# HOUSEHOLD WASTE DISPOSAL: KNOWLEDGE, PERCEPTION, PRACTICES, AND RELATIONSHIP WITH DIARRHEA FREQUENCY IN LAPUTTA TOWNSHIP IN MYANMAR

Mr. Ye Paing Kyi



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# ความรู้,การยอมรับ และการปฏิบัติที่เกี่ยวกับความสัมพันธ์ระหว่างการทิ้งขยะในครัวเรือนและความถี่ของการเกิดโรคท้องเสียในเมืองลาพูทา ประเทศพม่า

นาย เย ปาย อิ



วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาสาธารณสุขศาสตรมหาบัณฑิต
สาขาวิชา สาธารณสุขศาสตร์
วิทยาลัยวิทยาศาสตร์สาธารณสุข จุฬาลงกรณ์มหาวิทยาลัย
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| Thesis Advisor | Robert S. Chapman, M.D., M.P.H. |

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.....Dean of the College of Public Health Sciences

(Professor Surasak Taneepanichskul, M.D.)

THESIS COMMITTEE

.....Chairman

(Wattasit Siriwong, Ph.D.)

.....Thesis Advisor

(Robert S. Chapman, M.D., M.P.H.)

.....Examiner

(Assistant Professor Prathurng Hongsranagon, Ph.D.)

.....External Examiner

(Apaporn Siripornprasarn, Ph.D.)

เย ปาย จิ: การกำจัดของเสียของครัวเรือน: ความรู้ การรับรู้ การปฏิบัติ และความสัมพันธ์กับความถี่ของการเกิดโรคอุจจาระร่วง ในเมืองลาพุตตา ประเทศพม่า (HOUSEHOLD WASTE DISPOSAL: KNOWLEDGE, PERCEPTION, PRACTICES, AND RELATIONSHIP WITH DIARRHEA FREQUENCY IN LAPUTTA TOWNSHIP IN MYANMAR) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: Robert S. Chapman, M.D., M.P.H., 98 หน้า

การศึกษาแบบภาคตัดขวางนี้ได้ดำเนินการในหมู่บ้าน เย ทวิน เสก เมืองลาพุตตา ประเทศพม่า ในเดือนมีนาคม พ.ศ. 2554 โดยมีวัตถุประสงค์เพื่อประเมินระดับความรู้ การรับรู้ และการปฏิบัติในการกำจัดของเสียของครัวเรือน รวมทั้งเพื่อศึกษาความสัมพันธ์ระหว่างลักษณะทางประชากรสังคม ลักษณะครัวเรือน ระดับความรู้ การรับรู้และการปฏิบัติในการกำจัดของเสียของครัวเรือนกับความถี่ของการเกิดโรคอุจจาระร่วงในประชาชนเมืองลาพุตตา ประเทศพม่า กลุ่มตัวอย่างมีจำนวนทั้งสิ้น 389 คน ใช้แบบสอบถามแบบมีโครงสร้างโดยผู้สัมภาษณ์เป็นผู้กรอกแบบสอบถาม สถิติ ANOVA ใช้ในการทดสอบความสัมพันธ์ระหว่างตัวแปรต้นได้แก่ลักษณะทางประชากรสังคมและลักษณะครัวเรือน กับการปฏิบัติในการกำจัดของเสียของครัวเรือน สำหรับการทดสอบ Chi-Square ใช้อธิบายความสัมพันธ์ระหว่างคุณลักษณะทางสังคมประชากร และครัวเรือนที่มีการเกิดโรคอุจจาระร่วงกับความรู้และการรับรู้ในการกำจัดของเสียกับการปฏิบัติในการกำจัดของเสียของครัวเรือน เช่นเดียวกับความรู้และการรับรู้ของการเกิดโรคอุจจาระร่วง

ผลการศึกษาในภาพรวมพบว่ามีโรคอุจจาระร่วงเกิดขึ้น 19.5% โดยกลุ่มตัวอย่าง 78.1% มีความรู้อยู่ในระดับสูง และ 21.1% อยู่ในระดับปานกลาง สำหรับการรับรู้ในการกำจัดของเสียของครัวเรือนพบว่า 50.4% ของกลุ่มตัวอย่างมีการรับรู้อยู่ในระดับสูง และ48.1%อยู่ในระดับปานกลาง การปฏิบัติในการกำจัดของเสียครัวเรือนมีความแตกต่างกันอย่างมีนัยสำคัญเมื่อเปรียบเทียบแหล่งน้ำดื่ม ($p<0.001$) จำนวนถังขยะ ($p=0.032$) ถังขยะแบบมีฝาปิด ($p=0.01$) ถังขยะเปล่า ($p=0.008$) ขยะจากห้องครัว ($p=0.017$) และการรับรู้ต่อการกำจัดขยะในครัวเรือน ($p<0.001$) กล่าวคือ ครัวเรือนที่ใช้แหล่งน้ำดื่มจากบ่อน้ำและน้ำฝนมีการปฏิบัติในการกำจัดของเสียครัวเรือนสูง ครัวเรือนที่มีจำนวนถังขยะมากมีการปฏิบัติในการกำจัดของเสียครัวเรือนสูง ครัวเรือนที่มีถังขยะแบบมีฝาปิดและการมีความถี่ในการทิ้งขยะมากมีการปฏิบัติในการกำจัดของเสียครัวเรือนสูง การใช้ส้วมในบ้าน (OR=2.38; 95% CI: 1.02-5.49) และจำนวนเด็กอายุต่ำกว่า 5 ปี (OR=2.09; 95% CI: 1.08-4.04) ส่วนการใช้ถังขยะแบบมีฝาปิดสามารถป้องกันโรคอุจจาระร่วงได้ (OR=0.30, 95% CI: 0.16-0.59)

การศึกษาครั้งนี้เป็นการรวบรวมข้อมูลพื้นฐานเกี่ยวกับการกำจัดของเสียในครัวเรือนเพื่อประโยชน์สำหรับการศึกษาวิจัยต่อไป ผลการศึกษาแสดงให้เห็นถึงความสำคัญ ในการกำหนดยุทธศาสตร์และการวางแผนของผู้กำหนดนโยบายเพื่อปรับปรุงวิธีการกำจัดของเสียของครัวเรือนและลดการเกิดโรคอุจจาระร่วงในเมืองลาพุตตา ประเทศพม่า

สาขาวิชา สาธารณสุขศาสตร์ ลายมือชื่อนิสิต .....

ปีการศึกษา 2553 ลายมือชื่อ อ.ที่ปรึกษาวิทยานิพนธ์หลัก Robert S. Chapman

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YE PAING KYI: HOUSEHOLD WASTE DISPOSAL: KNOWLEDGE, PERCEPTION, PRACTICES, AND RELATIONSHIP WITH DIARRHEA FREQUENCY IN LAPUTTA TOWNSHIP IN MYANMAR. ADVISOR: ROBERT S. CHAPMAN, M.D., M.P.H., 98pp.

A cross-sectional study was done in Yay Twin Seik Village Tract in Laputta Township, Myanmar, in March, 2011. The main objectives of this study were to assess the level of knowledge, perception and practices on household waste disposal; and to find out the association between socio-demographic, household characteristics, level of knowledge and perception with level of practices on household waste disposal associated with diarrhea frequency in Laputta residents. This study was carried out with 389 subjects by using a structured interviewer-administrated questionnaire to acquire data, with ethical review protocol no. 031.1/54 which was approved on 24th March, 2011. To find out the association between independent variables, socio-demographic and household characteristics; and practice on household waste disposal, the one-way analysis of variance (ANOVA) test was used. Chi-square tests were done to assess the associations between socio-demographic and household characteristics with diarrhea; knowledge and perception towards household waste disposal with practice on household waste disposal as well as with diarrhea occurrence.

The overall diarrhea occurrence was 19.5%. Among respondents, 78.1% had high level of knowledge while 21.1% had moderate level of knowledge. For perception towards household waste disposal, 50.4% of respondents had high-level perception and 48.1% had moderate level of perception. Practice on household waste disposal differed significantly with drinking water source (<0.001), number of trash bin (p=0.032), trash bins with wide lids (p=0.01), emptying of trash bins (p=0.008), kitchen waste (p=0.017) and perception towards household waste disposal (<0.001). The households which used pond water and rain water had higher practice score; the more the number of the trash bins, the higher the practice score; the use of trash bins with wide lids was linked to the higher practice score; and the more frequent they emptied trash bins, the more practice score they had. Indoor latrine (OR=2.38; 95% CI: 1.02-5.49) and number of children under 5 (OR=2.09; 95% CI: 1.08-4.04) were risk factors for diarrhea while trash bins with narrow lids (OR=0.30, 95% CI: 0.16-0.59) were protective against diarrhea.

This study provides baseline data regarding household waste disposal for further studies. The result can also inform policy makers to develop strategy and planning to improve household waste disposal and to reduce diarrhea occurrence. Further research on determinants of waste disposal practices and diarrhea occurrence is needed in Laputta and elsewhere.

Field of Study: ...Public Health.....Student's Signature.....

Academic Year: ..2010.....Advisor's Signature Robert S. Chapman

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| | |
|---|---|
| EPA | Environmental Protection Agency |
| INGOs | International Non-Government Organizations |
| MDGs | Millennium Development Goals |
| SPSS | Statistical Package of Social Science software |
| UK | United Kingdom |
| UNICEF | United Nations Children's Fund |
| WHO | World Health Organization |

# CHAPTER I
# INTRODUCTION

## 1.1. Background and Rationale

As the world economy grows, its production of wastes also grows. For example, US production of hazardous and toxic waste rose from 9 million tons in 1970 to 238 million tons in 1990 (Gourlay, 1995). Europe produces more than 2.5 billion tons of solid waste a year (Elkington, 1995), and every day the inhabitants of New York throw away approximately 26,000 tons of solid waste (Gourlay, 1995).

The rapid growth of cities in the developing world in recent decades has resulted in increased consumption of resources to meet the growing demands of urban populations and industry, and this situation leads to the generation of large amounts of waste in cities (Boadi, 2005).

All of us produce waste, whether it is simply household waste or waste from manufacturing and industry. The ways in which we dispose of waste are often not sustainable. Individuals, companies and nations alike are all good at putting waste out of sight and forgetting it. However, the effects of poor waste disposal have a habit of catching up with us. Disposing of waste properly needs money and effort. Companies must be forced to dispose of their waste safely and to prevent pollution. Public concern is the most effective pressure. However, the best way of reducing pollution from waste disposal is to reduce – by more efficient use of resources – the amount of waste we produce. Many rich nations especially, are beginning to learn this lesson (Carter, 2005).

Household waste is made up of everyday items. Some seemingly innocuous items are classified as hazardous. It's important to know how to properly dispose of hazardous items safely. There are two types of household waste. Nonhazardous waste is made up of food, packaging, furniture and yard clippings. Hazardous waste includes such things as electronics, compact fluorescent bulbs, paints, batteries, pesticides, oils and some cleaners (U.S. EPA Solid Waste Division, 2009).

When the amount of wastes are produced and become substantially high which cannot be properly handled and treated, this would bring about many other problems to the environment. Poor environmental conditions cause a large proportion

of the global burden of disease. Maintenance of environmental goods and services underpins all aspects of human health and well-being. The development of the newly industrialized countries has affected the change of production, consumption and public service. Economic growth also made the technological development to respond the public need. This growth and development result in increasing solid waste quantity enormously.

The waste can block the drainage system of the house. Outdoor stockpiles of household waste will be turned into bacterial culture as it becomes food favorable for rodents and insects, which are disease carriers and can result in public health hazard. It can also create annoyance due to poor odor, poor scenery, and untidiness.

Some of major risk factors are unsafe water and sanitation and poor hygiene, indoor and urban air pollution, climate change and so on. These will be due to poor environmental conditions. In particular, waste discharges are already beginning to change the way the biosphere functions such as the depletion of the ozone layer and climate change which are beginning to reduce the productivity of global ecosystems (Simmons, 1996).

An efficient and last long solid waste problem solving concept is to reduce household waste quantity from the origin by recovery or recycle and reuse (using resources effectively, conservatively, and preserving community environment). These could reduce the solid waste collection expenditure of the authority. If we manage household waste properly, not contaminate it, we can bring it back for additional benefit further more. Systematic management of household waste will reduce its quantity, which is the root of the problem solving. That is why reducing household waste quantity before recycling, providing knowledge, understanding, and application should be done.

There are many major environmental risk factors which cause many diseases such as diarrheal diseases, respiratory diseases, vector borne diseases, road traffic injuries, unintentional poisonings and etc. Most deaths, 80% occur in children under five who frequently die from diarrhea associated with waterborne disease. In India alone, diarrhea kills about 500,000 children a year and it is the sixth largest cause of death globally. A 20056 World Bank document reported that four billion cases of diarrhea a year and other water related diseases. Two of the UN's Millennium

Development Goals (MDGs) are to cut in half the number of people without safe drinking water and without improved sanitation by 2015 (Marquita, 2010).

Diarrhea is one of the causes of the highest mortality and morbidity in children, especially in children younger than 5 years. In the world, as many as 6 million children die each year from diarrhea, where most deaths occur in developing countries (Parashar, 2003).

Diarrheal diseases are a leading cause of mortality and morbidity, especially among young children in low-income countries, and are associated with exposure to human excreta. Many of the microbial agents associated with diarrhea are transmitted via the fecal-oral route and a wide variety of bacterial, viral, and protozoan pathogens excreted in the faeces of humans and animals are known to cause diarrhea. Interventions need to be improved for the safe disposal of human faeces to prevent diarrhea. In low-income settings, among the estimated 2.6 billion people who lack basic sanitation, the interventions mainly consist of introducing or expanding the number and use of latrines and other facilities to contain or dispose of faeces (Clasen, 2010).

Diarrheal diseases can be caused by numerous pathogens and can be transmitted through multiple routes. Persons living in developing countries with poor access to safe water, sanitation, or hygiene infrastructures have increased risks of exposure to viral, bacterial, and parasitic pathogens that can lead to diarrheal diseases (Arvelo, 2010).

**Laputta Township**

It is one of the first coastal areas in the Delta region in the Southwestern part of Myanmar which was strike by the Cyclone Nargis in 2008. The United Nations estimated that as many as 2.5 million people have been severely affected by the cyclone. 40% of those who were affected by the cyclone were children. In Laputta Township, many children under five years are suffering from diarrhea or dysentery. The cyclone forced many residents to reside temporarily in camps, which were disorganized and lack of good sanitation. This, coupled with the shortage of food, raises grave concerns about children's health. Already, about 30 per cent of the children in the township are suffering from diarrhea or dysentery. About 200,000

people live within Laputta Township. Survivors cannot find food or water and diarrhea has now affected a great number of people in the Irrawaddy Delta due to infection from corpses and dead fish. The camp population in Laputta has declined from over 40,000 to an estimated 10,000 people.

It used to have 508 villages and 59 village tracts including Yae Way, Tha-bay Chaung, Hlwa Sar, Sa Lu Seik, Bine Tauk Chaung, A Hmat, Yae Twin Seik, Kamala, Naung Bin Tha, Thin Gan Gyi and Thin Gan Lay. A village tract is usually composed of at least 20 villages. In one village tract, the population can range from 3,000 to 10,000 people (Burma News Network, 2008). Because of the cyclone Nargis, 140,000 out of about 350,000 people lost their houses and thousands of buildings were damaged. 16 villages had been virtually wiped out after the cyclone. They lived in the tents and temporary shelters and six months after the cyclone most of the people returned to their new homes. Some of these homes were intact, and some were repaired after the cyclone. At present, all of the participants in this study have returned home (Humanitarian Practice Network, 2008).

### 1.2. Research questions

- What are the socio-demographic and household characteristics of people in Laputta Township in Myanmar?
- What is the prevalence of diarrhea in Laputta Township in Myanmar?
- What is the level of knowledge on household waste disposal of people in Laputta Township in Myanmar?
- What is the level of perception on household waste disposal of people in Laputta Township in Myanmar?
- What is the level of practice on household waste disposal of people in Laputta Township in Myanmar?
- Are the socio-demographic and household characteristic, level of knowledge and perception associated with level of practice about household waste disposal associated with diarrhea frequency in people in Laputta Township in Myanmar?

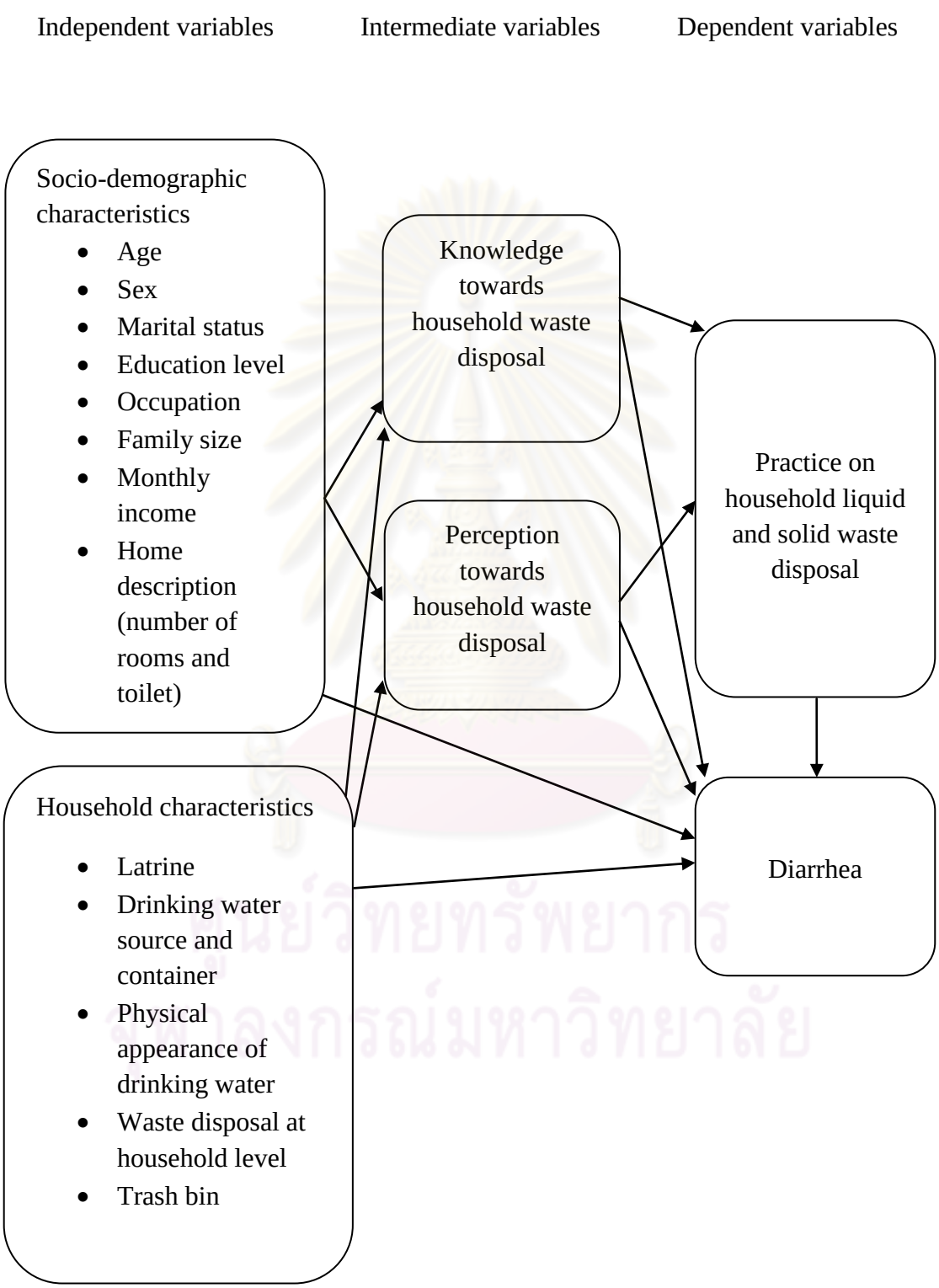
### 1.3. Research objectives

- To describe the socio-demographic and household characteristics of people and prevalence of diarrhea frequency in Laputta Township in Myanmar.
- To assess the level of knowledge, perception and practices on household waste disposal in people in Laputta Township in Myanmar.
- To assess the association between socio-demographic and household characteristics, level of knowledge, perception with level of practices on household waste disposal associated with diarrhea frequency in people in Laputta Township in Myanmar.

### 1.4. Research hypothesis

- $H_1$: There is association between socio-demographic and household characteristics and level of practices on household waste disposal as well as diarrhea frequency.
- $H_1$: There is association between level of knowledge and level of practices on household waste disposal as well as diarrhea frequency.
- $H_1$: There is association between level of perception and level of practices on household waste disposal as well as diarrhea frequency.
- $H_1$: There is association between practices on household waste disposal and diarrhea frequency.

**1.5. Conceptual framework**



### 1.6. Operational definitions

**Household or solid waste** refers to any solid waste comprising of garbage and rubbish (such as bottles, cans, clothing, compost, disposables, food packaging, food scraps, newspapers and magazines, and yard trimmings) that originates from private homes or apartments. It may also contain household hazardous waste and also called domestic waste or residential waste.

**Toilet or liquid waste** refers to the wastewater that has been adversely affected in quality by anthropogenic influence. It comprises liquid waste discharged by domestic residences, commercial properties, industry, and/or agriculture and can encompass a wide range of potential contaminants and concentrations. In the most common usage, it refers to the municipal wastewater that contains a broad spectrum of contaminants resulting from the mixing of wastewaters from different sources.

**Household waste disposal** refers to the activities and actions of households to their household wastes.

**Demographic characteristics** include age, sex, marital status, education level, occupation, family size and monthly income.

Age refers to the age of the respondent at the time of the interview.

Marital status refers to the legal status of each individual in relation to the marriage laws or customs of the country. This is categorized into single, married, divorced, separated, widowed and others.

Educational level refers to the highest level of education that the respondent had attained at the time of interview. Education is classified into illiterate, primary education level (1-4 years of school), secondary education level (5-8 years of school), high school level (9-10 years of school), higher education (university) and others.

Occupation refers to the type of job that the respondent has to earn money at the time of interview. Occupation is classified into housewife, farmer, general worker, laborer, construction worker and others..

Family size refers to the numbers of the family member including the respondent.

Monthly income refers to the total amount of monthly income earning of the whole household.

Home description refers to the number of the rooms in the household and toilet facilities.

**Household characteristics:**

**Type of latrine** is classified by swan neck latrine, pour-flash latrine, pit latrine and without latrine.

**Drinking water source** is classified as bottle water, tap water, well water, river water, rain water and others. **Type of water container** is classified as opened container, closed container and no container. **Distance of drinking water source from water pollution source** refers to if the water source originates from ground water (well water), source of water pollution (waste water/ pit latrine/septic tank/solid waste landfill) will affect the quality of water within a radius of less than 10 meters.

**Physical appearance of drinking water** is classified as if water is colorless, tasteless, not cloudy, not frothy and not smelly, it is defined as good.

**Liquid waste disposal** refers to the management of liquid waste as opened or closed at household level.

**Solid waste disposal** refers to the management of solid waste as indoor or outdoor and opened or closed at household level.

**Knowledge on household waste disposal** means information about household waste disposal and the respondent's ability to answer the practices of household waste disposal.

**Perception on household waste disposal** means the respondent's opinion of agreement or disagreement to the statement concerning household waste management

**Practice on household waste disposal** refers to the behaviors of people to use their knowledge and understanding of household waste management.

**Use of trash bins** refers to the use of bins that hold rubbish until it is collected. It is classified as trash bins with wide lids, with narrow lids and without lids.

**Reducing** refers to create less waste so that there is less that must be recycled or thrown away.

**Recycling** refers to processing used materials into new products to prevent waste of potentially useful materials, to reduce the consumption of fresh raw

materials, to reduce energy usage, to reduce air pollution from incineration and water pollution from land filling by reducing the need for conventional waste disposal.

**Reusing** refers using an item more than once. This includes conventional reuse where the item is used again for the same function and new-life reuse where it is used for a new function.

**Hand washing habit** refers to the behavior of hand washing before eating, preparing food, after defecation, cleaning child's contaminated materials.

**Bowel behavior** refers to the place where people defecate as latrine, riversides, ground holes and others.

**Diarrhea** refers to the condition of having three or more loose or liquid bowel movements per day including numbers of household who is diagnosed as diarrhea by a health personal within one month and numbers of household who has diarrhea within one month.

**Intermediate variables** are variables that can be treated as independent variables in some analyses, and as dependent variables in other analyses. For example, if influences of personal characteristics on knowledge were being analyzed, knowledge would be a dependent variable. If the influence of knowledge on diarrhea frequency were being analyzed, knowledge would be an independent variabl

# CHAPTER II
# LITERATURE REVIEW

## 2.1. Household waste

2.3.1. Definition of household waste

Household waste is a solid waste comprising of garbage and rubbish (such as bottles, cans, clothing, compost, disposables, food packaging, food scraps, newspapers and magazines, and yard trimmings) that originates from private homes or apartments. It may also contain household hazardous waste (Business dictionary.com).

**Household waste (Domestic Waste) is a form of s**olid waste, composed of garbage and rubbish, which normally originates in a private home or apartment house. Household waste also consists of toilet waste which is wastewater or liquid waste discharged by domestic residences, commercial properties and industry.

2.3.1. Types of household waste

There are two types of household waste. They are hazardous and non-hazardous wastes.

**Household hazardous waste is a h**azardous product used and disposed of by residential as opposed to industrial consumers including paints, stains, varnishes, solvents, pesticides, and other materials or products containing volatile chemicals that can catch fire, react or explode, or that are corrosive or toxic.

Non hazardous household wastes are kitchen wastes such as leftover food and vegetables, unused paper, old plastic bags and bottles, broken glass and bottles and etc.

Many kinds of the kitchen wastes are mostly combined with water and humidity becomes more than 50 percents. These factors can rapidly make waste degradable and produce unpleasant smell (Jantataeme, 2005).

2.3.1. Components of household wastes

According to definition from the environmental Institute of Thailand,

- Vegetables, fruits, and food are defined as the left-over vegetables, fruits and food from the cooking or preparation processes. They are also called kitchen wastes.
- Paper is defined as all the materials that are produced or manufactured from paper based textiles, such as, newspaper, magazines, books, cards, paper bags, paper boxes, etc.
- Plastics refer to any material or product that is made out of plastics, such as plastic bags, plastic plates or dishes, plastic toys, and fiberglass products, etc.
- Glass is defined as all the materials or products that are manufactured from glass, such as mirrors, bottles and light bulbs, etc (Kaewsawang, 2002).

**2.2. Household waste disposal**

Modernization and progress has had its share of disadvantages and one of the main aspects of concern is the pollution that is causing to the earth including land, air, and water. With increase in the global population and the rising demand for food and other essentials, there has been a rise in the amount of waste being generated daily by each household. This waste is ultimately thrown into municipal waste collection centers from where it is collected by the area municipalities to be further thrown into the landfills and dumps. However, either due to resource crunch or inefficient infrastructure, not all of this waste gets collected and transported to the final dumpsites. If at this stage the management and disposal is improperly done, it can cause serious impacts on health and problems to the surrounding environment. Waste that is not properly managed, especially excreta and other liquid and solid waste from households and the community, are a serious health hazard and lead to the spread of infectious diseases. Unattended waste lying around attracts flies, rats, and other creatures that in turn spread disease. Normally it is the wet waste that decomposes and

releases a bad odor. This leads to unhygienic conditions and thereby to a rise in the health problems. Poor solid waste management also has the potential of causing flooding and encourages the spread of diseases, pollution of ground and surface water (Akpen, 2009).

In the study on the bagging and collection of household solid waste in Brazil, the research was conducted to find out the influence on the three nematodes involving Ascaris lumbricoides, Trichuris trichiura, and hookworms in 1,893 children from 5 to 14 years of age. The study also included diarrhea incidence and nutritional status as shown by anthropometric indicators in 1,204 children less than 5 years of age. There was a higher diarrhea incidence in children living in households without proper bagging or isolation and collection of household solid waste as compared to those in areas with regular garbage collection and adequate isolation of solid waste. The differences were statistically significant when other socioeconomic, cultural and demographic characteristics were considered in the analysis (Moraes, 2007).

Diarrhea may be transmitted in a variety of ways, including food, water and person-to-person or animal-to-person contact. Fecal contamination is one source of environmental contamination and is responsible for the presence of these pathogens in the environment. The review in this study provides some evidence that excreta disposal interventions are effective in preventing diarrheal diseases. The studies included in this review are suggestive of the wide variety of interventions being undertaken to improve excreta disposal in low-income settings, both at the household and community level, and the extent to which they may be effective in minimizing human contact and pathogen exposure. They also suggest the considerable variations in quality, coverage, use, and sustainability of the interventions. Even uniform interventions implemented in a manner that is equally effective in containing excreta are nevertheless likely to yield different levels of effectiveness in reducing diarrhea, depending on other exposure pathways (Clasen, 2010).

## 2.3. Demographic characteristics

### 2.3.1. Age

In Manila, among the socio-economic variables, only the variable age of the household head has a significant effect on the probability of adoption of household waste segregation practices. The negative coefficient implies that the older the household head, the lower is the probability the household will engage in waste segregation. This result is consistent with some empirical studies that show a negative relationship between the age of household head and the probability of recycling and composting. The negative coefficient may be explained in the following fashion that older people are more resistant to changing their ways of doing things around the house, and since waste segregation and composting may be considered relatively new waste management practices, so the households with older household heads are less likely to engage in waste management (Bennagen, 2002).

In Sweden, among the personal and economic characteristics, the most significant variable is age. Older people seem to be generating significantly less waste perhaps reflecting a more frugal lifestyle (Sterner, 1998).

### 2.3.2. Sex

It is found that the level of knowledge about household waste disposal in female in Bangkok was higher than that in male. The average knowledge in female was 8.38 scores and the average knowledge in male was 7.72 scores. Based on statistical test, the different gender makes a difference in knowledge of solid waste selection with statistical significant at the 0.05 level (Kaewsawang, 2002).

The study revealed that in most of the households, 98.4% of waste management was the responsibility of women (girls and mothers) and men (fathers and boys) were reported to manage waste only in 1.6% of the households.

### 2.3.3. Marital status

In this study in Gboko town, Africa, there are a great proportion of the married and single respondents accounting for 90% of the people. Married life affects family size which in turn influences consumption patterns and wastes generation and

management. Married people encourage meals that are African in nature and minimum packaged food so they generate less waste while on the other hand; single people consume more packaged foods producing more waste (Akpen, 2009).

### 2.3.4. Education level

From the analysis, the problem of solid waste management and people's attitude and perceptions in the study area, Ghana can be linked to the levels of formal education. The response rate involvement in sanitation for tertiary level was 100%, for senior secondary school 80%, for junior secondary school 53%, for primary school 14% and for non-educated 5%. Improved teaching and learning of issues on sanitation in all levels of education could help improve the general sanitation in the communities. This supports the suggestion that perceptions and attitudes are learned response sets and can therefore be modified or changed through education. Hence, continuous public education of the people of Nima may help to improve the sanitation in the Area. The study also showed that as high as about 74% of the respondents do not educate their households on the need to clean the surroundings while about 26% do (George, 2004).

It is expected that a family consisting of members who have a higher education level will generate a reduced quality of household solid waste each day. However it is of interest that some studies have shown that education had a positive effect on total household waste generation. The relationship between education and household waste generation was reversed in this study in Beijing showing that families with and advanced education level produced that most household waste and families with a secondary education level produced the least. It is also the same for kitchen wastes but for paper and plastic wastes, the waste generation is almost the same in all three education level (Qu, 2010).

### 2.3.5. Occupation

In Bangkok, occupation showed personal social status and each type of the works would have different duties so that the occupants could have different knowledge, skills, and abilities according to their works, which could affect their perception and behaviors (Makmattayan, 2003).

### 2.3.6. Family size

The average plastic household solid waste generation rate of smallest household size (less than 2 residents per household) was highest, 25.17 g/cap/day and the rate got lower as the household size got larger. Regarding the rank correlation analysis, the results indicated that there were negative correlation between waste generation rates of plastic bottle for food, plastic packing for unspecified purpose, plastic shopping bag, number of packaging, total plastic and the household size. The results of this study in Vietnam were consistent with previous studies on household solid waste pointing out that the household waste generation rate was negatively correlated with the household size (Thanh, 2010).

It was found in this study in Beijing that household size was negatively related to daily per capita generation of total household wastes, kitchen wastes, paper and plastics. Previous researchers have focused on the relationship between household size and daily waste generation instead of per capita daily waste generation. It is known that daily per capita waste generation is the ratio of daily waste generation to household size. Due to common consumption, when household size increases, the increasing rate of daily household waste generation is lower than that expected due to household size. So the larger the household size, the smaller the daily per capita waste (Qu, 2010).

### 2.3.7. Monthly income

Regarding the rank correlation analysis between plastic waste generation rates with income level, the results of this study in Vietnam indicated that there were positive correlations between waste generation rates of plastic packaging for non-food, total plastic and the income level indicating that the household with higher income level generated larger amount of household solid wastes (Thanh, 2010).

Middle income families produce more household wastes than low income and high income families. In terms of the effect of income on waste generation, many researchers agree that with increased family income is associated with more household waste generated. Middle income families in Beijing City have the most favorable conditions that are enough money and time for consumption. In high income families, in spite of having money, they lack time for consumption. However

the correlation between income and the generation of kitchen wastes, paper wastes and plastic wastes was different from that between income and total household waste generated. Family income was negatively related to daily per capita generation of paper wastes but positively related to daily per capita generation of paper wastes and plastic wastes. In this case, more affluent families have more chance to dine in restaurants and this may be the reason why kitchen waste generation decreased with increased family income. Moreover, high income families produced most paper wastes as they do not care about the money for purchasing paper and they tended to squander more paper especially tissues. In low income families, people tend to reuse plastic wastes as a result of the policy of charging for plastic bags in every supermarket in China (Qu, 2010).

### 2.4. Household characteristics

Studies have shown that unsafe water, sanitation and hygiene remain major causes of mortality and morbidity in the world through infectious disease with estimated deaths of about 1.7 million annually. Nine out of ten deaths are amongst children and almost all are in developing countries. In the poorest countries and neighborhoods, unsanitary living conditions account for at least half of the total burden of ill health (Noreen, 2002).

Many studies have reported the results of interventions to reduce diarrhea illness through improvements in drinking water, sanitation facilities, and hygiene practices in less developed countries. Data were extracted from these studies and pooled by meta-analysis to provide summary estimates of the effectiveness of each type of intervention. All of the interventions studied were found to reduce significantly the risks of diarrhea illness. Most of the interventions had a similar degree of impact on diarrhea illness, with the relative risk estimates from the overall meta-analyses ranging between 0·63 and 0·75 (Fewtrell, 2005).

In the U.S. and Central Europe where water and sanitation services are nearly universal, water, sanitation and hygiene related diseases are significantly reduced by the start of the 20$^{th}$ century by protecting water sources and installing sewage systems. However, in developing countries, water and sanitation services are still severely lacking. As a result, millions of people are suffering from preventable disease and die

every year. Global mortality rate and morbidity rate for diarrheal diseases due to unsanitary exposal of excreta, unsafe drinking water and poor hygiene are 2.2 and 1 billion respectively. More than 1.1 billion people do not have access to improved drink-health standards such as those set by World Health Organization (WHO) guidelines for "Drinking Water Quality". The term improved access usually represents households that obtain water from sources which are superior to traditional and unprotected ones. Water sources that meet the definition of improved water include households connected with boreholes, have protected dug well or spring or rainwater collection. Connection to a public sewage or septic system and the use of ventilated pit latrines or simple pit latrines qualify as improved sanitation. WHO has declared 2005-2015 as the decade of water with the goal of establishing the framework to provide full access to water supply and sanitation for all people.

Asia and Africa had high percentage of without access to improved sanitation and improved water. Africa had 15 deaths per 1000 children due to diarrheal disease (Montgomery, 2007).

Availability of safe water, reliable sewage disposal facilities, and good hand washing practices are essential in efforts to reduce diarrhea morbidity in developing countries (Arvelo, 2010).

Combining water infrastructure investments with effective public action to promote health knowledge, income increasing and poverty reduction is important for reducing the diarrhea illness. The prevalence and duration of diarrhea among children under five in rural India are significantly lower on average for families with piped water than for observationally identical households without it. The results also indicate that the health gains largely by-pass children in poor families, particularly when the mother is poorly educated (Jalan, 2002).

A randomized control trial study is done on the determination of a new flocculent-disinfectant home water treatment which reduced diarrhea in rural Guatemala. During one year of observation, residents of control households had 4.31 episodes of diarrhea per 100 person-weeks, whereas the incidence of diarrhea was 24% lower among residents of households receiving flocculent-disinfectant, 29% lower among those receiving flocculent-disinfectant plus vessel, 25% lower among those receiving bleach, and 12% lower among households receiving bleach plus

vessel. In unannounced evaluations of home drinking water, free chlorine was detected in samples from 27% of flocculent-disinfectant households, 35% of flocculent-disinfectant plus vessel households, 35% of bleach households, and 43% of bleach plus vessel households. In a setting where diarrhea was a leading cause of death, intermittent use of home water treatment with flocculent-disinfectant decreased the incidence of diarrhea (Reller, 2003).

For general water use (washing), 32% of the people depend on well water, 52% on municipality water and 16% on vending water whereas for cooking, 55% rely on vending water, 27% on municipality water, 10% on bottled water and 8% on well water. When it came to the source of drinking water, a reliance of 68% on vended water, 16% on bottled water, 11% on municipality water and 5 % on well water was found. The lack of trust in the quality of municipality water and the need to supplement the deficient amount is an additional economical burden on households. This study also revealed that 25% of the sample population experienced vomiting and diarrhea because of the water and 19% had skin rashes. The cross-tabulation between sickness (vomiting and diarrhea) and the types of water used showed that 56% of the sickness related to the municipality water and 44% to the vended water. Moreover a statistically significant correlation was observed between sickness and well water (p-value $< 0.01$) as well as between sickness and vended water ($p < 0.05$) (Korfali, 2008).

Diarrhea is more likely to occur in households that stored water in containers with a wide mouth than those that stored water in containers with a narrow mouth (Rishi, 2010), and the children who developed diarrhea were more likely to have lived in households that stored drinking water. Wide-mouth buckets, which are easily contaminated by hands or utensils, are the most commonly reported storage vessel for household drinking water source (Arvelo, 2010).

Beside the availability of clean water, availability of toilets also has a greatly effect on water-borne diseases. In Indonesia, households with improper toilet facilities are more exposed to the risk of having diseases like dysentery, diarrhea, and typhoid fever (SCB, 2007).

Type of latrine that can be considered as sanitary is the use of swan neck latrine. In Banten province, 87.7% of households use the swan neck latrine, the highest in Serang (93.4%) and the lowest in Pandeglang (73.1%). Percentage of

households using septic tank is 54.3%, the rest is discharged into river or sea, yard, pond or wetland, and coastal or land. The percentage of using septic tank for excreta disposal is highest in Tangerang city (79.5%) and Cilegon (77.8%). The district that has percentage of septic tank excreta disposal below the provincial average is Pandeglang (14.0%) and Lebak (23.6%). The households that have dust bins in urban areas is higher (55.9% and 42.4% in homes outside the home) than in rural areas (34.8% and 9.3% in home away from home) (Research and Development Board, 2008).

In Nepal, 40 per cent of the total 75 districts have sanitation latrine coverage ranging between as low as 0 per cent to 10 per cent followed by those 28 per cent whose coverage is above 10 per cent to 20 per cent. Moreover, the sanitation latrine coverage in 24 per cent of the districts ranges from above 20 per cent to 50 per cent. Only 8 per cent of the districts are found to have sanitation latrine coverage above 50 per cent. Thus, on an average the sanitation latrine coverage in Nepal is as low as 25 per cent whereas it is 48 per cent in Asian countries (Environmental Sanitation Section, 2001).

The proper disposal of children's stool is extremely important in preventing the spread of diseases. If faeces are left exposed, diseases may spread among household members by direct contact or through animal contact. In Indonesia, mothers report that one in four children always use a toilet or latrine, three in ten have their stools thrown into a toilet or latrine, and 8% report throwing or burying their children's stools in the yard. Mothers with secondary or higher education are much more likely to dispose of their children's stools safely, 86% than mothers with no education, 48%. Similarly, mothers with high income are much more likely to dispose of their children's stools safely, 93% than mothers with low income, 47% (SCB, 2007).

Open dumping is the most common disposal method for solid wastes in the Metropolis. The recent closure of two landfills (in San Mateo and Carmona) and the partial closure of the Payatas dump site have resulted in the current garbage crisis in the Metropolis, with serious threats to public health and no clear solution in sight. The San Mateo landfill was closed in December 2000 while the Carmona landfill was closed in 1998. The household sector is the primary source of solid wastes in Metro

Manila; accounting for almost 75%. About 45% of Metro Manila household wastes consist of food/kitchen wastes, 16% paper, 15% plastic, and 9% glass and wood (Bennagen, 2002).

### 2.5. Knowledge and perception

In a study, the community's perception and knowledge about household hazardous waste and disposal method showed that majority of the respondents pointed pesticides, dish water, soap, paints etc. as hazardous waste. The respondents were not aware of the environmental impact on land and water due to improper disposal of household waste, but they were aware of the disposal method (Scudder, 1991).

In Ranong, Thailand, the level of knowledge towards household waste management among Myanmar migrants was that half of the respondents (49.8%) had high knowledge, 36% had moderate knowledge and only little percentage, 14.2% had low knowledge about household waste management. Majority of the respondents (83.7%) knew that waste is anything without value and one of the environmental problems that need to be solved rapidly. Almost all of the respondents (98.3%) were aware that keeping household waste into the garbage container is the responsibility of everybody at every household. In contrast, 18.2% of the respondents thought that practice of household waste management is not important for them. About three quarters of the respondents (76%) knew that taking old plastic bags for shopping is better than using new ones (Naing, 2009).

The gravity of the problems caused by the improper solid waste disposal is visualized by the perception of the people, affected or concerned. In this study in Gboko town, Africa, almost half of the people, 44% considered the problem of managing solid wastes as very serious while 20.6% said that this is a serious problem. But 19.5% of the people accepted that solid waste management problem is not severe enough (Akpen, 2009).

### 2.6. Practices on household waste disposal

It was found that most of the respondents (51.2%) in Muang District, Ranong Province had moderate level of practice towards household waste management which might not related to current situation that had public promotion to household waste

management because both of Thai government and any kinds of INGOs supported all kinds of services about household waste management but they did not explain the affects which could not get any arousal of the public. The researcher found that there were a few respondents, 16.5% who had good practice level of household waste management in that community while 2.2% had poor practice level. There was significant difference between knowledge level and practice towards household waste management (P-value < 0.001) and there was also highly significant between attitude level and practice towards household waste management (P-value < 0.001) (Naing, 2009).

In Manila, among the waste types, less than 20% of the food/kitchen wastes which account for 24% of total wastes was recovered through composting or given as food to animals and most of it was disposed of. While yard or garden wastes like grass clippings, plants, leaves, and flowers, accounted for only 7% of household wastes, 57% of most of this waste was disposed, 32% was burned, and only 11% was recovered. Among all other wastes or mixed wastes accounted for 69% of the total wastes generated, more than half or 54% was recovered by households and the rest was disposed of (Bennagen, 2002).

### 2.6.1. Reducing, recycling and reusing

The elements of household waste most commonly collected for recycling are garden waste for composting, then paper and third glass. Almost all household waste paper can be recycled. Recycling paper requires 28-70% less energy, produce 95% fewer emissions, requires less water, and far fewer raw materials. After being recycled about six times the fibers become too short for papermaking, so some virgin fibers will always be required to maintain paper strength and quality. Around 3.6 million tones of glass are used each year in the UK. Glass is infinitely recyclable with no loss in quality when reprocessed. Using recycled glass reduces the amount of energy required and the amount of new raw materials needed. Recycling also reduces carbon dioxide emissions. Recycled bottles and jars can contain between 25-40% of unwanted material, all of which must be removed, often by hand, prior to crushing. Color contamination is also an issue particularly for clear glass. Following automatic sorting of plastics, each plastic type can either be melted down and molded into a new

shape or broken down into its chemical components and used again to make other products (chemical recycling).Making carrier bags from recycled plastic consumes two-thirds less energy, releases lower levels of pollutants and uses nearly 90% less water than making them from new plastic (Parliamentary Office of Science and technology, 2005).

### 2.6.2. Use of public trash bins

In Ranong, Thailand, it was found that 64.8% of the subjects always used public trash bins and 34.6% sometimes used while 0.6% never used bins. Most of the respondents, 94.2% had trash bins in their households. Among those trash bins, 70.6% of the bins had no cover while 29.4% were having lids covered (Naing, 2009).

### 2.6.3. Hand washing

Many diseases are easily transmitted from hand to mouth through contaminated foods or hands and proper hand washing can minimize the transmission of both enteric and respiratory pathogens. The striking effect of hand washing with soap is consistent across various study designs, though it depends on access to water. It was found that diarrhea risk reductions of 48%, 17% and 36% were associated respectively, with hand washing with soap, improved water quality and excreta disposal. Most of the evidence is of poor quality and more trials are needed, but the evidence is nonetheless strong enough to support the provision of water supply, sanitation and hygiene for all (Cairncross, 2010).

Hand washing with soap is a cost effective intervention not only against diarrhea but also for the prevention of acute respiratory infections. Diarrhea episodes are reduced 36% by improving sanitation and 48% through hand washing with soap. In Pakistan, the majority of the respondents, 85.9% in this study claimed that they wash their hands regularly after contamination with solid wastes but only 50.9% of them reported that they use soap to clean their hands (Mengistie, 2010). It was found that 94% of the respondents were aware that dirty hands can cause diarrhea (Halvorson, 2003).

## 2.7. Diarrhea

The safe and effective management of the household health environment is critical to addressing the problem of diarrhea especially childhood diarrhea which is one of the greatest threats to child survival. In Pakistan, for example, diarrheal diseases account for approximately 250.000 deaths annually of children in their first five years of life. Diarrhea and dysentery account for 25-50% of mortality of children between one and five years of age in the region. There are several factors causing diarrheal diseases such as poor hygiene, unsafe drinking water, contaminated food and poor sanitation and have multiple oral fecal transmission routes. More important than unsafe drinking water is the link between poor sanitation and hygiene practices and diarrhea (Halvorsan, 2003). The child mortality rate in Ethiopia in 2007 was 199 per 1,000 births, and approximately one of every five deaths every year in Ethiopia is due to diarrheal disease (Mediratta, 2010).

In Myanmar, a developing country in Southeast Asia, diarrhea is reported to be the second most common childhood disease. A recent review estimates that 106,000 children under five years of age die in Myanmar each year and that 22,260 (21%) of them die due to diarrhea (Takahashi, 2008).

# CHAPTER III
# RESEARCH METHODOLOGY

## 3.1. **Study design**

Cross-sectional study with quantitative approach was used to describe the demographic characteristics of people in Laputta Township in Myanmar and to assess their knowledge, perception and practices on household waste disposal, and diarrhea.

## 3.2. **Study population and area**

All households in Laputta Township in Myanmar were included in this study. Laputta was affected by cyclone Nargis. More than half the people had to live temporarily in camps. Now they all live in their original homes again.

## 3.3. **Sample size**

The below formula was used for calculating sample size (Cochran, 2009).

$$n = \frac{z^2 pq}{e^2}$$

$$= \frac{(1.96)^2(0.5)(0.5)}{0.05^2}$$

$$= 384$$

Taking the 10% of non-responding rate into account,

$n = 384 + 38 = 422$

Where n = minimum sample size

e = error allowance (0.05)

$z^2$ = critical value from normal distribution for 95% confidence interval (1.96)

p = 50% = 0.5 (estimated prevalence of 50% was used in order to have the maximum sample size as the available data in this area are not very consistent)

q = 1 – p = 0.5

3.4. **Sampling method**

There are approximately 40 village tracts in Laputta Township and in one village tract, there are about 20 villages.

One village tract, Yay Twin Seik was purposively selected from Laputta Township. From that village tract, all 14 villages were chosen. From these villages, households were selected according to inclusion and exclusion criteria. From each household, the interviewee was the mother or other female guardian.

The names of 14 villages are Yay Twin Seik, Ga Saung Seik, Ga Saung Chaung, Nout Phay Kone, Nyung Kone, Seik Kalay, Kan Chaung, Alal Chaung, Lane Maw Kone, Shan Kone, Lay Kwa, Kyane Ni, Shaw Ni and Kant Malar Ta Pin.

3.4.1. Inclusion criteria

- Households who stay at the current home place for more than three months
- Households who have at least one child of less than 5 years old
- Households who are willing to participate

3.4.2. Exclusion criteria

- Households that do not want to participate

3.5. **Measurement tools**

The data was collected by using structured interviewer-administered questionnaires which were translated from English to Myanmar language by a native Myanmar. In the questionnaires of this study, there were six parts:

- Socio-demographic characteristics
- Household characteristics
- Knowledge towards household waste disposal
- Perception towards household waste disposal
- Practices on household waste disposal
- Diarrhea history in every household members

3.6. **Data collection**

The data was collected by doing face to face interview with the participants. During the interview in their houses, the household condition of the houses was also observed by the interviewers such as physical appearance of water, waste disposal at household level. The interviewer-administered questionnaires which were translated from English to Myanmar language were also used to collect the data. The data was collected by the help of four trained assistant researchers who were health assistants from health center of World Concern (WC) Non-government Organization. Assistant researchers had proper four hours for standardized training in the structured face-to-face interview and technique how to approach participants.

3.7. **Data analysis**

Questionnaires were coded before entering the data to the computer by the researcher.

Data analysis was conducted to address the specific objectives of the study. Descriptive statistics such as frequency, percentage, mean and standard deviation were used to describe the socio-economic characteristics.

For relationship of the variables, Chi-square test which is inferential statistics was used to find out the association between independent variables with categorical data and dependent variables with categorical data:

- Association between gender, marital status, education level, occupation and practices on household waste disposal.
- Association between gender, marital status, education level, occupation, household characteristics and diarrhea.

For the categorical independent variables and the continuous dependent variables, independent t-test or ANOVA test was used depending on the numbers of the independent variables:

- Association between gender, marital status, education level, occupation, household waste characteristics and knowledge, perception on household waste disposal.

Bi-variate analysis with binary logistic regression was used first and multivariable analysis was also used to get the final model among the statistically significant variables from bi-variate analysis as the dependent variable outcome is household member with or without diarrhea. This was used to determine:

- Association between socio-demographic characteristics and diarrhea.
- Association between knowledge, perception on household waste disposal and diarrhea.

The data analysis was done by using Statistical Package of Social Science (SPSS) software.

- **Scoring and its classification**

**Knowledge towards household waste disposal**

For the positive questionnaire,
The true answer got: 3 scores
The not sure answer got: 2 scores
The false answer got: 1 score

For the negative questionnaire,
The true answer got 1 score
The not sure answer got 2 scores
The false answer got 3 scores

As there were 11 questions with minimum score 1 and maximum score 3, the possible scores ranged from 11 to 33 and respondents' knowledge were classified into three levels. The cut-off point for "high knowledge" was greater than 80% of total scores; that for "moderate knowledge" was from 60% to 80% of total scores, and that for "low knowledge" was less than 60% of total scores.

**Perception towards household waste disposal**

The answers were categorized into five levels: strongly disagree, disagree, uncertain, agree and strongly agree.

The answer “strongly disagree” got 1 score
The answer “disagree” got 2 scores
The answer “uncertain” got 3 scores
The answer “agree” got 4 scores
The answer “strongly agree” got 5 scores

As there were 11 questions with minimum score 1 and maximum score 5, the possible scores ranged from 11 to 55 and the respondents’ perception was classified into three levels. The cut-off point for “high-level perception” was greater than 80% of total scores, that for “moderate-level perception” was from 60% to 80% of total scores, and that for “low-level perception” was less than 60% of total scores.

**Practice towards household waste management**

The answers were categorized into three levels: always, sometimes and never.

For those who answered the positive questionnaire, “always” got 3 scores; “sometimes” got 2 scores and 1 score for “never”.

For those who answered the negative questionnaire, “always” got 1 scores; “sometimes” got 2 scores and 3 scores for “never”.

As there were 11 questions with minimum score 1 and maximum score 3, the possible scores ranged from 11 to 33 and the respondents’ practice was classified into three levels. The cut-off point for “good practice” was greater than 80% of total scores, that for “moderate practice” was from 60% to 80% of total scores, and that for “poor practice” was less than 60% of total scores.

3.8. **Validity and Reliability test**

Validity

Validity is the ability to measure what it is designed to measure. The structured interviewer-administered questionnaires were checked by three experts for the accuracy, clarity, and appropriateness of the questionnaire. The questionnaires were modified according to recommendation.

Reliability Test

Pre-test was conducted with 30 subjects from Ei Ma village tract in Laputta Township in Myanmar. Questionnaires were revised for clarity as appropriate. Cronbach's alpha coefficient was calculated to assess the reliability of the questionnaire's questions on knowledge and perception regarding household waste disposal. The coefficient for knowledge was 0.70 and that for perception was 0.76.

### 3.9. **Ethical consideration**

This study was done according to the approval of Ethical Committee of Chulalongkorn University. Before doing the interview, the purpose, process, ethical issues and benefits of the study were explained and they were assured of confidentiality. After getting the informed signed consents, the interview questionnaires were asked. They were also informed that they can withdraw from the study if they do not want to participate at any time. Permission from township medical officer of Laputta Township in Myanmar was obtained. Moreover meetings with village leaders and community members will be carried out and a summary of study results will be presented to them.

### 3.10. **Limitation**

- Recall bias on questionnaires about occurrence of diarrhea within last one month.
- The result could not be generalized to other area because the socio-demographic characteristics might differ from one place to another.
- Seasonal effect was not included in this study which influences on both household waste disposal and diarrhea.

### 3.11. **Benefits and application of this study**

- This study is expected to give new information on the factors regarding socio-economic characteristics, household characteristic and household waste management which are associated with the occurrence of diarrhea.
- As this area has a high prevalence of diarrhea, the result can provide the policy makers to do further strategy and planning to reduce diarrhea in that area.

# CHAPTER IV
# RESULTS

This chapter consists of the result of this study including the descriptive characteristics of the general information and household characteristics of all households in Laputta Township in Myanmar; knowledge towards household waste disposal; perception of household waste disposal; practices on household waste disposal; and diarrhea frequency in Laputta Township in Myanmar.

Total number of the participants in this study was 389. The respondents in this study were the housewives or the female guardians in all households in Laputta Township in Myanmar. The response rate in this study was 100% as there was no drop out during the time of interview. Moreover, households which did not have anybody at the time of survey were skipped and the interviewers went and tried to get into these houses again in the following days. But there were some houses which did not come back until the end of the study.

## Part I: Descriptive Findings

### 4.1 General Socio-demographic Characteristics

This part shows frequency distribution of selected variables describing background characteristics of the respondents. Table 1 reveals that general information such as age, sex, marital status, education, occupation, and duration of stay in current household in Laputta Township, total family income per month, kinds of house they live in, and about how many people and rooms (including bathrooms) are there in their households.

Regarding age, all respondents were in the age ranged from 16 to 59. The mean age was 30.63 and standard deviation was 8.901. More than half of the respondents were in the age group 30 years and below (55.5%). The others were in the age group 31 to 40 years (28.8%) and in the age group older than 40 years (15.7%).

Since one of the selection criteria was the mother or the female guardian in each household, all the participants were female.

Majority of the respondents were married (93.0%) while the rests were widowed (4.4%), singles (2.3%) and divorced (0.3%).

For education attainment, more than half of the participants were in the primary education level (63.1%) and 15.2% of them were illiterate. Small percentage of the respondents, 11.1% and 4.4% finished secondary and high school level education respectively while other, 6.2% only learned from the monastery.

More than two-thirds of the respondents surveyed were housewives (84.6%), about one-third of them (39.8%) worked as general workers and minority of them were farmers (6.9%), laborers (5.4%) and construction workers (0.3%). Other 31.6% of them also worked in fishery and worked as traders and small shop owners.

The length of stay in their current household in Laputta Township ranged from 1 year to 50 years. Mean duration of residing in their houses was 10.88 years and standard deviation was 8.945. More than one-third of the respondents (40.6%) stayed 5 years and less. 35.0% of them had been staying between 6 and 15 years while 24.4% stayed more than 15 years in the current location.

The level of economic status of the respondents had been assessed on the basic of total monthly family income and it ranged from 10,000 Kyats to 500,000 Kyats (10 USD to 500 USD). Mean monthly income was 42892.03 Kyats (45 USD) and standard deviation was 34101.934**.** 44.0% of the participants had income less than 30,000 Kyats (30 USD). Only 18.3% had income more than 50,000 Kyats (50 USD).

Almost all of them (94.4%) had their own houses while others, 5.1% and 0.5% lived in rent house with one family (single-family house) and partitioned shared room provided by the employers respectively. After the Cyclone Nargis had destroyed most of the houses in Laputta Township, people got help from the Government as well as from the NGOs in building their new houses. So majority of them had their new houses some times after the cyclone.

Total number of people living in their households ranged from 2 to 10. Mean household member was 4.25 and standard deviation was 1.529. 48.6% of the households had 4 to 6 people while 42.7% had 1 to 3 people. Only 8.7% had 6 to 10 people in the households.

The minimum number of room including bathroom was 1 while that of maximum was 6. Mean number of rooms was 2.31 and standard deviation of that was 1.068. Majority of the households (90%) had 1 to 3 rooms inside whereas the rests (10%) had 4 to 6 rooms in the houses.

**Table 1: General socio-demographic characteristics (n=389)**

| Socio-demographic Characteristics | Number (n) | Percentage (%) |
|---|---|---|
| **Age (n=389) age in years** | | |
| ≤30 | 216 | 55.5 |
| 31-40 | 112 | 28.8 |
| >40 | 61 | 15.7 |
| Mean = 30.63, Medium = 30.00 | | |
| SD = 8.901, Range = 16-59 | | |
| **Sex (n=389)** | | |
| Male | 0 | 0.0 |
| Female | 389 | 389 |
| **Marital Status (n=389)** | | |
| Single | 9 | 2.3 |
| Married | 362 | 93.1 |
| Widowed | 17 | 4.4 |
| Divorced | 1 | 0.3 |
| **Education (n=389)** | | |
| Illiterate | 59 | 15.2 |
| Primary education | 246 | 63.2 |
| Secondary education | 43 | 11.1 |
| High School level | 17 | 4.4 |
| Others | 24 | 6.2 |
| **Occupation (n=389)*** | | |
| Housewife | 329 | 84.6 |
| Farmer | 27 | 6.9 |
| General worker | 155 | 39.8 |
| Laborer | 21 | 5.4 |
| Construction worker | 1 | 0.3 |

| | | |
|---|---|---|
| Others | 123 | 31.6 |
| **Duration of stay in current household (n=389)** | | |
| ≤5 | 158 | 40.6 |
| 6-15 | 136 | 35.0 |
| >15 | 95 | 24.4 |
| Mean = 10.88, Medium = 10.00 | | |
| SD = 8.945, Range = 1-50 | | |
| **Total family income per month (n=389) in Kyats** | | |
| <30,000 | 171 | 44.0 |
| 30,000-50,000 | 147 | 37.7 |
| >50,000 | 71 | 18.3 |
| Mean = 42,892.03, Medium = 40,000.00 | | |
| SD = 34,101.934, Range = 10,000-500,000 | | |
| **Kind of house (n=389)** | | |
| Rent house with one family | 20 | 5.2 |
| Partitioned shared room provided by the employers | 2 | 0.5 |
| Others (private house) | 367 | 94.3 |
| **Number of people in house (n=389)** | | |
| 1-3 | 166 | 42.7 |
| 4-6 | 189 | 48.6 |
| 6-10 | 34 | 8.7 |
| Mean = 4.25, Medium = 4.00 | | |
| SD = 1.529, Range = 2-10 | | |
| **Number of rooms in house (n=389)** | | |
| 1-3 | 350 | 90.0 |
| 4-6 | 39 | 10.0 |
| Mean = 2.31, Medium = 2.00 | | |
| SD = 1.068, Range = 1-6 | | |

## 4.2 Household Characteristics

This part reveals the frequency and percentage of each characteristic of household in Laputta Township as in the following table 2.

Majority of the households (88.9%) had latrine while the remaining ones (11.1%) did not have a latrine. Moreover, among those households who had latrine,

92.5% of them kept their latrines outside the houses while the rests (7.5%) inside the houses. For the type of latrine that they use, pour-flush ones were mostly used (88.1%).

More than half of the respondents (54.4%) used water from the pond for both drinking and cooking. Furthermore, well water and rain water were used by 21.9% and 18% of the surveyed people respectively. 94.9% of the participants had at least one drinking water container in their houses and from that 76.4% were closed containers whereas the rests (18.5%) opened containers.

The use of trash bin was occupied in more than half of the houses (60.7%) and most of the people in those houses (53.5%) had only one trash bin. Among the households which had trash bin, large percentages of them, 43.2% and 39.4% used trash bin with narrow lids and with wide lids respectively. Only 24.2% did not keep their trash bins covered with lids. The participants mostly emptied their trash bins about once a week for 33.9%, about twice a week for 27.9% and every two days for 20.8%. Very few people, only 9.7% and 7.7% threw waste in the trash bins everyday and less than once a week respectively.

Three quarters of the respondents (75.1%) used some method to control house flies in their house while the others did not do anything to prevent house flies. About one-third of them (32.9%) threw their household wastes into the outdoor stockpile whereas the rests did not. Moreover, there were stockpile of garbage near about half of the houses (51.2%). The most produced household wastes from the households were kitchen waste (food waste) which was 76.1%; and old plastic bags and bottles which were 59.4%. Majority of the respondents (93.8%) never stored pesticides or herbicides in the houses.

Regarding physical appearance of water, the participants mostly used good water (69.2%) while the rests (30.8%) used bad water. Water was defined as good if it was colorless, tasteless, not cloudy, not frothy and not smelly. Solid and liquid waste were disposed mainly as opened (62.2%) at household level and in contrast to, they were disposed as closed by 37.8% of households. 96.1% of the respondents placed the drinking water source like well 10 meters away from the water pollution source such as waste water, pit latrine, solid waste landfill, etc.

**Table 2: Frequency and percentage of household characteristics (n=389)**

| Household Characteristics | Number (n) | Percentage (%) |
|---|---|---|
| **Latrine (n=389)** | | |
| Yes | 346 | 88.9 |
| No | 43 | 11.1 |
| **Kind of latrine (n=347)** | | |
| Indoor | 26 | 7.5 |
| Outdoor | 321 | 92.5 |
| **Type of latrine (n=389)** | | |
| Swan neck | 1 | 0.3 |
| Pour-flush | 343 | 88.1 |
| Pit | 3 | 0.8 |
| No latrine | 42 | 10.8 |
| **Main source of drinking water (n=389)** | | |
| Tap water | 5 | 1.3 |
| Well water | 85 | 21.9 |
| Rain water | 70 | 18.0 |
| Vending water | 17 | 4.4 |
| Others (pond water) | 212 | 54.4 |
| **Kind of drinking water container (n=389)** | | |
| Open container | 72 | 18.5 |
| Closed container | 297 | 76.4 |
| No container | 20 | 5.1 |
| **Trash bin (n=389)** | | |
| Yes | 236 | 60.7 |

| | | |
|---|---|---|
| No | 153 | 39.3 |
| **Number of trash bin (n=389)** | | |
| 0 | 153 | 39.3 |
| 1 | 208 | 53.5 |
| ≥2 | 28 | 7.2 |
| **Kind of trash bin (n=236)*** | | |
| With wide lids | 93 | 39.4 |
| With narrow lids | 102 | 43.2 |
| Without lids | 57 | 24.2 |
| **Emptying of trash bin (n=236)** | | |
| Everyday | 23 | 9.7 |
| Every two days | 49 | 20.8 |
| About twice per week | 66 | 27.9 |
| About once per week | 80 | 33.9 |
| Less than once per week | 18 | 7.7 |
| **House flies (n=389)** | | |
| Yes | 292 | 75.1 |
| No | 97 | 24.9 |
| **Throwing of household wastes into stockpile (n=389)** | | |
| Yes | 128 | 32.9 |
| No | 261 | 67.1 |
| **Stockpile of garbage near house (n=389)** | | |
| Yes | 199 | 51.2 |
| No | 190 | 48.8 |
| **Mostly produced household wastes (n=389)** | | |
| Kitchen waste (food waste) | | |
| Yes | 296 | 76.1 |

| | | |
|---|---|---|
| No | 93 | 23.9 |
| Unused glass and paper | | |
| Yes | 92 | 23.7 |
| No | 297 | 76.3 |
| Old plastic bags and bottles | | |
| Yes | 231 | 59.4 |
| No | 158 | 40.6 |
| Toilet waste | | |
| Yes | 144 | 37.0 |
| No | 245 | 63.0 |
| **Storage of pesticides or herbicides in houses (n=389)** | | |
| Yes | 24 | 6.2 |
| No | 365 | 93.8 |
| **Physical appearance of water (n=389)** | | |
| Good | 269 | 69.2 |
| Bad | 120 | 30.8 |
| **Waste disposal at household level (n=389)** | | |
| Opened | 242 | 62.2 |
| Closed | 147 | 37.8 |
| **Drinking water source is more than 10 meters from water pollution source (n=389)** | | |
| Yes | 374 | 96.1 |
| No | 15 | 3.9 |

### 4.3 Knowledge towards household waste disposal

Questions were asked to explore the respondents' knowledge about household waste disposal including 11 questions for knowledge which consisted of both positive and negative questions. For positive questions, the respondents got 3 scores for true answer, 2 scores for not sure answer and 1 score for false answer. For negative questions, they got 1 score for true answer, 2 scores for not sure answer and 3 scores for false answer. The possible scores ranged from 11 to 33 for all 11 questions.

Among these questions, most of the respondents could not answer question number 4 and 9 correctly because they thought that burning household waste is the one of the methods of reducing household waste and it cannot affect anything to environment and that question was very controversy for them. Similarly, almost half of the respondents chose the false answer in question 5 as throwing household waste into the outdoor stockpile is the way they usually do to reduce household waste. The description of the frequency and percentage of Myanmar people who answered true, false and not sure to each question about knowledge towards household waste disposal was shown in details in table 14 in appendix D.

The cutting point of knowledge was categorized into three groups according to Bloom's classification (Bloom, 1956). The cutting point of knowledge was categorized into three parts: that for high level of knowledge was higher than 80% (>26.4) of total scores, that for moderate level of knowledge was from 60% to 80% (19.8-26.4) of total scores and that for low level of knowledge was less than 60% (<19.8) of total scores.

**Table 3: Level of knowledge of respondents towards household waste disposal (n=389)**

| Level of knowledge | Frequency | Percentage |
|---|---|---|
| High knowledge (>26.4) | 304 | 78.1 |
| Moderate knowledge (19.8-26.4) | 82 | 21.1 |
| Low knowledge (<19.8) | 3 | 0.8 |

In order to summarize the knowledge level of the respondents, the distribution of knowledge towards household waste disposal was shown in table 3. More than two-thirds of the participants (78.1%) had high level of knowledge while less than one-third of them (21.1%) had the moderate. Only 0.8% of respondents had low knowledge level about household waste disposal.

### 4.4 Perception towards household waste disposal

In order to know the perception towards household waste disposal, all the respondents were asked about their opinions to agree or disagree the statements for perception of household waste disposal. The perception part had 11 questions which consisted only of positive aspects. For all questions, the score was given 5 for strongly agree answer, 4 for agree answer, 3 for uncertain answer, 2 for disagree answer and 1 for strongly disagree answer. The possible scores ranged from 11 to 55 for all questions.

Almost all of the respondents (97.4%) accepted that waste is anything without value and one of the environmental problems that need to be solved rapidly. Similarly, high percentages of respondents, 98.2%, 98.7% and 97.9% were aware respectively that proper disposal of household waste can prevent environmental impact on land and water; keeping household waste into the trash bins properly is responsibility of everybody in household; and practice of proper household waste disposal is important. Moreover, practice of hand washing after handling with contaminated materials as well as proper disposal of toilet waste including child's stool in preventing water-borne diseases were perceived as important by a majority of respondents (98.9%). The number and percentage of respondents' perception towards household waste disposal was shown in details in the table 15 in appendix D.

The cutting point of perception was categorized into three groups according to Bloom's classification (Bloom, 1956): the cutting point for high-level perception was higher than 80% (>44) of total scores, that for moderate-level perception was from 60% to 80% (33-44) of total scores and that for low-level perception was less than 60% (<33) of total scores.

**Table 4: Level of perception towards household waste disposal (n=389)**

| Level of perception | Frequency | Percentage |
|---|---|---|
| High-level perception (>44) | 196 | 50.4 |
| Moderate-level perception (33-44) | 187 | 48.1 |
| Low-level perception (<33) | 6 | 1.5 |

In order to show the perception level of the respondents, the distribution of level of perception towards household waste disposal was shown in table 4. About half of the respondents (50.4%) were in the high perception level while almost equal percentage (48.1%) perceived as moderate level. Only 1.5% of the participants had low perception level.

### 4.5 Practices towards household waste disposal

For practice on household waste disposal, all the respondents' practices were asked as always, sometimes and never in the questionnaire. There were 11 questions in this part which were both in the positive and negative directions. In positive statement, 3 scores were given for always answer, 2 scores for sometimes answer and 1 score for never answer. In vise visa, 1 score was given for always answer, 2 scores for sometimes answer and 3 scores for never answer in negative statement. The possible scores ranged from 11 to 33 for all 11 questions.

Almost half of the respondents, 47.1% always had enough trash bins in their houses; 42.7% always threw away household waste in the trash bins properly; and 42.7% always kept the trash bins covered with lids. Furthermore, about half of them (52.7%) sometimes put household waste in bags before disposing. But about two-thirds of them (64.8%) threw household waste into the outdoor stockpiles near their houses. A high percentage of respondents (71.5%) kept their toilets clean and removed toilet waste properly. In contract to, one-third of them (34.7%) never sold recyclable waste for recycling. The detailed distributions of frequency and percentage of practices regarding household waste disposal were shown in the table 16 in appendix D.

The cutting point of practice on household waste disposal was categorized into three groups according to Bloom's classification (Bloom, 1956): the cutting point of

good practice was higher than 80% (>26.4) of total scores, that of moderate practice was from 60% to 80% (19.8-26.4) of total scores and that of bad practice was less than 60% (<19.8) of total scores.

**Table 5: Level of practice on household waste disposal (n=389)**

| Level of practice | Frequency | Percentage |
|---|---|---|
| Good practice (>26.4) | 143 | 36.8 |
| Moderate practice (19.8-26.4) | 224 | 57.5 |
| Poor practice (<19.8) | 22 | 5.7 |

In order to show the practice level of the respondents, the distribution of level of practice towards household waste disposal was shown in table 5. More than half of the respondents (57.5%) were in the moderate practice level. More than one-third of them (36.8%) had good practice and in contrast, only 5.7% of them had poor practice on household waste disposal.

### 4.6 Diarrhea history in every household

According to the following table 6, there were 339 households (87.1%) who had no diarrhea history within last one month while the rests (12.9%) had at least one case of diarrhea within last one month.

**Table 6: Number and percentage of diarrhea occurrence in each household (n=389)**

| Diarrhea frequency | Number | Percentage |
|---|---|---|
| 0 | 339 | 87.1 |
| ≥1 | 50 | 12.9 |

**Part II: Relationship between socio-demographic characteristics, knowledge, perception and practice on household waste disposal and diarrhea occurrence**

## 4.7 Relationship between socio-demographic characteristics, household characteristics and practice on household waste disposal (n=389)

The relationship between socio-demographic characteristics, household characteristics and household waste disposal's practice was done by the use of ANOVA test. The significant level of the test was 0.05. The results are shown in the table 7.

There was no significant difference between age and practice on household waste disposal (p=0.743). Among the respondents aged 30 years and below, the mean practice score was 25.18 while in the age between 31 and 40 years, the mean score was 24.93. For the age group over 40 years, 24.93 practice score was the mean.

There was no significant difference between marital status and household waste disposal practice (p=0.282). Married females had practice mean score of 25.11 while the rests had 24.44.

There was significant difference between household waste disposal practice and education level (p=0.025). Illiterate respondents had mean score of 24.07 while the others with primary education level had 25.29 mean score. Those with secondary education level and above had 25.11 mean score.

There was no significant difference between housewife and practice scores (p=0.752). Housewives had more mean practice score (25.09) than those who were not (24.95).

Working women were not significantly different with practice on household waste disposal (p=0.053). Working women had mean score of 25.24 which was higher than that of the respondents who were not working (24.55).

There was no significant difference between duration of stay and practice on household waste disposal (p=0.065). The respondents who stayed at the current location for at least 5 years had mean score of 24.75 whereas those who lived from 6 to 15 years had 25.57. Among the participants who stayed more than 15 years, they had 24.87 mean score.

There was no significant difference between household waste disposal practice and income level (p=0.601). The respondents who earned less than 30,000 Kyats (30 USD) had mean score of 24.89 while those who had income between 30,000 Kyats (30 USD) to 50,000 Kyats (50 USD) had 25.18 mean score. For the participants with income more than 50,000Kyats (50 USD), means score was 25.25.

There was no significant difference between kind of house and practice on household waste disposal (p=0.461). The respondents who owned private houses had mean score of 25.10 while the others with other kinds of house had 24.59 mean practice score.

There was no significant difference between number of people and household waste disposal practice (p=0.917). For the houses with 1 to 3 people, they had mean score of 25.01 while those with 4 to 6 people had 25.09 mean practice score. In the house with 6 to 10 people, the mean practice score was 25.24.

There was also no significant difference between number of children under 5 and practice score (p=0.427). If the households had one child under 5, mean practice score was 25.12. When there were 2 and more children under 5, mean score was 24.74.

There was no significant difference between household waste disposal practice and number of rooms including bathrooms in house (p=0.111). In the houses with 1 to 3 rooms, the mean practice score was 24.98 while those with 4 to 6 rooms had 25.82 mean score.

There was highly significant difference between presence of latrine and practice on household waste disposal (p=0.005). For the households with latrine, the mean score of practice was 25.22 while for those without latrine, it was 23.81.

There was highly significant difference between outdoor latrine and household waste disposal practice ($p<0.001$) while the reverse was true for indoor latrine and practice on household waste disposal (p=0.107). For the households with indoor latrine, the mean score was 24.12 whereas those without latrine had 25.13 mean score of practice. In the households with outdoor latrine, the mean score was 25.32 while in those without latrine, it was 23.85.

There was significant difference between type of latrine and practice scores (p=0.011). Among the households with pour-flush latrine, they had 25.21 mean

practice score while those with other types of latrine and without latrine had mean score of 23.98.

There was highly significant difference between main drinking water source and household waste disposal practice ($p<0.001$). The respondents who used pond water had highest practice mean socre. For the respondents who used water from pond, the mean practice score was 25.83 and among those who drank rain water mainly had 23.90 mean score. For the participants who used other types of water source had 24.31 mean practice score.

There was significant difference between main drinking water container and practice on household waste disposal ($p=0.043$). Opened container used households had mean score of 25.71 while households with closed container had 24.99 mean score. For those without container, they had mean practice score of 23.85.

There was highly significant difference between presence of trash bin and practice scores ($p<0.001$). The households with trash bins had mean practice score of 26.22 while those without had 23.29 mean score.

There was also highly significant difference between number of trash bins and household waste disposal practice ($p<0.001$). In the households without bins, the mean practice score was 23.29. Among the households with one trash bin, the mean score was 26.17 while those with 2 and more trash bins had 26.61 mean practice score.

There was highly significant difference between trash bins with wide lids and household waste disposal practice ($p<0.001$) as well as between trash bins with narrow lids and practice scores ($p<0.001$). In contrast to, there was no significant difference between trash bins without lids and practice score ($p=0.167$). For the households which had trash bin with wide lids, the mean score was 26.66 compared to those without wide lids who had 24.57 mean score. Among the households which had trash bins with narrow lids, they had mean practice score of 26.19 while those without narrow lids had 24.67. For the households which had trash bins without lids, the mean score was 25.60.

There was highly significant difference between emptying of trash bins and practice on household waste disposal ($p<0.001$). The respondents who emptied bins every day or every two days had mean score of 26.43 while those who emptied bins

about twice or once per week had 26.28 mean practice score. The participants who emptied trash bins less than once per week and below had mean practice score of 23.46.

There was also highly significant difference between the use of methods for controlling house flies and practice scores ($p<0.001$). For the respondents who used any method had mean score of 25.45 whereas the score 23.91 was for those who did not use any method.

There was no significant difference between throwing of household waste and practice scores ($p=0.718$). For the respondents who threw household waste into the stockpile, they had mean practiced score of 25.15 while those who used other methods to throw away waste had 25.03 mean score.

There was no significant difference between presence of stockpile of garbage near houses and practice scores ($p=0.422$). For the households who had stockpile near their houses, the mean practice score was 25.19 whereas 24.94 mean score was for those who did not have stockpile near their houses.

There was no significant difference between mainly produced household wastes and practice scores except toilet waste which had highly significant difference with practice scores ($p=0.042$). For the households which threw toilet waste mainly, the mean practice score was 25.49 while mean score of 24.82 was for those households which did not throw.

There was highly significant difference between storage of pesticide or herbicides and practice on household waste disposal ($p<0.001$). Among the households which stored pesticides or herbicides in the houses, they had mean practice score of 27.54 while those which did not store had 24.90 mean score. This may reflect the situation that most of the people stored pesticide or herbicides inside their houses properly as they knew that it is important to prevent from contamination of pesticide or herbicides.

There was highly significant difference between physical appearance of water and practice scores ($p=0.010$). Among the households who used good quality water, the mean score was 25.34 whereas those who used bad water had mean practice score of 24.46.

There was highly significant difference between waste disposal at household level and practice scores (p=0.018). For the households who kept waste opened, they had mean score of 24.78 and those who kept waste closed at household level had 25.54 mean practice score.

There was no significant difference between distance between drinking water source and water pollution site like pit latrine and waste landfill and practice on household waste disposal (p=0.363). When the distance is more than 10 meters, mean practice score was 25.10 of which was higher than the mean score, 24.33 if the distance is less than 10 meters.

**Table 7: Relationship between socio-demographic characteristics and household characteristics with practice on household waste disposal (n=389)**

| Characteristics | Practice (Mean Score) | F test | P-value |
|---|---|---|---|
| **Age** | | | |
| ≤30 years | 25.18 | | |
| 31-40 years | 24.93 | 0.297 | 0.743 |
| >40 years | 24.93 | | |
| **Number of children under five** | | | |
| 1 | 25.12 | 0.795 | 0.427 |
| ≥2 | 24.74 | | |
| **Marital status** | | | |
| Married | 25.11 | 1.160 | 0.282 |
| Single, widowed and divorced | 24.44 | | |
| **Education** | | | |
| Illiterate | 24.07 | | |
| Primary education | 25.29 | 3.745 | 0.025* |
| Secondary education and above | 25.11 | | |

| | | | |
|---|---|---|---|
| **Occupation** | | | |
| Housewife | | | |
| Yes | 25.09 | 0.100 | 0.752 |
| No | 24.95 | | |
| Working women | | | |
| Yes | 25.24 | 3.751 | 0.053 |
| No | 24.55 | | |
| **Duration of stay in current location** | | | |
| ≤5 years | 24.75 | | |
| 6-15 years | 25.57 | 2.759 | 0.065 |
| >15 years | 24.87 | | |
| **Average monthly income** | | | |
| <30,000 Kyats (<30 USD) | 24.89 | | |
| 30,000-50,000 Kyats (30-50 USD) | 25.18 | 0.509 | 0.601 |
| >50,000 Kyats (>50 USD) | 25.25 | | |
| **Kind of house** | | | |
| Private house | 25.10 | 0.544 | 0.461 |
| Others | 24.59 | | |
| **Number of people in house** | | | |
| 1-3 people | 25.01 | | |
| 4-6 people | 25.09 | 0.086 | 0.917 |
| 6-10 people | 25.24 | | |
| **Number of rooms in house** | | | |
| 1-3 rooms | 24.98 | 2.551 | 0.111 |
| 4-6 rooms | 25.82 | | |
| **Latrine** | | | |
| Yes | 25.22 | 7.971 | 0.005* |
| No | 23.81 | | |

| | | | |
|---|---|---|---|
| **Kind of latrine** | | | |
| Indoor | | | |
| Yes | 24.12 | 2.613 | 0.107 |
| No | 25.13 | | |
| Outdoor | | | |
| Yes | 25.32 | 12.914 | <0.001* |
| No | 23.85 | | |
| **Type of latrine** | | | |
| Pour-flush | 25.21 | 6.469 | 0.011* |
| Others including no latrine | 23.98 | | |
| **Main source of drinking water** | | | |
| Pond water | 25.83 | | |
| Rain water | 23.90 | 15.643 | <0.001* |
| Others | 24.31 | | |
| **Main kind of drinking water container** | | | |
| Opened container | 25.71 | | |
| Closed container | 24.99 | 3.175 | 0.043* |
| No container | 23.85 | | |
| **Trash bin** | | | |
| Yes | 26.22 | 104.315 | <0.001* |
| No | 23.29 | | |
| **Number of trash bin** | | | |
| 0 | 23.29 | | |
| 1 | 26.17 | 52.417 | <0.001* |
| ≥2 | 26.61 | | |

| | | | |
|---|---|---|---|
| **Kind of trash bin** | | | |
| Wide-lid trash bin | | | |
| Yes | 26.66 | 34.603 | <0.001* |
| No | 24.57 | | |
| Narrow-lid trash bin | | | |
| Yes | 26.19 | 18.692 | <0.001* |
| No | 24.67 | | |
| No-lid trash bin | | | |
| Yes | 25.60 | 1.914 | 0.167 |
| No | 24.98 | | |
| **Emptying of trash bins** | | | |
| Every day and every two days | 26.43 | | |
| About twice and once a week | 26.28 | 51.555 | <0.001* |
| Less than once a week and below | 23.46 | | |
| **Usage of any method for house flies** | | | |
| Yes | 25.45 | 18.750 | <0.001* |
| No | 23.91 | | |
| **Throwing of household waste** | | | |
| Put them into the stockpile | 25.15 | 0.131 | 0.718 |
| Others | 25.03 | | |
| **Stockpile of garbage near house** | | | |
| Yes | 25.19 | 0.647 | 0.422 |
| No | 24.94 | | |
| **Mostly produced household wastes** | | | |
| Kitchen waste (food waste) | | | |
| Yes | 25.20 | 2.136 | 0.145 |
| No | 24.66 | | |

| | | | |
|---|---|---|---|
| Unused glass and paper | | | |
| Yes | 25.05 | 0.002 | 0.965 |
| No | 25.07 | | |
| Old plastic bags and bottles | | | |
| Yes | 24.84 | 3.040 | 0.082 |
| No | 25.40 | | |
| Toilet waste that was thrown away | | | |
| Yes | 25.49 | 4.181 | 0.042* |
| No | 24.82 | | |
| **Storage of pesticides or herbicides in house** | | | |
| Yes | 27.54 | 16.824 | <0.001* |
| No | 24.90 | | |
| **Physical appearance of water** | | | |
| Good | 25.34 | 6.728 | 0.010* |
| Bad | 24.46 | | |
| **Waste disposal at household level** | | | |
| Opened | 24.78 | 5.623 | 0.018* |
| Closed | 25.54 | | |
| **Drinking water source is more than 10 meters from water pollution source (pit latrine/waste landfill)** | | 0.866 | 0.353 |
| Yes | 25.10 | | |
| No | 24.33 | | |

***Significant by ANOVA test**

### 4.8 Relationship between knowledge levels and practice on household waste disposal (n=389)

The determination of association between knowledge towards household waste disposal and practice on household waste disposal was done by using Chi-square test. The level of significance of statistical test was 0.05.

Since the significant level was 0.555 which was greater than p-value 0.05, there was no statistical significant association between knowledge levels and practice on household waste disposal. For the participants who had high knowledge level, more than half of them (56.6%) had moderate practice while the others, 37.2% of them had good practice and only 6.2% had the bad. Similarly, among those who had low and moderate level of knowledge, almost two-thirds of them (61.2%) had moderate practice whereas the others, 35.3% practiced well and only 3.5% practiced badly. The results are shown in the following table 8.

**Table 8: Relationship between levels of knowledge and practice on household waste disposal (n=389)**

| Characteristics | Practice n (%) | | | $X^2$ | p-value |
|---|---|---|---|---|---|
| | Good practice | Moderate practice | Bad practice | | |
| **Levels of Knowledge** | | | | 1.177 | 0.555 |
| High knowledge | 113 (37.2) | 172 (56.6) | 19 (6.2) | | |
| Low and moderate knowledge | 30 (35.3) | 52 (61.2) | 3 (3.5) | | |

### 4.9 Relationship between perception levels and practice on household waste disposal (n=389)

The relationship between levels of perception and practice on household waste disposal were determined by the use of Chi-square test. The level of significant was 0.05.

There was highly statistically significant association between perception level and practice on household waste disposal as the significant value of the test was 0.005 which is less than p-value 0.05. Among the respondents who had high-level perception, about half of them (51.5%) had moderate practice on household waste disposal and the nearly same percentage (44.4%) practiced well. Only 4.1% of the participants had bad practice on disposal of household waste. Concerning the low and moderate-level perception, almost two-thirds of them (63.7%) had moderate practice while the others, 29.0% had good practice and 7.3% had bad practice on household waste disposal. The results are shown in the table 9 as follow.

**Table 9: Relationship between levels of perception and practice on household waste disposal (n=389)**

| Characteristics | Practice n (%) | | | $X^2$ | p-value |
|---|---|---|---|---|---|
| | Good practice | Moderate practice | Bad practice | | |
| **Levels of perception** | | | | 10.500 | 0.005 |
| High-level perception | 87 (44.4) | 101 (51.5) | 8 (4.1) | | |
| Low and moderate-level perception | 56 (29.0) | 123 (63.7) | 14 (7.3) | | |

### 4.10 Relationship between socio-demographic and household characteristics with diarrhea occurrence within last one month (n=389)

Chi-square test was done to find out the relationship between socio-demographic characteristics and household characteristics with diarrhea history. The significant level of the test for relationship between these variables was set at p= 0.05. The results are shown in the table 10.

The respondents' age was compared with diarrhea and without diarrhea in households within last one month. The result revealed that there was no significant association between age group and diarrhea frequency (p=0.055). Among the respondents who were at the age between 31 and 40 years, the diarrhea frequency was

highest with 34.8% while it was lowest, 23.1% in the age group 30 years and below. For the respondents who aged above 40years, 32.8% had diarrhea within last one month.

This study showed that marital status had no significant association with diarrhea frequency within last one month (p=0.487). Among the females surveyed, 28.5% of married women had diarrhea within last one month and that percentage was more than that of single, divorced and widowed women of which 22.2% had diarrhea.

The comparison between respondents' education with diarrhea frequency within last one month indicated that there was no significant association between these two variables (p=0.161). The proportion of diarrhea occurrence was highest in the illiterate women (35.6%). 32.1% of women with secondary education and above had diarrhea compared to 24.8% of those with primary education had diarrhea within last one month.

There was no significant association between housewife and diarrhea frequency within last one month (p=0.053). Housewives were less likely to have diarrhea (26.1%) than those who were not (38.3).

There was also no significant association between working women and diarrhea frequency (p=0.332). Working women were more likely to get diarrhea (29.3%) than those who were not (24.2).

Regarding duration of stay in current location, there was no significant association between duration of stay and diarrhea occurrence within last one month (p=0.215). Among the respondents who stayed more than 15 years at current households, 32.6% had diarrhea within last one month which was the highest. The occurrence of diarrhea in those who had duration of stay between 6 and 15 years (22.8%) was lower than that in respondents who stayed 5 years and less in current location (29.7%).

The comparison between respondents' monthly income and diarrhea frequency presented that there was no significant association between these two variables (p=0.190). The occurrence of diarrhea increased with increasing income per month. It was lowest (24.0%) in income level less than 30,000 Kyats (30 USD), increased to 29.3% in income level between 30,000 Kyats (30 USD) and 50,000

Kyats (50 USD) and it was highest (35.2%) in income level more than 50,000 Kyats (50 USD).

The result showed that there was no significant association between kind of house and diarrhea frequency (p=0.370). The respondents who stayed in private houses were less likely to have diarrhea (27.5%) than those living in other kinds of house such as rent houses with one family and partitioned shared room (36.4%).

Concerning the number of people in households, there was no significant association between number of people and diarrhea occurrence (p=0.325). The proportion of diarrhea frequency was lowest in households having 1 to 3 people (24.1%), increased to 30.7% in households with 4 to 6 people and reached highest at 32.4% in households with 6 to 10 people.

There was no significant association between number of children under 5 and diarrhea frequency within last one month (p=0.092). When the number of children under 5 increased from 1 to 2, the occurrence of diarrhea also raised from 26.5% to 38.0%.

The total number of rooms in house was compared to diarrhea frequency within last one month and the result revealed that there was no significant association between them (p=0.140). 29.1% of the households with 1 to 3 rooms inside had at least one diarrhea case within last one month while 17.9% of those with 4 to 6 rooms inside had diarrhea.

The result showed that there were no significant association between latrine and diarrhea frequency within last one month (p=0.461). Households with latrine had more diarrhea cases within last one month (28.6%) than those without latrine (23.3%).

Concerning indoor latrine, there was significant association between indoor latrine and diarrhea occurrence within last one month (p=0.010). The percentage of having diarrhea in households which had indoor latrines (50%) was much higher than that of having diarrhea in households which did not have latrines (26.4%).

Regarding outdoor latrine, there was no significant association between outdoor latrine and diarrhea within last one month (p=0.241). 26.8% of households having outdoor latrines had diarrhea which was lower than that did not have latrines (33.8%).

The comparison between type of latrine and diarrhea frequency within last one month presented that there was no significant association between these two variables (p=0.756). In households that used pour-flush latrines, 28.3% had diarrhea whereas in those using other types of latrine and no latrine, diarrhea frequency was 26.1%.

There was no significant association between drinking water source and diarrhea (p=0.066). The respondents who used pond water had the lowest percentage of diarrhea frequency (24.1%), increased to 27.1% for those who drank rain water and reached the highest percentage (36.4%) in those who used tap water, well water and vending water.

The result revealed that there was no significant association between kind of drinking water container and diarrhea frequency (p=0.221). The diarrhea occurrence was highest in households with opened water containers (36.1%) while it was lowest in households with closed water containers (25.9%). In households without any water containers, 30% had diarrhea within last one month.

The comparison between presence of trash bins and diarrhea frequency showed that they were not significantly associated with each other (p=0.157). Households having trash bins had less diarrhea cases (25.4%) than those without trash bins (32.0%).

When number of trash bins was compared to diarrhea occurrence within last one month, there was no significant association between them (p=0.339). Diarrhea occurred more in households with no trash bin (32.0%) than those with one trash bin (25.0%) and those with more than one trash bin (28.6%).

Regarding trash bins with wide lids, there was no significant association between wide-lid trash bins and diarrhea frequency (p=0.297). In households that used trash bins with wide lids, 32.3% had diarrhea within last one month while 26.7% of diarrhea occurred in those that did not use them.

Concerning trash bins with narrow lids, there was highly significant association between narrow-lid trash bins and diarrhea occurrence (p<0.001). Among the households that used trash bins with narrow lids, 13.7% of them had at least one diarrhea case which is much lower when compared to those that did not use (33.1%).

There was no significant association between trash bins with no lid and diarrhea frequency (p=0.341). For the households which use trash bins without lids, diarrhea occurred in 33.3% of them.

It was shown that emptying of household wastes were not significantly associated with diarrhea frequency within last one month (p=0.230). The less frequent the respondents threw household wastes, the more the diarrhea frequency was. When they threw household wastes every day or every two days in a week, 22.2% of them suffered from diarrhea. If they emptied household wastes about twice or once per week, diarrhea occurred in 26.0%. 32.2% got diarrhea if they threw wastes less than once per week or below.

The comparison between usage of any method to control house flies and diarrhea frequency within last one month presented that there was no significant association between these two variables (p=0.569). The households who did some methods to control house flies had diarrhea in about 28.8% while 25.8% of those who did not do had diarrhea.

There was no significant association between throwing of household wastes into the stockpile with diarrhea frequency (p=0.835). The proportion of diarrhea cases was almost the same in both households which threw wastes into the stockpile (27.3%) and those which threw wastes into dumping areas, backyards and river (28.4).

The presence of stockpiles near the respondents' houses were not significantly associated with diarrhea frequency within last one month (p=0.957). If there was stockpile near the house, diarrhea occurred in 28.1% of them. The percentage of diarrhea was 27.9 in households having no stockpile near their houses.

Regarding kitchen waste (food waste), it was not significantly associated with diarrhea frequency (p=0.062). 30.4% of the households which produced mainly kitchen wastes had diarrhea within last one month while 20.4% of those which did not produce had diarrhea.

Concerning unused glass and paper, they were not significantly associated with diarrhea frequency within last one month (p=0.315). Among the households that mainly produced unused glass and paper, diarrhea occurred in 23.9% while it occurred in 29.3% of households that did not produce.

Old plastic was not significantly associated with diarrhea occurrence (p=0.867). The occurrence of diarrhea was lower in households that produced mainly old plastic bags and bottles (27.7%) than that in households that did not produce (28.5%).

There was no significant association between toilet waste and diarrhea frequency (p=0.434). 25.7% of diarrhea cases occurred in households that mainly produced toilet waste whereas 29.4% in those that did not produce.

There was no significant association between storage of pesticides or herbicides in house with diarrhea frequency (p=0.286). The diarrhea percentage was higher in households that stored pesticides or herbicides (37.5%) than those that did not (27.4%).

The physical appearance of water was not significantly associated with diarrhea (p=0.737). The respondents got diarrhea more when they used bad quality water (29.2%) than those who used good water (27.5%).

The comparison between waste disposal at household level with diarrhea frequency showed that there was no significant association between these two variables (p=0.965). Diarrhea occurred more in opened waste disposal at household level (28.1%) than in closed waste disposal (27.9%).

The result revealed that there was no significant association between distance between drinking water source and water pollution site with diarrhea occurrence (p=0.139). When the distance is less than 10 meters, 46.7% of the respondents got diarrhea. If the distance is more than 10 meters, diarrhea occurred only in 27.3%.

**Table 10: Relationship between socio-demographic and household characteristics with diarrhea occurrence within last one month (n=389)**

| Characteristics | Diarrhea n (%) | | $X^2$ | P-value |
|---|---|---|---|---|
| | Yes | No | | |
| **Age** | | | | |
| ≤30 years | 50 (23.1) | 166 (76.9) | 5.798 | 0.055 |
| 31-40 years | 39 (34.8) | 73 (65.2) | | |
| >40 years | 20 (32.8) | 41 (67.2) | | |

| | | | | |
|---|---|---|---|---|
| **Number of children under 5** | | | | |
| 1 | 90 (26.5) | 249 (73.5) | 2.833 | 0.092 |
| ≥2 | 19 (38.0) | 31 (62.0) | | |
| **Marital status** | | | | |
| Married | 103 (28.5) | 259 (71.5) | 0.484 | 0.487 |
| Single, widowed and divorced | 6 (22.2) | 21 (77.8) | | |
| **Education** | | | | |
| Illiterate | 21 (35.6) | 38 (64.4) | 3.653 | 0.161 |
| Primary education | 61 (24.8) | 185 (75.2) | | |
| Secondary education and above | 27 (32.1) | 57 (67.9) | | |
| **Occupation** | | | | |
| Housewife | | | | |
| Yes | 86 (26.1) | 243 (73.9) | 3.741 | 0.053 |
| No | 23 (38.3) | 37 (61.7) | | |
| Working women | | | | |
| Yes | 85 (29.3) | 205 (70.7) | 0.940 | 0.332 |
| No | 24 (24.2) | 75 (75.8) | | |
| **Duration of stay in current location** | | | | |
| ≤5 years | 47 (29.7) | 111 (70.3) | 3.077 | 0.215 |
| 6-15 years | 31 (22.8) | 105 (77.2) | | |
| >15 years | 31 (32.6) | 64 (67.4) | | |
| **Average monthly income** | | | | |
| <30,000 Kyats (<30 USD) | 41 (24.0) | 130 (76.0) | 3.317 | 0.190 |
| 30,000-50,000 Kyats (30-50 USD) | 43 (29.3) | 104 (70.7) | | |
| >50,000 Kyats (>50 USD) | 25 (35.2) | 46 (64.8) | | |

| | | | | |
|---|---|---|---|---|
| **Kind of house** | | | | |
| Private house | 101 (27.5) | 266 (72.5) | 0.805 | 0.370 |
| Others | 8 (36.4) | 14 (63.6) | | |
| **Number of people in house** | | | | |
| 1-3 people | 40 (24.1) | 126 (75.9) | 2.250 | 0.325 |
| 4-6 people | 58 (30.7) | 131 (69.3) | | |
| 6-10 people | 11 (32.4) | 23 (67.6) | | |
| **Number of rooms in house** | | | | |
| 1-3 rooms | 102 (29.1) | 248 (70.9) | 2.180 | 0.140 |
| 4-6 rooms | 7 (17.9) | 32 (82.1) | | |
| **Latrine** | | | | |
| Yes | 99 (28.6) | 247 (71.4) | 0.544 | 0.461 |
| No | 10 (23.3) | 33 (76.7) | | |
| **Kind of latrine** | | | | |
| Indoor | | | | |
| Yes | 13 (50.0) | 13 (50.0) | 6.674 | 0.010* |
| No | 96 (26.4) | 267 (73.6) | | |
| Outdoor | | | | |
| Yes | 86 (26.8) | 235 (73.2) | 1.376 | 0.241 |
| No | 23 (33.8) | 45 (66.2) | | |
| **Type of latrine** | | | | |
| Pour-flush | 97 (28.3) | 246 (71.7) | 0.097 | 0.756 |
| Others including no latrine | 12 (26.1) | 34 (73.9) | | |
| **Main source of drinking water** | | | | |
| Pond water | 51 (24.1) | 161 (75.9) | 5.447 | 0.066 |
| Rain water | 19 (27.1) | 51 (72.9) | | |
| Others | 39 (36.4) | 68 (63.6) | | |

| | | | | |
|---|---|---|---|---|
| **Main kind of drinking water container** | | | | |
| Opened container | 26 (36.1) | 46 (63.9) | 3.022 | 0.221 |
| Closed container | 77 (25.9) | 220 (74.1) | | |
| No container | 6 (30.0) | 14 (70.0) | | |
| **Trash bin** | | | | |
| Yes | 60 (25.4) | 176 (74.6) | 2.006 | 0.157 |
| No | 49 (32.0) | 104 (68.0) | | |
| **Number of trash bin** | | | | |
| 0 | 49 (32.0) | 104 (68.0) | 2.162 | 0.339 |
| 1 | 52 (25.0) | 156 (75.0) | | |
| ≥2 | 8 (28.6) | 20 (71.4) | | |
| **Kind of trash bin** | | | | |
| Wide-lid trash bin | | | | |
| Yes | 30 (32.3) | 63 (67.7) | 1.088 | 0.297 |
| No | 79 (26.7) | 217 (73.3) | | |
| Narrow-lid trash bin | | | | |
| Yes | 14 (13.7) | 88 (86.3) | 14.007 | <0.001* |
| No | 95 (33.1) | 192 (66.9) | | |
| No-lid trash bin | | | | |
| Yes | 19 (33.3) | 38 (66.7) | 0.908 | 0.341 |
| No | 90 (27.2) | 241 (72.8) | | |
| **Emptying of trash bins** | | | | |
| Every day and every two days | 16 (22.2) | 56 (77.8) | 2.943 | 0.230 |
| About twice and once a week | 38 (26.0) | 108 (74.0) | | |
| Less than once a week and below | 55 (32.2) | 116 (67.8) | | |
| **Usage of any method for house flies** | | | | |
| Yes | 84 (28.8) | 208 (71.2) | 0.324 | 0.569 |
| No | 25 (25.8) | 72 (74.2) | | |

| | | | | |
|---|---|---|---|---|
| **Throwing of household waste** | | | | |
| Put them into the stockpile | 35 (27.3) | 93 (72.7) | 0.043 | 0.835 |
| Others | 74 (28.4) | 187 (71.6) | | |
| **Stockpile of garbage near house** | | | | |
| Yes | 56 (28.1) | 143 (71.9) | 0.003 | 0.957 |
| No | 53 (27.9) | 137 (72.1) | | |
| **Mostly produced household wastes** | | | | |
| Kitchen waste (food waste) | | | | |
| Yes | 90 (30.4) | 206 (69.6) | 3.491 | 0.062 |
| No | 19 (20.4) | 74 (79.6) | | |
| Unused glass and paper | | | | |
| Yes | 22 (23.9) | 70 (76.1) | 1.008 | 0.315 |
| No | 87 (29.3) | 210 (70.7) | | |
| Old plastic bags and bottles | | | | |
| Yes | 64 (27.7) | 167 (72.3) | 0.028 | 0.867 |
| No | 45 (28.5) | 113 (71.5) | | |
| Toilet waste that was thrown away | | | | |
| Yes | 37 (25.7) | 107 (74.3) | 0.613 | 0.434 |
| No | 72 (29.4) | 173 (70.6) | | |
| **Storage of pesticides or herbicides in house** | | | | |
| Yes | 9 (37.5) | 15 (62.5) | 1.140 | 0.286 |
| No | 100 (27.4) | 265 (72.6) | | |
| **Physical appearance of water** | | | | |
| Good | 74 (27.5) | 195 (72.5) | 0.113 | 0.737 |
| Bad | 35 (29.2) | 85 (70.8) | | |

| | | | | |
|---|---|---|---|---|
| **Waste disposal at household level** | | | | |
| Opened | 68 (28.1) | 174 (71.9) | 0.002 | 0.965 |
| Closed | 41 (27.9) | 106 (72.1) | | |
| **Drinking water source is more than 10 meters from water pollution source (pit latrine/ waste landfill)** | | | 2.689 | 0.139 |
| Yes | 102 (27.3) | 272 (72.7) | | |
| No | 7 (46.7) | 8 (53.3) | | |

***Significant by Chi-square test**

### 4.11 Relationship between knowledge, perception and practice on household waste disposal with diarrhea occurrence within last one month (n=389)

The determination of association between knowledge, perception and practice on household waste disposal with diarrhea frequency within last one month was done by using Chi-square test. The level of significance of statistical test was set at p=0.05. The results are shown in table 11.

Knowledge towards household waste disposal was not significantly associated with diarrhea frequency (p=0.289). The occurrence of diarrhea was highest in low knowledge group (66.7%). Moreover, it was lowest in high knowledge respondents (27.3%).

Regarding perception towards household waste disposal, it was not significantly associated with diarrhea frequency (p=0.140). Like knowledge, low-level perception group had the highest diarrhea percentage (33.3%) among three groups. The percentages in other two groups were 32.1% in high-level perception and 23.5% in moderate-level perception.

When practice on household waste disposal was compared to diarrhea frequency, there was no significant association between them (p=0.976). The proportion of diarrhea occurrence was 28.7%, 27.7% and 27.3% in good practice group, moderate practice group and poor practice group respectively.

**Table 11: Relationship between knowledge, perception and practice on household waste disposal with diarrhea occurrence within last one month (n=389)**

| Variables | Diarrhea n (%) | | $X^2$ | p-value |
|---|---|---|---|---|
| | Yes | No | | |
| **Knowledge towards household waste disposal** | | | | |
| High knowledge | 83 (27.3) | 221 (72.7) | 2.373 | 0.289 |
| Moderate knowledge | 24 (29.3) | 58 (70.7) | | |
| Low knowledge | 2 (66.7) | 1 (33.3) | | |
| **Perception towards household waste disposal** | | | | |
| High-level | 63 (32.1) | 133 (67.9) | 3.788 | 0.140 |
| Moderate-level | 44 (23.5) | 143 (76.5) | | |
| Low-level | 2 (33.3) | 4 (66.7) | | |
| **Practice on household waste disposal** | | | | |
| Good practice | 41 (28.7) | 102 (71.3) | 0.049 | 0.976 |
| Moderate practice | 62 (27.7) | 162 (72.3) | | |
| Poor practice | 6 (27.3) | 16 (72.7) | | |



### 4.12 Results from Multivariable Analysis

The linear regression and logistic regression analysis examined all independent variables that are significant at bi-variate level after controlling for other variables to get a clear identification of the significant factors.

**Table 12: Liner regression analysis of factors for practice on household waste disposal in Laputta Township (n=389)**

| Variables | B | 95% CI | | P-value |
|---|---|---|---|---|
| | | Lower | Upper | |
| Drinking water source* | | | | <0.001* |
| Pond | 1.903 | 1.282 | 2.525 | <0.001* |
| Rain | 0.044 | -0.750 | 0.839 | 0.913 |
| Others | 0 | | | |
| Number of trash bin* | 0.838 | 0.071 | 1.605 | 0.032* |
| Trash bins with wide lids* | 1.477 | 0.626 | 2.327 | 0.001* |
| Trash bins with narrow lids* | 0.747 | -0.082 | 1.577 | 0.077 |
| Emptying of trash bins* | -0.717 | -1.242 | -0.192 | 0.008* |
| Kitchen waste* | 0.737 | 0.132 | 1.341 | 0.017* |
| Storage of pesticides or herbicides | 1.014 | -0.072 | 2.101 | 0.067 |
| Waste disposal at household level | 0.520 | -0.007 | 1.047 | 0.053 |
| Perception towards household waste disposal* | 0.096 | 0.047 | 0.145 | <0.001* |

***Statistically Significance**

Table 12 reveals the final model for the relationship between each independent variables and practice scores on household waste disposal after controlling all other variables. In the bi-variate analysis, there were 20 independent variables such as education of respondents, working women, duration of stay, main drinking water source, mainly used water container, number of rooms in house, outdoor latrine, type of latrine, number of trash bins, trash bins with wide lids, trash bins with narrow lids, emptying of trash bins, kitchen waste, control of house flies, old plastics, toilet waste, storage of pesticides or herbicides, physical appearance of water, waste disposal at household level and perception towards household waste disposal.

From the table, it can be seen that drinking water source was significantly different with practice score ($p<0.001$). Households which used pond water had 1.9 more practice score than others while those which used rain water had 0.04 more practice score than others.

There was statistically significant difference between number of trash bins and practice score (p=0.032). One unit change in number of trash bins caused 0.84 unit increased in practice score.

There was statistically significant difference between trash bins with wide lids and practice score (p=0.001). In households having trash bins with wide lids, practice score increased to 1.48 score when compared to those without wide lids.

The finding between trash bins with narrow lids and practice score showed that there was no significant difference between these two variables (p=0.077). Households having trash bins with narrow lids had 0.75 more practice score than those without it.

Emptying of trash bins was found to be significantly different with practice score (p=0.008). The less frequent the respondents emptied trash bins, 0.72 more practice score was seen.

Kitchen waste (food waste) was also significantly different with practice on household waste disposal (p=0.017). The households which mainly produced kitchen wastes had 0.74 more practice score than those did not produce.

There was no significant difference between pesticides or herbicides storage with practice score (p=0.067). The households which stored pesticides or herbicides had 1.01 more score.

Similarly, there was no significant difference between waste disposal at household level (p=0.053). When wastes were disposed closed, the practice score increased to 0.52 practice score compared to open waste disposal.

Regarding perception towards household waste disposal, there was highly significant difference between perception and practice score (p<0.001). One unit change in perception score caused 0.09 unit change in practice score.

**Table 13: Logistic regression analysis of factors associated with diarrhea occurrence in Laputta Township (n=389)**

| Variables | B | Odds Ratio | 95% CI | | P-value |
|---|---|---|---|---|---|
| | | | Lower | Upper | |
| Age >40 | | | | | 0.029* |
| Age ≤30 | -0.502 | 0.605 | 0.316 | 1.161 | 0.131 |
| Age 31-40 | 0.193 | 1.213 | 0.608 | 2.422 | 0.584 |
| Indoor latrine | 0.865 | 2.375 | 1.027 | 5.490 | 0.043* |
| Trash bins with narrow lids | -1.194 | 0.303 | 0.156 | 0.587 | <0.001* |
| Kitchen waste (Food waste) | 0.534 | 1.705 | 0.935 | 3.108 | 0.081 |
| Number of children under 5 | 0.738 | 2.092 | 1.081 | 4.049 | 0.029* |
| Low-level perception | | | | | 0.078 |
| High-level perception | -0.425 | 0.654 | 0.097 | 4.410 | 0.663 |
| Moderate-level perception | -0.953 | 0.385 | 0.056 | 2.633 | 0.331 |

***Statistically Significance**

Table 13 shows the final model for the relationship between each independent variables and diarrhea occurrence after controlling all other variables. In the bi-variate analysis, there were 10 independent variables such as age of respondents, housewives, number of rooms in house, children under 5, drinking water source, indoor latrine, trash bins with narrow lids, kitchen waste, distance between drinking water source with water pollution site and perception towards household waste disposal.

Age was found to be significantly associated with diarrhea occurrence within last one month (p=0.029).

Similarly, there was significant association between indoor latrine and diarrhea occurrence (p=0.043). The B coefficient showed that there was positive effect of indoor latrine on diarrhea as the households with indoor latrine were 2.38 times more likely to get diarrhea than those without it.

There was highly significant association between trash bins with narrow lids and diarrhea occurrence (p<0.001). The households using trash bins with narrow lids

were less likely to cause diarrhea that those that did not use by odds ratio 0.303 as the B coefficient showed negative effect of trash bins with narrow lids on diarrhea.

Kitchen wastes were not significantly associated with diarrhea occurrence (p=0.081). The households that produced kitchen waste as a main waste had diarrhea 1.7 times than those that did not produce.

There was significant association between number of children under 5 with diarrhea occurrence (p=0.029). The more children under 5 in households, the more diarrhea cases were found by 2.1 times.

Perception towards household waste disposal was not significantly associated with diarrhea occurrence (p=0.078).

# CHAPTER V
# DISCUSSTION, CONCLUSION AND RECOMMENDATION

## 5.1. Discussion

The main purpose of this study was to describe the socio-demographic and household characteristics; to assess the level of knowledge, perception and practices on household waste disposal; and to find out the association between socio-demographic, household characteristics, level of knowledge and perception with level of practices on household waste disposal associated with diarrhea occurrence in people in Laputta Township in Myanmar. The participants in this study were the mothers or other female guardians in Laputta Township in Myanmar.

After the cyclone Nargis in 2008,140,000 out of about 350,000 people in Laputta Township lost their houses and thousands of buildings were destroyed. About after six month of the cyclone, most of the people built and returned to their new houses by the help of the Government and NGOs. They provided funds to build not only the houses but also the latrines in the villages that were struck by the cyclone to prevent the health problems. This study found opportunities and constraints in addressing the promoting practices on household waste disposal and reducing diarrhea occurrence in Laputta Township in Myanmar.

The analysis found that there were about more than two-thirds of the respondents (78.1%) who had high knowledge level towards household waste disposal while the others had moderate level (21.1%) and low level (0.8%) of knowledge about household waste disposal. It was noted that knowledge towards household waste disposal was a lot higher among Myanmar people as compared to Myanmar migrant in Thailand in which high knowledge level was only 49.8% (Naing, 2009).

The results showed that about half of the respondents (50.4%) had high level of perception and 48.1% had moderate level of perception while very few percentage (1.5%) of the respondents were having low level of perception towards household waste disposal.

The study also found that about half of the respondents (57.6%) in Laputta Township in Myanmar had moderate level of practice towards household waste

disposal and there were only a few respondents (5.7%) who had bad practice level of household waste disposal in that community while the rests, 36.8% had good practice level. This might reflect the current situation after the cyclone Nargis that had public promotion to household waste disposal because both of Myanmar government and INGOs supported all kinds of services about household waste disposal such as providing of latrines, trash bins and so on. Moreover, they also gave health education about how to manage household waste properly to prevent health problems like diarrhea so their knowledge towards household waste disposal was quite high.

Regarding age, all respondents were in the age ranged from 16 to 59. More than half of the respondents were in the age group 30 years and below (55.5%). The others were in the age group 31 to 40 years (28.8%) and in the age group older than 40 years (15.7%).

There was no significant difference between age and practice on household waste disposal (p=0.743) as well as with diarrhea occurrence (p=0.055) in bi-variate analysis. This finding was controversy with the study done in Sweden (Sterner, 1998) in which older people seemed to be generating significantly less household wastes.

In multivariable analysis, age of the participants is significant with diarrhea occurrence after controlling other variables. In this study, age group 30 years and below was likely to had diarrhea when compared to the women older than 40 years. But in the age group ranging from 31 to 40 years, the diarrhea occurred 1.2 times more than in women older than 40 years.

For education attainment, more than half of the participants were in the primary education level (63.1%) and 15.2% of them were illiterate. Small percentage of the respondents, 11.1% and 4.4% finished secondary and high school level education respectively while other, 6.2% only learned from the monastery. Most of the Myanmar people in the Laputta Township had finished primary school but there were a lot of service providers such as the government and many INGOs that supported a lot of services such as trash bins and information about practice of household waste management.

There was significant difference between household waste disposal practice and education level in bi-variate analysis (p=0.025) which was different from the

study (Makmattayan, 2003) showing no relationship between education level and practice about household waste. But there was no significant association between education of the respondents with diarrhea occurrence within last one month (p=0.161).

Concerning duration of stay in current home place, there was no significant difference between duration of stay and practice on household waste disposal (p=0.065) which was consistent with the study conducted among housewives in Bang Sue District, Bangkok (Makmattayan, 2003).

The level of economic status of the respondents had been assessed on the basic of total monthly family income and it ranged from 10,000 Kyats to 500,000 Kyats (10 USD to 500 USD). 44.0% of the participants had income less than 30,000 Kyats (30 USD). Only 18.3% had income more than 50,000 Kyats (50 USD). There was no significant difference between household waste disposal practice and income level (p=0.601). This finding was not consistent with the findings from the study done in Muang district (Naing, 2009) and in Bangkok Metropolis (Phakdiphibool, 1992) in which the income significantly affected on practice on household waste management. There was also no significant association between income level with diarrhea occurrence (p=0.190) in bi-variate analysis.

Almost all of them (94.4%) had their own houses while others, 5.1% and 0.5% lived in rent house with one family (single-family house) and partitioned shared room provided by the employers respectively. After the Cyclone Nargis had destroyed most of the houses in Laputta Township, people got help from the Government as well as from the NGOs in building their new houses. So majority of them had their new houses some times after the cyclone. There was no significant difference between kind of house and practice on household waste disposal (p=0.461) as well as with diarrhea (p=0.370) in bi-variate analysis.

Total number of people living in their households ranged from 2 to 10. 48.6% of the households had 4 to 6 people while 42.7% had 1 to 3 people. Only 8.7% had 6 to 10 people in the households. There was no significant difference between number of people and household waste disposal practice (p=0.917) and this finding was not consistent with the study done in Hinlard Subdistrict, Nakornnayok Province (Sapharnsiht, 2000) which showed that people who lived in households with big

family size, acted properly about solid waste management better than those lived in households with small family size significantly in statistic. There was also no significant association between family size with diarrhea occurrence (p=0.325).

There was also no significant difference between number of children under 5 and practice score (p=0.427). There was no significant association between number of children under 5 and diarrhea frequency within last one month (p=0.092) in the bi-variate analysis. But in the multivariable analysis, number of children under 5 had significant association with diarrhea occurrence after controlling the other variables (p=0.029). The diarrhea occurred 2.1 times more in the households which had at least one child under 5 than in those which had no children under 5. This finding was consistent with the study done in Thailand (Wilunda, 2006) which found the increased risk of diarrhea among the households with one child less than 5 years.

Majority of the households (88.9%) had latrine while the remaining ones (11.1%) did not have a latrine. There was highly significant difference between latrine and practice on household waste disposal (p=0.005) in bi-variate analysis but there was no significant association between latrine and diarrhea occurrence (p=0.461).

Among those households who had latrine, 92.5% of them kept their latrines outside the houses while the rests (7.5%) inside the houses. In bi-variate analysis, there was highly significant difference between outdoor latrine and household waste disposal practice (p<0.001) while the reverse was true for indoor latrine and practice on household waste disposal (p=0.107). In contrast to, there was highly significant association between indoor latrine with diarrhea (p0.010) while outdoor latrine was not significantly associated (p=0.241).

In multivariable analysis, indoor latrine was significantly found to be a risk factor for diarrhea occurrence after controlling other variables (p=0.043). Households with indoor latrines had a more chance of getting diarrhea (OR= 2.4) than those without indoor latrines.

For the type of latrine that they use, pour-flush ones were mostly used (88.1%). There was significant difference between type of latrine and practice scores (p=0.011) but it was not significantly associated with diarrhea (p=0.756).

More than half of the respondents (54.4%) used water from the pond for both drinking and cooking. Furthermore, well water and rain water were used by 21.9%

and 18% of the surveyed people respectively. There was highly significant difference between water source and household waste disposal practice ($p<0.001$) but no association was found between water source and diarrhea ($p=0.066$) in bi-variate analysis. This finding was not consistent with the study done in Lebanon (Korfali, 2008) in which there was a statistically significant association between diarrhea and well water ($p<0.01$) as well as between diarrhea and vended water ($p<0.05$).

In multivariable analysis, the drinking water source was found to be significant with practice score (<0.001). The households who used pond water have more 1.9 practice scores than other kinds of water as well as those who used rain water have more 0.04 practice score than other kinds of water. This may be due to the proper storage of pond and rain water.

94.9% of the participants had at least one drinking water container in their houses and from that 76.4% were closed containers whereas the rests (18.5%) opened containers. There was significant difference between water container and practice on household waste disposal ($p=0.043$) but it was not significantly associated with diarrhea occurrence ($p=0.221$) in bi-variate analysis. This was not consistent with the study done in Ethiopia (Mediratta, 2010) in which diarrhea was more likely to occur in households that stored water in containers with a wide mouth than those that stored in containers with a narrow mouth.

Regarding trash bins, there was no significant association between number of trash bins and diarrhea ($p=0.339$). But there was highly significant difference between number of trash bins and household waste disposal practice ($p<0.001$) in bi-variate analysis. In multi-variable analysis, it was also found to be significant different ($p=0.032$) and the more the numbers of the trash bins, the more the practice scores.

Among the households which had trash bin, large percentages of them, 43.2% and 39.4% used trash bin with narrow lids and with wide lids respectively. Only 24.2% did not keep their trash bins covered with lids. There was highly significant difference between trash bins with wide lids and household waste disposal practice ($p<0.001$) as well as between trash bins with narrow lids and practice scores ($p<0.001$). In contrast to, there was no significant difference between trash bins without lids and practice score ($p=0.167$). In multivariable analysis, trash bins with wide lids remained significant with practice score ($p=0.001$) and in the households

having trash bins with wide lids, practice score increased by 1.5. But trash bins with narrow lids became not significant (p=0.077).

In multi-variable analysis, trash bins with narrow lids was found to be a protective factor for diarrhea since diarrhea reduced in households having trash bins with narrow lids by odds ratio 0.303.

The participants mostly emptied their trash bins about once a week for 33.9%, about twice a week for 27.9% and every two days for 20.8%. Very few people, only 9.7% and 7.7% threw waste in the trash bins everyday and less than once a week respectively. There was highly significant difference between emptying of trash bins and practice on household waste disposal (p<0.001) in bi-variate analysis. In multivariable analysis, it was also highly significant with practice score (p=0.008). The less frequent the respondents emptied trash bins, the practice score decreased by 0.7.

About one-third of them (32.9%) threw their household wastes into the outdoor stockpile whereas the rests not. There was no significant difference between throwing of household waste and practice scores (p=0.718).

There were stockpile of garbage near about half of the houses (51.2%). There was no significant difference between presence of stockpile of garbage near houses and practice scores (p=0.422).

The most produced household wastes from the households were kitchen waste (food waste) which was 76.1%; and old plastic bags and bottles which were 59.4%. There was no significant difference between mainly produced household wastes and practice scores except toilet waste which had highly significant difference with practice scores (p=0.042).

In multivariable analysis, only kitchen waste was found significant with practice score (p=0.017). In households which mainly produced kitchen waste, practice score increased by 0.74. This may reflect the condition that most of the respondents managed kitchen waste properly into the bags before disposed it to prevent from getting sickness.

Regarding physical appearance of water, the participants mostly used good water (69.2%) while the rests (30.8%) used bad water. There was highly significant difference between physical appearance of water and practice scores (p=0.010).

Wastes were disposed mainly as opened (62.2%) at household level and in contrast to, they were disposed as closed by 37.8% of households. There was highly significant difference between waste disposal and practice scores (p=0.018) but in multivariable analysis, there was no significant difference between them (p0.053).

Since the significant level was 0.555 which was greater than p-value 0.05, there was no statistical significant association between knowledge levels and practice on household waste disposal. For the participants who had high knowledge level, more than half of them (56.6%) had moderate practice while the others, 37.2% of them had good practice and only 6.2% had the bad. Similarly, among those who had low and moderate level of knowledge, almost two-thirds of them (61.2%) had moderate practice whereas the others, 35.3% practiced well and only 3.5% practiced badly.

There was no statistical significant difference between knowledge on household waste disposal and practice score (p=1.177). This is controversy with the study (Saphansithi, 2000) in which knowledge had significant difference with solid waste disposal and management.

There was highly statistically significant association between perception level and practice on household waste disposal as the significant value of the test was 0.005 which is less than p-value 0.05. So it was consistent with the study (Naing, 2009) in which there was significant difference between attitude and practice towards household waste management (p<0.001).Moreover, in multivariable analysis, it remained strongly significant (p<0.001) after controlling other variables. When one unit increases in perception scores, there was 0.1 unit increase in practice score.

In this study, 12.9% of the households had at least one person which was higher than the finding from the study done in Bangladesh (Piechulek, 2003) in which diarrhea prevalence was 8.1%.

## 5.2. Conclusion

The data from this study was collected in Laputta Township in Myanmar in March, 2011 by using structured questionnaires. The sample size for this study was 389 Myanmar people.

From this study, the occurrence of diarrhea at least one in each household in Laputta Township was 12.9% which was higher than the finding from the study done in Bangladesh (Piechulek, 2003) in which diarrhea prevalence was 8.1%.

The main purpose of this study was to assess the level of knowledge, perception and practices on household waste disposal; and to find out the association between socio-demographic, household characteristics, level of knowledge and perception with level of practices on household waste disposal associated with diarrhea frequency in people in Laputta Township in Myanmar.

The statistical package for social science (SPSS) were using for analysis of the data of this study. Chi-square test and Fisher Exact test were used for relationship between independent variables and dependent variable, practice towards household waste management.

The results showed that among the respondents, 78.1% had high knowledge, 21.1% had moderate knowledge and only 0.8% had low knowledge. 50.4% of respondents had high-level perception, 48.1% had moderate-level perception and only 1.5% had low perception. 36.8% of the respondents had good practice on household waste disposal, 57.5% had moderate practice and only 5.7% had bad practice. In this study, over all diarrhea frequency was 12.9%.

From the multivariable analysis between independent variables and practice score, drinking water source, number of trash bins, trash bins with wide lids, emptying of trash bins, kitchen waste (food waste) and perception towards household waste disposal is significant after controlling other independent variables.

Concerning the relationship between significant independent variables and diarrhea occurrence in multivariable analysis, age of the respondents, indoor latrines, trash bins with narrow lids and number of children under 5 were found significant after controlling other independent variables.

This study was expected to obtain a baseline data regarding household waste disposal for further studies. The result can also provide the policy makers to do further strategy and planning to reduce diarrhea in Laputta Township in Myanmar. Non-Governmental organizations like World Concern Myanmar, health authorities, policy makers and communities should be collaborate together with each other to implement for intervention.

### 5.3. Recommendation

Since this study was done both with descriptive and analytical statistics, the results can clearly provide the factors which were strongly associated and can also show the direction of the association.

This study was done with only 389 participants from Yay Twin Seik village tract in Laputta Township in Myanmar and it cannot be the figure for the whole Myanmar people as the socio-demographic characteristics might differ from one place to another.

Practice towards household waste disposal is one of the important factors influencing the quality of life of Myanmar people and environmental health of that community in Laputta Township because this area is struggling to face many environmental problems like flooding especially after the Cyclone Nargis. People in this community should be more involved with the local government organizations and INGOs when solving certain problems about waste disposal. Local community-based organizations should be developed in that area in order to improve their quality of life and protect their environmental health by promoting the community participation so that they could be able to withstand even after returning of the NGOs from that area.

As found in this study, people in Laputta Township should be encouraged to have outdoor latrines and trash bins with narrow lids to reduce diarrhea occurrence as diarrhea occurred 2.4 times higher in households with indoor latrine and having trash bins with narrow lids can reduce diarrhea risk by 0.3. Moreover, the Government services and NGOs should focus on encouraging and promoting the practices to reduce diarrhea especially in children under 5 since households having more children under 5 have 2.1 times more chance to get diarrhea.

Moreover, the health education programs targeting to age, sex and occupation including community participation should be emphasized in order to improve practice towards household waste disposal and to reduce diarrhea occurrence.

This study was emphasized on practice towards household waste disposal and diarrhea occurrence by quantitative method as this study had limited by time constraint so that further qualitative studies should be carried out in order to understand more from all perspectives. Since seasonal effect was not included in this

study which had influence on both waste disposal and diarrhea, further research including seasonal effect should be done.

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# APPENDICES

# APPENDIX A

## Patient/ Participant Information Sheet

**Title of research project …Household waste disposal: Knowledge, Perception, Practices and relationship with diarrhea frequency in Laputta Township in Myanmar.....**

**Principle researcher's name** ...Mr. Ye Paing Kyi…….**Position** ……MPH student…
**Office address**…Collage of Public Health Science, Chulalongkorn University.....…
**Home address** …521/3-4, Soi Sriayuthaya 2-4, Sriayuthaya Road, Prayatai Distric, Rajthavee, Bangkok 10400……...…
**Cell phone**…0885204820……. **E-mail:** …witmonemdy@gmail.com……

1. You are being invited to take part in a research project. Before you decide to participate it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and do not hesitate to ask if anything is unclear or if you would like more information.

2. This research project involves "knowledge, belief, value and feeling of how you manage your household waste and relationship with diarrhea occurrence".

3. Objectives of the project are:
   3.1. To describe the demographic and household characteristics of people and prevalence of diarrhea in Laputta Township in Myanmar.
   3.2. To assess the level of knowledge, perception and practices on household waste disposal in people in Laputta Township in Myanmar.
   3.3. To assess the association between demographic and household characteristics, level of knowledge, perception with level of practices on household waste disposal associated with diarrhea frequency in people in Laputta Township in Myanmar.

4. Details of participant.
    - Characteristics of participant are the mother or the female guardian in Laputta Township, Myanmar.

    4.1. Inclusion criteria

    . Household who stay at the current home place for more than three months

    . Household who have at least one child of less than 5

    . Household who are willing to participate

    4.2. Exclusion criteria

    . Household who do not want to participate

    - Number of participants needed is 422.
    - One village tract is purposively selected and from that village tract, six villages will be chosen by simple random method. From these villages, household will be selected by inclusion and exclusion criteria. From each household, the interviewee will be the mother or the female guardian. If the required sample is not enough, get another village by simple random sampling. In one village tract, there are about 20 villages and in one village, there are about 100 households. The names of the six villages are Yae Cho Kan, Thin Baw Kwin, Aung Hlaing Kone, Mingalar Thaung Tan, Kwin Ma Gyi and Chan Thar Kone.

5. The three assistant researchers who are health assistants from health center of Laputta Township, Myanmar will recruit and they have already known proper technique to approach participants. It will take about 30-40 minutes for each subject during the face to face interview. During the interview, the household condition of the houses will be observed such as physical appearance of water, management of solid and liquid waste disposal as opened or closed at household level. Information will be kept confidential and the presentation of research result will be in an overall picture only.

6. Process of providing information which also be stated in the proposal.
   6.1. Researcher and three assistant researchers will provide information to potential participants.

7. You will have no risk when taking part in this research. The research will provide the baseline information of knowledge, perception and practices about household waste disposal and diarrhea occurrence in Laputta Township. Further research can be done depending on the data in this research.

8. Your participation in this research is voluntary and you have the right to refuse this participation or to withdraw at any given time with no harm on your benefit and there will be no adverse impact on you.

9. If you have any question or if you would like to obtain more information, the researcher is available at all time. If the researcher has a piece of new information regarding the benefit or the risk/harm, the participant will be immediately informed. This practice will provide an opportunity for you to decide whether to stay in/to leave the research. (The only exception is when there is only one-time interview and it is not possible to contact the same participants later on).

10. Information includes the following clause "Information that is directly related to you will be kept confidential. Results of the study will be reported as an overall statement with anonymity.

11. There is no payment or compensation for participation in this study.

12. If the researcher does not treat you as stated in the patient's information sheet, you can report to the Ethical Review Committee for Research Involving Human Research Subjects, Health Sciences Group, Chulalongkorn University (ECCU). Institute Building 2, 4th Floor, Soi Chulalongkorn 62, Phyathai Rd., Bangkok 10330, Thailand, Tel: 0-2218-8147 Fax: 0-2218-8147 E-mail: eccu@chula.ac.th

# APPENDIX B

## Informed Consent Form

Address……..…….

Date ……..……..

**Code number of participant** ……

I who have signed here below agree to participate in this research project.

**Title: "Household waste disposal: Knowledge, Perception, Practices and relationship with diarrhea frequency in Laputta Township in Myanmar"**

**Principle researcher's name** ……Mr. Ye Paing Kyi…….……...……

**Contact address** …521/3-4, Soi Sriayuthaya 2-4, Sriayuthaya Road, Prayatai District, Rajthavee, Bangkok 10400…….…….

**Telephone** ……0885204820…….……

I have (**read or been informed**) about the rationale and objective(s) of the research project, about what I will engage in details, about the risk/ham and the benefit of this research project. The researcher has explained to me and I **clearly understand with satisfaction.**

I willingly **agree** to participate in this project and allow the researcher to ask a series of questions in this structured face to face interview which covers general information, living and working condition, knowledge, belief, value and feeling about household waste disposal, disposal practices and diarrhea occurrence.

I have **the right** to withdraw from this research project at any time as I wish without any clarification. This withdrawal **will not have any negative impact upon me** (for instance, health care services are still received as usual).

The researcher has confirmed that the procedure(s) will be exactly the same as indicated in the information sheet. Any personal information will be **kept confidential**. Results of the study will be reported as an overall statement with anonymity.

**If I am not treated as indicated in the information sheet**, I can report to the Ethical Review Committee for Research Involving Human Research Subjects, Health Sciences Group, Chulalongkorn University (ECCU). Institute Building 2, 4 Floor, Soi Chulalongkorn 62, Phyathai Rd., Bangkok 10330, Thailand, Tel: 0-2218-8147 Fax: 0-2218-8147 E-mail: eccu@chula.ac.th

I have also received a copy of information sheet and an informed consent form.

Sign ……..……
(……Mr. Ye Paing Kyi..……)
Researcher

Sign ……..……
(……..……)
Participant

Sign ……..……
(……..……)
Witness

# APPENDIX C

## Questionnaire

**Questionnaire for knowledge, perception and practices on household waste disposal and diarrhea in Laputta Township in Myanmar. This questionnaire is to be answered by the mother or other female guardian.**

**Household Identify No. _____ Interviewer _____**

**Date _____/_____/_____**

**NOTE: Diarrhea is the condition of having three or more loose or liquid** bowel movements **per day.**

**Part A: Household census (list everybody in the household)**

| No. | Name | Age | Sex | Position in household | Diarrhea in last one month? | | If yes, was diarrhea diagnosed by a doctor? | |
|---|---|---|---|---|---|---|---|---|
| | | | | | YES | NO | YES | NO |
| 1. | | | | | | | | |
| 2. | | | | | | | | |
| 3. | | | | | | | | |
| 4. | | | | | | | | |
| 5. | | | | | | | | |
| 6. | | | | | | | | |
| 7. | | | | | | | | |
| 8. | | | | | | | | |
| 9. | | | | | | | | |
| 10. | | | | | | | | |

**Part B: General information and household information**

1. How old are you now?

---------- Years

2. Gender:

1. [ ] Male 2. [ ] Female

3. Marital status:

1. [ ] married 4. [ ] single
2. [ ] separated 5. [ ] widowed
3. [ ] divorced 6. [ ] others (specify) ----------

4. Education status:

1. [ ] illiterate
2. [ ] primary education (1-4 years of school)
3. [ ] secondary education (5-8 years of school)
4. [ ] high school level (9-10 years of school)
5. [ ] higher education (university)
6. [ ] others (specify) ----------

5. Current occupation (you may check more than one):

1. [ ] housewife 4. [ ] laborer
2. [ ] farmer 5. [ ] construction worker
3. [ ] general worker 6. [ ] others (please specify) ----------

6. How long have you been living in current location?

---------- Years ---------- Months

7. What is your average monthly household income?

---------- (kyat)

8. Which kind of house do you live currently?

1. [ ] Rent house with one family (single-family house)
2. [ ] Partitioned shared room provided by the employers
3. [ ] others (please specify) ----------

9. How many people are staying in your house?

----------

10. How many rooms are there in your house (counting bathroom)?

----------

11. Do you have latrine?

1. [ ] Yes 2. [ ] No (If no, answer question no. 14)

12. What kind of toilet do you have?

1. [ ] indoor toilet 2. [ ] outdoor toilet

13. What type of latrine are you using?

1. [ ] Swan neck latrine
2. [ ] Pour-flash latrine
3. [ ] Pit latrine
4. [ ] No latrine
5. [ ] Others (please specify) ----------

14. What is the main source of drinking water used in your household (please check only one)?

1. [ ] bottle water
2. [ ] tap water
3. [ ] well water
4. [ ] river water
5. [ ] rain water
6. [ ] vending water
7. [ ] Others (please specify) ----------

15. What is the main kind of drinking water container used in your household? Check only one.

1. [ ] open container
2. [ ] closed container
3. [ ] no container

16. Do you have trash bin in your house?

1. [ ] Yes 2. [ ] No (If no, answer question no.20)

17. How many trash bins/garbage containers are there in your house?

---

18. What kinds of trash bins/garbage containers do you use in your house (you may check more than one)?

1. [ ] with wide lids (cover)
2. [ ] with narrow lids (cover)
3. [ ] without lids (without cover)

19. Each week, about how often do you empty your trash bins? Or how often do you throw away trash from trash bins (please check only one)?

1. [ ] everyday
2. [ ] every two days
3. [ ] about twice per week
4. [ ] about once per week
5. [ ] less than once per week

20. Do you use any method to control house flies in your house?

1. [ ] Yes 2. [ ] No

21. Does the municipality collect all of your household waste?

1. [ ] Yes 2. [ ] No

22. If no, about what percentage of household waste does municipality collect?

---------- %

23. Each week, about how often does municipality come and collect household waste (please check only one)?

1. [ ] every two days or more often
2. [ ] every three days
3. [ ] about twice per week
4. [ ] about once per week
5. [ ] less than once per week

24. How do you throw household wastes that are not collected by municipality?

1. [ ] put them into the stockpile
2. [ ] wait until municipality come and collect
3. [ ] others (please specify) ----------

25. Is there a stockpile of garbage near your house?

1. [ ] Yes 2. [ ] No

26. What kinds of the household wastes are mostly produced from your house (you may check more than one)?

| | Kinds of household waste | YES | NO |
|---|---|---|---|
| 1. | Kitchen waste (food waste) | | |
| 2. | Broken glass and bottle | | |
| 3. | Unused paper | | |
| 4. | Old plastic bags and bottles | | |
| 5. | Toilet waste that you throw away | | |

27. Do you ever store pesticides or herbicides in your house?

1. [ ] Yes 2. [ ] No

**Part C: Knowledge towards the household waste disposal**

| | Statement | True | False | Not sure |
|---|---|---|---|---|
| 1. | Waste paper, cloths and nappies, a piece of metal and wood, plastic bottles are rubbish. | | | |
| 2. | Kitchen waste – left over food, vegetables and fruits are garbage. | | | |
| 3. | Household waste is one of the problems that polluted solid, water and air. | | | |
| 4. | Burning waste is not the best way in reducing household waste. | | | |
| 5. | Throwing uncollected household waste into the outdoor stockpile is not good. | | | |
| 6. | Plastic bags and plastic bottles cannot be degraded naturally. | | | |
| 7. | Food waste (kitchen waste) is a source for growing germs in the household. | | | |
| 8. | Reusing plastic bag, bottle and paper can reduce waste and solve natural sources. | | | |
| 9. | Every kind of waste can be disposed by burning without effect to the environment. | | | |

| | | | | |
|---|---|---|---|---|
| 10. | Toilet waste which is left exposed can cause spreading of diseases. | | | |
| 11. | I am aware of the benefits of household waste management. | | | |

**Part D: Perception towards the household waste disposal**

**Instruction** Please mark in the box for your opinion about attitude of household waste disposal. How do you think about following?

Strongly agree = SA

Agree = A

Uncertain = UN

Disagree = D

Strongly disagree = SD

| | **Statement** | **SD** | **D** | **UN** | **A** | **SA** |
|---|---|---|---|---|---|---|
| **1.** | Waste is anything without value and one of the environmental problems that need to be solved rapidly. | | | | | |
| **2.** | I think proper disposal of household waste can prevent the environmental impact on land and water. | | | | | |
| **3.** | I think keeping household waste into the trash bins properly is the responsibility of everybody in household. | | | | | |
| **4.** | Practice of proper household waste disposal is important for me. | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **5.** | Reducing household waste by reusing and recycling is important for me. | | | | | |
| **6.** | Selling waste which can be recycled is important for reducing household waste. | | | | | |
| **7.** | Taking old plastic bags shopping, rather than using new ones is good for reducing the household waste. | | | | | |
| **8.** | Use of packaging that can be easily reused is time saving. | | | | | |
| **9.** | Making the old plastic bottles into drinking water bottles is necessary for me. | | | | | |
| **10.** | Practice of hand washing after handling with contaminated materials is important for me. | | | | | |
| **11.** | Proper disposal of toilet waste including child's stool is important in preventing water-borne diseases. | | | | | |

**Part E: Practice towards the household waste management**

**Instruction** Please mark in the box that you think is the most correct.

| | Statement | Always | Sometimes | Often | Seldom | Never |
|---|---|---|---|---|---|---|
| **1.** | I have enough trash bins in my household. | | | | | |
| **2.** | I throw away household waste in the trash bins properly. | | | | | |
| **3.** | I keep the trash bins in the house covered with lids. | | | | | |
| **4.** | I keep my kitchen safely by cleaning the kitchen properly. | | | | | |
| **5.** | I collect household waste in a bag before disposing it. | | | | | |
| **6.** | I throw waste that is not collected by municipality into the outdoor stockpile near my house. | | | | | |
| **7.** | I collect and sell recyclable waste to reduce waste by recycling. | | | | | |
| **8.** | I reuse the old paper waste rather than buying new for | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | reducing the household waste. | | | | | |
| **9.** | I keep my toilet clean and removed toilet waste properly. | | | | | |
| **10.** | I do hand washing thoroughly before eating, preparing food, after defecation and after cleaning child's contaminated materials. | | | | | |
| **11.** | I give my family member advices how to manage household wastes properly. | | | | | |

**Part F: Observation list for interviewer to complete**

1. Physical appearance of water: ----------
2. Solid and liquid waste disposal: ----------
3. Is the distance of drinking water source from water pollution source (waste water/ pit latrine/septic tank/solid waste landfill) less than 10 meters?

   1. [ ] Yes  2. [ ] No

# APPENDIX D

**Table 14: Frequency and percentage of respondents who answered true, false and not sure to each question about knowledge towards household waste disposal (n=389)**

| No. | Statement | Frequency (Percentage) | | |
|---|---|---|---|---|
| | | True | False | Not sure |
| 1. | Waste paper, cloths and nappies, a piece of metal and wood, plastic bottles are rubbish. | 369 (94.9) | 16 (4.1) | 4 (1.0) |
| 2. | Kitchen waste – left over food, vegetables and fruits are garbage. | 305 (78.4) | 83 (21.3) | 1 (0.3) |
| 3. | Household waste is one of the problems that polluted solid, water and air. | 366 (94.1) | 13 (3.3) | 10 (2.6) |
| 4. | Burning waste is not the best way in reducing household waste. | 163 (41.9) | 199 (51.2) | 27 (6.9) |
| 5. | Throwing uncollected household waste into the outdoor stockpile is not good. | 91 (23.4) | 193 (49.6) | 105 (27.0) |

| | | | | |
|---|---|---|---|---|
| 6. | Plastic bags and plastic bottles cannot be degraded naturally. | 271 (69.7) | 68 (17.5) | 50 (12.8) |
| 7. | Food waste (kitchen waste) is a source for growing germs in the household. | 381 (97.9) | 6 (1.5) | 2 (0.6) |
| 8. | Reusing plastic bag, bottle and paper can reduce waste and solve natural sources. | 324 (83.3) | 40 (10.3) | 25 (6.4) |
| 9.* | Every kind of waste can be disposed by burning without effect to the environment. | 199 (51.2) | 166 (42.7) | 24 (6.1) |
| 10. | Toilet waste which is left exposed can cause spreading of diseases. | 376 (96.6) | 12 (3.1) | 1 (0.3) |
| 11. | I am aware of the benefits of household waste management. | 379 (97.4) | 3 (0.8) | 7 (1.8) |

*** Negative Statement**

**Table 15: Frequency and percentage towards respondents' perception towards household waste disposal (n=389)**

| No | Statement | Frequency (Percentage) | | | | |
|---|---|---|---|---|---|---|
| | | SD | D | UN | A | SA |
| 1. | Waste is anything without value and one of the environmental problems that need to be solved rapidly. | 5 (1.3) | 3 (0.8) | 2 (0.5) | 169 (43.4) | 210 (54.0) |
| 2. | I think proper disposal of household waste can prevent the environmental impact on land and water. | 2 (0.5) | 4 (1.0) | 1 (0.3) | 204 (52.4) | 178 (45.8) |
| 3. | I think keeping household waste into the trash bins properly is the responsibility of everybody in household. | 3 (0.8) | 2 (0.5) | 0 (0.0) | 212 (54.5) | 172 (44.2) |
| 4. | Practice of proper household waste disposal is important for me. | 2 (0.5) | 3 (0.8) | 3 (0.8) | 204 (52.4) | 177 (45.5) |

| | | | | | | |
|---|---|---|---|---|---|---|
| 5. | Reducing household waste by reusing and recycling is important for me. | 10 (2.6) | 51 (13.1) | 49 (12.6) | 207 (53.2) | 72 (18.5) |
| 6. | Selling waste which can be recycled is important for reducing household waste. | 37 (9.5) | 30 (7.7) | 88 (22.6) | 182 (46.8) | 52 (13.4) |
| 7. | Taking old plastic bags shopping, rather than using new ones is good for reducing the household waste. | 8 (2.1) | 25 (6.4) | 104 (26.7) | 194 (49.9) | 58 (14.9) |
| 8. | Use of packaging that can be easily reused is time saving. | 3 (0.8) | 24 (62.0) | 89 (22.9) | 214 (55.0) | 59 (15.1) |
| 9. | Making the old plastic bottles into drinking water bottles is necessary for me. | 43 (11.1) | 46 (11.8) | 74 (19.0) | 172 (44.2) | 54 (13.9) |
| 10. | Practice of hand washing after handling with contaminated materials is | 4 (1.1) | 0 (0.0) | 0 (0.0) | 167 (42.9) | 218 (56.0) |

| | | | | | |
|---|---|---|---|---|---|
| | important for me. | | | | |
| 11. | Proper disposal of toilet waste including child's stool is important in preventing water-borne diseases. | 3 (0.8) | 1 (0.3) | 0 (0.0) | 143 (36.8) | 242 (62.1) |

**SD=strongly disagree, D=disagree, UN=uncertain, A=agree, SA=strongly agree**

**Table 16: Frequency and percentage of practices of the respondents regarding household waste disposal (n=389)**

| No. | Statement | Frequency | Percentage |
|---|---|---|---|
| 1. | **I have enough trash bins in my household.** | | |
| | Always | 183 | 47.1 |
| | Sometimes | 123 | 31.6 |
| | Never | 83 | 21.3 |
| 2. | **I throw away household waste in the trash bins properly.** | | |
| | Always | 167 | 42.9 |
| | Sometimes | 187 | 48.1 |
| | Never | 35 | 9.0 |
| 3. | **I keep the trash bins in the house covered with lids.** | | |
| | Always | 166 | 42.7 |
| | Sometimes | 118 | 30.3 |
| | Never | 105 | 27.0 |

| | | | |
|---|---|---|---|
| 4. | **I keep my kitchen safely by cleaning the kitchen properly.** | | |
| | Always | 196 | 50.4 |
| | Sometimes | 176 | 45.2 |
| | Never | 17 | 4.4 |
| 5. | **I collect household waste in a bag before disposing it.** | | |
| | Always | 116 | 29.8 |
| | Sometimes | 205 | 52.7 |
| | Never | 68 | 17.5 |
| 6.* | **I throw waste that is not collected by municipality into the outdoor stockpile near my house.** | | |
| | Always | 105 | 27.0 |
| | Sometimes | 252 | 64.8 |
| | Never | 32 | 8.2 |
| 7. | **I collect and sell recyclable waste to reduce waste by recycling.** | | |
| | Always | 49 | 12.6 |
| | Sometimes | 205 | 52.7 |
| | Never | 135 | 34.7 |
| 8. | **I reuse the old paper waste rather than buying new for reducing the household waste.** | | |
| | Always | 85 | 21.9 |
| | Sometimes | 236 | 60.7 |
| | Never | 68 | 17.4 |

| | | | |
|---|---|---|---|
| 9. | **I keep my toilet clean and removed toilet waste properly.** | | |
| | Always | 278 | 71.5 |
| | Sometimes | 90 | 23.1 |
| | Never | 21 | 5.4 |
| 10. | **I do hand washing thoroughly before eating, preparing food, after defecation and after cleaning child's contaminated materials.** | | |
| | Always | 317 | 81.5 |
| | Sometimes | 70 | 18.0 |
| | Never | 2 | 0.5 |
| 11. | **I give my family member advices how to manage household waste properly.** | | |
| | Always | 253 | 65.0 |
| | Sometimes | 126 | 32.4 |
| | Never | 10 | 2.6 |

*** Negative Statement**

# APPENDIX E

## Budget

| No. | Activities | Responsible person | Unit cost (Baht) | Total cost (Baht) |
|---|---|---|---|---|
| 1. | Document Printing | | | |
| | Paper + Printing | Researcher | 5 x 800 | 4,000 |
| | Copy (exam + final submission) | Researcher | 1,000 | 1,000 |
| | | | Subtotal | 5,000 |
| 2. | Data collection | | | |
| | Questionnaires photocopy | Researcher | 5 x 400 | 2,000 |
| | Printing | Researcher | 1,000 | 1,000 |
| | Hiring of interviewers | Interviewers | 3,000 x 4 persons | 12,000 |
| | | | Subtotal | 15,000 |
| 3. | Travelling cost | | | |
| | Travel to study place and back to institute | Researcher | 8,000 | 8,000 |
| | Travel within Myanmar for data collection | Researcher and interviewers | 2,400 x 5 persons | 12,000 |
| | | | Subtotal | 20,000 |
| 4. | Logistic cost (Food and stationary) | Researcher and interviewers | 20,000 | 20,000 |
| | | | Grand Total | 60,000 |

# APPENDIX F

## Time Schedule

| No | Activity | 2010 | | | | | 2011 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May |
| 1. | Literature Review | | | | | | | | | | |
| 2. | Thesis proposal writing | | | | | | | | | | |
| 3. | Submission of proposal exam | | | | | | | | | | |
| 4. | Ethical approval from Chulalongkorn University | | | | | | | | | | |
| 5. | Pretest questionnaires | | | | | | | | | | |
| 6. | Go to the field | | | | | | | | | | |
| 7. | Collection of data | | | | | | | | | | |
| 8. | Analysis of data | | | | | | | | | | |
| 9. | Thesis and report writing | | | | | | | | | | |
| 10. | Final thesis exam | | | | | | | | | | |
| 11. | Submission of thesis | | | | | | | | | | |

# APPENDIX G

## Pictures showing household characteristics (drinking water sources and latrines) and practices on household waste disposal in Laputta Township

**Figure 2: Pictures showing household characteristics (drinking water sources and latrines)**

**Figure3: Pictures showing practices on household waste disposal in Laputta Township**

# VITAE

## PERSONAL DETAILS

Full name: Ye Paing Kyi

Address: Permanent: 32nd street between 83rd & 84th street, Mandalay, Myanmar

Local address: 521/3-4 Soi Sriayuthaya 2-4, Sriayuthaya Road, Payathai District, Rajthavee, Bangkok, Thailand

Mobile: +66885204820

Email: witmonemdy@gmail.com

Nationality: Myanmar

Gender: Male

Date of Birth: May 20th 1986

Marital status: Single

## EDUCATION

- June 2010 to date: Graduate student at College of Public Health Sciences, Chulalongkorn University, Bangkok, Thailand.
- 2002-2008: University of Medicine, Mandalay, Myanmar: M.B.,B.S

## LANGUAGE:

Myanmar : Speaking, writing and understanding-Excellent

English : Speaking, writing and understanding-Good

## EMPLOYMENT HISTORY

July 2009 – February 2010: Medical officer in private hospital in Mandalay, Myanmar