

CHAPTER II

REVIEW OF THE LITERATURE

The study of acute infantile diarrhea and related factors was aimed to study the prevalence of acute diarrhea and related factors including the relationship between these factors and the onset of acute infantile diarrhea in municipal communities of Thungsnog District, Nakhon Si Thammarat Province. The results from literature review were Presented as follows :

1. General Information about Diarrhea
2. Prevention and Control of Diarrhea Program Among Children in Nakhon Si Thammarat Province
3. The PRECEDE – PROCEED framework
4. Related Researches

1. General Information about Diarrhea (WHO, 1992)

Types of diarrhea

Diarrhea is usually defined epidemiological studies as the passage of three or more loose or watery stools in a 24-hour period a loose stool being one that would take the shape of a container. However, mothers may use a variety of terms to describe diarrhea, depending, for example, upon whether the stool is loose, watery, bloody or mucoid, or there is vomiting. It is important to be familiar with these terms when

asking whether a child has diarrhea. Infants who are exclusively breast - fed normally pass several soft or semi-liquid stools each day, for them, it is practical to define diarrhea as an increase in stool frequency or liquidity that is considered abnormal by the mother.

Acute watery diarrhea

This term refers to diarrhea that begins acutely, lasts less than 14 days (most episodes last less than 7 days), and involves the passage of frequent loose or watery stools without visible blood. Vomiting may occur and fever may be present. Acute watery diarrhea causes dehydration, when food intake is reduced, it also contributes to malnutrition. When death occurs, it is usually due to acute dehydration. The most important causes of acute watery diarrhea in young children in developing countries are rotavirus, enterotoxigenic *Escherivhia coli*, *Shigella*, *Campylobacter jejuni*, and *Cryptosporidium*. In some areas, *Vibrio cholerae* 01, salmonella and enteropathogenic *E. coil* are also important.

Dysentery

This is diarrhea with visible blood in the feces. Important effects of dysentery include anorexia, rapid weight loss, and damage to the intestinal mucosa by the invasive bacteria. A number of other complications may also occur. The main cause of acute dysentery is *Shigella*, other causes are *Campylobacter iejuni* and, interquently, entero-invasive *E. coli* or *Salmonella*. *Entamonella*, *Entamoeba histolytica* can cause serious dysentery in young adults but is rarely a cause of dysentery in young children.

Persistent diarrhea

This is diarrhea that begins acutely but is of unusually long duration (at least 14 days). The episode may begin either as watery diarrhea or as dysentery. Marked weight loss is frequent. Diarrhea stool volume may also be great, with a risk of dehydration. There is no single microbial cause for persistent diarrhea, enter aggregative *E. coli*, *Shigella* and *Cryptosporidium* may play greater role than other agent.

Epidemiology

Transmission of agents that cause diarrhea

The infectious agents that cause diarrhea are usually spread by the fecal-oral route, which includes the ingestion of focally contaminated water or food, and direct contact with infected feces.

A number of specific behavior promote the transmission of enteric pathogens and thus increase the risk of diarrhea. These include:

- Failing to breast-feed exclusively for the first 4-6 months of life. The risk of developing severe diarrhea is many times greater in infants who are not breast-fed than in those who are exclusively breast-fed; the risk of death from diarrhea is also substantially greater.
- Using infant feeding bottles. These easily become contaminated with fecal bacteria and are difficult to clean. When milk is added to an unclean bottle it becomes contaminated; if it is not consumed immediately, bacterial growth occurs.

- Storing cooked food at room temperature. When food is cooked and then saved to be used later, it may easily be contaminated, for example, by contact with contaminated surfaces or containers. If food is kept for several hours at room temperature, bacteria in it can multiply many times.
- Using drinking – water contaminated with fecal bacteria. Water may be contaminated at its source or during storage in the home. Contamination in the home may occur when the storage container is not covered, or when a contaminated hand comes into contact with the water while collecting it from the container.
- Failing to wash hands after defecation, after defecation of faeces or before handling food.
- Failing to dispose of feces (including infant feces) hygienically. It is often believed that infant feces are harmless, whereas, they may actually contain large numbers of infectious viruses or bacteria; animal feces can also transmit enteric infections to humans.

Host factors that increase susceptibility to diarrhea

Several host factors are associated with increased incidence, severity, or duration of diarrhea. They include:

- Failing to breast-feed until at least 2 years of age. Breast milk contains antibodies that protect against certain types of diarrheal disease, such as shigellosis and cholera.

- Malnutrition. The severity, duration and risk of death from diarrhea are increase in malnourished children, especially those with severe malnutrition.
- Measles. Diarrhea and dysentery are more frequent or severe in children with measles or who have had measles in the previous 4 weeks. This presumably result from immunological impairment caused by measles.
- Immunodeficiency or immunosuppression. This may be temporary, e.g. after certain viral infections (e.g. measles), or it may be prolonged, as in people with acquired Immunodeficiency Syndrome (AIDS). When immunosuppression is severe, diarrhea can be caused by unusual pathogens and may also be prolonged.

Age

Most diarrhea episodes occur during the first 2 years of life. Incidence is highest in the age group 6-11 months, when weaning often occurs. This pattern reflects the combined effects of declining levels of maternally acquired antibodies, the lack of active immunity in the infant, the introduction of food that may be contaminated with fecal bacteria, and direct contact with human or animal feces when the infant starts to crawl. Most enteric pathogens stimulate at least partial immunity against repeated infection or illness, which helps to explain the declining incidence of disease in older children and adults.

Seasonality

Distinct seasonal patterns of diarrhea occur in many geographical areas. In temperate climates, bacterial diarrheas occur more frequently during the warm season, whereas viral diarrheas, particularly diarrhea caused by rotavirus, peak during the winter. In tropical areas, rotavirus diarrhea occurs throughout the year, increasing in frequency during the drier, cool months, whereas bacterial diarrheas peak during the warmer, rainy season. The incidence of persistent diarrhea follows the same seasonal pattern as that of acute watery diarrhea.

Asymptomatic infections

Most enteric infections are asymptomatic, and the proportion that is asymptomatic increases beyond 2 years of age owing to the development of active immunity. During asymptomatic infections, which may last for several days or weeks, stools contain infectious viruses, bacteria, or protozoal cysts. People with asymptomatic infections play an important role in the spread of many enteric pathogens, especially as they are unaware of their infection, take no special hygienic precautions and move normally from place to place.

Epidemics

Two enteric pathogens, *Vibrio cholerae* 01 and *Shigella dysenteriae* type 1, cause major epidemics in which morbidity and mortality in all age groups may be high. Since 1961, cholera caused by the eltor biotype of *V. cholerae* 01 has spread to countries in Africa, Latin America, Asia, and the Eastern Mediterranean, and to some areas in North America and Europe. During the same period, *S. dysenteriae* type 1 has

been responsible for large epidemics of severe dysentery in Central America, and more recently in Central Africa and Southern Asia.

Etiology

General considerations

Until a few years ago, pathogenic organisms could be identified in the feces of only about 25 % of patients with acute diarrhea. Today, using new techniques, experienced laboratory technicians can identify pathogens in about 75 % of cases seen at a treatment facility and up to 50 % of milder cases detected in the community.

Several of these pathogens are important causes of acute diarrhea in all developing countries. They are:

- rotavirus
- enterotoxigenic *Escherichia coli*
- *Shigella*
- *Campylobacter jejuni*
- *Cryptosporidium*

Prevention of diarrhea

The review concluded that efforts to prevent diarrhea and thus to reduce deaths not prevented by proper case management should focus on a few interventions of proven efficacy. The seven practices identified as targets for promotion are:

- breast – feeding;
- improved weaning practices;
- use of plenty of water for hygiene and use of clean water for drinking;

- hand –washing
- use of latrines
- safe disposal of the stools of young children
- measles immunization.

Breast feeding

Although breast milk is the best and safest too for young infants the incidence of breast – feeding is declining in most developing countries. The reasons for this decline include the belief that bottle – feeding is modern the aggressive promotion of infant formulas the need for mothers to work away from their children the lack of facilities for breast - feeding at places of work fear of not being able to breast – feed adequately and a lack of medical and nursing support for mothers who want to breast – feed. Nearly all women can breast –feed satisfactorily and breast-feeding has many benefits for both infant and mother Some major benefits are that breast-fed babies have fewer and less severe episodes of diarrhea and a lower risk of dying from diarrhea than babies who are not breast – fed. For example during the first 6 months of life the risk of having severe diarrhea that requires admission to hospital can be 30 times greater for infants who are not breast – fed than for those who are exclusively breast –fed

Important advantages of breast –feeding are:

- Exclusive breast – feeding during the first 4 –6 months greatly reduces the risk of severe or fatal diarrhea: the risk of other serious infections is also reduced.

- Breast –feeding is clean: it does not require the use of bottles teats water and formula which are easily contaminated with bacteria that may cause diarrhea.
- Breast milk has immunological properties (especially antibodies) that protect the infant from infection and especially from diarrhea these are not present in animal milk or formula.
- The composition of breast milk is ideal for the infant formula or cow's milk may be made too dilute (which reduces its nutritional value) or too concentrated (so that it does not provide sufficient water) and may provide too much salt and sugar.
- Breast milk is a complete food it provides all the nutrients and water needed by a healthy infant during the first 4 –6 months of life. (However low –birth – weight infants benefit from the provision of iron if available.)
- Breast –feeding is cheap there are none of the expenses associated with feeding breast-milk substitutes e.g. the costs of fuel utensils and special formulas and of the mother's time in formula preparation.
- Breast-feeding helps with birth spacing mothers who breast –feed usually have a longer period of infertility after giving birth than mothers who do not breast –feed.
- Milk intolerance rarely occurs in infants who take only breast milk.
- Breast –feeding immediately after delivery encourages the bonding of the mother to her infant which has important emotional benefits for both and helps to secure the child's place within the family.

If possible infants should be exclusively breast-fed during the first 4-6 months of life. This means that a healthy baby who is growing normally should receive only breast milk and no other fluids or foods such as water, tea, juices or formula. Between 4 and 6 months of age infants should start to receive cereals and other foods to meet their increased nutritional requirements but breast-feeding should be continued at least until 2 years of age. Breast milk given after the age of 6 months is an important source of nutrients and it continues to help protect the child against episodes of severe diarrhea.

Improved weaning practices

Weaning is the process by which an infant gradually becomes accustomed to an adult diet. During weaning, supplementary foods other than milk are introduced in order to meet the child's increased nutritional demands. However, breast milk remains an important part of the diet. Weaning is a hazardous period for many infants. This is because the child may not receive food of adequate nutritional value and the food and drinks provided may be contaminated with pathogenic microorganisms, including those that cause diarrhea. The danger is that the child will become malnourished due to an inadequate diet and repeated episodes of diarrhea, or will succumb to dehydration caused by an acute episode of diarrhea. Unfortunately, these processes are interrelated: malnutrition increases the child's susceptibility to infection so that the child experiences more prolonged and more severe episodes so that the child experiences more prolonged and more severe episodes of diarrhea, and diarrhea accelerates the development of malnutrition.

Some specific problems associated with weaning that can lead to malnutrition or diarrhea are :

- delaying the start of weaning beyond 4-6 months of age
- weaning too abruptly;
- giving too few meals per day;
- giving supplementary foods with a low content of protein and energy,
- preparing and serving weaning foods in a way that permits bacterial contamination and growth;
- giving milk or other drinks prepared with contaminated water or in a contaminated feeding bottle.

When to begin weaning

Weaning should begin when the child is 4 –6 months old. While continuing to breast feed, the mother should give a little well-cooked soft or mashed food, such as cereal and vegetables, twice each day. When the child is 6 months of age, the variety of foods should be increased and meals should be given at least four times per day, in addition to breast-feeding. After one year of age, the child should eat all types of food; vegetables, Cereals, and meat should continue to be well cooked, and mashed or ground. Food should be given at least four times a day. If possible, breast-feeding should be continued.

What foods to give

Cereals and starchy roots are the most widely used weaning foods, but these are relatively low in energy. They should be given as a thick pap or porridge, using a

spoon, and not as a dilute drink. The energy content should be increased by mixing one or two teaspoonfuls of vegetable oil into each serving. The objective is to achieve an energy intake of about 110 kcal/kg per day. Between the age of 6 months and 1 year, pulses, fruit, green vegetables, eggs, meat, fish, and milk products should be added to the diet.

Preparing and giving weaning foods

Mothers should be taught ways of preparing, giving, and storing weaning foods that minimize the risk of bacterial contamination. These include.

- Carefully washing the hands before preparing weaning foods and before feeding the baby.
- Preparing the food in a clean place.
- Cooking or boiling the food well.
- If possible, preparing the food immediately before it will be eaten.
- Covering food that is being kept. Keeping food in a cool place: refrigerating it if possible.
- If cooked food was prepared more than 2 hours it is used, reheating it until it is thoroughly hot (and then allowing it to cool) before giving it to the baby.
- Feeding the baby with a clean spoon, from a cup, or with a special feeding spoon.
- Washing uncooked food in clean water before feeding it to the baby; an exception is fruit that is peeled before it is eaten, such as a banana.

Proper use of water for hygiene and drinking

Most infectious agents that cause diarrhea are transmitted by the fecal – oral route. This includes transmission by contaminated drinking – water or contaminated food, and from person to person. A plentiful supply of water helps to encourage hygienic practices, such as hand – washing, cleaning of eating utensils, and cleaning of latrines; these practices can interrupt the spread of infectious agents that cause diarrheas. To facilitate good hygiene, it is more important that the water supply be abundant than clean, although both qualities are desirable. Clean water is essential, however, for drinking and for preparing food. Families that have ready access to a generous supply of water, and to clean water for drinking and preparing food, have diarrhea less frequently than families whose access to water is difficult or whose drinking –water is heavily contaminated. Improved water supplies can result from government – sponsored programmes, in which families and communities may play an important role, or from other community or family efforts, such as collecting and storing rainwater.

What families should do

- Use the most readily available water for personal and domestic hygiene. If this water is likely to be contaminated, store it separately from water used for drinking or preparing food.
- Collect drinking – water from the cleanest available source.
- Protect water sources by keeping animals away, by locating latrines more than 10 metres away and downhill, and by digging drainage ditches to divert stormwater.

- Collect and store drinking-water in clean containers. Keep the storage container covered and do not allow children or animals to drink from it. Do not allow anyone to put his or her hand into the storage container. Take out water only with a long handled dipper that is kept especially for that purpose. Empty and rinse out the container every day.
- Boil water that will be used to make food or drinks for young children. Boil other drinking –water if sufficient fuel is available. Water needs to boil for only a few seconds; vigorous boiling is unnecessary and wastes fuel.

Hand – washing

Parents can help to protect young children against diarrhea by adopting certain hygienic practices. One very important practice is hand-washing. Hand washing is especially effective for preventing the spread of Shigella, which is the most important cause of dysentery. For example, a study in Bangladesh has shown that hand-washing with soap and water reduced the incidence of secondary cases of shigellosis by a factor of seven (from 14%to 2%) in households where a case of shigellosis had been detected.

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What families should do

- Create a place within the home for hand –washing. This should have a wash basin, a container for water, and soap (of a local substitute)
- All members should wash their hands well:

- after cleaning a child who has defecated, or after disposing of a child's stool;
 - after defecating ;
 - before preparing food;
 - before eating;
 - before feeding a child.
- An adult or older sibling should wash the hands of young children.

Use of latrines

Human feces should be disposed of in a way that prevents them from coming into contact with hands or contaminating a water source. This is best achieved through regular use of a well-maintained latrine. The proper use of latrines can reduce the risk of diarrhea to almost the same extent as improved water supplies, but the greatest benefit occurs when improvements in sanitation and water supply are combined and education is given on hygienic practices.

Every family should have and use a clean and well-maintained latrine. Families that do not have a latrine should be encouraged to build one, following a design recommended by the relevant government agency. If there is no latrine or pit, families should defecate as hygienically as possible, away from the path, and at least 10 metres away from any home or source of water. Consideration should be shown by not defecating in an area uphill or upstream from other people. If possible, feces should be covered with dirt.

What families should do

- Have a clean, functioning latrine that is used by all members of the family old enough to do so. Keep the latrine clean by regularly washing down fouled surfaces.
- If there is no latrine:
 - defecate away from the house, and from areas where children play, and at least 10 metres from the feces with earth;
 - cover the feces with earth;
 - do not allow children to visit the defecation area alone; keep children's hands off the ground near the defecation area.

Safe disposal of the stools of young children

In many communities stools of infants and young children are considered harmless. However, young children are frequently infected with enteric pathogens and their stools are actually an important source of infection for others. This is true both for children with diarrhea and for those with asymptomatic infections. Therefore, hygienic disposal of the feces of all young children is an important aspect of diarrhea prevention. Education is needed to warn families of the dangerous nature of young children's stools and to stress the importance of disposing of them properly'

What families should do

- Help older children to defecate into a potty. Empty the stool immediately into a latrine and wash out the potty. Alternatively, have the child

defecate onto a disposable surface, such as newspaper or a large leaf.

Wrap up the stool and dispose of it in a latrine, or bury it.

- Promptly clean a child who has defecated. Then wash their own and the child's hands with soap and water.

Measles immunization

Children who have measles, or have had the disease in the previous 4 weeks, have a substantially increased risk of developing severe or fatal diarrhea or dysentery (there is some evidence that the increased risk lasts up to 6 months after the measles episode). Because of the strong relationship between measles and serious diarrheas, and the effectiveness of measles vaccine, immunization against measles is a very cost effective measure for reducing the morbidity and mortality associated with diarrhea. Measles vaccine given at the recommended age can prevent up to 25% of diarrhea associated deaths in children under 5 years of age.

What families should do

- Have children immunized against measles at the recommended age.

2. Prevention and Control of Diarrhea Program Among Children in Nakhon Si Thammarat Province.

In Nakhon Si Thammarat Province, there are program for prevention and control for diarrhea among children as follows:

2.1 Baby Friendly Hospital Initiative

Since breast milk is the most valuable food for infants because it provides all complete nutrients needed for infant growth including immunity, convince, cleanliness, and also breasts the warm relation between mother and child which is the important foundation for the physical, intelligent, and psychological growth of the infants the breast feeding promotion than bun started in Thailand in 1979 and the decline trend has been found. Therefore, the United Nations International Children 's Emergency Fund (UNICEF) and the World Health Organization (WHO) have promoted the Baby friendly Hospital Initiative by suggestion ten steps to successful breast feeding which states that every facility providing maternity services and care for newborn infants should :

1. Have a written breast – feeding policy that is routinely communicated to all health care staff;
2. Train all health care staff in skills necessary to implement this policy;
3. Inform all pregnant women about the benefits and management of breast feeding, starting at the prenatal care;
4. Help mothers initiate breast feeding within a half an hour of firth or right after birth;

5. Show mothers how to breast feed and how to maintain lactation even if they should be separated from their infants;
6. Give newborn infants no food nor drink other than breast – milk unless medically indicated. Not receiving any water nor bottle formula is not dangerous for the baby breast receiving Water or bottle formula is more dangerous than beneficial;
7. Practice rooming – in, allow mothers and infants to remain together 24 hours a day;
8. Encourage breast feeding on demand;
9. Give no artificial teats or pacifiers to breast - feeding infants; and
10. Foster the establishment of breast feeding support groups and refer mothers to them on discharge from the hospital or clinic.

In Nakhon Si Thammarat Province, all government hospitals under the Ministry of Public Health have been evaluated and have met all criteria of Baby-Friendly Hospital.

2.2 Food – born and Air-born Disease Prevention Program

1999-2001 (Provincial public health officer, Nakhon Si Thammarat Province)

The health educational activities for staffs and people have been performed as follows:

Year 1999

2.2.1 Health Education & Public Relations

- health education through radio – broadcasting for 30 minutes once a day

2.2.2 Training Program

- Organizing a refresher course for public health personnel in community hospitals and health centers.

Year 2001

1. Health Education, Et Public Relations and Developing Local Educational Materials. The health personnel at the District, subdistrict and village levels educate community people regarding diarrhea. The following printed materials were developed :-

Fliers	5,000	copies
Leaflets	5,000	copies
Posters	2,000	copies
Tape cassettes	900	copies

Public relations were done through mass media twice

2. Training Program Training /meeting was organized for every level of 265 public health personnel regarding

Control of diarrhea disease. For Thungsong Hospital which is a community hospital in Nakhon Si Thammarat Province, is responsible for the health of the launched the Baby – Friendly Hospital Initiative since 1993 but evaluation in the community has not been done. No any specific model for health education program on diarrhea prevention has been implemented.

3. Precede-Proceed Framework

Several factors are related to health behavior. The study of acute infantile diarrhea and related factors in municipal communities, Thungsong District, Nakhon Si Thammarat Province is based on the concept proposed by Green and Kreuter (1991). This concept states that health behavior of individuals is influenced by several factors and the reasons underlying such behavior should be analyzed before making an attempt to change the behavior. The combination of various processes and techniques are required to develop a plan and to determine strategies for health behavior changes.

RECEDE-PROCEED framework consists of 2 parts as shown below.

Part I. PRECEDE (Predisposing, Reinforcing and Enabling Cause in Educational Diagnosis and Evaluation) means the utilization of predisposing, enabling and reinforcing factors for the diagnosis and evaluation of health education performances in order to change health behavior. This process is composed of five steps of analysis starting with the current situation of the health problems. The problems are then examined backwards to identify the causes of the problems and the obtained data are utilized in the planning of further management for behavioral changes.

Part II PROCEED (Policy, Regulatory, Organizational, Constructs in Education and Environmental Development) is the development and implementation of the plan. The PROCEED part must be completed before the planning starts. Then leads to implementation and evaluation in steps 6 to 9. Details about each step of the PRECEDE PROCEED framework are presented in Figure 4

Step 1 Social Diagnosis is a process of considering and analyzing quality of life. It involves the assessment of problems in various population groups, judging which problems have impacts on an individual or group of people and their health. The assessed problems indicate levels of quality of life of the population, for example, unemployment, crime, and overpopulation.

Step 2 Epidemiology Diagnosis is an analysis of health problems, which affect the population being studied. The Epidemiology diagnosis helps in specifying health problems, understanding the distribution of the problems and the risk factors related to the problems. The data are then utilized in determining the priority of the problems so that the more important ones can be selected for further management.

Step 3 Behavior and Environmental Diagnosis is the process of examining the environmental and behavioral components that are related to health conditions and health problems.

Step 4 Education and Organization Diagnosis is an examination of factors that cause or affect health behavior. The factors are categorized into predisposing,

Step 5 Administrative and Policy Diagnosis is associated with the assessment of capacity and resources of an organization, as well as its policy, which leads to the management plan, and the actions, which should be consistent with the factors influencing health behavior found from step 4.

Step 6 Implementation is the utilization of the plan.

Step 7-8-9 Evaluation involves three aspects as follows:

Process Evaluation is the evaluation of problems arising during the implementation as well as the evaluation of the progression of the program in order to assess and ensure that the program is progressing as planned.

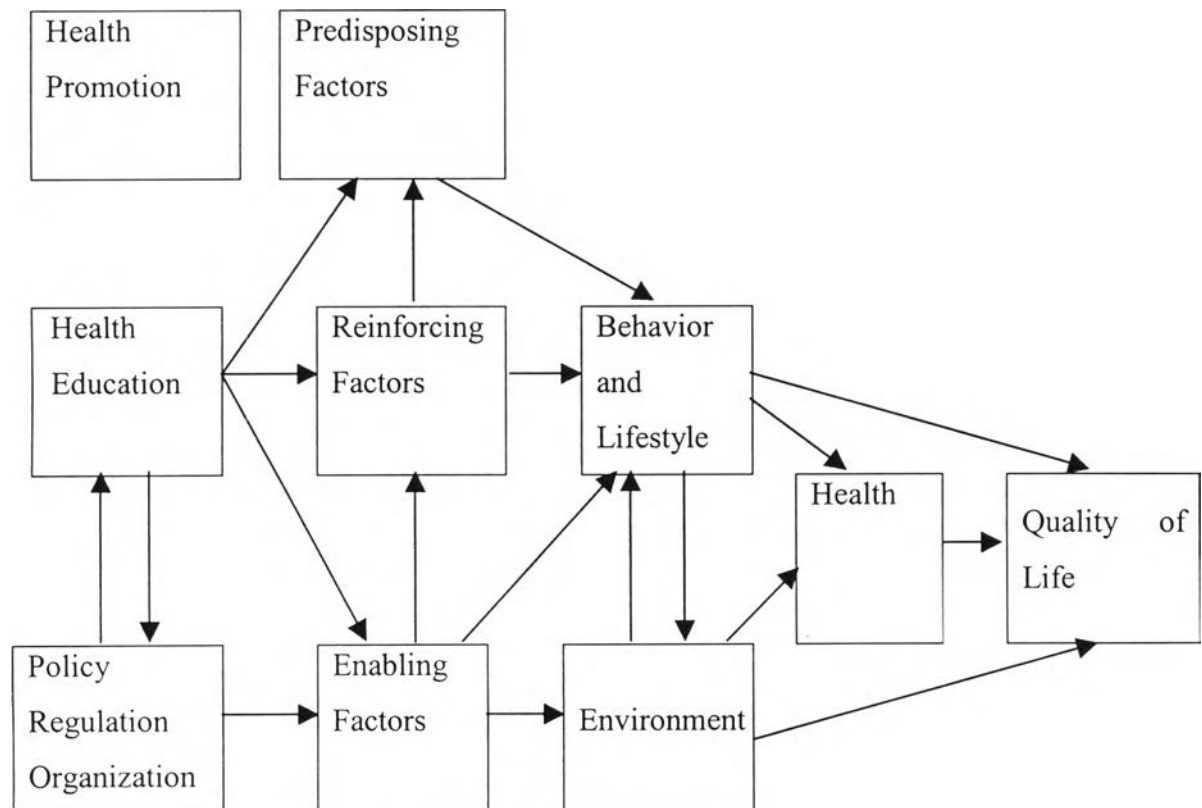
Impact Evaluation is the evaluation of unexpected impacts, both in positive and negative ways.

Outcome Evaluation is the evaluation of the outcomes directly resulted from the program. This evaluation includes three issues: effectiveness adequacy and efficiency (Green & Kruter, 1991: 22-31).

This research only focused on Step 4 of the PRECEDE PROCEED framework. It was an examination of factors related to preventive behaviors of Acute diarrhea. These factors are categorized into predisposing, enabling and reinforcing factor.

PRECEDE

Phase 5	Phase 4	Phase 3	Phase 2	Phase 1
Administrative	Education and	Behavior	Epidemiology	Social
Policy diagnosis	Organization	Environmental	diagnosis	diagnosis
	diagnosis	diagnosis		



Phase 6	Phase 7	Phase 8	Phase 9
Implementation	Process	Impact	Outcome
	evaluation	evaluation	evaluation

PROCEED

Figure 1 : THE PRECEDE-PROCEED Framework (Green & Kreuter 1991: 150)

4. Related Researches

4.1 Related Researches in Thailand

Waleerak Nantawang(1990) has studied the mothers' health behaviors which were related to the onset of diarrhea among children under five years of age in the Province of Chiangmai. The sample group consisted of 358 mothers with 15-49 years of age and with the children under five years of age in Tambon Nongjom, Sansai District, Chiangmai by using the Multi –stages random sampling method. The collection of data was conducted through interviewing and from the disease surveillance records during the study periods from 15 July – 31 October 1998. The data analysis was calculated by using the Chi – Square Test. It was found that the mothers' behaviors in choosing drinking water, cleaning the hands after excrement and before preparing food, putting the lid on the food, washing their hands before feeding their children, washing the children hane before letting them feed themselves, the disposal of the children's excreta, washing up the formula bottles and cleaning their nipples were related to the onset of the diarrhea with the statistic significance at the level of p. value 0.01 and 0.003 respectively, while the behaviors of selecting the food and the types of the formula ware not related to the onset of diarrhea among children under five years of age.

Dusit Sujirarat (1990) has studied the risk factors of the onset of the infantile diarrhea among 466 children under five years of age whose were outside the municipal areas of the Province of Singhaburi by using the Multi-stage random sampling. The data were collected through the reports of the local public health personnel and interviewing the children's background and history. The data were analyzed by using

Stepwise Logistic Regression Method. It was found that the factors related to the diarrhea were incorrect knowledge about diarrhea, the beliefs, the attitudes and the health behaviors of the care-givers together with the children's ailment history, the low monthly average income, and the most serious one was that the children were not cared by their parents. The value of RR was 88.3, 45.2, 6.0, 5.9 and 2.7 respectively, while the factors which were not related to diarrhea were the children's records of receiving disease immunization, the condition of environmental sanitary condition of the families, gender, age, occupation, and the level of education of the care-givers.

Suree Sattayawisit (1990) has studied the factors which were related to acute diarrhea among children under five years of age in Thailand by using the Cross-Sectional Study Method. The sample group was the children under five years old in Thailand. The random sampling was conducted by using chi-square Test and 95 Confidence Interval of Relative Odds Ratio. The onset of diarrhea among the children under the age of two was that boys were likely to risk diarrhea 1.53 times as much as were girls and that the children which were cared by the mothers who were under the age of 25 were likely to have a risk from diarrhea 1.83 times as much as the ones cared by the mothers who were over 25 years of age.

Somchai Tlongpudsa (1994) has studied care givers factors affecting diarrhea among children under five years of age in Khamsagalsang District, Nakhonracha sima Province by applying cross – sectional research design the samples were composed of 218 care – givers of under five years old children. The data were collected by interviewing and Chi – square was used for data analysis. It was found that there was a

significant relationship between the balanced income of the care givers per year, allowing the children to play neither pets, and not having the children defecated into a potty or a latrine, and the onset of diarrhea among children under five years of age ($p < 0.05$). No significant difference was found between the following factors and the onset of diarrhea : sex, age, marital status, number of family members, educational level, occupation, income, knowledge, attitudes, hand washing before preparing foods and after defecation, washing food or milk containers, cleaning bottles, drinking water of the children, supple mentaly foods, and food feeding.

Wantanee Issasapijitr (1995) has studied the incidence and factors related to diarrhea among children under five years of age in municipal communities of Sukhothai Province by employing cross - sectional research design. The samples were composed of all 0-5 year children in the sampled areas during 1 October - 31 December, 1994. The data were collected through interviewing and were analyzed by computing t-test and Chi-square test. Incidence rate was found to be 15.2 per 100 children, the highest incidence rate of diarrhea was found in October (7.3 : 100), the frequency of diarrhea in an ill child was 1.19 times, and the level of severity was moderate (63.8%). The factors that were found related significantly with the onset of diarrhea ($p < 0.05$) were : the behaviors of care – givers regarding improper waste disposal; environmental sanitation regarding improper refuse disposal, used – water – drainage system, The density of rats and insects, and animal disease-carriers found most were rats and cockroaches, and respiratory tract infection occurred during the episodes of diarrhea. The factors that did not relate to the onset of diarrhea were : Characteristics of family structure, occupation of household heads, education of

household heads, age, income, knowledge of and attitudes toward diarrhea, nutritional status, and children's dietary.

Punjawatna Plengsa-ard (1999) studied risk factors of acute diarrhea among under five years of age in Chacherngsou Province by employing the hospital – based case control design. The samples were 358 children with diarrhea who admitted at the hospitals in Chacherngsoa Province, 142 cases in the experimental group and 216 cases in the comparison group. Simple random sampling was used to select the cases for the experimental and the comparison groups, The data were collected during 1 August, 1995 - 31 March, 1996 by using the interviewing schedule, and were analyzed by computing t- test, Chi-Square test, and 95% confidence interval of relative odds ratio. It was found that the factors related to the onset of diarrhea were : illness occurred one month before the onset ; no breast – feeding among children under 6 months ; ever been sick with diarrhea among family members; improper use of water for drinking, family that did not have proper drainage system of used water, and family that did not control houseflies (OR = 3.57, 2.41,4.51,1.62,3.41,and 2.3 respectively). For the knowledge of car-givers and 17 variables of health preventive behaviors, significant correlation was found among the onset of acute diarrhea and 10 factors as follows : no hand washing before eating of the care – givers: no hand washing before preparing food or preparing bottle formula of the care – givers : not having children washed their hands before eating; no hand washing before breast feeding; no cleaning of breasts before breast feeding; using spoon for eating sometimes; picking up the food from the floor for eating or putting in the mouth; preparing bottle formula than children can be fed many times until the bottle is empty; cleaning the bottle only before preparing the bottle

formula; and did not keep the bottle covered. It was also found that knowledge about diarrhea of the care – givers related significantly with the onset of diarrhea. But no significant relationship was found. The onset of acute diarrhea and the following variable child factors regarding sex, birth weight, and nutritional status; and care – giver factors regarding age, occupation and educational level.

Nicom Kasiwitumnay (2000) used case control method to study the risk factors of diarrhea disease among children under five years of age in Rachaburi Province. The samples were composed of 630 care – givers, 210 care – givers of children with diarrhea disease and 420 care- givers of children with no diarrhea disease. Multi- stage 30 clusters Sampling technique was employed to select the research site and the data were collected by interviewing during 15 May - 31 August, 1998. The data were analyzed by computing t-test, Chi-square test, Odds ratio, and 95% confidence interval of relative Odds ratio. It was found that the factors that related significantly to the onset of diarrhea at the confidence level of 95% were : hand washing with water (OR = 3.10, 95% CL 2.09 – 4.61); hand washing with water after cleaning a child who has defecated (OR = 2.32, 95% CL 1.60-3.37), hand washing with water before feeding a child (OR = 3.52, 95% CL 1.42 – 10.47); unhygienic disposal of a child's stool (OR = 1.63, 95% CL 1.15 - 2.31); and did not warm the left food before feeding a child (((OR = 1.71, 95% CL 1.04-2.83). The factors that did not relate significantly with the onset of diarrhea disease were education and income.

Suparat Bunnag (2000) studied the factors related to diarrhea disease preventive behaviors of the care - givers in Bangpa-in district, Ayudhaya Province by using a

descriptive research design. The samples were Composed of 400 care - givers of the children under one year of age who were selected purposively. The data were collected by using. questionnaire, during June 10 December 1999. Chi – square and Pearson’s product Moment Correlation Coefficient were employed to analyze the data. It was found that the biosocial factors that related to the disease preventive behaviors of the care – gives were education level, occupation, income, marital status, relationship with the children, illness of care – givers and of children, giving food for infants, getting medical service when were sick, and the service cost. The predisposing factors that related to the care- givers, diarrhea disease preventive behaviors were : knowledge about diarrhea, perceived susceptibility of getting diarrhea, perceived severity of diarrhea, attitudes toward diarrhea disease prevention, and perceived self-efficacy. For the enabling factors, the following factors were found to be related diarrhea preventive behaviors : accessibility to the public health services, environments that conducive to the onset of disease, sources of water, used waters drainage system, waste disposal system, and refuse disposal system, the reinforcing factors that were found to be related to the disease preventive behaviors of the care - giver were family support, receiving health information from public health personal and public relation staff, including cooperation, regulations and supports from the community.

4.2 Related Researches in Other Countries

Ahmed et al. (1994) Surveyed of knowledge, attitudes, and practices of mothers in the rural community of two villages in Sudan. The study showed that mothers can define and describe diarrhea, however, awareness about the etiology and the importance of germs in its causation was low. The majority of mothers attributed diarrhea to

teething, milk, of pregnant women, hot food and salty water. Less than 40 % of mothers identify symptoms and sign of "dehydration" and the need for consultation.

EkanemEE, Adedeji OT, Akitoye CO. (1994) Studied environmental and behavioural risk factors for prolonged diarrhea in Nigerian children. It was found that a significantly high risk of prolonged diarrhea was found among children who were given ogi, amaize pap, as the main diet (odds ratio = 4.13).Children who were fed mainly with foods bought from street vendors also had a significantly higher risk (odds ratio = 2.91) of prolonged diarrhea. No association was found between domestic, environmental, and personal hygiene practices and prolonged diarrhea.

Lal et al. (1996) Studied Incidence of diarrhea and some related environmental and behavioral factors in Jhuggis of Delhi. It was found that incidence of diarrhea was 29.1 per thousand persons, and was selectively predominant among under fives (60.2 per thousand). This low incidence of diarrhea could be attributed to safe drinking water availability and common practice of hand washing by most of the people. But unsafe storage of drinking water at household level (70.5 %) and peridomestic open air defecation by children (22.9%) are potential threat for transmission of the disease.

Yoon et al. (1996) Studied the effect of not breast feeding on the risk of diarrhea and respiratory mortality in children in children under 2 years of age in Metro Cebu, the Philippines. It was found that not breastfeeding had a greater effect on diarrhea mortality than on acute lower respiratory infection (ALRI) mortality. In the first 6 months of life, failing to initiate breastfeeding or ceasing to breastfeed resulted in an 8-

to 10 –fold increase in the rate of diarrhea mortality. The rate of mortality associated with both ALRI and diarrhea was increased nearly six times by not breastfeeding, but the rate of ALRI mortality alone was not increased. The data also suggested that the risk of mortality associated with not breastfeeding was greater for lowbirth wight infants and infants and infants whose mothers had little formal education.

Getaneh, Assefa, and Tadesse. (1997) Studied of diarrhea morbidity in an municipal area of southwest Ethiopia. It was found that nearly 37 % of the 820 children surveyed had one or more episodes of diarrhea over a period of one month. Factors that significantly associated with diarrhea morbidity on bivariate analysis were child, s age, immunization status, father’s ethnicity, family income and availability of latrine. Infant feeding patterns and child nutrition status were not associated with diarrhea after possible confounding factors were controlled.

Ahiadeke. (2000) Studied of breast-feeding, diarrhea and sanitation as the components of infant and child health in Ghana and Nigeria. It was found that mixed-fed infants aged between 0 and 11 months trend to have a higher risk of diarrhea than fully breast-fed children. While the risk of diarrhea among weaned infants is twice that of mixed-fed infants.

Moawed and Saeed. (2000) Studied of knowledge and practices of mothers about infants’ diarrhea episodes. It was found that the majority of parents of infants with diarrhea were illiterate or can just read and write, mothers were mostly young aged 20-29 years, family income for about 40 % of the subjects was less than 5000 Saudi

Riyals per month. Diarrhea episodes were mostly in infants 6 months or less in age, mostly the first child in order with males more affected than females. Mothers' knowledge about many aspects of diarrhea was grossly deficient but tends to increase with increasing age, educational level, and birth order. Mothers' practices were better but still deficient and sources of information about diarrhea was mostly from non-health professionals.

Mahmud et al. (2001) Studied sociodemographic, environmental and clinical risk factors for developing persistent diarrhea among infants in a rural community of Egypt. It was found that development of persistent diarrhea was associated with water storage in mud-containers, pump-water supply, and absence of a latrine in the household.

Gasana et al. (2002). Studied the impact of water supply and sanitation on diarrhea morbidity among young children in the socioeconomic and cultural context of Rwanda, Africa. The study was aimed to assess the frequency and intensity of water contamination at the source, during transportation, and at home to determine the causes of contamination and its impact on the health of children aged 0 to 5 years. The methods used were construction of the infrastructure for three sources of portable water, administration of questionnaire about socioeconomic status and sanitation behavior, anthropometric measurement of children, and analysis of water and feces. The contamination, first thought to be only a function of rainfall, turned out to be a very complex phenomenon. Water in home was contaminated (43.4%) with more than 1100 total coliforms/100ml. due to the use of unclean utensil to transport and store water.

This socioeconomic and cultural problem should be addressed with health education about sanitation. The latrines (found in 40.8 % of families) presented a double-edged problem. The extremely high population density reduced the surface area of land per family, which resulted in a severe nutritional deficit (15% of the children) affecting mainly young children, rendering them more susceptible to diarrhea (three episodes/child/year)

Strina et al. (2003) Studied childhood diarrhea and observed hygiene behavior in Salvador, Brazil. It was found that the prevalence of diarrhea among children for whom mainly unhygienic behavior was recorded, was 2.2 times that among children in the mainly hygienic group.

Etiler, Velipasaoglu, and Aktekin. (2004). Study risk factors for overall and persistent diarrhea in infancy in Antalya, Turkey by using a cohort study. It was found that diarrhea and persistent diarrhea increased risks were associated with having an uneducated mother and a self-employed father. Among environmental factors, living in a slum was associated with both overall and persistent diarrhea ,whereas living in a crowded house, having no kitchen or having an unhygienic toilet. Factors related to the infant were preterm birth, low birth weight, underweight children. stunted or wasted children. By logistic regression analysis, both overall and persistent diarrhea were found to be associated with mother's education.

From the literature reviewed, the PRECEDE framework developed by Green has been modified to analyze the factor related to preventive behaviors, as shown in the research conceptual frameworks presented in Figure 2

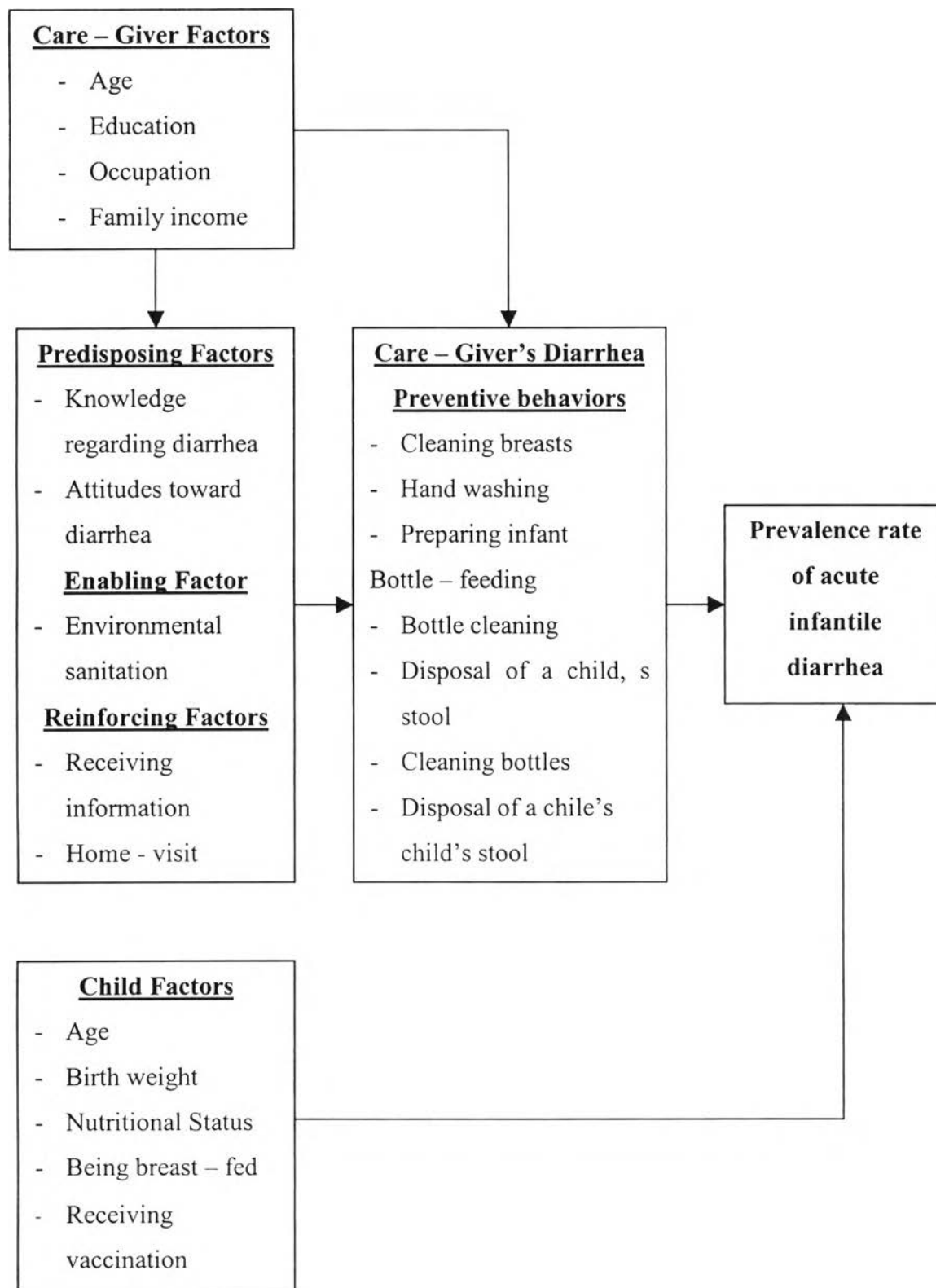


Figure 2 : Research conceptual framework