

**RISK FACTORS RELATING TO THE DIARRHEAL DISEASE
OCCURRENCE AMONG UNDER 5 CHILDREN AT
SAMUT SAKHON PROVINCE, THAILAND**



**A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF PRIMARY HEALTH CARE MANAGEMENT
FACULTY OF GRADUATE STUDIES
MAHIDOL UNIVERSITY**

2007

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Thesis
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SAMUT SAKHON PROVINCE, THAILAND**



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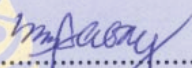
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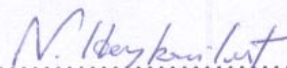
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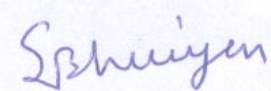
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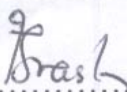
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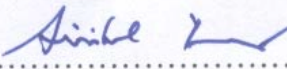

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Erwin M. Labay

**RISK FACTORS RELATING TO THE DIARRHEAL DISEASE OCCURRENCE
AMONG UNDER 5 CHILDREN AT SAMUT SAKHON PROVINCE, THAILAND**

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ABSTRACT

This cross sectional study was conducted by interviewing 158 caretakers of under 5 children in Krathum Baen district Samut Sakhon province, Thailand. This study aimed to measure the occurrence of diarrhea and to describe and identify the associations between the variables, socio-demographic, child, environmental and sanitation, and behavioral factors and diarrheal disease occurrence among under 5 children. The instrument used to collect the data was a structured questionnaire.

The majority of the caretakers were mothers, ranging from 16 to 53 years old and with a median age of 29 years. A greater number had completed secondary school or higher and belonged to the low income group. Ages of children ranged from 1 to 55 months old with a median of 18 months.

Among the children, 19% had diarrheal occurrence during the previous one month inclusive of the day of interview. Overall, 17.1% of the caretakers had good knowledge, 88.6% had negative attitude, and 54.4% had good level of practice related to childhood diarrhea. The majority of the caretakers had a water source and storage for drinking water, a latrine in their house, garbage collection, and drainage system for domestic water waste, and housing sanitation that were characterized as hygienic.

Caretakers who were non-mothers and who had a lower level of education, children belonging to the less than 6 months group, poor level of knowledge, negative attitude, poor practice on childhood diarrhea, and unhygienic environmental sanitation were associated with a higher number of diarrheal occurrences among under 5 children, though without statistical significance.

The high diarrheal disease occurrence among under 5 children in Samut Sakhon district needs to be confirmed through prospective studies with more representative settings and sample size. An in-depth qualitative research is highly recommended in the future in order to address the important key points that this study has found.

**KEY WORDS: DIARRHEA/ OCCURRENCE/ UNDER 5 CHILDREN/
RISK FACTOR/ CARETAKERS**

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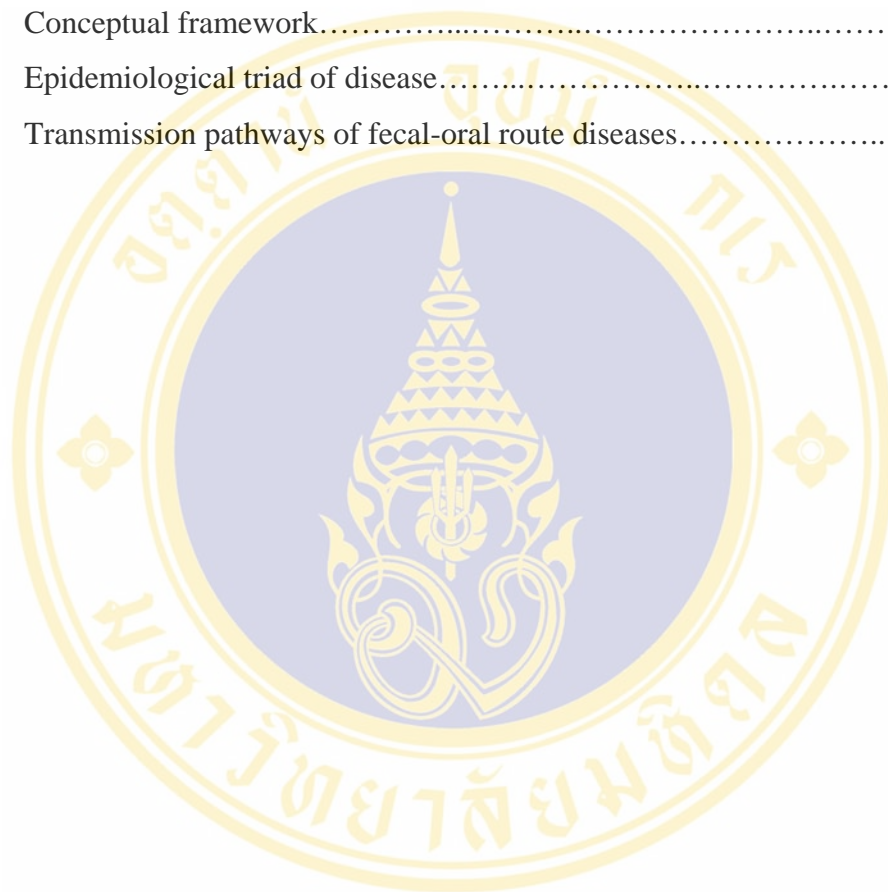
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CHAPTER 1

INTRODUCTION

1.1 Rational and justification

Worldwide 73% of the 10.6 million yearly deaths in children younger than age 5 years: pneumonia (19%), diarrhea (18%), malaria (8%), neonatal pneumonia or sepsis (10%), preterm delivery (10%), and asphyxia at birth (8%). Of the 6.6 million deaths among children aged 28 days to five years: 1.7 million (26%) are caused by diarrhea. 1 million (61%) of these deaths are due to the presence of undernutrition. Millions more survive only to face diminished futures, unable to develop to their full potential. [1]

Diarrhea occurs world-wide and causes 4% of all deaths and 5% of health loss to disability. It is most commonly caused by gastrointestinal infections which kill around 2.2 million people globally each year, mostly affecting 15% of under 5 children in developing countries: 80% of which in the first two years of their life; 42,000 a week, 6,000 a day, four every minute, and one every 15 seconds. The use of water in hygiene is an important preventive measure but contaminated water is also an important cause of diarrhea. Cholera and dysentery, being severe by nature, are sometimes considered to the life threatening forms of diarrhea. [2]

In developing countries, 88% of diarrheal disease is attributed to unsafe water supply, inadequate sanitation and hygiene. By improving water supply, it reduced diarrhea morbidity by 6% to 25%, when severe outcomes were included. Improved sanitation reduced diarrhea morbidity by 32%. Hygiene interventions including hygiene education and promotion of hand washing has lead to a reduction of diarrheal cases by up to 45%. Improvements in drinking-water quality through household water treatment, such as chlorination at point of use, have lead to a reduction of diarrhea episodes by between 35% and 39%. [3]

Causes of death in children

Infectious and parasitic diseases remain the major killers of children in the developing world, partly as a result of the HIV/AIDS epidemic. Although notable success has been achieved in certain areas (for example, polio), communicable diseases still represent seven out of the top 10 causes of child deaths, and account for about 60% of all child deaths. Overall, the 10 leading causes represent 86% of all child deaths (table 1).

Table 1 Leading causes of death among children in developing countries, 2002.

Rank	Cause	Number (x 1000)	% of all deaths
1	Perinatal conditions	2,375	23.1
2	Lower respiratory infections	1,856	18.1
3	Diarrheal diseases	1,566	15.2
4	Malaria	1,098	10.7
5	Measles	551	5.4
6	Congenital anomalies	386	3.8
7	HIV/AIDS	370	3.6
8	Pertussis	301	2.9
9	Tetanus	185	1.8
10	Protein energy malnutrition	138	1.3
	Other causes	1,437	14
	Total	10,263	100

Source: World Health report 2003. World Health Organization

Many countries of the Eastern Mediterranean Region and in Latin America and Asia have partly shifted towards the cause-of-death pattern observed in developed countries. Here, conditions arising in the perinatal period, including birth asphyxia, birth trauma and low birth weight, have replaced infectious diseases as the leading cause of death and are now responsible for one-fifth to one-third of deaths. Such a shift in the cause-of-death pattern has not occurred in sub-Saharan Africa, where perinatal conditions rank in fourth place. Here, undernutrition, malaria, lower

respiratory tract infections and diarrheal diseases continue to be among the leading causes of death in children, accounting for 45% of all deaths. [4]

In South East Asian Region (SEAR), several countries are still facing these problems, especially when they occur in children under 5 years of age. In Bangladesh, Bhutan, PDR Korea, Myanmar, India, Indonesia, Sri Lanka and Thailand diarrheal diseases were one of the five leading causes of morbidity and mortality (table 2). [5]

Table 2 Deaths among children under five years of age due to diarrheal diseases in South East Asian Region countries (%).

Country	Value	Latest year
Bangladesh	20.0	2000
Bhutan	20.9	2000
Democratic People's Republic of Korea	18.9	2000
India	20.3	2000
Indonesia	18.3	2000
Maldives	20.3	2000
Myanmar	21.1	2000
Nepal	20.5	2000
Sri Lanka	13.5	2000
Thailand	16.2	2000
Timor-Leste	21.9	2000

Source: WHO: 'World Health Statistics 2006' and 'The World Health Report, 2006 Edition'

In Thailand, the mortality rate has been declining considerably due to improved health services and extensive coverage as well as the success of the campaign on oral rehydration therapy (ORT). Distribution of the causes of death among under 5 children have shown that diarrhea is still a public health concern, being the 3rd leading cause of mortality in Thailand from 2000 to 2003 (table 3). [6]

Table 3 Distribution of causes of death among children under 5 years of age, Thailand 2000-2003

Causes	Death ^b	Regional average
	(%)	(%)
Total neonatal deaths	100	100
Neonatal causes ^a	45	44
HIV/AIDS	6	1
Diarrheal diseases	16	20
Measles	0	3
Malaria	0	1
Pneumonia	11	18
Injuries	5	2
Others	16	10

^a Includes diarrhea during neonatal period

^b Sum of individual proportions may not add up to 100% due to rounding

Source: Bureau of Epidemiology, Department of Disease Control

A recent provincial health status survey revealed that the diarrhea incidence in children has been declining over the past five years from 6.0 episodes/person/year in 1995 to 3.6 episodes/person/year in 2001. Nevertheless, the incidence is still higher than the target of not exceeding 1 episode/person/year (table 4). [7]

Table 4 Episode of illness with diarrhea among children under 5 years of age, 1995-2001.

Type of areas	Illness (episode/person/year)			
	1995	1996	2001	Target, 8 th Plan
Municipality	4.9	3.1	3.4	
Non-municipality	5.2	3.4	3.9	
Total	6.0	3.4	3.6	Not exceeding 1

Source: Provincial Health Status Survey: 1995, 1996, and 2001.

Samut Sakhon Province

Samut Sakhon is one of the central provinces (*changwat*) of Thailand. Neighboring provinces are (from the southwest clockwise) Samut Songkhram, Ratchaburi, Nakhon Pathom and Bangkok. It has a population of 461,792 (rank 58th), [8] with an area of 872.3 km² (rank 72nd), population density of 529.40 (rank 6th). [9] Province is subdivided into 3 districts (*Amphoe*) namely; Mueang Samut Sakhon, Kratum Baen, and Ban Phaeo. These districts are further subdivided into 40 communes (*tambon*) and 288 villages (*muban*).

Krathum Baen district

Krathum Baen is a district (*Amphoe*) in the northern part of Samut Sakhon Province, central Thailand. It has a population of 138,309 (2005), an area of 135.276 km², and a population density of 1,022 inh./km².

Geography

Neighboring districts are (from the north clockwise) Sam Phran district of Nakhon Pathom Province, Nong Khaem and Bang Bon of Bangkok, Mueang Samut Sakhon and Ban Phaeo of Samut Sakhon Province. The important water resource are the Tha Chin river and Phasi Charoen canal.

Administration

The district is subdivided into 10 communes (*tambon*), which are further subdivided into 76 villages (*muban*). There are two towns (*thesaban mueang*) within the district - Krathum Baen and Om Noi. The non-municipal area is administrated by 8 Tambon administrative organizations (TAO).

Health profile

According to the to the provincial health office report (2006), Krathum Baen District has 1 community hospital with 120 official bed capacity and 15 health centers, 2 of which are located inside the municipality and 13 are located outside the

municipality. The ratio of health center to its personnel is apparently low due to high turn-over rate, mainly because many would like to work in the busier Bangkok metropolitan area and work in private establishments (table 5).

Table 5 Ratio of human resource per health center and per population at Krathum Baen district

District	No. of health center or PCU	No. of health center staff	Average no. of health staff	Ratio per population
Krathum Baen	13	44	3.46	2,226

Source: Provincial health status report, 2006

In Krathum Baen district, diarrhea ranked first in the morbidity report and has been consistently among the first top 5 morbidity of Samut Sakhon province as well (table 6). [10]

Table 6 Top 10 causes of morbidity in Krathum Baen District

Rank	Disease	2006	
		Number (n)	Rate (per 100,000)
1	Diarrhea	10,502	2,323.36
2	conjunctivitis	4,477	990.45
3	Pneumonia	789	174.55
4	DHF (DHF+DF+DSS)	401	88.71
5	Unknown fever	369	81.63
6	Food poisoning	362	80.09
7	TB lung	349	77.21
8	Infuenza	298	65.93
9	chickenpox	290	64.16
10	Measles	52	11.05

Source: Provincial health status report, 2006

Diseases of the digestive, where diarrhea is being included, ranked second on the leading cause of morbidity among the hospital reports (table 7). [10]

Table 7 Ten leading causes of morbidity in all hospitals (OPD) of Samut Sakhon Province

Rank	Causes	2006	
		Number (n)	Rate (per 100,000)
1	Diseases of the respiratory system	381,494	84,398.15
2	Diseases of the digestive system	142,844	31,601.47
3	Diseases of the respiratory system	135,332	29,939.58
4	Diseases of musculoskeletal system and connective tissue	133,863	29,614.59
5	Endocrine, nutritional and metabolic diseases	100,418	22,215.54
6	Certain infectious and parasitic diseases	80,688	17,850.66
7	Diseases of the eye and adnexa	59,492	13,161.45
8	Diseases of the skin and subcutaneous tissue	58,512	12,944.65
9	Diseases of the genitourinary system	40,366	8,930.20
10	Diseases of the nervous system	39,489	8,736.18

Source: Provincial health report, 2006

Thailand has made tremendous effort to reduce the unacceptable and tragic loss of life around birth and in precious early years of childhood. They have shown efforts to ensure child health in particular, is highlighted in their national health and development plans. In spite of the numerous projects that have been conducted through the years, the fact still remains, that diarrhea still exists as a public health concern not only to the health sectors, but to the entire country as well.

Diarrhea, being ranked as the third leading cause of mortality among under 5 children in Thailand, [6] has raised the researcher's curiosity to consider this study. The disease in these children is not purely medical but a huge part of this should be traced back to the social and economic aspect of the family. Despite a number of studies that were conducted in Thailand, little has been known about the level of risk awareness, care in food and or drink selection and consumption or how well the foods are being prepared, and hygienic practice among caretakers of under 5 children in Samut Sakhon province. There is a need to discover the behavioral factors of caretaker, specifically the caretakers through K.A.P. assessment and environmental sanitation factor and identify their associations with diarrhea.

Study like this is a step forward to discover the possible factors that made the diarrhea stay as one of the leading causes of morbidity and mortality not only to Thailand, but also to other developing and developed countries as well. Without doing a research such as this, diarrhea would still remain to be a public health problem in the future.

1.2 Research question:

What are the risk factors relating to the diarrheal disease occurrence among under 5 children at Samut Sakhon province, Thailand?

1.3 Research objectives

1.3.1 General objective:

To describe the risk factors relating to the diarrheal disease occurrence among under 5 children at Samut Sakhon province, Thailand.

1.3.2 Specific objectives:

1. To measure the diarrheal disease occurrence among under 5 children at Samut Sakhon province, Thailand.

2. To describe the socio-demographic factors of caretakers and relating to the diarrheal disease occurrence among under 5 children.
3. To describe the environmental and sanitation factors relating to the diarrheal disease occurrence among under 5 children.
4. To describe child factors relating to the diarrheal disease occurrence among under 5 children.
5. To describe the behavioral factors of caretakers (knowledge, attitude and practice) relating to the diarrheal disease occurrence among under 5 children.
6. To identify an association between risk factors (Socio-demographic, environmental and sanitation, child, and behavioral factors of caretakers) and diarrheal disease occurrence among under 5 children.

1.4 Variables and Operational Definition

1.4.1 Dependent variable

Diarrheal disease occurrence in under 5 children: refers to under 5 children ill with diarrhea, as stated by the respondent or child's mother (caretaker) that took place from the previous one month up to the actual date of interview (study period).

Diarrhea: is defined as one or more of the following conditions:

1. Three or more loose watery stools in one day
2. One or more mucous stools in one day
3. One or more mucous-bloody stool in one

Diarrheal diseases may present in any of these five forms:

1. Acute diarrhea
2. Dysentery
3. Enteric fever
4. Food poisoning
5. Cholera

Percentage of under 5 children with diarrhea will be calculated as: number of children ill with diarrhea (as stated by the respondents or child's mother/caretaker) at

anytime during the previous one month (inclusive of the date of interview) divided by number of under 5 children who consulted at Out Patient Department of Krathum Baen Community hospital and four Krathum Baen Primary Care Units (PCUs), during the study period.

1.4.2 Independent variables

Factors: refer to all independent variables.

1.4.2.1 Socio-demographic factors

Relationship: refers to the affiliation of the child to the caretakers. It will be categorized into two groups:

Group 1 mother

Group 2 others or non mother such as; grandparent, aunt or uncle, father, or babysitter

Education: refers to the highest year of schooling completed by the caretaker. I made reference to the National Education Scheme for the year 1977, prescribing the level of education to be divided into 4 level namely: pre-school education; elementary education taking 6 years; secondary education which is divided into 2 levels: lower and upper secondary, both taking 3 years each, and; higher education. In the 9th plan, it is specified that by 2006, Thai population aged 15 years and over will have an average 9 years of schooling [11]. In this study education will be categorized into two groups:

Group 1 Elementary or less (≤ 6 years)

Group 2 Secondary or higher (> 6 years)

Occupation: refers to the job or work of the caretaker that generates income to sustain daily needs of the family. It will be categorized into four groups:

1. Service worker: includes those who have regular income; labor workers, government and private employee
2. Small business: includes those who have small stores and those who are self-employed

3. Housewife: includes all mother who are not working for income and those who are unemployed
4. Agriculture

Household income: include wages and salaries, tips, bonuses, etc.; net profits from farming and non-farming business. The current average monthly income of the area where Samut Sakhon closely belonged is 12,185 baht (lowest is 7,853 and highest is 24,690 baht). [12] In using this as point of reference, I arrived at categorizing the economic status into three groups:

- Group 1 Low income group: less than 7,000 baht/month
- Group 2 Middle income group: 7,000 to 19,999 baht/month
- Group 3 High income group: equal or more than 20,000 baht/month

Time allocation: means the time that is being spent by the caretaker for caring the child during daytime. It will be categorized into three groups:

- Group 1 less than 8 hours/day
- Group 2 8 to 15 hours/day
- Group 3 16 hours and more

1.4.2.2 Child factor

Birth weight: is defined as the first weight of the fetus or newborn after birth that was measured preferably within the first hour of life. [13] In this study it will be classified into 2 groups:

- Group 1 Low birth weight: less than 2,500 grams. [14]
- Group 2 Normal birth weight: 2,500 grams or more.

Birth order: refers to the rank of child in terms of age in months. First order will refer to the eldest or highest number of age in months. Second order will refer to the next younger sibling and so on. In this study it birth order will be categorized into two groups:

- Group 1 First order
- Group 2 Second order and up

Breastfeeding: Exclusive breastfeeding is defined as an infant's consumption of human milk with no supplementation of any type (including infant formula, cow's milk, juice, sugar water, baby food and anything else, even water) except for vitamins, minerals, and medications. [15, 16] In this study breastfeeding will be categorized into two groups:

Group 1 Exclusively breastfed

Group 2 Others: refer to those children who have not been exclusively breastfed or those who have been bottle-fed with formula milk.

1.4.2.3 Behavioral factors of caretakers

Caretaker: refers to a person who takes the responsibility of child health, and in this study, it will be defined as mothers, fathers, grandparents or other relatives like aunt or uncle.

Knowledge: refers to the technical know-how of the caretaker about nature of diarrheal disease occurrence, as to its prevention and control, and care of a child with diarrhea. Knowledge in this study is going to be classified into three groups:

Group 1 Poor

Group 2 Fair

Group 3 Good

Attitude: stated as an evaluative statement or judgment of caretakers concerning the hazards of diarrheal disease occurrence, the degree of compliance towards its prevention and control, care, and impact of disease. Attitude in this study will be classified into two groups:

Group 1 Positive attitude

Group 2 Negative attitude

Practice: means the performance of the duties and responsibilities of a caretaker. In this study, it is defined as performance of tasks by caretakers toward childhood diarrhea such as hand washing, food storage, feeding, child's stool disposal

and the care of the diarrheic child. In this study, practices were classified into three groups:

- Group 1 Poor
- Group 2 Moderate
- Group 3 Good

1.4.2.4 Environmental and sanitation factors:

Information on sanitation and environmental conditions includes water resources, human waste disposal, solid waste disposal, waste water disposal, and housing condition. In this study, sanitation and environmental conditions were classified into two categories:

- Group 1 Hygienic
- Group 2 Unhygienic

Water resources: defined as resources of water for drinking and other use. This would also refer to water segregation or use of containers for water; separating into containers for drinking water and for water that is being used for cooking, washing, and others.

- **Drinking water**

Hygienic source: refers to deep well, tap water, or plastic tank containing filtered or purified water or those being sold in registered water refilling stations

Unhygienic source: refers to shallow well or rain water

- **Water for other use**

Hygienic source: refers to deep well, sanitary shallow well, tap water, or plastic tank

Unhygienic source: refers to unsanitary shallow well or rain water

- **Container or storage for drinking water**

Hygienic: refers to a jar with cover, big plastic container, metal, concrete or plastic tank

Unhygienic: refers to a jar without cover

- Container or storage of water for other use

Hygienic: refers to a jar with cover, metal, concrete or plastic tank

Unhygienic: uncovered jar

Human waste disposal: In this study, it is defined as the presence or absence of the following items stated below, and will be classified as hygienic and unhygienic.

- Availability of latrines

Hygienic: refers to the presence of latrine in the house

Unhygienic: refers to the absence of latrine in the house

- Use of latrines by family members

Hygienic: means every person in the house is using the latrine

Unhygienic: means not every person in the house is using the latrine

- Condition of latrine in the house

Hygienic: refers to good ventilation with no unpleasant odor, and clean floor

Unhygienic: refers to poor ventilation with unpleasant odor, and dirty floor

- Materials used for cleaning after the child has defecated

Hygienic: refers to both washing and drying the bottoms with paper

Unhygienic: refers to the cleaning without using both water and paper.

Solid waste disposal: refers to refuse or garbage collection, type of refuse container, and whether sanitary or unsanitary.

- Garbage collection

Hygienic: refers to the garbage collection that are being maintained on a regular basis such as once/week, twice/week, or three times a week or more

Unhygienic: refers to the absence of regular collection or no collection.

Waste water disposal: refers to the availability of drainage system and the drainage condition surrounding the house of caretaker. It will be classified into hygienic and unhygienic.

- Drainage system

Hygienic: refers to the presence of drainage

Unhygienic: refers to the absence of drainage

- Condition of drainage around the house

Hygienic: refers to the waste water that are free-flowing and has no foul odor

Unhygienic: refers to the waste water that are not free-flowing and has a foul odor.

Housing sanitation: In this study, it refers to the physical set-up of the house, particularly insect breeding place within the vicinity of the caretaker's house, and whether they have livestock or not. They were further categorized into two groups; hygienic and unhygienic.

- Condition of the immediate area surrounding the house

Hygienic: refers to the absence of insects breeding place

Unhygienic: refers to the presence of insects breeding place

- Condition of the kitchen's flooring

Hygienic: refers to concrete, tiled or wooden flooring

Unhygienic: refers to earth ground or soil

- Cooking fuel used

Hygienic: refers to the use of gas or electric in cooking their foods

Unhygienic: refers to the use of charcoal or wood in cooking their food

- Animal raising or livestock

Hygienic: refers to the absence animal raising or livestock adjacent to the house

Unhygienic: refers to the presence of livestock or animal raising in the perimeter or inside their house. Distance of the livestock from the house adds more to the description and in support of the housing sanitation status.

1.5 Conceptual framework

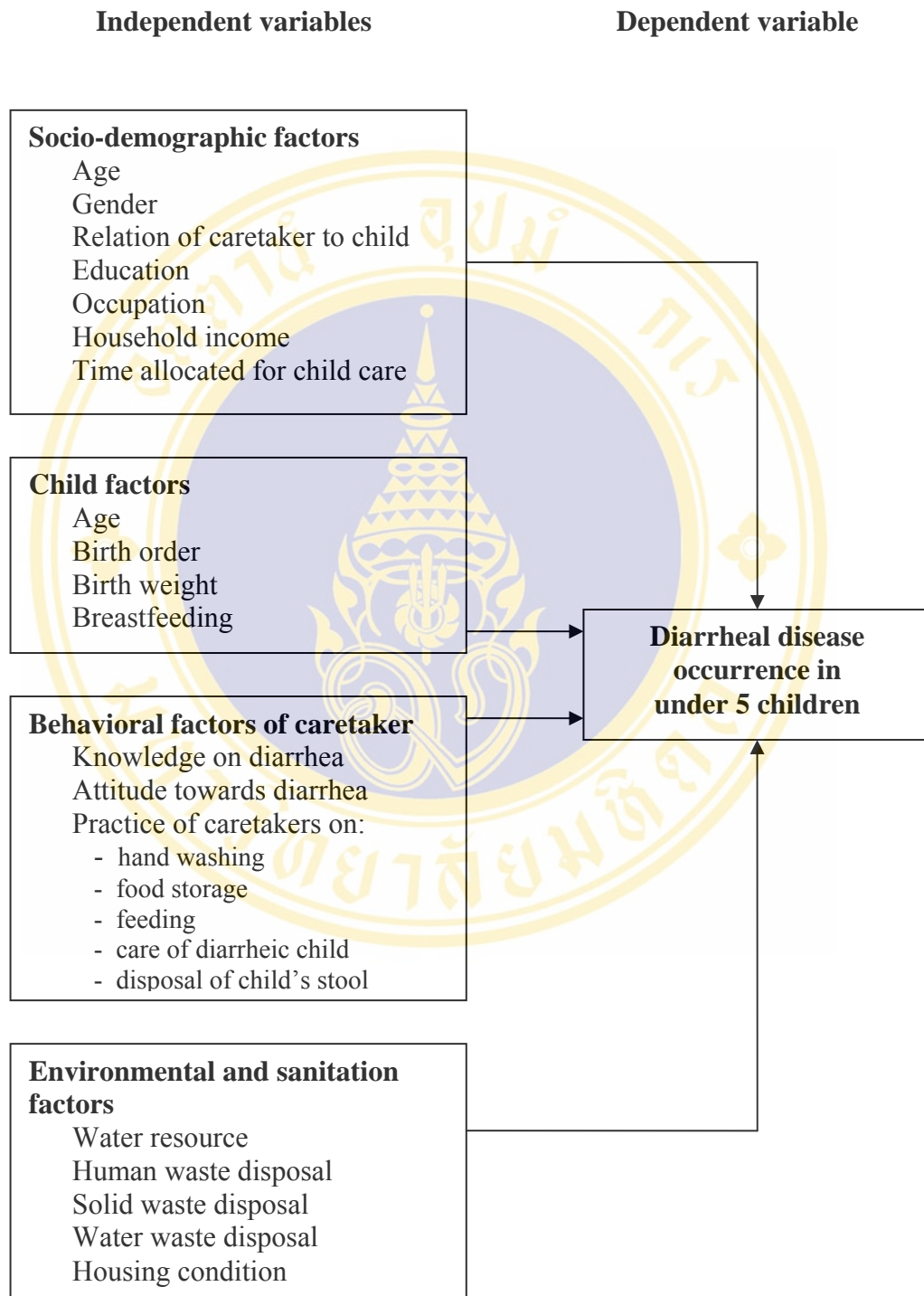


Figure 1 Conceptual framework

1.6 Scope and limitation

Samut Sakhon province was selected for the area of study because of their high incidence rates of diarrheal diseases. Based on the situational analysis and the previous studies on diarrheal diseases, 19 influencing factors were selected. Although some of the previous studies took more other influencing factors into consideration, they were excluded from this study due to a reliability of questions. Severity of the dependent variable, diarrhea occurrence, will not be assessed in this study. The researcher will not include an observation part in the practice of caretakers, and in the environmental and sanitation condition of the household.

1.7 Usefulness of the study

The findings on this study will serve as very essential baseline information for health care practitioners, decision makers, future researchers, students and teachers, and the general public who will be interested in this study. The program planners can use this as a guide to bridge the gap in the prevention and control of diarrheal disease among the locality of Krathum Baen district, Samut Sakhon province. And hopefully this will help them to improve the incidence of diarrhea and ultimately, to reduce the mortality among children under five years old.

CHAPTER 2

LITERATURE REVIEW

2.1 Theoretical Model

Epidemiological Triad of Disease

Human disease does not arise in a vacuum. It results from an interaction of the host (a person), the agent (e.g., a bacterium) and the environment (e.g., a contaminated water supply). Although some diseases are largely genetic in origin, virtually all disease results from an interaction of genetic and environment factors, with the exact balance differing for different diseases. Many of the underlying principles governing the transmission of disease are most clearly demonstrated using communicable diseases as a mode. However, the concepts are also applicable to diseases that do not appear to be of infectious in origin. Disease has been classically described as the result of an epidemiologic triad. It is the product of an interaction of the human host, an infectious or other type of agent, and the environment that promotes the exposure. For such an interaction to take place, the host must be susceptible. Diseases can be transmitted person-to-person (direct transmission) by means of direct contact or a disease can be transmitted indirectly through a contaminated water supply. [17]

This study will use the concept of epidemiologic triad of disease model, an integrated approach which shows diarrheal disease occurrence as product of interaction of the human host, an infectious or other type of agent, and the environment that promotes the exposure. This framework is based on the recognition that, Agents represents behavioral factors such as: Knowledge, Attitude ,and Practice on diarrhea disease, especially drinking safe water and eating safe food, sanitary disposal of feces, and washing hands with good technique at appropriate times.

Host susceptibility, represented by child, is determined by a variety of factors including age, gender, birth order, birth weight, and breastfeeding status.

Environment in this study refers to all external condition and influences affecting the under 5 children such as physical and socio-demographic factors.

Enabling Environmental factors: refer to good housing condition, accessibility to good water resources, human waste disposal, solid waste disposal and waste water disposal system.

Socio-demographic factors of caretaker include age, relationship of caretaker to child, occupation, household income and time allocation for care of child.

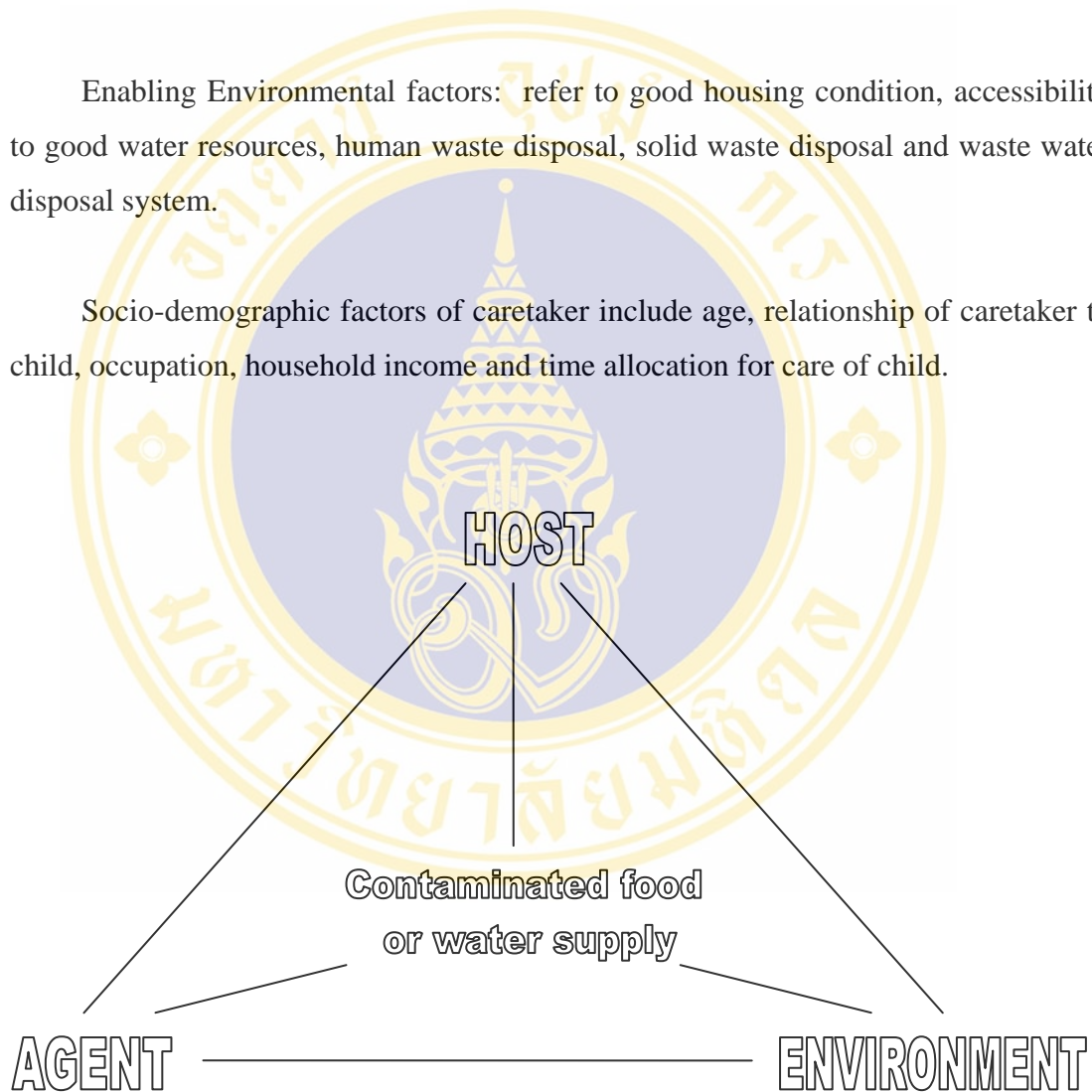


Figure 2 Epidemiological Triad of Disease

2.2 Information about diarrhea

2.2.1 Definition

Diarrhea is characterized by three or more watery or loose stools within a 24-hour period. [18] There are three different types of diarrhea: Dysentery diarrhea causes bacterial damage to the intestinal mucosa. In the gut, pathogenic toxins are released causing cell and tissue death. [19] Tissue layers deteriorate and blood is present in the feces. Symptoms include rapid weight loss and anorexia and this diarrhea can be fatal. An example of dysentery is *Shigellae*. [20]

Acute watery diarrhea has an acute beginning. Although it usually lasts less than seven days, it can often last up to 14 days. [19] Acute watery diarrhea involves the passing of frequently occurring watery stools without any visible signs of blood. The stool is clear and termed "rice water stool" because it looks like rice water. [20] Of the three types, acute watery is the most common killer; however, one hundred percent of these deaths are preventable by standard case management. [21] An example of acute watery diarrhea is *Cholera*. [20]

Persistent diarrhea is parasitic and can last for unusually long periods of time (at least 14 days). Often, it begins as either acute or dysentery and once present in the gut, it is difficult to remove. Significant weight loss is expected with the diarrhea looking like the food ingested. An example of persistent diarrhea is *Cryptosporidium*. [20]

2.2.2 Etiology and Transmission

Rotavirus most often infects infants and young children, and in children ages 3 months to 2 years, is one of the most common causes of diarrhea. The etiologic agents that cause diarrhea in both developing and developed countries are the same. Almost all children have had a rotavirus infection by the time they are 5 years old. Severe infection, rotavirus gastroenteritis, is the leading cause of severe, dehydrating diarrhea in infants and young children. Rotavirus infection is very contagious. The virus passes in the stool of infected persons before and after they have symptoms of the illness. Children can become infected if they put their fingers in their mouths after touching something that has been contaminated by the stool of an infected person. Usually this

happens when children forget to wash their hands often enough, especially before eating and after using the toilet. People who care for children, including health-care and child-care workers, can also spread the virus, especially if they do not wash their hands after changing diapers. [22]

2.2.3 Factors increasing the risk of diarrhea diseases

Socioeconomic factors such as overcrowding, poor sanitation, contaminated water and inadequate food hygiene, were associated with a high incidence of diarrheal diseases in early infancy in several studies. Similar findings related to poverty found higher attack rates of diarrhea in poor areas versus prosperous areas. Risk factors include socioeconomic deprivation manifested by household crowding, low maternal education, and low birth weight. Behavioral factors include failure to breast feed exclusively for the first 4-6 months of life, failure to continue breast feeding until one year of age, using infant bottles which are difficult to clean, storing food at room temperature, failure to wash hands, failure to dispose of feces hygienically, and drinking contaminated water. Immunosuppression is another factor linked to higher rates of diarrheal diseases, as well as an episode of measles. Of all infectious diseases, the diarrheal diseases have the greatest adverse effect on the growth of children. This is the result of factors such as malabsorption of nutrients caused by the infectious process in the gut and reduced dietary intake resulting from anorexia and from food withdrawal during diarrhea. This is a consequence of traditional practices and improper advice from health workers. [19]

2.2.4 Symptoms of Diarrhea

As dehydration increases, signs and symptoms develop. These include thirst, restless or irritable behaviors, dry mucous membranes, decreased skin turgor, sunken eyes, sunken fontanelle (in infants), absence of tears when crying vigorously, moist and pale hands and feet, no urine flow for several hours, and drinks poorly. [23]

2.3 Risks factors relating to under 5 diarrhea

2.3.1 Socio-demographic factors

A study on diarrhea and feeding practices of young children attending two

selected urban clinics in Dhaka, Bangladesh had demonstrated a high incidence of diarrhea among children who belonged to lower income family groups and mothers with low educational level. [24] Another study on the factors associated with incidence of acute diarrheal disease in children under 5 years of age in Khon Kaen Province, Thailand showed association between household income and incidence of diarrhea in children under 5, but there was no significant association between education and occupation, and incidence of diarrhea in under 5 children. [25] One study demonstrated an association among household income, occupation and diarrheal diseases occurrence among children under 5, but no association between education of caretaker and diarrhea. [26]

In a case-control study among the urban poor of Dhaka, Bangladesh, the association of maternal education and family income with severity of disease due to diarrhea in children was examined. After adjusting for family income, 7 or more years of school education was associated with 54% reduced risk of severe disease as indicated by the presence of dehydration. Income in the uppermost quartile of this population, independently of maternal education, was associated with 41% reduced risk of severe disease compared to the lowest quartile. In the logistic regression model the effect of maternal education remained high after adjustment for several confounders. Based on the concept that socioeconomic variables operate through a set of proximate variables it is contended that maternal education, independently of economic power, through its impact on disease from acute diarrhea, favorably influences child survival. [27]

2.3.2 Child factors

A study on the diarrheal disease among the rural children of Khon Kaen had revealed a significant difference on diarrheal disease occurrences among age groups. The risk groups were children aged 6-12 months and 1-2 years, respectively. [28] In another study on the pattern of diarrhea in Khon Kaen Northeastern Thailand result had showed that the incidence of diarrhea under 3 years, especially 0-6 months and 7-12 months, was significantly higher than children aged 2 years and above. [29]

Risk factors associated with diarrhoea were evaluated from a cross-sectional nutrition and health study in 1,620 Ecuadorian children less than 5 years old. Prevalence of diarrhoea was highest among children who were between 6 and 23 months old. In this age range prevalence was significantly associated with hygienic factors (quality of drinking water, sanitation and refuse system), but not with demographic factors (sex, altitude, population density, family size). [30]

A study on the association of low birthweight and acute childhood diarrhea in an urban settlement of Papua New Guinea had demonstrated a significant association between low birth weight and diarrhea in children of at least 3 years of age. [31] Similarly, a significant association between low birth weight children and higher incidence of dehydration complication was found on the association of breastfeeding, nutritious status, and other prognostic factors for dehydration among young children with diarrhea in Brazil. [32]

The study on the role of breastfeeding on the prevention of infant mortality found that any breastfeeding is associated with more than two-fold protection against infant mortality compared with no breastfeeding in the first year of life in developing countries. [33] Further, they found that compared with breastfed infants, infants who are not breastfed in the first 6 months of life have a six-fold greater risk of mortality due to diarrhea, and infants who are not breastfed from 6 to 11 months of age have a two-fold greater risk of mortality due to diarrhea. Similarly, among children 0 to 6 months of age already hospitalized for diarrhea in India, lack of breastfeeding was associated with a six-fold greater risk of mortality. [34]

A study on the relationship between belief and preventive behavior of the mother and diarrheic child had found that more diarrhea incidence were linked to the first and highest ordered child. [35] Furthermore, high birth order was significantly associated with an increase risk of dehydration in diarrheic child. [32]

A study of large scale survey data on breast-feeding, diarrhea and sanitation as components of infant and child health in Ghana and Nigeria showed that mixed-fed infants aged between 0 and 11 months tend to have a higher risk of diarrhea than fully

breast-fed children, while the risk of diarrhea among the weaned infants is twice that of mixed-fed infants. [36]

A study on childhood diarrhea in a low income urban community in Bangkok had demonstrated that breastfeeding was an important factor on diarrheal disease occurrence, particularly in children under 1 year. This study showed a significant difference on the occurrence of diarrhea between breastfed and non breastfed children. The morbidity and mortality of diarrhea in children were able to be reduced by breastfeeding. [37] On the contrary, a study on behaviors and treatment of diarrheal disease household survey on childhood conducted [38] and a study on the relationship of psychosocial factors on child carer's behavior and diarrheal disease among children under 5 years of age in Ratchaburi Province had found no association between breastfeeding and occurrences of diarrhea. [26]

2.3.3 Behavioral factors

Soap and education decreased impetigo by 34%, diarrhea by 53% and pneumonia by 50%. Diarrhea reduction [39] was consistent with previous pooled estimates. [40] Disease duration was shorter, thus probably reducing the duration of infectiousness for household contacts. Children were 56% less likely to consult a health-care practitioner for diarrhea and 26% less likely to be hospitalized. [39]

Hygiene interventions act by reducing contamination of hands, food, water, and fomites, and seem to be at least as effective as the other interventions. In our review, separate meta-analyses of hand washing (relative risk 0.56, 0.33–0.93) and hygiene education studies (relative risk 0.72, 0.63–0.83) were possible. The results support those who focused on hand washing studies as opposed to general hygiene interventions and also combined results from developed and less developed countries. Despite the effectiveness of hygiene interventions in disease prevention, health considerations may be less effective at motivating people to use them than are other factors at inducing hygienic behaviors, such as the desire to feel and smell clean, and the desire to follow social norms. The study suggested that the promotion of hand

soap as a desirable consumer product may be a more effective dissemination strategy than that of health campaigns. [41]

The hygiene intervention studies on the effectiveness of a training program in reducing infections in toddlers attending day care centers had found that simply observing and recording illness seemed to be at least, if not more, effective at reducing diarrhea and hand contamination than a one-day training program. Despite the differences between the studies, the meta-analysis produced a statistically significant pooled estimate (0.582; 95% CI 0.476 – 0.712) suggesting that hand-washing is effective in reducing diarrheal illness in this setting. With the small number of studies, however, it is not possible to determine which intervention format produces the greatest illness reduction. [42]

A study conducted by Suknirin C. (1991) on the factors affecting diarrheal preventive and self care behavior of the people in Yasothon province, had demonstrated that factors including knowledge, perception of the dangers and preventive practices, availability of resources, having time to practice and amount of household income had a positive relationship that was statistically significant to preventive practices. Predictive weights of various factors relating to the variance practices for preventive, availability of resources, amount of household income and having time to practice had predictive weights of 44.9% in the mothers. [43]

The place of residence had an influence on the behavior of mother and practice as well. The study compared a sick role behavior of mothers living inside the municipality and those living outside the municipality area of Ubon, Ratchathani province, Thailand., when their under 5 children were suffering from diarrhea. The results revealed that mothers who lived inside the municipality area had a higher level of knowledge on perceived benefits, perceived barrier, treatment and care seeking behavior and disease spreading preventive behavior than those mothers living outside the municipality. On the other hand, ability to detect signs and symptoms during illness by mothers living outside the municipality area was higher than those living

inside. The difference in occupation, knowledge and perceived barrier showed significant difference in maternal sick role. [44]

A study on childhood diarrhea in a low income urban community in Bangkok had demonstrated that human behaviors were important risk factor. Human behaviors that affected diarrhea morbidity and mortality were determined by socio-demographic factors. The study had demonstrated the following findings:

- a. There was a reduced diarrheal disease occurrences with sanitary hand washing before food preparation, cooking and after using the toilet.
- b. Unsanitary food preparation, food handling, food storage, and consumption have led to more occurrences of diarrheal disease.
- c. Unsanitary water resources for drinking and other use had strong association with diarrhea.
- d. Unsanitary disposal of human excreta had strong association with diarrhea.
- e. Other results revealed that breastfeeding was able to prevent morbidity and reduce mortality, particularly in children under 6 months of age. [37]

A survey study on the behaviors and treatment of diarrheal disease conducted by with 30 cluster sampling technique in children under 5 years, in 12 representative provinces of Thailand demonstrated a statistically significant relationship between diarrheal disease occurrence and unsanitary practice of child's stool disposal. [38]

A study on the factors associated with the incidence of acute diarrhea in children under 5 years old in Khon Kaen province, Thailand had revealed that knowledge, attitude and practice of mother were associated with the incidence of acute diarrhea. The risk of diarrhea among children having mothers with low knowledge was 11 times higher than those children whose mothers have good knowledge. In the same manner, the risk of getting diarrhea among children whose mothers have poor attitude and poor practice was 3 and 9 times greater, respectively. [25]

The study on the relationship of psycho-social factors on child carer's behavior and diarrheal diseases in Ratchaburi province had found that the factor that has been

the most influential on the frequency of diarrhea among children was the behavior on personal hygiene and sanitation. The child carers who had poor behavior on personal hygiene and sanitation were 2.96 times more likely that their children had diarrhea than those whose mothers have good behavior on personal hygiene and sanitation. The study also revealed a positive relationship between child care's behavior on personal hygiene and sanitation with knowledge, practice on child care and diarrheal diseases, and education with income. [26]

2.3.4 Environmental and sanitary factors

In developing countries, household storage of water prior to consumption is commonplace. In the five possible interventions types examined in this review, the quality of stored water may potentially play a role in three of them, namely, multiple interventions, water supply interventions and water quality interventions. Additionally, some hygiene interventions are expected to improve stored water quality. With the exception of interventions specifically aimed at point-of-use treatment, household storage was generally not considered. Possible sources of household contamination include unclean water containers, unhygienic domestic water handling practices, natural contamination from the ambient domestic environment as a result of uncovered containers and biofilm occurrence in plastic containers. [45] Another study had revealed that there was fecal contamination in drinking water during collection and household storage, and reported that even water from safe sources was subject to frequent and extensive fecal contamination (with over 90% of samples containing thermotolerant coliforms after collection). [46]

A study on the prevalence, mortality, and socio-environmental determinants of diarrheal diseases in under 5 children of Ondo State Nigeria had found that inadequate disposal of feces and household refuse and poor storage of drinking water were significantly associated with high incidence of diarrhea. [47]

The result from a study exploring the influence of sanitation and environmental factors on diarrheal disease occurrence at Samrong district, Ubon Ratchathani province had found that the most influential factors associated to diarrhea were: house

fly breeding places, house fly control and its aggravating conditions such as waste water drainage and cattle excreta in the perimeter of the house. The moderate influencing factors were: personal hygiene and food sanitation, and water storage and handling practices. However, after logistic regression analysis, the results of the study could be summarized as follows;

- a. Personal hygiene and eating place cleanliness (receiver) were the most crucial factors influencing the diarrheal disease occurrence.
- b. House flies and water availability or accessibility (carriers) were other major influential factors.
- c. Cattle excreta refuse and/or garbage dumpsites and wet soil were all critical breeding places (sources) that influenced diarrhea.
- d. Family's perception on diarrheal diseases was significantly associated with diarrheal disease occurrence.
- e. Considered diarrhea as a food-borne and a water-washed infectious disease.

The epidemiological pathway of diarrhea could be summarized in terms of sources/breeding places → carriers → receivers. [48] The various transmission routes by which fecal-oral pathogens can cause infection and illness (Figure 3) have been described previously [41, 49, 50, 51]; These are complex and often inter-related; whereby the improvements in water supply, excreta disposal or hygiene behaviors had resulted in the percentage reduction of diarrhea incidence among children (table8). [52]

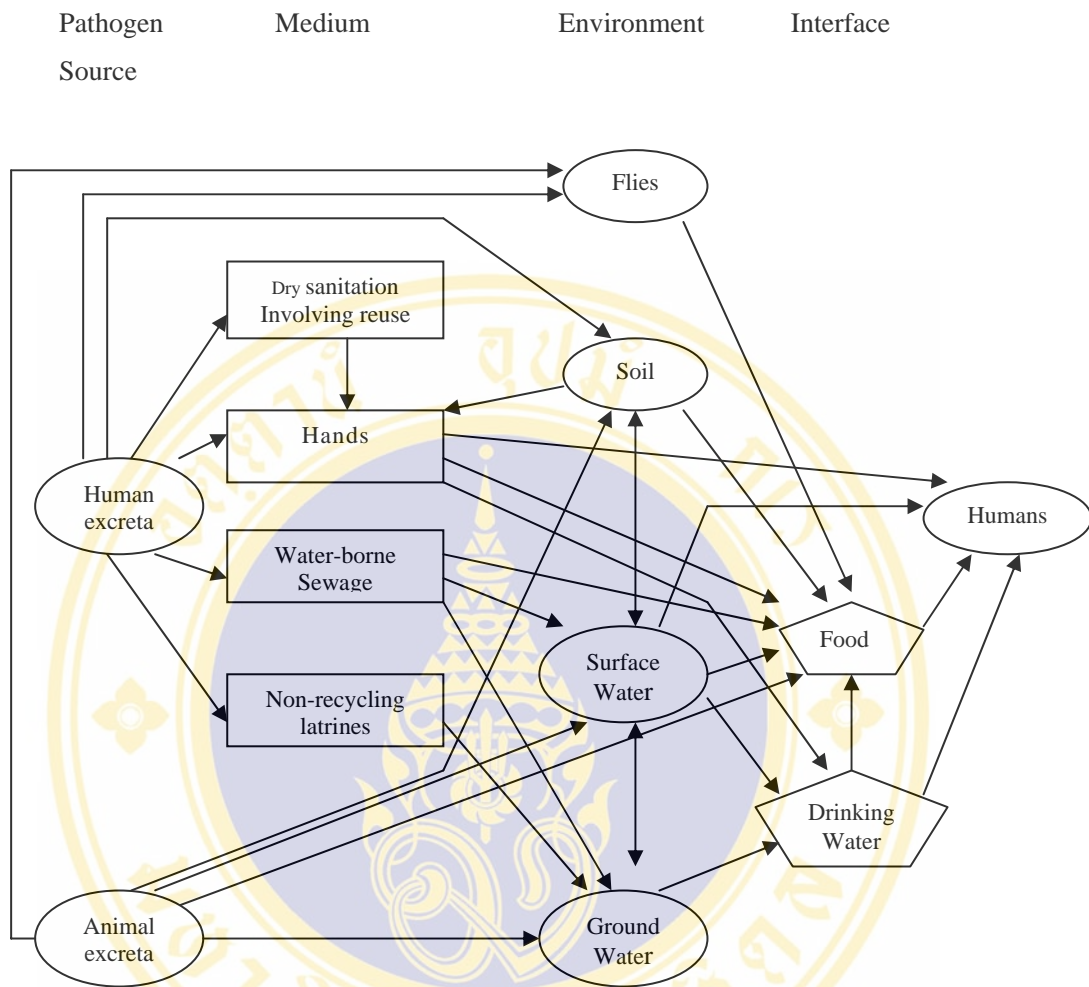


Figure 3 Transmission pathways of fecal-oral route diseases^a

^a Adapted from Pruss *et.al.* (2002)

Table 8 Expected reduction in diarrheal disease morbidity from improvements in one or more components of water and sanitation^a

Intervention	All studies		Regional studies	
	N	%	N	%
		Reduction in diarrheal disease		Reduction in diarrheal disease
1. Water and sanitation	7 ^b /11 ^c	20	2 ^b /3 ^c	30
2. Sanitation	11/30	22	5/18	36
3. Water quality and quantity	22/43	16	2/22	17
4. Water quantity	7/16	17	4/7	15
5. Water quantity	7/15	27	5/10	20
6. Hygiene	6/6	33	6/6	33

^a Adapted from Esrey, *et.al.* (1991)

^b The number of studies for which morbidity reduction calculations could be made.

^c The total number of studies that related the type of facility to diarrheal morbidity, nutrition and mortality studies.

It can be seen from Table 8 that all the interventions reduced diarrhea levels, with the effect varying between 15 to 36%, depending upon the intervention and the perceived quality of the study. [46]

The risk factor “water, sanitation, and hygiene,” as investigated here, comprises a number of interrelated transmission pathways, composed of competing or complementing events for causing disease. The number of resulting diseases is large. Fecal–oral diseases account for an important part of this disease burden and are the main focus of this article. Their transmission routes illustrated are complex (figure 3). Human and animal excreta can affect human health through drinking water, sewage, indirect contact, and food through various pathways. This first exposure based assessment of disease at the global level should therefore be considered an initial estimate, which will undergo refinement as additional information becomes available. [50]

A study on the risk factors of diarrheal disease occurrence among under 5 children had demonstrated the following findings:

- a. low socio-economic status and low educational level of parents had statistically significant relationship with diarrhea occurrences among children
- b. children in 6-12 months age group, lack of breastfeeding, incomplete immunization especially measles vaccine, low birth weight, and those with vitamin deficiency had statistically significant relationship to diarrhea occurrences
- c. behavioral factors: poor knowledge on diarrhea disease, and poor practice on hygiene and sanitation like hand washing after defecation, were associated with increased occurrences of diarrhea among children
- d. environmental factors: poor housing sanitation, lack of or unsanitary latrine, and contaminated water source were associated with increased occurrences of diarrhea among children [53]

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Study design

This research is a cross sectional study.

3.2 Study area and population

The study was carried out in Krathum Baen, a district in the northern part of Samut Sakhon province, central Thailand. This area was selected because of its notably high diarrheal disease occurrences among under 5 children.

3.2.1 Inclusion criteria

- a. All the caretakers or mothers who brought their under 5 children at the Krathum Baen community hospital's out patient department (OPD-under 5 clinic) and four other Primary Care Units to receive services for diarrhea or other purpose.
- b. All caretakers of under 5 children who consulted on both health facility as mentioned above; regardless of their legal status or citizenships.
- c. For caretakers who have two or more under five children with them, then the youngest would be selected.

3.2.2 Exclusion criteria

- a. Non infectious diarrhea with malabsorption disorder such as celiac disease lactose intolerance, fructose malabsorption, short bowel syndrome secondary secondary to surgery/resection of bowel (as diagnosed by their physician).
- b. Chronic inflammatory diseases such as ulcerative colitis and crohn's disease (as diagnosed by their attending physician)
- c. Diarrhea epidemics

3.3 Study period

The study was conducted from January 26, 2007 to February 6, 2007.

3.4 Sample size

The sample size for this study was calculated, using the following formula:

$$n = \frac{Z^2 \times PQ}{d^2} = \frac{(1.96)^2 \times 0.105 \times 0.895}{(0.05)^2} = 129.24$$

Where:

n = desired sample size

Z = standard normal deviation, set at $\alpha=0.05$

P = the estimated proportion of diarrhea = 0.105 [10]

Q = $1 - P = 0.895$

d = allowable error = 0.05

The minimum sample size is 130.

3.5 Sampling technique

Caretakers or mothers of under 5 children who came to Krathum Baen community hospital's out patient department (OPD-Under 5 clinic) and four other primary care units were recruited by convenience sampling. This process continued, until a sample size of 158 was achieved.

3.6 Research instrument

The instrument was a structured questionnaire that was initially formulated in English and finally it was translated to Thai. Generally, the items were closed-ended type of questions. The questionnaire was divided into six parts namely;

Part 1: contains 7 (Q1-Q7) items regarding socio-demographic factors of caretaker, such as age, gender, relationship to under 5 child, educational attainment, occupation, average household income per month, and time allocated for caring their child during daytime

Part 2: contains 5 items (Q1-Q5) about child factors such as age, birth order, birth weight, milk given during first 4 months of life, and experience of diarrhea during the previous one month

Part 3: contains 20 items (Q1-Q20), regarding knowledge of caretaker on childhood diarrhea, that are answerable by “yes” or “no”

Part 4: contains 10 (Q1-Q10) items regarding attitude of caretaker towards childhood diarrhea

Part 5: contains 15 (Q1-Q15) items regarding practice of caretaker on childhood diarrhea

Part 6: contains 15 (Q1-Q15) items about environmental and sanitation factors of caretaker

Scoring system

Knowledge: Score of 1 and 0 was given for correct and incorrect answer, respectively. The knowledge was classified into three categories; good, fair and poor, and they were measured as equal to 80% or more, 60% to 79% and less than 60% of the total maximum score (20 points), respectively. The items were marked correct if they answered “yes” to item numbers 1, 5, 6, 10, 11, 14, 16, 17, 18, 19, and 20. The respondents who answered “no” to the remaining items were marked incorrect. Range of score was 0 to 20.

Attitude: For positive statements, Likert’s scales of scoring were 5,4,3,2, and 1 for strongly agree, agree, neutral, disagree, and strongly disagree, respectively. The scoring was reversed for negative statements. The score was graded as “good attitude” for score that was equal or more than 80% and “poor attitude” if

the score was less than 80% of the total score. Positive statements were item numbers 1,2,5,6,7, and 9. Range of score was 10 to 50.

Practice: Three (Q1, Q3, and Q7) items with choices; always, often, sometimes, and never were scored as 3, 2, 1, and 0, respectively for good practice. One (Q5) item with the choices; always, sometimes, and never was scored as 2, 1, and 0, respectively for good practice. In another (Q9, choose only 1 answer) item, only 1 point score was granted to respondents who answered any of the three choices (#1, #2, or #3). Same rule applied to another (Q13) item, where only 1 point score was given to those respondents who answered any of the three choices (#1, #4, or #5). In four (Q2, Q4, Q6, and Q8) items, choices #1 and #2 (washing with water alone and washing with soap and water, respectively) was awarded 0 and 1 point, respectively for good practice. The rest of the items were multiple choice-type of question requiring only one answer, as well. The practice of caretakers was classified into three categories; good, moderate, and poor, and they were measured as equal to 80% or more, 60% to 79% and less than 60% of the total maximum score (22points), respectively. The range of score was 0 to 22.

3.7 Validity and reliability

Questionnaire was created and had been revised based on some reference books and recommendation from technical experts in research. Before actual data collection, the questionnaire was pre-tested for reliability by selecting 30 caretakers of under 5 children at Krathum Baen community hospital at Samut Sakhon province, Thailand. Cronbach's Alpha and Kuder-Richardson (KR20) coefficient was used to determine the reliability of attitude and knowledge part, respectively. Reliability of knowledge part was 0.46 for 22 questions and after 2 questions were deleted, the new reliability rose 0.63. The 10-question attitude part had a reliability coefficient of 0.51. However, after deleting 1 question from it, the reliability rose to 0.62 (though, the researcher opted not to remove it based on the recommendation of experts). After the final corrections on the questionnaire have been made, technical experts gave the approval for the actual collection of data.

3.8 Data collection

After getting the approval from the participants, through verbal consent, data were collected by trained interviewer via face-to-face interview and with the use of a structured questionnaire. The following steps were carried out prior to the conduct of data collection:

- a. A courtesy call with officer-in-charge of the Krathum Baen community hospital and Krathum Baen PCUs was initially done prior to the conduct of actual study.
- b. Eight staffs were recruited to become interviewers of this study. They were trained for two days on the proper way of collecting the data, such as explaining the purpose of data collection and explaining each item without inducing bias to the respondents, how to check the data for its completeness, and taught them on how to handle difficulties felt by the participant during interview process.
- c. After completing the training of all the interviewers, questionnaires were distributed to their respective study areas.

3.9 Data processing and analysis

Data entry was first accomplished through Epi-data software and SPSS was used for data analysis. By the end of each working day, the collected questionnaires were being checked for mistakes and completeness. After that, the data were entered into the computer. Descriptive statistics like frequency, percentage and median were used to describe the independent variables. The association between independent and dependent variables, and diarrheal disease occurrence among under 5 children in both study areas were determined using cross-tabulations. Chi-square and Fisher's exact tests were used to identify the statistical significance of the associations between independent and dependent variables ($p < 0.05$).

CHAPTER 4

RESULTS

This cross sectional study was conducted to describe the risk factors relating to the diarrheal disease occurrences among under 5 children at Samut Sakhon province, Thailand. A total sample of 158 caretakers of under 5 children were enrolled, of which, 50 and 108 came from Krathum Baen Hospital's out patient department (OPD) and primary care units (PCUs), respectively. Face to face interviews were utilized for data collection by 8 personnel specifically trained for this study. The analysis was conducted and the results were presented into two parts, namely:

Part 1 The descriptive information

- 1.1 Socio-demographic factors
- 1.2 Child factors
- 1.3 Diarrheal disease occurrences in study areas
- 1.4 Knowledge on childhood diarrhea
- 1.5 Level of knowledge on childhood diarrhea
- 1.6 Attitude towards childhood diarrhea
- 1.7 Level of attitude towards childhood diarrhea
- 1.8 Practice regarding childhood diarrhea
- 1.9 Level of practice regarding childhood diarrhea
- 1.10 Environmental and sanitation factors
- 1.11 Level on environmental and sanitation factors

Part 2 Analytical information

- 2.1 Relationship between socio-demographic factors and diarrhea occurrences
- 2.2 Relationship between child factors and diarrhea occurrences
- 2.3 Relationship between knowledge of caretakers and diarrhea occurrences
- 2.4 Relationship between attitudes of caretakers and diarrhea occurrences
- 2.5 Relationship between practices of caretakers and diarrhea occurrences

2.6 Relationship between environmental and sanitation factors and diarrhea occurrences

4.1 Descriptive information

4.1.1 Socio-demographic characteristics of caretakers

Age, gender, relation of caretakers to under 5 children, education, occupation, average household income, and time allocated by caretaker for looking after the child during daytime were included in socio-demographic factors.

Majority of caretakers were more than 25 years old (72.2%). The median age of the respondents was 29 years of age, being 16 and 53 as the youngest and the oldest, respectively.

Majority of the study sample were female (95.6%) and most of them were mothers (81.6%). Regarding education, majority of the respondents have completed secondary and higher education (59.5%), and remaining (40.5%) had elementary education or less.

Majority of the respondents earned their living as service workers (55.7%), and about one third of the respondents were housewives (32.9%) who have to rely solely on their husbands to sustain their daily needs. Only few (3.2%) work in agriculture.

The majority belonged to the low income group (66.5%), middle income represents nearly one third of the respondents (31.0%), and only few belonged to the high income group (2.5%). Majority (41.1% and 38.3%) of the children has been taken cared of for 16 hours or more, and 8-15 hours per day, respectively (table 9).

Table 9 Number and percentage distribution of caretakers by demographic factors

Demographic factors	Number (n=158)	Percentage (%)
Age group (yrs)		
< 25	44	27.8
≥ 25	114	72.8
Median = 29	q1-q3 = 24-36	min = 16 max = 53
Gender		
Female	151	95.6
Male	7	4.4
Relation		
Mother	129	81.6
Others or non-mother	29	18.4
Education		
≤Elementary	64	40.5
Secondary and higher	94	59.5
Occupation		
Service	88	55.7
Housewife	52	32.9
Small business	13	8.2
Agriculture	5	3.2
Household income (Baht/month)		
Low income (<7000)	105	66.5
Middle income (7000 – 19999)	49	31.0
High income (≥ 20000)	4	2.5
Time allocation for child care(hrs)		
< 8	32	20.3
8-15	61	38.6
≥ 16	65	41.1

4.1.2 Child factors

Age, birth order, birth weight, breastfeeding history for the first 4 months of life and the experience of diarrhea for the past 1 month were included in the child factors. More than half of the under five children belonged to the 12-59 months old group (58.9%). The median age was 18 months, being 1 and 55 months as the youngest and oldest, respectively. Most of the children belonged to the first order (50%) group. The median birth weight for under 5 children who were enrolled in the study was 3100 grams, being 2200 and 4300 grams as the lightest and the heaviest, respectively. Just slightly over half of the children were exclusively breastfed during their first 4 months of life (50.6%) and others were given condensed or powdered milk or in combination (49.4%) with irregular breastfeeding. There had been a considerable number of diarrheal disease occurrences among under 5 children (19%) during their past 1 month (table 10).

Table 10 Number and percentage distribution by child factors

Child factors	Number (n=158)	Percentage (%)
Age group (months)		
< 6	33	20.9
6 – 11	32	20.3
12-59	93	58.9
Median = 18 q1-q3 = 6-32.25 min = 1 max = 55		
Birth order		
First	79	50.0
Second and up	79	50.0
Birth weight (grams)		
< 2500	3	1.9
≥ 2500	155	98.1
Median = 3100 q1-q3 = 2900-3400 min = 2200 max = 4300		

Table 10 Number and percentage distribution by child factors (cont.)

Child factors	Number (n=158)	Percentage (%)
Milk during 1st 4 months of life		
Breast/human milk	80	50.6
Others	78	49.4
Diarrhea during past 1 month		
Yes	30	19.0
No	128	81.0

4.1.3 Diarrheal disease occurrence in study areas

A greater number of diarrheal disease occurrences among under 5 children came from the four primary care units (23.1%) of Krathum Baen district, as reported by their caretakers from the face-to-face interview, compared to the fewer diarrhea occurrences (10.0%) in Krathum Baen community hospital (table 11).

Table 11 Number and percentage distribution of diarrheal disease occurrence by study area

Diarrhea	Number (n=158)	Percentage (%)
Health facility		
PCU	(n=108)	(100)
No diarrhea	83	76.9
With diarrhea	25	23.1
Hospital	(n=50)	(100)
No diarrhea	45	90.0
With diarrhea	5	10.0

4.1.4 Knowledge of caretakers on childhood diarrhea

There were 20 questions on knowledge and 11 were correct for “Yes” answer and 9 were correct for “No” answer. According to the number of percent distribution

of correct answers for each item of knowledge, the items where more than 85% of respondents got a correct answer were: item number 1 (86.7%)“Diarrhea is a passage of 3 or more watery stools per day”, item number 5 (85.4%)“Sunken eyes, dry lips, and skin are severe consequences of diarrhea, item number 6 (85.4%)“Eating uncovered foods for hours can cause diarrhea”, item number 10 (88.6%)“Dehydration is the most leading cause of death in under 5 diarrhea”, item number 11 (93.7%)“Giving ORS in a child with diarrhea can prevent dehydration”, item number 14 (89.9%)“A child with diarrhea who is unable to eat and drink as usual can be a symptom of severe diarrhea, and needs to be brought to a doctor”, and item number 18 (100.0%)“Hand washing of caretaker before feeding their child may prevent diarrhea. On the other hand, majority of respondents answered incorrectly in item number 7 (61.4%) “Watery stools of 5 or more without sunken eyes is a severe diarrhea”, item number 9 (72.8%) “Infection is the most leading cause of death in under 5 diarrhea, item number 12 (51.9%) “In general, diarrhea responds best to antibiotic and anti-diarrheal drug, item number 15 (78.5%) “ A child who got thirsty and sunken eyes is normal if they have diarrhea, and item number 19 (41.1%) “Whenever your child experiences three or more loose stools, it is better to give an ORS first instead of antibiotic drugs” (table 12).

Table 12 Number and percentage distribution of respondents with correct answers per knowledge item

Item	Correct Answers	
	Number (n=158)	Percentage (%)
1. Diarrhea is a passage of 3 or more watery stools per day	137	86.7
2. Diarrhea is a passage of one loose stool/day	138	87.3
3. Diarrhea is a passage of 1 watery stool per day with or without diarrhea	91	57.6
4. Breastfeeding causes diarrhea in under 5 children	117	74.1

Table 12 Number and percentage distribution of respondents with correct answers per knowledge item (cont.)

Item	Correct Answers	
	Number (n=158)	Percentage (%)
5. Sunken eyes, dry lips and skin are severe consequences of diarrhea	135	85.4
6. Eating uncovered foods for hours can cause diarrhea	135	85.4
7. Watery stools of 5 or more without sunken eyes is a severe diarrhea	61	38.6
8. Diarrhea is a normal part of child's growth and development process	90	57.0
9. Infection is the most leading cause of death in under five children with diarrhea	43	27.2
10. Dehydration is the most leading cause of death in under 5 children with diarrhea	140	88.6
11. Giving ORS in a child with diarrhea can prevent dehydration	148	93.7
12. In, general diarrhea responds best to antibiotic and anti-diarrheal drug	76	48.1
13. It is better to stop giving food, fluids, and milk during diarrhea	99	62.6
14. A child with diarrhea who is unable to eat and drink as usual can be a symptom of severe diarrhea, and needs to be brought to a doctor	142	89.9
15. A child who got thirsty and sunken eyes is normal if they have diarrhea	34	21.5
16. In general, children improve their condition with ORS or homemade fluids treatment and need not		

Table 12 Number and percentage distribution of respondents with correct answers per knowledge item (cont.)

Item	Correct Answers	
	Number (n=158)	Percentage (%)
see a doctor	76	48.1
17. Infantile diarrhea may be prevented by breastfeeding	98	62.0
18. Hand washing of caretaker before feeding their child may prevent diarrhea	158	100.00
19. Whenever a child experiences 3 or more loose stools, it is better to start with ORS rather than with an antibiotics	93	58.9
20. Frequent diarrhea may cause malnutrition and growth retardation	103	65.2

4.1.5 Knowledge level of caretakers on childhood diarrhea

The level of knowledge was divided into three groups; poor (<60%), fair (60-79%), and good (80% and above the maximum score). Majority of respondent (57.0%) had fair level of knowledge. Just over one third of respondents (25.9%) had poor knowledge and the remaining had good knowledge (17.1%). The minimum and maximum scores were 8 and 19, respectively, and with a median of 14 (table 13).

Table 13 Number and percentage distribution of caretakers by level of knowledge on childhood diarrhea

Level of knowledge on childhood diarrhea (Full score = 20)	Number (n=158)	Percentage (%)
Poor (<12)	41	25.9
Fair (12-15)	90	57.0

Table 13 Number and percentage distribution of caretakers by level of knowledge on childhood diarrhea (cont.)

Level of knowledge on childhood diarrhea (Full score = 20)	Number (n=158)	Percentage (%)
Good (≥ 16)	27	17.1
Median = 14 q1-q3 = 11-15	min=8	max=19

4.1.6 Attitude of caretakers towards childhood diarrhea

In order to measure the attitude, 10 items of the questionnaire were used. There were 6 positive items and 4 negative items. Likert's scale of scoring; 5,4,3,2, and 1 for strongly agree, agree, neutral, disagree, and strongly disagree were given, respectively for positive items. The score were reverse for negative items. For the result of item analysis, majority of the respondents (62.7% and 31.6%) answered strongly agree and agree, respectively for positive statement in item number 1 "Children who take uncooked food and unsanitary water are prone to diarrhea". Majority of respondents (29.7% and 19.0%) answered disagree and strongly disagree, respectively for negative statements in item number 4 "Children with more than 3 watery stools should be treated first with antibiotics and anti-diarrheal drug". Majority of respondents (39.2% and 36.1%) answered disagree and strongly disagree, respectively for positive statements in item number 7 "Diarrhea in children is usually safe, and heals naturally without treatment. Majority of respondents (18.4% and 37.3%) answered strongly agree and agree, respectively for negative statements in item number 8 "Avoiding fluids/milk and solid foods will prevent vomiting and help the child to recover faster. Majority of respondents (25.9%, 22.8%, and 24.1%) answered strongly agree, agree, and neutral, respectively for negative statements in item number 10 "All children with diarrhea need to be confined for intravenous fluid infusion to prevent dehydration (table 14).

Table 14 Number and percentage distribution of caretakers per scale on the attitude items

Item	Number (%)				
	SA	A	N	D	SD
1. Children who eat uncooked food and unsanitary water are prone to diarrhea	99 (62.7)	50 (31.6)	8 (5.1)	0 (0.0)	1 (0.6)
2. Exclusive breastfeeding during infancy reduces occurrence of diarrhea	60 (38.0)	59 (37.3)	28 (17.7)	10 (6.3)	1 (0.6)
3. Diarrhea in children is unpreventable	19 (12.0)	26 (16.5)	23 (14.6)	48 (30.4)	42 (26.6)
4. Children with more than 3 watery stools should be treated first with antibiotics and anti-diarrheal drug	19 (12.0)	29 (18.4)	33 (20.9)	47 (29.7)	30 (19.0)
5. ORS can compensate for the fluid and electrolytes lost during diarrhea	53 (33.5)	82 (51.9)	17 (10.8)	6 (3.8)	0 (0.0)
6. Diarrheal disease from one household can affect other community members	44 (27.8)	51 (32.3)	35 (22.2)	23 (14.6)	5 (3.2)
7. Diarrhea in children is usually safe, and heals naturally without treatment	7 (4.4)	18 (11.4)	14 (8.9)	62 (39.2)	57 (36.1)
8. Avoiding fluids/milk and solid foods will prevent vomiting and helps the child recovers faster	29 (18.4)	59 (37.3)	26 (16.5)	31 (19.6)	13 (8.2)
9. Under 5 children have more chance of dying from severe diarrhea than adults	57 (36.1)	53 (33.5)	40 (25.3)	8 (5.1)	0 (0.0)
10 All children with diarrhea need to be confined for intravenous fluid infusion to prevent dehydration	41 (25.9)	36 (22.8)	38 (24.1)	41 (25.9)	2 (1.3)

SA = Strongly Agree A = Agree N = Neutral D = Disagree SD = Strongly Disagree

4.1.7 Attitude level of caretakers on childhood diarrhea

There were two groups in levels of attitude towards childhood diarrhea. The level was categorized as positive attitude if the score was equal or more than 80% and negative attitude if the score was less than 80% of the maximum score. Majority of respondents (88.6%) had negative attitude towards childhood diarrhea. The minimum and maximum scores were 26 and 47, respectively, and with a median score of 34 (table 15).

Table 15 Number and percentage distribution of caretakers by level of attitude towards childhood diarrhea

Level of knowledge on childhood diarrhea (Full score = 20)	Number (n=158)	Percentage (%)
Poor (<12)	41	25.9
Fair (12-15)	90	57.0
Good (≥16)	27	17.1
Median = 14 q1-q3 = 11-15	min=8	max=19

4.1.8 Practice of caretakers on childhood diarrhea

Assessing the practice of caretakers regarding childhood diarrhea was conducted by asking the 15 questions. Questions had a score of 3, 2, 1, and 0 for always, often, sometimes, and never, respectively. Some questions had a score of 2, 1, and 0 for always, sometimes, and never, respectively. Some questions had a score of “1” for single correct answer and “0” for wrong answer. Result has shown that, most of the respondents (58.2% and 20.3%) practices always and often, respectively in item number 1 “Hand washing before food preparation”. In item number 2, just slightly over half of the respondents (51.9%) do not wash their hands with soap and water before food preparation. Majority of respondents (57.0% and 23.4%) answered always and often, respectively to item number 3 “Hand washing before feeding the child”, however just nearly over half of the respondents (54.8%) used soap and water in washing their hands before feeding their child. Majority of respondents (92.4%) answered always to item number 5 “Hand washing after defecation”. Most of the

respondents (89.9%) answered always in item number 7 “Way of cleaning the eating utensils used by the child”. In item number 9, respondents (43.0% and 39.0%) used cupboard and food cover, respectively to prevent food contamination. In item number 11, caretakers (66.5%) wash their breast nipples with luke warm water before breastfeeding while few of them (7.6%) still did not clean their breast nipples due to lack of time and inconvenience. In item number 13, majority of respondents (93.7%) used boiled water to feed their child. In item number 14 “Done to stool when their child had previous episode of diarrhea”, majority of respondents (72.2%) threw them in the latrine whereas, some had still poor practices of putting them in a trash can (24.1%). In item number 15 “Action done or treatment given to the child during previous episode of diarrhea, majority of respondents (41.8) still opted to see a medical doctor, went to PCU (35.4%), and some (15.8%) gave ORS (table 16).

Table 16 Number and percentage distribution regarding the practice of caretakers on childhood diarrhea

Item	Number (n=158)	Percentage (%)
1. Hand washing before preparing food		
Always	92	58.2
Often	32	20.3
Sometimes	31	19.6
Never	3	1.9
2. Use to wash hand before food preparation		
Water only	82	51.9
Soap and water	73	46.2
3. Hand washing before feeding the child		
Always	90	57.0
Often	37	23.4
Sometimes	28	17.7
Never	3	1.9

Table 16 Number and percentage distribution regarding the practice of caretakers on childhood diarrhea (cont.)

Item	Number (n=158)	Percentage (%)
4. Use to wash hand before feeding the child		
Water only	70	45.2
Soap and water	85	54.8
5. Hand washing after defecation		
Always	146	92.4
Sometimes	12	7.6
6. Use to wash hand after defecation		
Water only	52	32.9
Soap and water	106	67.1
7. Way of cleaning the eating utensils used by the child		
Always	142	89.9
Often	8	5.1
Sometimes	8	5.1
8. Use to wash eating utensils for the child		
Water only	40	25.3
Soap and water	118	74.7
9. Way to prevent food contamination from flies/insects		
Food cover	63	39.9
Cupboard	68	43.0
Refrigerator	27	17.1
10. Way of feeding the child		
Bare hands	4	2.5
Use of eating utensils (spoon, fork, etc.)	110	69.6
Both	42	26.6

Table 16 Number and percentage distribution regarding the practice of caretakers on childhood diarrhea (cont.)

Item	Number (n=158)	Percentage (%)
Neither/others	2	1.3
11. Way of cleaning breast nipples		
Washing with lukewarm water	105	66.5
Washing with soap and water	26	16.5
Do not wash (no time)	12	7.6
Never (Did not breastfeed)	15	9.5
12. Way of cleaning feeding bottle		
Soap and water then boil them	97	61.4
Soap and water	14	8.9
Water without soap	4	2.5
Did not bottle-feed	43	27.2
13. Water used to feed the child		
Boiled water	148	93.7
Shallow well, without boiling	1	0.6
Bottled (purified or filtered)	8	5.1
Tap water	1	0.6
14. Done to stool when the child had previous episode of diarrhea		
Throw them in latrine	114	72.2
Left around the house	3	1.9
Put them in dust bin/ trash can	38	24.1
Put them in the lot outside the house	3	1.9
15. Action done/treatment given to child during previous episode of diarrhea		
Gave ORS/homemade fluid	25	15.8
Gave anti-diarrheal or antibiotics	6	3.8

Table 16 Number and percentage distribution regarding the practice of caretakers on childhood diarrhea (cont.)

Item	Number (n=158)	Percentage (%)
See a medical doctor	66	41.8
Went to PCU	56	35.4
Did nothing	5	3.2

4.1.9 Practice level of caretakers on childhood diarrhea

Level of practices was categorized into three groups. It was measured as good if score was equal to or more than 80%, moderate if the score was 60% to 79% and poor if the score was less than 60% of the maximum score, respectively. The result had shown that, more than half of the respondents (54.4%) had good level of practice on childhood diarrhea. The minimum and maximum score were 6 and 22, respectively, with 17.5 as median score (table 17).

Table 17 Number and percentage distribution of caretakers by level of practice on childhood diarrhea

Level of practice on childhood diarrhea (Full score = 22)	Number (n=158)	Percentage (%)
Poor (≤ 12)	16	10.1
Moderate (13-17)	56	35.4
Good (≥ 18)	86	54.4
Median = 17.5 q1-q3 = 15-19	min= 6	max= 22

4.1.10 Environmental and sanitation factors

Nearly three fourth of the respondents (75.3%) used filtered, purified or bottled water for drinking purposes and about one sixth of respondents (17.1%) still used rain water for drinking purposes. Respondents (56.3% and 41%) were getting water from tap and deep well for purposes other than drinking, respectively. Just slightly over

half of the respondents (52.5%) used big plastic container to store their drinking water. Nearly one fifth of respondents (17.7%) used a jar with cover and only few (1.3%) used jar without cover as container of their drinking water.

Nearly all of the respondents (98.1%) had a latrine in their houses but still few (1.3%) of the respondents' household did not use the latrine religiously, and nearly one fifth of them (19.0%) had a problem on poor ventilation. Majority (63.3%) used water for cleaning their bottoms after defecation, whereas, about one third (32.9%) used water and paper.

Majority of domestic solid waste (39.2%) were being collected by a garbage truck once a week and still nearly one fifth of the respondents (17.1%) had no regular collections and just threw their domestic waste in dumpsites near their houses daily. There are still few respondents (2.5%) who relied on burning their solid waste. About three fourth of respondents (74.1% and 75.9%) had drainage system for waste water and without clogged drainage system around their house, respectively. With regards to housing sanitation, majority of the kitchen's flooring (91.8%) were cemented tiled or wooden and barely tenth (8.2%) were earth ground or soil. Majority (91.8%) used gas or electric stove for cooking and still few (5.7%) have to rely on charcoal for cooking. Nearly one third (29.7%) had problems with breeding places for insect/flies nearby their houses and still, few of the respondents (3.8%) had animal raising or livestock nearby their houses (table 18).

Table 18 Number and percentage distribution of caretakers by environmental and sanitation factors

Item	Number (n=158)	Percentage (%)
Water resource		
1. For drinking purpose		
Plastic tank/filtered water	119	75.3

Table 18 Number and percentage distribution of caretakers by environmental and sanitation factors (cont.)

Item	Number (n=158)	Percentage (%)
Rain water	27	17.1
Tap water	8	5.1
Deep well	4	2.5
2. For other use		
Tap water	89	56.3
Deep well	66	41.8
Plastic tank/filtered water	3	1.9
Storage or container		
3. For drinking purpose		
Big plastic container	83	52.5
Metal, plastic or cemented tank	45	28.5
Jar with cover	28	17.7
Uncovered jar	2	1.3
4. For other use		
Metal, plastic or cemented tank	116	73.4
Jar with cover	24	15.2
Uncovered jar	18	11.4
Human waste disposal		
5. Latrine available in the house		
Yes	155	98.1
No	3	1.9
6. Everybody use the latrine in the house		
Yes	156	98.7
No	2	1.3
7. Latrine condition		
With ventilation/no foul-smell	126	79.7

Table 18 Number and percentage distribution of caretakers by environmental and sanitation factors (cont.)

Item	Number (n=158)	Percentage (%)
Without ventilation/with foul-smell	30	19.0
8. Material used for cleaning after defecation		
Water	100	63.3
Paper	6	3.8
Water and paper	52	32.9
Solid waste disposal		
9. Garbage collection system		
Once a week	62	39.2
Twice a week	39	24.7
Thrice a week	26	16.5
Others:	31	19.6
- Just throw them in dumpsites daily	(27)	(17.1)
- no collection, and some burn them	(4)	(2.5)
Waste water disposal		
10. .Drainage system for domestic waste water		
Present	117	74.1
Absent	41	25.9
11. Clogged drainage around or near the house		
Absent/clean	120	75.9
Present/dirty	38	24.1
Housing sanitation		
12. Breeding places for flies/insects near the house		
Absent/clean	111	70.3
Present/dirty	47	29.7

Table 18 Number and percentage distribution of caretakers by environmental and sanitation factors (cont.)

Item	Number (n=158)	Percentage (%)
13. Fuel used for cooking in the kitchen		
Gas/electric stove	145	91.8
Charcoal	9	5.7
Both	4	2.5
14. Flooring structure of the kitchen		
Cemented/tiled/wooden	145	91.8
Earth ground/soil	13	8.2
15. Animal raising near or around the house		
No	152	96.2
Yes	6	3.8

4.1.11 Level of caretakers' environmental and sanitation factors

Information on sanitation and environmental conditions were assessed in terms of water resources and their storage system, human waste disposal, waste water disposal, and house sanitation. Items in each condition were categorized into two hygienic and unhygienic.

Majority of respondents (82.9%) had access to hygienic water resources for drinking and all have access to hygienic water resources for other uses as well. Majority of respondents have hygienic way of separating the storage or container of water intended for drinking (96.8%) and other use (88.6%).

Although most of them (98.1%) have latrine in their houses, and used them, there were still an ample (20.9%) who failed to maintain hygienic condition of their latrines. Majority (96.2%) were hygienic in term of cleaning their bottoms after defecation.

Majority (80.4%) of the respondents had hygienic garbage collection scheduled whereas some (19.6%) would resort to throw their domestic garbage in an unhygienic manner.

In terms of waste water disposal system, slightly more than one fourth of respondents (25.9%) had drainage system in their houses. Similarly almost same number of respondents (24.1%) had unhygienic drainage surrounding their houses due to dirty water waste due to clogged drainages, against majority who had hygienic drainage system.

In housing sanitation, majority had hygienically built kitchen (91.8%) and hygienic way of cooking as well (91.8%); although an ample of respondents (3.8%) were unhygienic in terms of keeping animals nearby or close to their houses (table 19).

Table 19 Number and percentage distribution of caretakers by level on environmental and sanitation factors

Level of environmental and sanitation factors	Number	Percentage
Item	(n=158)	(%)
Water resource		
1. For drinking purpose		
Hygienic	131	82.9
Unhygienic	27	17.1
2. For other use		
Hygienic	158	100.0
Storage or container		
3. For drinking purpose		
Hygienic	153	96.8
Unhygienic	5	3.2
4. For other use		
Hygienic	140	88.6

Table 19 Number and percentage distribution of caretakers by level on environmental and sanitation factors (cont.)

Level of environmental and sanitation factors Item	Number (n=158)	Percentage (%)
Unhygienic	18	11.4
Human waste disposal		
5. Latrine available in the house		
Hygienic	155	98.1
Unhygienic	3	1.9
6. Everybody use the latrine in the house		
Hygienic	155	98.1
Unhygienic	3	1.9
7. Latrine condition		
Hygienic	125	79.1
Unhygienic	33	20.9
8. Material used for cleaning after defecation		
Hygienic	152	96.2
Unhygienic	6	3.8
Solid waste disposal		
9. Garbage collection system		
Hygienic	127	80.4
Unhygienic	31	19.6
Waste water disposal		
10. Drainage system for domestic waste water		
Hygienic	117	74.1
Unhygienic	41	25.9
11. Clogged drainage around or near the house		
Hygienic	120	75.9
Unhygienic	38	24.1

Table 19 Number and percentage distribution of caretakers by level on environmental and sanitation factors (cont.)

Level of environmental and sanitation factors	Number (n=158)	Percentage (%)
Item		
12. Breeding places for flies/insects near the house		
Hygienic	111	70.3
Unhygienic	47	29.7
13. Cooking method in the kitchen		
Hygienic	145	91.8
Unhygienic	13	8.2
14. Flooring of the kitchen		
Hygienic	145	91.8
Unhygienic	13	8.2
15. Animal raising near or around the house		
Hygienic	152	96.2
Unhygienic	6	3.8

4.2 Analytical information

4.2.1 Relationship between the socio-demographic characteristics of caretakers and diarrheal disease occurrence among under 5 children

Socio-demographic factors included on this part of the study were age, gender, relation of caretaker to under 5 children, education, occupation, household income and time allocation for child care. Cross-tabulation was performed to test the association between these independent variables and diarrheal disease occurrences among under 5 children. Pearson's chi-square and Fisher's Exact test were used to test statistical significance.

The results revealed that prevalence of diarrhea in under 5 children was 19%. There was more diarrhea occurrences (21.1%) in children who were handled by

caretakers aged 25 years and above, compared to the fewer case (13.6%) that were handled by caretakers less than 25 years old. In spite of the difference, the relationship was statistically not significant (p -value >0.05).

Regarding the gender, there had been more diarrheal occurrences in under 5 children that were handled by male caretakers (42.9%), compared to those children handled by female (17.9%) caretakers (p -value >0.05).

Mothers taking care of their under 5 children had fewer diarrhea occurrences (16.3%), compare to more occurrences (31.0%) in non-mother caretaker. The relationship revealed a finding that was statistically not significant (p -value >0.05).

Under 5 diarrhea seemed to have higher occurrences (21.9%) if handled by caretakers with Elementary education or less, against the lesser occurrences (17.0%) when handled by caretakers who had completed a secondary or higher education. Again, it revealed a result that was statistically not significant (p -value >0.05).

There were more diarrheal occurrences in under 5 children handled by caretakers who worked in agricultural set-up (60.0%), compared to service worker and housewife (18.2% and 19.2%, respectively). The relationship was statistically not significant (p -value >0.05).

Children handled by caretaker who belonged to the lower income group (22.9%) got the highest occurrences of diarrhea compared to those middle, and higher income group (12.2% and 0.0%, respectively). The relationship was statistically not significant (p -value >0.05).

In terms of time allocated to child for caring, occurrence of diarrhea was highest (23.1%) among caretakers who allocated 16 hours and more, and the lowest (15.6%) was found among caretakers who allotted less than 8 hours. The chi square test showed a relationship that was statistically not significant (p -value >0.05).

Even if there was a difference in the occurrences of diarrhea, the result has revealed that, the relationship between socio-demographic factors of caretakers and diarrheal disease occurrences among under 5 children was statistically not significant (p-value >0.05). (table 20)

Table 20 Relationship between the socio-demographic factors of caretakers and diarrheal disease occurrence among under 5 children

Socio-demographic factors	Diarrheal disease occurrence				χ^2	df	p-value
	With diarrhea		Without diarrhea				
	(n)	(%)	(n)	(%)			
Age (yrs)					1.135	1	*0.203
< 25	6	13.6	38	86.4			
≥ 25	24	21.1	90	78.9			
Gender					2.713	1	*0.126
Female	27	17.9	124	82.1			
Male	3	42.9	4	57.1			
Relation					3.351	1	*0.063
Mother	21	16.3	108	83.7			
Others	9	31.0	20	69.0			
Education (yrs)					0.536	1	*0.287
Elementary or less (≤ 6)	14	21.9	46	78.1			
Secondary and up (> 6)	16	17.0	82	83.0			
Occupation					6.585	3	0.086
Agriculture	3	60.0	2	40.0			
Small business	1	7.7	12	92.3			
Service worker	16	18.2	72	81.8			
Housewife	10	19.2	42	80.8			
Household income (Baht/month)					3.408	2	0.182
Low (< 7,000)	24	22.9	81	77.1			

Table 20 Relationship between the socio-demographic factors of caretakers and diarrheal disease occurrence among under 5 children (cont.)

Socio-demographic factors	Diarrheal disease occurrence				χ^2	df	p-value
	With diarrhea		Without diarrhea				
	(n)	(%)	(n)	(%)			
Middle (7,000 – 19,999)	6	12.2	43	87.8			
High ($\geq 20,000$)	0	0.0	4	100.0			
Time allocation for child care(hrs)					1.209	2	0.546
< 8	5	15.6	27	84.4			
8-15	10	16.4	51	83.6			
≥ 16	15	23.1	50	76.9			

*Fisher's exact test

4.2.2 Relationship between the child factors and diarrheal disease occurrence

The study showed that nearly a quarter (24.7%) of diarrheal occurrences came from the age group 12-59 months, and only few (6.1%) belonged to under 6 months of age. The relationship was statistically not significant (p-value >0.05).

There were more occurrences of diarrhea among under five children who belonged to the first order group (16.5%) compared to second order or higher (21.5%), however no statistically significant relationship was found (p-value >0.05).

In terms of birth weight, results revealed that, all (19.4%) diarrheal occurrences were found among the normal weight group or ≥ 2500 grams group. The relationship was statistically not significant as well (p-value >0.05). Diarrheal disease occurrences were fewer (17.5%) among children who were breastfed during the first 4 months of life compared to (20.5%) children who were fed by bottled milk. Again, no statistically significant relationship was found (p-value >0.05).

According to the study, there was no association between the child factors and diarrheal disease occurrence among under 5 children (p-value >0.05). (table 21)

Table 21 Relationship between the child factors and diarrheal disease occurrence

Child factor	Diarrheal disease occurrence				χ^2	df	p-value
	With diarrhea		Without diarrhea				
	(n)	(%)	(n)	(%)			
Age (months)					5.815	2	0.055
< 6	2	6.1	31	93.9			
6 – 11	5	15.6	27	84.4			
12-59	23	24.7	70	75.3			
Birth order					0.658	1	*0.272
First	13	16.5	66	83.5			
Second and up	17	21.5	62	78.5			
Birth weight (grams)					0.717	1	*1.0
< 2500	0	0.0	3	100.0			
≥ 2500	30	19.4	125	80.6			
Milk during 1st 4 months of life					0.233	1	*0.390
Breast/human milk	14	17.5	66	82.5			
Others	16	20.5	62	79.5			

*Fisher's exact test

4.2.3 Relationship between the knowledge of caretakers and diarrheal disease occurrence among under 5 children

Most of the under 5 diarrhea occurrences came from the caretakers with poor knowledge (24.4%) compared to fewer cases (14.8%) among caretakers with good knowledge. The result was statistically not significant (p-value >0.05). (table 22)

Table 22 Relationship between the knowledge of caretakers and diarrheal disease occurrence among under 5 children (n=158)

Knowledge of caretaker on diarrheal disease	Diarrheal disease occurrence				χ^2	df	p-value
	With diarrhea		Without diarrhea				
Full score (20)	(n)	(%)	(n)	(%)			
Knowledge level					1.169	2	0.557
Poor (<12)	10	24.4	31	75.6			
Fair (12-15)	16	17.8	74	82.2			
Good (≥ 16)	4	14.8	23	85.2			

4.2.4 Relationship between the attitude of caretakers and diarrheal disease occurrence among under 5 children

Relationship between attitude of caretakers and diarrhea occurrence was assessed by cross tabulation, and the Fisher's Exact test was used to determine the statistical significance.

The occurrences of diarrhea in under 5 children cared for by caretakers with negative attitude was higher than those who have positive attitude (20.7% and 5.6%, respectively). In spite of this difference, the relationship was statistically not significant (p-value >0.05). (table 23)

Table 23 Relationship between the attitude of caretakers and diarrheal disease occurrence among under 5 children (n=158)

Attitudes of caretakers on childhood diarrhea	Diarrheal disease occurrence				χ^2	df	p-value
	With diarrhea		Without diarrhea				
Full score (50)	(n)	(%)	(n)	(%)			
Level of Attitude					2.383	1	*0.200
Negative (<40)	29	20.7	111	79.3			
Positive (≥ 40)	1	5.6	17	94.4			

*Fisher's exact test

4.2.5 Relationship between the practice of caretakers and diarrheal disease occurrence among under 5 children

Similarly, diarrhea occurrences tended to be higher (37.5%) among under 5 children that were taken cared of by those who have poor practice, compared to those with good practice (16.3%). Again, there was no significant relationship was found as shown by Pearson's chi-square (p-value >0.05). (table 24)

Table 24 Relationship between the practice of caretakers and diarrheal disease occurrence among under 5 children (n=158)

Practice of caretakers on childhood diarrhea	Diarrheal disease occurrence				χ^2	df	p-value
	With diarrhea		Without diarrhea				
Full score (22)	(n)	(%)	(n)	(%)			
Level of practice					4.021	2	.134
Poor (<13)	6	37.5	10	62.5			
Moderate (13-17)	10	17.9	46	82.1			
Good (\geq 18)	14	16.3	72	83.7			

4.2.6 Relationship between the environmental and sanitation factors of caretakers and diarrhea occurrence among under 5 children

Most of the diarrhea occurrences (29.6%) were found among under 5 children who have unhygienic water resource for drinking or feeding against those who have hygienic (16.8%) drinking water source. No significant relationship was found (p-value >0.05).

In children who have unhygienic container for water used in other purpose, one third (33.3%) had diarrhea compare to lower occurrence (17.1%) in those who have hygienic container. Relationship showed no statistical significance (p-value >0.05). With regards to human waste disposal, more diarrhea have occurred among under 5 children living in a household with unhygienic latrine condition and unhygienic use of material for cleaning the bottoms after defecation (both 33.3%). On the other hand, more diarrhea (50%) have occurred among children whose household

had unhygienic usage of their latrine against a fewer diarrhea occurrence (18.6%) if the usage of latrine was hygienic. Relationship showed no statistical significance (p -value >0.05).

In solid waste disposal, result showed a higher occurrence of diarrhea (20.5%) among children who had hygienic garbage collection in their area compared to a fewer cases (12.9%), when the garbage collection was unhygienic. Finding was statistically not significant (p -value >0.05).

Results from waste water disposal showed that, slightly higher diarrhea occurrences (19.5%) were found among children living in a household with unhygienic drainage system for domestic waste compared to slightly lower diarrhea occurrence (18.8%) among household who had unhygienic drainage. The relationship was statistically not significant as well (p -value >0.05).

The unhygienic cooking method was linked to a higher occurrence of diarrhea (33.3%) compared to hygienic method (17.9%). Similarly, unhygienic flooring of the kitchen in terms of housing sanitation revealed a higher occurrence of diarrhea (38.5%), whereas, in hygienic kitchen flooring, we found a fewer diarrhea occurrence (17.2%) among under 5 children. The result showed no significant relationship, statistically (p -value >0.05).

Statistical test revealed that, the relationship between environmental sanitation factors and diarrheal disease occurrence among under 5 children was not significant (p -value >0.05). (table 25)

Table 25 Relationship between the environmental and sanitation factors of caretakers and diarrheal disease occurrence among under 5 children (n=158)

Environmental and sanitation factors	Diarrheal disease occurrence				χ^2	df	p-value
	With diarrhea		Without diarrhea				
	(n)	(%)	(n)	(%)			
Water resource							
1. For drinking purpose					2.398	1	*.103
Hygienic	22	16.8	109	83.2			
Unhygienic	8	29.6	19	70.4			
2. For other use							**
Hygienic	30	19.0	128	81.0			
Unhygienic	0	0.0					
Storage or container							
3. For drinking purpose					0.475	1	*.655
Hygienic	30	19.2	126	80.8			
Unhygienic	0	0.0	2	100.0			
4. For other use					2.718	1	*.096
Hygienic	24	17.1	116	82.9			
Unhygienic	6	33.3	12	66.7			
5. Latrine available in the house					0.409	1	*.471
Hygienic	29	18.7	126	81.3			
Unhygienic	1	33.3	2	66.7			
6. Everybody use the latrine in the house					1.267	1	*.345
Hygienic	29	18.6	127	81.4			
Unhygienic	1	50.0	1	50.0			
7. Latrine condition					0.943	1	*.232
Hygienic	22	17.5	104	82.5			
Unhygienic	8	25.0	24	75.0			
8. Material used for cleaning after defecation					0.834	1	*.319
Hygienic	28	18.4	124	81.6			
Unhygienic	2	33.3	4	66.7			
9. Garbage collection system					0.928	1	*.245
Hygienic	26	20.5	101	79.5			
Unhygienic	4	12.9	27	87.1			
Waste water disposal							
10. Drainage system for domestic waste water					0.010	1	*.543
Hygienic	22	18.8	95	81.2			
Unhygienic	8	19.5	33	80.5			

Table 25 Relationship between the environmental and sanitation factors of caretakers and diarrheal disease occurrence among under 5 children (n=158) (cont.)

Environmental and sanitation factors	Diarrheal disease occurrence				χ^2	df	p-value
	With diarrhea		Without diarrhea				
	(n)	(%)	(n)	(%)			
11. Clogged drainage around or near the house					0.139	1	*.436
Hygienic	22	18.3	98	81.7			
Unhygienic	8	21.1	30	78.9			
Housing sanitation							
12. Breeding places for flies/insects near the house					0.228	1	*.393
Hygienic	20	18.0	91	82.0			
Unhygienic	10	21.3	37	78.7			
13. Cooking method in the kitchen					1.278	1	*.215
Hygienic	26	17.9	119	82.1			
Unhygienic	4	30.8	9	69.2			
14. Flooring of the kitchen					3.492	1	*.074
Hygienic	25	17.2	120	82.8			
Unhygienic	5	38.5	8	61.5			
15. Animal raising near or around the house					0.022	1	*.681
Hygienic	29	19.1	123	80.9			
Unhygienic	1	16.7	5	83.3			

* Fisher's exact test

**No statistics are computed because the item is constant

CHAPTER 5

DISCUSSION

Diarrheal diseases remain a major cause of morbidity and mortality, especially among under 5 children in Thailand. In Samut Sakhon province, diarrhea among under 5 children was an important health concern. Many strategies have already been conducted to address this, but the incidence of diarrhea still continued to be elevated. This cross sectional study was conducted in Krathum Baen District, Samut Sakhon province, Thailand, which aimed to measure the diarrhea occurrence of, describe and identify the associations between the risk factors and diarrheal disease occurrence among under 5 children. This study was conducted in a PCU and hospital-based setting, which started on January 26, 2007 and was completed on February 6, 2007. There were 158 participants who have been recruited by convenience sampling in this study, and were interviewed face-to-face using a structured questionnaire. Statistics that were used to describe all the risk factors were number, percentage, and median whereas, chi-square and fisher's exact tests were used to identify the associations between the independent and dependent variables; where the level of significance was set to $p < 0.05$. Based on the results, the researcher would want to describe in more details about the following findings.

In this study, the overall diarrheal disease occurrence was 19.0%. The overall occurrence was higher than the current diarrhea prevalence of 10.5% in Krathum Baen District. [10] One possible reason was that, this study was conducted within the peak diarrhea season for children, especially for rotavirus infection. [22] On the other hand the prevalence of diarrhea on the study was lower probably because it represented a total picture of the whole year that included peak and off peak season all together.

5.1 Socio-demographic characteristics of caretakers

In this study, majority of the caretakers were mothers aged 25 or over. The result had shown a non-significant negative association between the age of caretakers and diarrheal disease occurrence among under 5 children. The reason can be accounted on the premise that health services such as ANC and well baby clinics were available and accessible in the said study area. The role and responsibilities of village health volunteers could have confounded the relationship since they were instrumental in advocating the preventive practices against childhood diarrhea, especially to the young mothers. This may have gained impact also on the majority of caretakers who might have gotten some learning experiences from the previous histories of diarrhea among their children that probably helped younger caretakers to act appropriately. The result was in contrary to the study conducted by Victoria *et.al.*, where mothers aged 25-29 and less than 20 years old had significant association with increased incidence of dehydration secondary to diarrhea. [32]

Majority of the caretakers have completed their secondary school or higher (59.5%). The caretakers' level of educational was inversely proportional with the frequency of diarrhea in their under 5 children. However, there was no statistically significant difference between the two groups (21.9% and 17.0%) elementary or less and secondary or higher group, respectively. A lot of possible confounding factors may have influenced their current technical know-how on childhood diarrhea, since everyone had no difficulty in terms of access to information. These may be in terms of tri-media campaigns about the prevention and control of childhood diarrhea such as in radio, television, and through newspapers or posters, which were practically better for them rather learning it from school. Similar result was obtained from the study of Phouvong, which revealed no significant association between incidence of diarrhea and maternal education (p-value 0.8524). [25] On the other hand, a different study conducted by Mahalanabis *et.al.* among the urban poor of Dhaka, Bangladesh had revealed otherwise, associating the maternal education with severity of disease due to diarrhea in children. After adjusting for family income, 7 or more years of school

education was associated with 54% reduced risk of severe disease as indicated by the presence of dehydration. [27]

The researcher had found that majority of the caretakers were service workers. The result of this study was similar to the study of Phouvong, implicating the absence of significant association between the occupations of caretakers and the incidence of diarrhea among under 5 children. Even if there had been several types of occupations in this study, their socio-economic status and living environment conditions were more or less homogenous in nature, and this might have contributed to the lack of significance between diarrhea occurrence among under 5 children and the caretakers' occupation. [25] However, Truong had demonstrated a significant association between occupation of caretakers and diarrhea among under 5 children in Ratchaburi province. [26]

The majority of caretakers in the study area belonged to the low income bracket which was approximately two thirds of the whole respondent's size. Apparently their income was lower than the average monthly household income in central Bangkok area. Although there was no significant association between under 5 diarrhea and household income, this study had found a greater number of under 5 diarrhea among the lower income group. And also, there was a proportionate decline in diarrhea occurrence among children who have been taken cared of by the higher income groups. But again, it failed to reach a statistically significant level. The credible reason for this was probably due to inaccurate declaration of their true household income. A study conducted by Ahmed *et.al.* demonstrated a high incidence of diarrhea among children who belonged from the low-income grouped family and mothers with low educational level. [24] Similar study of Phouvong showed significant association between household income and incidence of diarrhea in under 5 children (p-value 0.0147). [25]

Majority of the caretakers had allotted 16 hour or more for caring their children during daytime. There had been a higher diarrhea occurrence on children when their mothers took care of them for ≥ 16 hours during daytime. However, there was no

association between time allocation given by the caretaker and diarrheal disease occurrence among under 5 children. This study did not explore the number of hours spent by those child who were attending dare care school or centers. Since the number of hours in day care centers could have benefited those children while missing the number of hours that should have been allotted for them by their caretakers.

5.2 Child factor

This study had found that, the median age was 18 months. Study of Sutra *et.al.* found that, children under 24 months old particularly the 0-6 months and 7-12 months were the most vulnerable age group for diarrheal disease occurrence. [29] The result of this current study was in contrary to the result of previously mentioned, revealing a positive (though non-significantly) association between child age and diarrhea. Older children were probably more mobile and playful than younger children. They have higher chance to get diarrhea from hand contamination especially when these older children were touching toys or any objects, playing in the ground, and unknowingly putting their dirty fingers into their mouth.

Majority of the under 5 children belonged to the first order group, as claimed by their caretakers. Diarrheal disease occurrence in the first order children was lower than the second or higher order. This study had shown no statistical significance. This was apparently different from the study conducted by Victoria *et.al.*, which significantly associated the high birth order of children with an increase risk of dehydration secondary to diarrhea. [32] Similar to this study, Tantivaranaporn *et.al.* got a non significant result also but this time, it showed a higher frequency of diarrhea in the first and third or higher ordered children. Caretakers with higher educational attainment were the ones looking after the children belonging to second order and higher. [35] They probably have thought that bringing their child at the onset of diarrhea was the better option than jeopardizing their child later on. It was not a part of this study to explore the possible relationship of birth order and other demographic factors with the severity of diarrhea. Another interesting point was the possibility caretakers who were having their first child so far could probably have paid more

attention to them. It was not part of this study to collect information about the total number of children per household.

Almost all (98.1%) of the children have a normal birth weight. This study had found no significant association between birth weight and under 5 diarrhea. A case control study by Troung had found no statistically significant association between children with normal birth weight or low birth weight and diarrheal disease occurrence (p-value 0.232). [26] This was probably due to the regular prenatal check up that was received by mothers at their respective health facilities. Because of this, everybody probably knew how to take care of themselves by eating the right foods and taking the necessary supplemental vitamins when needed during their pregnancy.

Majority of the caretakers' children were exclusively breastfed during their first 4 months of life. According to the assumption of the researcher, the group of children who have been nurtured by breast milk or human milk alone for the first 4 months of life (exclusively breastfed) got a lower occurrence of diarrhea compared to the children who were either bottled fed and or breastfed (others group). The result of the study showed that breastfeeding had slight negative (though non-significant) association with occurrence of diarrhea in under 5 children. The reason could probably be attributed to the fact that the definition of exclusive breastfeeding for this study included the extra water, where in strict sense; it should not be the case. A study of Punyaratabandhu had demonstrated the importance of breastfeeding as a factor in the occurrence of diarrhea among children below 12 months of age. [37] This study revealed a statistically significant association on the occurrence of diarrhea between breastfed and non breastfed children. On the contrary, study conducted by Thavonnonth and Truong had both demonstrated the absence of association between breastfeeding and occurrences of diarrhea. [38, 26]

5.3 Behavioral factors of caretakers

Nearly half (46.8%) of the caretakers had fair level of knowledge. The descriptive information regarding the knowledge of caretakers was explored in detail

and found out that, most of them had good knowledge (>85%) in few salient items like:

- a. diarrhea is a passage of 3 or more stools per day
- b. sunken eyes as well as dry lips and skin are severe consequences of diarrhea
- c. eating uncovered food for hours can cause diarrhea
- d. dehydration is the most leading cause of death in under 5 diarrhea
- e. giving ORS in a child with diarrhea can prevent dehydration
- f. a child with diarrhea who have diarrhea and is unable to eat and drink as usual are symptoms of severe diarrhea, and needs to be brought to a doctor
- g. hand washing of caretaker before feeding a child may prevent diarrhea

There were many (72.8%) caretakers who answered wrongly in item “Infection is the most leading cause of death in under 5 diarrhea”, which probably was the same reason why some (51.9%) thought wrongly in items “In general, diarrhea responds best to antibiotic and anti-diarrheal drug” and hence, some (41.1%) answered wrongly in item “Whenever a child experiences 3 or more loose stools, it is better to start with ORS rather than with an antibiotics”, as well. This probably meant that, although most caretakers had good knowledge about the ORS and its capacity to reverse dehydration if given soon enough, there are still many of them who seek for medical consultation to cast some doubts on their mind. Another interesting point of conflict was that, there were still some (38.0%) who did not believe on the item “Infantile diarrhea may be prevented by breastfeeding”, and maybe same reason why majority (78.5%) answered wrongly in item “A child who gets thirsty and sunken eyes is normal if they have diarrhea”. Some caretakers probably think that withholding foods and fluids can really help the child recover faster from diarrhea. Quite interestingly, there were few (25.9%) who believed that breastfeeding causes diarrhea, which probably came from caretakers who were bottle-feeding their children. This was probably been invoked by the many promotional activities of milk formula from big multi-national companies, endorsement from pediatricians, and most especially they were readily available in markets and grocery stores.

Although majority of the caretaker were reasonably knowledgeable about childhood diarrhea as to its health promotion, preventive, and treatment aspect, there were still some respondents whose know-how on the exact role of ORS, antibiotics and anti-diarrheal drugs in diarrhea management were poor. The reason probably for this was that, some questions were a little difficult or technical for some respondents, especially those with lower educational level.

Although the occurrence of diarrhea among poor, fair, and good knowledge groups was statistically not significant, the trend of diarrhea was highest (24.4%) in the poor knowledge, fair group (17.8%), and lowest (14.8%) in the poor knowledge group. This was probably brought about by the mentality of caretakers that their children will be taken cared of better if they will bring their child to the health facilities. Other confounding factors also would be the accessibility of the health facilities with consultation and medicines being given were free of charge. Another important factor was that most of the diarrhea occurrence came from the group with higher level of education and this group tends to have a modernized type of mentality. Some previous studies approved that there was no significant association between knowledge and practice. This probably meant that having good knowledge does not necessarily lead people to practice positively. Similarly, a case and control study by Troung indicated that, there was no significant association between maternal knowledge and under 5 diarrhea, (p-value 0.185). [26] On the contrary, a study by Phouvong had shown a significant association between mothers' knowledge and diarrhea in children (p-value 0.0000). [25]

Majority (88.6%) of the caretakers had negative attitude toward childhood diarrhea. However, when the descriptive information regarding their attitude was explored in more detail, the researcher had found out that only three out of ten salient item had positive attitude (>85%) from the respondents, namely:

- a. children who eat uncooked food and drink unsanitary water are prone to get diarrhea
- b. exclusive breastfeeding during infancy reduces the occurrence of diarrhea

- c. ORS or homemade fluids can compensate for the fluid and electrolytes lost in diarrhea

This study revealed a negative (though non-significantly) association between attitude of caretakers and diarrheal disease occurrence in under 5 children. This was in contrary to the studies conducted by Phuovong and Truong, who had found a statistically significant negative association between attitude of mothers and incidence of diarrhea in children (p-value 0.0001 and p-value 0.035, respectively). [25, 26] Diarrheal diseases were basically a behavioral disease that can be observed through practice among children and their caretakers. It probably did not follow that, a positive attitude of caretaker always have good practice. Motivation to perform and change were probably based on caretakers' feelings as well.

This study found out that only (50.0%) of caretakers had good practice or preventive behavior against childhood diarrhea. When the descriptive information was explored in more detail, only few salient items had a uniformly good (89.0% or more) preventive practice, namely:

- a. hand washing after cleaning a child who just defecated
- b. cleaning of utensils which will be used by the child
- c. way of preventing food contamination
- d. water used for feeding the child

Regarding hand washing the study revealed that, only some (46.2%, 54.8%, and 67.1%) have strictly used soap in hand washing before food preparation, before feeding a child, and after cleaning a child who have just defecated, respectively. Luby *et.al.* found that soap and education decreased diarrhea by 53%. Based on the study of Curtis *et.al.*, diarrhea reduction was consistent with the previous pooled estimates as well. [39]

Regarding food storage, feeding of child, stool disposal and child caring during previous diarrhea, it was revealed that most of them have practice appropriately. However, in spite of their good knowledge on ORS, majority (41.8 and 35.4%) of

caretakers have sought consultation with medical doctors and PCUs. This was probably due to the modernized attitudes of caretakers, specially the caretakers with higher levels of education. Another possible reason was the accessibility of health facilities from respective respondents and the complete medication being given free of charge.

Although the result had demonstrated a negative relationship between caretakers' practice (poor, moderate, and good) and diarrheal occurrence (37.5%, 19.0%, and 15.2%, respectively) among under 5 children, it failed to reach statistically significant level. This may be due to demonstration of the emphasis on hand washing by community hygiene promoters or any health personnel in health facilities from the study area. Though caretakers probably thought also that, washing or flushing with water was just enough, and washing with soap was not practical because their hands were not visibly dirty. These were probably the reasons why caretakers do not always wash their hands properly. According to Curtis and Cairncross, despite the effectiveness of hygiene interventions in disease prevention, health considerations may be less effective at motivating people to use them than are other factors at inducing hygienic behaviors, such as the desire to feel and smell clean, and the desire to follow social norms. Therefore, Curtis and Cairncross suggested that the promotion of hand soap as a desirable consumer product may be a more effective dissemination strategy than that of health campaigns. [41]

5.4 Environmental and sanitation factors

Majority had hygienic water resources for drinking water and water used for other purpose as well There was a negative (though, non-significantly) association between water resources and its storage, and diarrheal disease occurrence. Majority of diarrhea came from the group of under 5 children whose households were using unhygienic (rain) water as their drinking water. However, this study did not include analysis for fecal contamination or water quality analysis of their drinking and water for other use.

Almost all of the caretakers practice hygienic storage of water by assigning different containers for drinking water and water for other uses. This study did not explore the duration of storage before they could refill or discard their respective containers for drinking and other use, respectively. It was important to note about the homogeneity among the responders, since almost all (97.5%) had similar hygienic drinking water source. These factors were probably some of the potential confounder that precluded the study from getting statistically significant findings. According to Jagals *et.al.*, possible sources of household contamination include unclean water containers, unhygienic domestic water handling practices, natural contamination from the ambient domestic environment as a result of uncovered containers and biofilm occurrence in plastic containers. [45] In the same manner, Clasen and Bastable examined fecal contamination of drinking water during collection and household storage and reported that even water from safe sources was subject to frequent and extensive fecal contamination (with over 90% of samples containing thermotolerant coliforms after collection). [46] The study conducted by Huangprasert *et.al.* said that, the water storage was associated with incidence of diarrhea, but no association had existed after the logistic regression analysis was applied. [48] In contrast, a study by Jinadu *et.al.* had revealed that, poor storage of drinking water was significantly associated to the high incidence of childhood diarrhea. [47]

Almost everybody had hygienic practice on human waste disposal. Almost all (98.1%) of the caretakers owned a latrine in their house and apparently remaining ones shared a latrine with other families within their compound. Majority (80.8%) of them have hygienic latrine conditions. In this study, although there was no significant difference on the diarrhea incidence between hygienic and unhygienic groups, diarrhea was negatively associated with the sanitation status. The same result was gathered in the study of Huangprasert *et.al.*, [48] On the other hand, an intervention study was conducted by Esrey *et.al.*, to find the percentage reductions in diarrhea expected to result from improvement to water supply, excreta disposal or hygiene behaviors. Results had shown that all the interventions reduced of diarrhea levels, with the effect varying between 15-36%, depending upon the intervention and the perceived quality of the study. [52]

Majority (80.4%) of the caretakers had hygienic garbage collection system in their respective areas, ranging from once/week, twice/week, and thrice/week schedule (39.2%, 24.75, and 16.5%, respectively). Others (17.1%) threw their garbage in the perimeter of their respective houses as non-formal dumping sites and some (2.5%) resorted to burning their garbage. These two modes of garbage disposal were considered unhygienic. In this study, the hygienic solid waste disposal among caretakers was associated with more (20.5%) diarrhea occurrence against a lower (12.9%) occurrence among caretakers with unhygienic garbage collection system. The association though, was not statistically significant. Different study gathered by Phouvang had revealed an association between no garbage collection and incidence of diarrhea (p-value 0.0000). [25] On the contrary, a study by Huangprasert *et.al.* had a significant association between unsanitary garbage collection and incidence of diarrhea. [48]

Majority (74.1%) of the caretakers had a good drainage system in their respective communities and was hygienic at the same time. This study presented a negative (though, non-significantly) association of hygienic drainage system with under 5 diarrhea occurrence. On the same manner, Huangprasert *et.al.*, had revealed a significant association between the drainage system and incidence of diarrhea. [48]

Almost all of the respondents had a hygienic housing sanitation in terms of the fuel used for cooking, flooring of the kitchen, and presence of livestock in the household or near the house (91.8%, 91.85, and 96.2%, respectively). However some (29.7%) claimed that, there were previous instances where breeding places for house flies and other insects would thrive in temporary garbage area near their house in between garbage collections. A study conducted by Vatanopas had demonstrated that poor housing sanitation were associated with increased occurrence of diarrhea among children. [53] The result of this study showed that hygienic housing condition had a negative (though, non-significantly) association with diarrheal occurrence among under 5 children. These were as follows; hygienic and unhygienic (17.9% and 33.3%, respectively) cooking method, hygienic and unhygienic (17.2% and 38.5%, respectively) flooring of the kitchen, the absence and presence (19.1% and 16.7%,

respectively) of livestock, and the absence and presence (18.0% and 21.3%, respectively) of breeding areas near their houses. Several previous studies revealed the association between housing sanitation and incidence of diarrhea.

The limitations of this study included the following: 1) all diarrhea cases were based on self-reports without any confirmation from the attending health practitioner or any health record. Furthermore the risks of childhood diarrhea varied by season, but the data were collected at only one time-point. Thus, there is room for misclassification of some cases; 2) the cross-sectional study design means that the ability to make causal inferences from the results is limited; 3) the small sample size had larger variances than the reference population. Therefore, the high diarrhea occurrence observed in this study must be interpreted with caution, and it is unclear whether these findings could be generalized to the under 5 children in Krathum Baen district.

CHAPTER 6

CONCLUSION AND RECOMMENDATION

6.1 Conclusion

This cross sectional study was conducted in a PCU and Hospital-based setting, which had the purpose of describing the risk factors relating to the diarrheal disease occurrence among under 5 children in Samut Sakhon province, Thailand. And accordingly, the researcher had found the following:

Majority of the caretakers were mothers aged 25 or over and with a median age of 29 years. Most of them had completed their secondary schools and higher. The main occupation of caretakers belonged to the service worker group and majority belonged to the low income group, which was apparently lower than the average monthly household income in central Bangkok area. The majority of caretakers have allotted more than 16 hours per day for caring their children during daytime.

The median age of the under 5 children was 18 months and half of them belonged to the first order group, as claimed by their caretakers. Almost all had a normal birth weight and barely over half have been exclusively breastfed during the children's first 4 months of life. About 19% had experienced diarrhea during the previous one month from the date of interview.

Majority of caretakers have a fair level of knowledge on childhood diarrhea. A greater proportion of the caretakers had positive attitudes towards childhood diarrhea and most of the mothers have good level of practice on childhood diarrhea.

Regarding environmental and sanitation factors, majority had hygienic water resources for drinking water and water used for other purpose as well. Almost all of the caretakers practice hygienic storage of water by assigning different containers for

drinking water and water for other uses. Almost everybody had hygienic practice on human waste disposal, solid waste disposal, and housing sanitation

After applying Chi Square and Fisher's Exact tests to test the statistical significance of the relationships between the four categories of independent variables and diarrheal disease occurrence among under 5 children, this study had found an association that was not statistically significant.

The study has been conducted in a PCU and hospital-based setting, but if we have conducted it in community-based setting results could have turned-out differently. In the same manner, we have interviewed our participants using structure questionnaires in a hospital-based setting, but if we have conducted it in a community-based setting using an in-depth interview, the result might have been different as well. The result of this study is not suitable to be generalized because of its small sample size.

6.2 Recommendations

1. The high diarrheal disease occurrence among under 5 children in Samut Sakhon district needs to be confirmed through prospective studies with more representative settings and sample size.
2. An in-depth qualitative research is highly recommended in the future in order to address the important key points that this study had found.

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APPENDIX A

QUESTIONNAIRE

Risk factors relating to the diarrheal disease occurrence among under 5 children at Samut Sakhon province, Thailand

This questionnaire is prepared for the thesis writing purpose of MPHM course. Please answer with all honesty. All information that will be gathered on this interview will be strictly kept confidential.

Date of interview.....

ID.....

Part I : Socio demographic factors of caretaker

1. Age of caretaker years
2. Gender of caretaker

<input type="checkbox"/> 1 Female	<input type="checkbox"/> 2 Male
-----------------------------------	---------------------------------
3. Relationship between child and caretaker

<input type="checkbox"/> 1 mother	<input type="checkbox"/> 2 father
<input type="checkbox"/> 3 grand parent	<input type="checkbox"/> 4 aunt/uncle
<input type="checkbox"/> 5 babysitter	<input type="checkbox"/> 6 others (please specify).....
4. What is the highest level of education you completed in school?

<input type="checkbox"/> 1 none (did not go to school)	<input type="checkbox"/> 2 primary (elementary)
<input type="checkbox"/> 3 secondary	<input type="checkbox"/> 4 college
<input type="checkbox"/> 5 higher than college level	<input type="checkbox"/> 6 others (pls specify).....
5. What is your occupation?

<input type="checkbox"/> 1 agriculture	<input type="checkbox"/> 2 self-employed
<input type="checkbox"/> 3 private employee	<input type="checkbox"/> 4 government employee
<input type="checkbox"/> 5 skilled worker	<input type="checkbox"/> 6 unemployed
<input type="checkbox"/> 7 housewife	<input type="checkbox"/> 8 babysitting
<input type="checkbox"/> 9 others (please specify).....	

6. What is your average household income level per month right now?
- 1 less than 7,000 baht
 - 2 7,000 to 19,999 baht
 - 3 20,000 or more
7. How much time do you allocate for caring your child (hours/day) during daytime?
- 1 less than 8 hours
 - 2 8 to 15 hours
 - 3 16 hours or more

Part II: Child factors

1. Child's age.....months.
2. Birth order.....
3. Birth weight.....grams
4. What kind of milk was given to your child at the first 4 months of life?
 - 1 human milk only (exclusive breastfeeding)
 - 2 powdered milk
 - 3 condensed milk (sweetened)
 - 4 both human milk and powdered milk
 - 5 others (please specify)
5. Did your child experience an episode/s of diarrhea during the past one month including today?
 - 1 yes
 - 2 no

Part III Knowledge of caretaker on childhood diarrhea

According to the question numbers 1-20, interviewer must ask each question and answer by checking the space provided in the yes or no column.

Question	Yes	No
1. Diarrhea is a passage of 3 watery stools or more per day.		
2. Diarrhea is a passage of one loose stool per day.		
3. Diarrhea is a passage of one watery stool per day with/without vomiting.		

Part III Knowledge of caretaker on childhood diarrhea (cont.)

Question	Yes	No
4. Breastfeeding causes diarrhea in under 5 children.		
5. Sunken eyes, dry lips and skin are severe consequences of diarrhea.		
6. Eating uncovered foods for hours can cause diarrhea.		
7. Watery stools of 5 or more without sunken eyes is a severe diarrhea.		
8. Diarrhea is a normal part of child's growth and development process.		
9. Infection is the most leading cause of death in under 5 diarrhea.		
10. Dehydration is the most leading cause of death in under 5 diarrhea.		
11. Giving ORS in a child with diarrhea can prevent dehydration.		
12. In general, diarrhea responds best to antibiotic and anti-diarrheal drug.		
13. It is better to stop giving food, fluids and milk during diarrhea.		
14. A child with diarrhea who is unable to eat and drink as usual can be a symptom of severe diarrhea, and needs to be brought to a doctor.		
15. A child who got thirsty and sunken eyes is normal if they have diarrhea.		
16. In general, children improve their condition with ORS or Homemade fluids treatment, and need not see a doctor.		
17. Diarrhea can be prevented by breastfeeding your infant/child.		
18. Hand washing of caretaker before feeding their child may help prevent diarrhea.		
19. Whenever your child experiences 3 or more loose stools, it is better to give an ORS first instead of antibiotics drugs.		
20. Frequent diarrhea may cause malnutrition and growth retardation.		

Part IV Attitude of caretaker

Answer in question numbers 1-10 will be classified into 5 degrees such as:

SA = strongly agree, **A** = agree, **N** = neutral, **D** = disagree, and **SD** = strongly disagree. The interviewer must select or check only one degree, the one that is closest to the respondent's opinion.

Question	SA	A	N	D	SD
1. Children who eat uncooked food and drink unsanitary water are prone to get diarrhea.					
2. Exclusive breastfeeding during infancy period reduces the occurrence of diarrhea.					
3. Diarrhea in children is unpreventable.					
4. Children with more than 3 watery stool should be treated first by giving them anti-diarrheal drug and antibiotic from the pharmacy.					
5. ORS or oral home fluid can compensate for the fluid and electrolyte lost due to diarrhea.					
6. Diarrheal disease from one member of the household is capable of being transmitted not only to other member of the family but to other community members as well.					
7. Diarrhea in children is safe, and usually heals naturally without treatment.					
8. During diarrheal episode, avoiding fluid/milk and solid food will prevent vomiting and will help the child to recover faster.					
9. Under 5 children have more chance of dying from severe diarrhea than adults.					
10. All children with diarrhea will need to be confined for Intravenous Fluid Infusion in order to prevent dehydration.					

Part V Practice of caretaker

In question numbers 1-15, interviewer must ask each question and answer by checking one which is closest to the respondent's opinion.

1 How do you practice hand washing before preparing the food? (choose only 1 answer)

1 Always (means ≥ 3 times a day)

2 Often (means twice a day)

3 Sometimes (means once a day)

4 Never (please skip to Q3)

2 Do you wash with soap before preparing food?

1 no, water only

2 yes, water and soap

3 How do you practice hand washing before feeding your child? (choose only 1 answer)

1 Always (means ≥ 3 times a day)

2 Often (means twice a day)

3 Sometimes (means once a day)

4 Never (please skip to Q5)

4 Do you wash with soap before feeding your child?

1 no, water only

2 yes, water and soap

5 How do you practice hand washing after defecation?

1 Always

2 Sometimes

3 Never (please skip to Q7)

6. Do you wash with soap after defecation?

1 no, water only

2 yes, water and soap

7 How do you clean the eating/feeding utensils of your child?

1 Always (means ≥ 3 times a day)

2 Often (means twice a day)

3 Sometimes (means once a day)

4 Never (please skip to Q9)

8. Do you wash with soap in cleaning the eating/feeding utensils of your child?

- 1 no, water only 2 yes, water and soap

9. How do you keep or prevent the flies from landing or contaminating your cooked and eft-over foods? (choose only 1 answer)

- 1 with the use of food cover
 2 cupboard
 3 refrigerator
 4 without any cover
 5 others (please specify).....

10. How do you give food to your infant or child? (choose only 1 answer)

- 1 by using my bare hands
 2 by using an eating utensils like spoon, fork, chopsticks, etc.
 3 both
 4 others (please specify).....

11. How do you clean your breast nipples prior to breastfeeding your infant?

(This question is applicable to mothers who practiced exclusive breastfeeding, and mothers who practiced both bottle feeding and breastfeeding. (choose only 1 answer)

- 1 washing them with luke warm water
 2 washing them with soap and water
 3 do not wash them, why?.....
 4 did not breastfeed

12. How do you clean the feeding bottle that is being used by your child? (This question is applicable only to those respondents who fed their infants or child through bottle feeding, and those respondents who both breastfed and bottle fed their child. (choose only 1 answer)

- 1 washing them with soap or detergent and boiling them afterwards
 2 washing them with detergent or soap and water only
 3 washing with water only, without soap or detergent
 4 did not bottle-feed

13. What kind of water do you use to feed your infant or child? (choose only 1 answer)

- 1 boiled water

- 2 water from deep well, without boiling them
 3. water from shallow well. Without boiling them
 4 bottled water (purified or sterilized)
 5 tap water
 6 others (please specify).....
14. What did you do during the last time that your child passed stools? (choose only 1 answer)
- 1 throw them in latrine
 2 left them around the house
 3 put them in a dust bin
 4 left them in the lot outside my house
 5 others (please specify).....
15. What did you do or treatment did you give to your child during the last time that he/she had a diarrhea? (choose only 1 answer)
- 1 gave ORS or homemade fluids at home
 2 gave anti-diarrheal drug or antibiotics from the nearest pharmacy
 3 went to see a doctor
 4 went to PCU (health center)
 5 went to see VHV
 6 others (please specify).....

Part VI Environmental and sanitation factors

In question numbers 1-15, interviewer must ask each question and answer by checking one which is closest to the respondent's opinion.

Water resource

- | | |
|--|--|
| 1. Current source of drinking water | 2. Source of water for other use |
| <input type="checkbox"/> 1 deep well | <input type="checkbox"/> 1 deep well |
| <input type="checkbox"/> 2 unsanitary shallow well | <input type="checkbox"/> 2 unsanitary shallow well |
| <input type="checkbox"/> 3 sanitary shallow well | <input type="checkbox"/> 3 sanitary shallow well |
| <input type="checkbox"/> 4 tap water | <input type="checkbox"/> 4 tap water |
| <input type="checkbox"/> 5 rain water | <input type="checkbox"/> 5 rain water |

- | | |
|--|--|
| <input type="checkbox"/> 6 plastic tank | <input type="checkbox"/> 6 plastic tank |
| <input type="checkbox"/> 7 others (please specify) | <input type="checkbox"/> 7 others (please specify) |
3. Collection or storage container for drinking water
- | | |
|--|---|
| <input type="checkbox"/> 1 jar with cover | <input type="checkbox"/> 1 jar with cover |
| <input type="checkbox"/> 2 uncovered jar | <input type="checkbox"/> 2 uncovered jar |
| <input type="checkbox"/> 3 big plastic container tank | <input type="checkbox"/> 3 cement, metal/plastic tank |
| <input type="checkbox"/> 4 rain water | <input type="checkbox"/> 4 others (please specify) |
| <input type="checkbox"/> 5 cement, metal or plastic tank | |
| <input type="checkbox"/> 6 others (please specify) | |
4. Collection or Storage container for other use
- | | |
|--|---|
| <input type="checkbox"/> 1 jar with cover | <input type="checkbox"/> 1 jar with cover |
| <input type="checkbox"/> 2 uncovered jar | <input type="checkbox"/> 2 uncovered jar |
| <input type="checkbox"/> 3 big plastic container tank | <input type="checkbox"/> 3 cement, metal/plastic tank |
| <input type="checkbox"/> 4 rain water | <input type="checkbox"/> 4 others (please specify) |
| <input type="checkbox"/> 5 cement, metal or plastic tank | |
| <input type="checkbox"/> 6 others (please specify) | |

Human waste disposal

5. Is there a latrine available in your house?
- | | |
|--------------------------------|---|
| <input type="checkbox"/> 1 yes | <input type="checkbox"/> 2 no (proceed to Q #8) |
|--------------------------------|---|
6. Does everybody use the latrine?
- | | |
|--------------------------------|-------------------------------|
| <input type="checkbox"/> 1 yes | <input type="checkbox"/> 2 no |
|--------------------------------|-------------------------------|
7. Latrine condition (Adequate ventilation, water, and type of flooring).
- | | |
|-------------------------------------|---------------------------------------|
| <input type="checkbox"/> 1 hygienic | <input type="checkbox"/> 2 unhygienic |
|-------------------------------------|---------------------------------------|
8. Material used for cleaning after defecation.
- | | |
|----------------------------------|--|
| <input type="checkbox"/> 1 water | <input type="checkbox"/> 2 paper |
| <input type="checkbox"/> 3 both | <input type="checkbox"/> 4 others (pls specify)..... |

Solid waste disposal

9. Collecting system
- | | |
|---|--|
| <input type="checkbox"/> 1 once a week | <input type="checkbox"/> 2 twice a week |
| <input type="checkbox"/> 3 three times a week | <input type="checkbox"/> 4 others (pls specify)..... |

Waste water disposal

10. Is there a drainage system for domestic waste water?
- | | |
|--|--------------------------------------|
| <input type="checkbox"/> 1 yes/present | <input type="checkbox"/> 2 no/absent |
|--|--------------------------------------|
11. Is there a clogged drainage around or near your house?

1 yes/present/dirty

2 no/absent/clean

Housing sanitation

12. Condition of surrounding area regarding house flies and breeding places.

1 present

2 absent

13. Fuel used in cooking your food.

1 cooking by charcoal

2 cooking by gas

3 others.....

14. Flooring of the kitchen.

1 cement

2 earth ground

3 others.....

15. Is there animal raising or livestock under or around the house?

1 yes. Distance from their house..... (in meters)

2 none

Thank you very much for your cooperation!

Name of interviewer.....

BIOGRAPHY

NAME	Erwin M. Labay, M.D.
DATE OF BIRTH	March 1, 1969
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