.68, 95% CI 0.520.90; 4 trials).

Evaluation of the evidence

Validity: The study contained in the review were randomize control trail (RCTs). The objective of the systematic review were evaluate the effect of intervention promote hand washing in diarrheal episodes in children and adult. The selection criteria, types of intervention, outcomes, evaluation and discussion were also appropriates. The primary outcome of the review was clear.

Reliability: The outcome of the review was reduced diarrheal episodes. Fourteen randomized control trials met the inclusion criteria. The hand washing promotion activity intervention yielded a statistically significant reduction in the diarrheal episodes of institutional and community-based children, respectively. Episodes of diarrhea were measured by all included trials. Follow-up periods ranged from four to twelve months.

Applicability: The similar population of the review and the author clinical setting are appropriate for community setting. The intervention outcome was efficient for community residents in reducing diarrheal episodes. This type of intervention can be implemented in the community with low cost and effectiveness. Hence, these activities can be helpful for the residents in the author's community setting**.**

3.2 Conclusion

3.2.1 Summary of the evidence

In conclusion, the author describes the successful interventions among the populations and outcomes discovered in the selected evidence-based nursing as follows:

The author's search yielded 49 studies. Five of these studies met the inclusion criteria: one study was a randomized controlled trial (RCT), two were quasi experimental studies (CBA) and two were systematic reviews. 44 evidences were excluded from the study which was not relevant with the population intervention and outcome. The findings were published from 2000-2014. Before, selected the evidence author reads the title to determine relevance in terms of population, intervention and outcome of the study. If the title relevance to the framework the author read the abstract of the article fit with author study. Next the author read the introduction; methodology; result discussion and conclusion. Finally, author selected the appropriate evidences and concluded that "health educational intervention" is a valuable strategy for caregivers of under five children to prevent diarrheal disease in the community.

1. Participants: All of the study participants were caregivers of children under five years old. The caregivers of one study were involved with at least one child of 15 years old. (Luby et al., 2004: Level II). Most of the participants' education levels were primary school, secondary school and university. The caregivers in the diarrhea prevention program were farmers, workers and business people (Takanashi et al, 2013: Level III).

2. Setting: All of the studies were conducted in community-based settings at urban slums and rural communities (Takanashi et al, 2013: Level III; Luby et al., 2004: Level II: Ejemot-Nwadiaro et al., 2012: Level I; McDonald et al., 2008: Level I: Sheth & Obrah. 2004: Level III).

3. Diarrhea Prevention: There are many strategies for preventing diarrheal disease in the community. The evidence shows that the prevention of the incidence rate of childhood diarrhea in the community includes environmental sanitation, uncontaminated food and purified water, and personal hygiene.

3.1 Environmental sanitation: Diarrhea can be prevented by improving the environmental sanitation. It is an important technique for preventing early childhood diarrhea in the community.

Defecation: Diarrhea can be prevented by proper sanitation. According to the studies, before intervention most of the households were uses open defecation inside and outside the houses. However, post intervention the households gain knowledge about sanitation hygiene and modified their behavior (Sheth & Obrah, 2004).

Water quality**:** Diarrhea can be prevented by improving the quality of drinking water. The participants in the studies used poor quality water that was contaminated. The participants gained knowledge after receiving food safety education. As a result, they used clean, safe, boiled and decontaminated water in their homes (Takanashi et al, 2013: Level III: Sheth & Obrah, 2004; Level III**).**

Clean households**:** Most of the households started using a dustbin for household waste disposal after receiving the food safety education intervention (Sheth & Obrah, 2004).

3.2 Uncontaminated food and purified water**:** The health worker provided information in the education program about food hygiene and food safety behaviors for households. The households were taught to cover food, keep food at proper temperatures and use separate utensils for raw and cooked foods. They covered food to prevent germs from flies and other insects. The generally used

expended tube well water and rain water that had been boiled (Takanashi et al, 2013: Level III)**.**

3.3 Personal hygiene**:** Personal hygiene is an important technique for preventing diarrhea**.**

Hand washing: The mothers were taught about hand washing prior to cooking, eating and feeding the children. Hand washing is very important to avoid disease and micro-organisms. Most of the mothers performed hand washing with soap and water after visiting the toilet, cleaning the children's defecation, cleaning the children's noses, sweeping and mopping (Sheth & Obrah. 2004: Level III: Takanashi et al, 2013: Level III; Luby et al., 2004: Level II: Ejemot-Nwadiaro et al., 2012: Level I; McDonald et al., 2008: Level I**).**

Clean body: Mothers clean their nails regularly to prevent germs, washing their heads and keeping their hair neatly combed (Sheth & Obrah, 2004: level III).

4. Diarrhea prevention program: The program for caregivers is a very important strategy for reducing the incidence rate and preventing of diarrhea in rural communities**.** The processes for conducting diarrhea prevention programs are as follows:

4.1 Survey and screen for the problem in the community. Arrange an interview and collect baseline data from caregivers about the incidence rate of diarrhea among children under five years of age in community settings with respect to the knowledge and practice of caregivers (Takanashi et al., 2013: Level III).

4.2 The researcher made up a participatory team composed of community members, the village leader, subgroup leaders, operators, leaders of the health station and village health workers (Takanashi et al., 2013: Level III).

4.3 Health education intervention**:** The education intervention was conducted by health workers in the community. Most of the studies used methods consisting of lectures, demonstrations, role plays and home visits.

Lecture: During the education, the researchers used lectures with group discussions, video tapes, powerpoint presentations, flipcharts,

community announcements and leaflets to increase the mothers' knowledge and awareness (Takanashi et al., 2013: Level III; Luby et al., 2004: Level II; Ejemot-Nwadiaro et al., 2012: Level I; McDonald et al., 2008: Level I).

Demonstration: Practical skills were provided by demonstrating how to wash hands with soap to improve the practice of caregivers (Takanashi et al., 2013: Level IV; Harun et al., 2010: Level III; Ejemot-Nwadiaro et al., 2012: Level I).

Role play: During the educational intervention, role play is an effective method for increasing caregivers' awareness about hand washing practice, environmental hygiene and personal hygiene to prevent diarrhea (Luby et al., 2004: Level II; Ejemot-Nwadiaro et al., 2012: Level I; Sheth & Obrah, 2004: Level III).

Home visits: Health workers visited the households weekly and once a month to monitor the caregiver's activities in their families. The health workers followed up on the caregivers' practice and attitudes. All of findings were recorded. Field supervisors revisited the families each week and reviewed the history of diarrhea. (Luby et al, 2004: Level II; Takanashi et al., 2013: Level III; McDonald et al, 2008: Level I; Ejemot-Nwadiaro et al., 2012: Level I).

5. Contents: The evidence indicated that caregivers should have information about diarrhea in children. The educational intervention provided information consisting of the prevention, definition, etiology, signs and symptoms and severity of diarrhea (Takanashi et al., 2013: Level III; Ejemot-Nwadiaro et al., 2012: Level I: Sheth & Obrah., 2004: Level III; McDonald et al, 2008: Level I). Environmental sanitation, information about defecation, no use of unclean water for cooking, personal hygiene and food hygiene were described with respect for mothers' knowledge, practice and attitudes (Takanashi et al., 2013: Level III; Sheth & Obrah., 2004: Level III). Caregivers detected dehydration and complications of diarrhea with proper health education intervention (Sheth & Obrah. 2004: Level III; McDonald et al, 2008: Level I; Ejemot-Nwadiaro et al., 2012: Level I).

6. Measurements: The primary outcome was reducing the incidence rate of diarrhea and the secondary outcomes were knowledge and practice**.**

The primary outcomes on the incidence of diarrhea measured by questionnaires (Luby et al, 2004: Level II; McDonald et al, 2008: Level I; Ejemot-Nwadiaro et al., 2012: Level I; Takanashi et al., 2013: Level III). The outcome of the education intervention can be assessed by evaluating caregivers' knowledge and practice. The information on the mothers' knowledge, attitudes and practice concerning environmental sanitation, food hygiene practice, personal hygiene and hand washing practices used structured questionnaires with site observation (Sheth & Obrah. 2004: Level III). Other studies measured hand washing practice by observational checklists and weekly home visits recorded for four months (Luby et al, 2004: Level II; McDonald et al, 2008: Level I; Ejemot-Nwadiaro et al., 2012: Level I). One point was granted for good behaviors and 0 points were granted for wrong behaviors (Takanashi et al., 2013: Level III).

In conclusion, all of the above evidence supports that health education intervention is very effective for reducing the incidence of diarrhea rates in children under five years old in community settings. The studies applied some strategies in their education intervention for improving knowledge and promoted health behaviors in real situations such as proper hand washing practices, water treatment, food hygiene practice, domestic hygiene, sanitation, hygiene and childcare. After providing multiple education interventions among caregivers to modify health behaviors, understanding was gained about disease severity and susceptibility. For this purpose, the researchers used lectures, videos, slideshows, leaflets, posters, group discussions, demonstrations and home visits. Caregivers were promoted in the healthy behaviors and learned how to take care of their babies at home.

3.2.2. Recommendations

All of the above evidence recommends that health education intervention is effective for community residents in preventing diarrhea as follows:

1. Diarrhea prevention programs are recommended for diarrhea prevention from five selected samples of evidence. The summarized evidence focused on primary prevention, which is environmental sanitation: defecation, water and clean household surroundings; personal hygiene: hand washing, clean nails and neatly combed hair. Food hygiene and food safety behavior are interrelated in reducing diarrhea. Hence, the author recommends the inclusion of the above in water and health

programs in the author's setting. Improvement in hand washing in the families reduces the incidence of diarrhea amongst children at higher risk for death from diarrhea. Studies to evaluate the stability of behavioral modification from hand washing promotion are also important in assessing cost effectiveness. Health education interventions should experiment with the integration of hand washing promotion into current activities (Sheth & Obrah. 2004: Level III; Takanashi et al, 2013: level III; Luby et al, 2004: Level I; Ejemot-Nwadiaro et al, 2012: Level I; McDonald et al, 2008: Level I).

2. Health education intervention is an easy process for providing information to caregivers. Individual and group discussions are very effective in increasing maternal knowledge. Demonstration is another technique for improving skills and practice in real situations in caring for children at home (Luby et al, 2004: Level I; Ejemot-Nwadiaro et al, 2012: Level I; McDonald et al, 2008: Level I). The researchers in the above studied used flipcharts and exercised essential communication skills through role plays (Takanashi et al, 2013: level III; Sheth & Obrah. 2004: Level III).

3. Home visits are one technique of evaluating the incidence rate of diarrhea. Health workers visited the households weekly and once a month to monitor the caregivers' activities with their families. The workers followed up on the caregivers' practice and attitudes (Ejemot-Nwadiaro et al, 2012: Level I; McDonald et al, 2008: Level I Luby et al, 2004: Level I

CHAPTER IV
CONCLUSION AND SUGGESTIONS

4.1 Conclusion

Diarrhea is a critical public health problem worldwide, especially in low and middle income countries. Diarrhea is also the leading cause of morbidity and mortality in the young children of Bangladesh where there are high diarrhea incidence rates in the rural and urban-slum areas. If a child becomes ill with diarrhea, most family caregivers are in crisis situation. The etiology of diarrhea in Bangladesh involves the fact that caregivers do not have good hygienic practice, use contaminated food and drinking water and they live in unsanitary environments. In addition, there are limited health care facilities in the community. There is no community nurse in the community and only one district public health nurse monitors the entire district. Bangladesh health care providers work in the community and rural areas, but they have some limitations such as knowledge and skills, especially in caring for children. There is a general shortage of nurses and health care providers within a deficient health care system.

Therefore, the appropriate recommendations or guidelines for diarrhea prevention in children may facilitate nurses and health care providers in helping caregivers. The results are improved behaviors, changes in practice and decreased incidence rates of diarrhea. To achieve the aforementioned, it is essential that evidence-based nursing be implemented with updated information and knowledge for the prevention of diarrhea in rural community settings. Evidence-based practice is important because it integrates scientific documents, adds to clinical experience and improves patient values. Hence, evidence-based practice is useful for nurses and health care providers in caring for children less than five years of age in the community settings. The potential benefits of the study are improved caregivers knowledge and practice, provision of proper care for children and prevention of diarrheal disease among children under five years old. The purpose of the study was to

analyze and synthesize current evidence-based practice for caregivers in regard to the prevention of diarrheal disease among children under five years old.

The author searched for available and current evidence using the Mahidol University electronic library system and other websites to search for related evidence. The Cumulative Index to Nursing and Allied Health (CINAHL), Ovid Full Text, Pro-Quest Nursing and Allied Health Source, PubMed and Science Direct were used to search for single research studies. The PICO framework was used to guide the keywords for the search. A manual search was also conducted with track back references from the papers. The author then searched further from libraries. Google Scholar was also used to search for experimental studies. The keywords were used in the search according to the PICO framework as follows: P = "Caregiver" of children under five years old; I = "Health education intervention; and O = "Diarrhea prevention". The author used a Boolean operator to search for each PICO element. The author collected any synonyms by linking terms with "OR", then located citations relevant to all of the PICO elements by linking with "AND".

The author searched for guidelines, systematic reviews of randomized controlled trials (RCTs), quasi-experimental studies and single randomized controlled trials acquired from full-text studies published in English from 2000 to 2014. The author appraised the evidence with validity, reliability and applicability. The author also appraised the strength and levels of evidence. The author's preliminary screening yielded 49 articles related to the study. Finally, five articles meeting the evaluation criteria were selected for the study. The remaining 44 articles were excluded because they were not related to the objectives of the author's study. Among these selected five articles, one was a randomized controlled trial, two were quasi-experimental studies and two were systematic reviews.

The summary of the five articles revealed that health education interventions provided for caregivers in communities should be conducted for large populations. Health education intervention for diarrhea prevention should be conducted by nurses and health workers. Health education interventions are part of diarrhea prevention programs. This section aims to improve the knowledge and practice of caregivers to reduce the incidence rate of diarrhea. Health education interventions for this program consisted of three learning activities, namely, group

lecture and discussion, practices and home visits. The studies provided lectures with group discussions using PowerPoint presentations, video tapes, flipcharts, community announcements and leaflets to increase the mothers' knowledge and awareness. Four studies provided practical skills for caregivers by demonstration and role play. The health workers demonstrated and discussed how to properly wash hands with soap and how to rub the hands together step-by-step to improve the practice of caregivers. Caregivers' awareness was increased by role plays about environmental hygiene, personal hygiene, food hygiene and food safety behaviors. Four studies revealed that health workers visited the households weekly and once a month to monitor the caregivers' activities in their families. The incidence rate of diarrhea was measured by have the caregivers complete questionnaires about the episodes of diarrhea in previous weeks. In addition, health workers advised to caregivers to clean surroundings purify water and cover food to prevent germs from flies and other insects. They were also instructed about clean nails, clean heads and neatly combed hair, cleaning children's noses, sweeping and mopping.

The contents of the educational intervention were information about diarrhea prevention consisting of the definition, etiology, signs and symptoms and severity of diarrhea. Two studies provided information about environmental sanitation, personal hygiene, food hygiene and food safety behaviors.

The primary outcome was the reduced incidence rate of diarrhea and this was measured by asking the caregivers to complete questionnaires about the episodes of diarrhea in previous weeks. Secondary outcomes were information on mothers' knowledge, attitudes and practice concerning environmental sanitation, food hygiene, personal hygiene and hand washing by using structured questionnaires with site observation. The practice of hand washing was measured by observational checklists and weekly home visits.

Limitations: One of the limitations of the study was the small amount of evidence on community based diarrhea prevention programs. Hence, the selected evidence included only five articles. The author did not include the WHO guidelines because the guidelines do not mention the outcomes pertinent to the author's outcomes. In addition, the guidelines do not provide any health education interventions. Next, the summarization was based on only a few studies. The weak

points of this study are that the evidence was not conducted with randomized control trials. Some evidence did not clearly identify the method, media and content of the education programs. The outcome measurement used questionnaires and observational checklists developed by researchers.

4.2 Suggestions

The author would like to implement a health education intervention in the community and urban slum areas near the author's clinical area in Chittagong district in Bangladesh. The strategies below should be considered when implementing this program. The dissemination of knowledge from this study is also recommended. Based on the study findings, it is recommended that caregivers of children under five years of age receive the education intervention in the community in order to reduce incidence rate of diarrhea. The implementation of the educational intervention should be applied for practice and research as follows:

4.2.1 Implementation for practice: This program will be prepared by nurses in the community. The strategies will be as follows:

1. Discuss the importance of the diarrhea prevention program with the health authorities and conduct a meeting with community leaders.

2. Build a multidisciplinary team for this education program incorporating quality health workers, expert nurses, community leaders and water authorities.

3. Train nurses and health workers to organize the education program. The program should be practical for caregivers of children under five years of age and produced within the perspective of the Bangladeshi culture and Bangali language.

4. Invite the caregivers to attain the education program. Describe the future benefits of health education programs as a motivation for caregivers to participate in diarrhea prevention education programs.

5. Diarrhea prevention educational programs should be conducted with a variety of learning activities and materials. The learning activities may be lectures, group discussions, demonstrations and home visits to improve knowledge and practice. The media used will include videos, slide shows, flipcharts, pamphlets and booklets as appropriate for the group of participants.

6. The education intervention should be provided by nurses and health workers. The duration of educational program will be one day. The program should have three sections. In the first session, the workers will provide lectures with discussion for improved knowledge. The second session will include demonstration and role play. The third section should be weekly follow-up visits conducted in the households.

7. Follow-up visits will be made by a team leader and health worker to the households in order to evaluate the health education intervention outcomes.

4.2.2 Implications for research

1. The baseline data about the incidence of diarrhea, knowledge, attitudes and practice of caregivers in the community in Bangladesh are needed.

2. A pilot study should be conducted to examine the effectiveness of health education programs prior to implementation of health education programs to determine feasibility and appropriateness in the community setting for diarrhea prevention. A pre-test should be conducted by questionnaire and observational checklists within a small group of caregivers to identify the problems in the community.

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