ความสัมพันธ์ด้านสิ่งแวดล้อม ปัจจัยเสี่ยงทางเศรษฐสังคม และการปฏิบัติตัวเพื่อป้องกันไข้เลือดออกต่อการแพร่ระบาดของไข้เลือดออกในค่ายพักชั่วคราวแม่ลา จังหวัดตาก ประเทศไทย

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ASSOCIATION OF ENVIRONMENTAL, SOCIO-ECONOMIC RISK FACTORS AND DENGUE PREVENTIVE PRACTICE RELATED TO DENGUE OUTBREAK IN MAELA TEMPORARY SHELTER IN TAK PROVINCE, THAILAND

MR. THET WIN

A Thesis Submitted in Partial Fulfillment of the Requirements
for the Degree of Master of Public Health Programs in Public Health
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Thesis title	ASSOCIATION OF ENVIRONMENTAL, SOCIO-ECONOMIC RISK FACTORS AND DENGUE PREVENTIVE PRACTICE RELATED TO DENGUE OUTBREAK IN MAELA TEMPORARY SHELTER IN TAK PROVINCE, THAILAND
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เทียต วิน: ความสัมพันธ์ด้านสิ่งแวดล้อม ปัจจัยเสี่ยงทางเศรษฐสังคม และการปฏิบัติตัวเพื่อป้องกันไข้เลือดออกต่อการแพร่ระบาดของไข้เลือดออกในค่ายพักชั่วคราวแม่ลา จังหวัดตาก ประเทศไทย (ASSOCIATION OF ENVIRONMENTAL AND SOCIO-ECONOMIC RISK FACTORS RELATED TO DENGUE OUTBREAK IN MAELA TEMPORARY SHELTER IN TAK PROVINCE, THAILAND) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: อ .ดร.วัฒน์สิทธิ์ ศิริวงศ์, 86 หน้า.

การศึกษาภาคตัดขวาง ณ ค่ายพักชั่วคราวแม่ลา อำเภอท่าสองยาง จังหวัดตาก ประเทศไทย ตั้งแต่กลางเดือนกุมภาพันธ์ถึงสิ้นเดือนมีนาคม พ.ศ. 2554 มีวัตถุประสงค์หลักของการวิจัยเพื่อหาความพันธ์ระหว่างปัจจัยเสี่ยงด้านสิ่งแวดล้อม เศรษฐสังคม และการปฏิบัติตนในการป้องกันการระบาดไข้เลือดออกในปีพ.ศ. 2553 การศึกษานี้มีกลุ่มประชากรตัวอย่างจำนวน 400 ราย โดยใช้แบบสอบถามอย่างมีโครงสร้างในการเก็บข้อมูล

ผลการศึกษาพบว่า ประชากรส่วนใหญ่อาศัยอยู่ในพื้นที่แม่ลามากกว่าสิบปี มีช่วงอายุระหว่าง 15-49 ปี ประกอบด้วยเพศหญิงร้อยละ 64.8 และเพศชายร้อยละ 35.2 สามารถอ่านออกเขียนได้คิดเป็นร้อยละ 37.2 ประชากรร้อยละ 51.5 ว่างงานและรายได้เฉลี่ยต่อครัวเรือนน้อยกว่า 1,000 บาทต่อเดือน คิดเป็นร้อยละ 43 ของจำนวนครัวเรือนทั้งหมด นอกจากนี้พบว่าความสัมพันธ์ระหว่างกลุ่มอายุ ศาสนา อาชีพ แหล่งวางไข่ของยุง การระบายน้ำในครัวเรือน แสงสว่างภายในครัวเรือน และ จำนวนผู้ป่วยไข้เลือดออกอย่างมีนัยสำคัญ ($p<0.05$) การศึกษานี้ชี้ให้เห็นว่าควรมีการปรับปรุงสภาพความเป็นอยู่ของผู้อพยพในค่ายพักชั่วคราว แม่ลา และเพิ่มมาตรการในการป้องกันและควบคุมไข้เลือดออก รวมทั้งให้การศึกษาแก่ประชาชนในค่ายพักแห่งนี้ต่อไปในอนาคต

สาขาวิชา .....สาธารณสุขศาสตร์..... ลายมือชื่อนิสิต.....

ปีการศึกษา.....2553..... ลายมือชื่อ อ.ที่ปรึกษาวิทยานิพนธ์หลัก.....

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SCIO-ECONOMIC / RISK FACTORS / DENGUE OUTBREAK / MAE LA TEMPORARY SHELTER/ TAK PROVINCE / THAILAND

THET WIN: ASSOCIATION OF ENVIRONMENTAL, SOCIO-ECONOMIC RISK FACTORS AND DENGUE PREVENTIVE PRACTICE RELATED TO DENGUE OUTBREAK IN MAELA TEMPORARY SHELTER IN TAK PROVINCE, THAILAND.
ADVISOR: WATTASIT SIRIWONG, Ph.D., 86 pp

A cross-sectional study was carried out in Mae La Temporary Shelter, Tha Saung Yan District, Tak Province, Thailand from the mid of February to the end of March, 2011 with the purpose of investigating the association between environmental, socio-economic risk factors & dengue prevention practice with 2010 Mae La dengue outbreak. This study was conducted with 400 participants by using a structured interview questionnaire.

The result showed the majority of the respondents stayed in Mae La for more than 10 years. The age group was in the range of 15-49 years. Of 64.8% were females and 35.2% were men. Some of them (37.2%) were illiterate. And 51.5% were jobless and 43% of families had household income of less than 1,000 THB/month. The result revealed that age group, religion, occupational status, mosquito breeding places, household drainage condition and lighting condition of households were significantly associated to Dengue patients ($p<0.05$). The study results suggested that living condition of refugees in Mae La temporary shelter need to be strengthened for preventing and controlling of dengue and it needs to be included more education for people in this area in the future.

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

Academic Year: .....2010..... ... Advisor's Signature.....

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LIST OF ABBREVIATIONS

CBO	Community Based Organization
CFR	Case Fatality Rate
COERR	Catholic Office for Emergency Relief and Refugees
DALY	Disability-Adjusted Life Years
DF	Dengue Fever
DHF	Dengue Haemorrhagic fever
DSS	Dengue Shock Syndrome
IgM	Immunoglobulin M
ITN	Insecticide Treated Bed Net
ML	Mae La
NGO	Non government organization
TBBC	Thailand-Burma Border Consortium
THB	Thai Bath
U5	Under 5 years
U15	Under 15 years
UNHCR	United Nations High Commissioner for Refugees

CHAPTER I

INTRODUCTION

1.1 Background and Rationale

Of 15.2 million refugees worldwide, approximately one third live in temporary shelters known as refugee camps protected by UNHCR and supported by international non-government organizations (UNHCR, 2009). These refugees often live in crowded conditions and have contact with populations from the host country and the country of origin, where public health infrastructure and surveillance system is poor (Ezard, 2006).

Refugee camps are exceptionally vulnerable to communicable diseases including vector born diseases like Dengue Fever outbreaks because of constrained resources, poor sanitation infrastructure, overcrowding, transitory populations, and poor nutritional status of inhabitants (Charly, 2005).

Refugee Situation in Thailand and Mae La Temporary Shelter

Approximately 150,000 refugees from Myanmar are housed in several camps on the Thailand–Myanmar border. Mae La Temporary Shelter (ML) was located in Tha Song Yang District, Tak Province of Thailand. It is the largest among 9 Thailand-Myanmar border refugee camps, with housed refugee population about 44,000 in a 4 km^2 area (Turner, 2010). It is located in the hills adjoining the Myanmar border; 500 km northwest of Bangkok and has been in operation since 1984. Majority of refugees in ML are Karen ethnic group but all other ethnic groups like Kachin, Burma, Shan, Muslim, etc. are also residing in ML. For health care services of these refugees, primary health and sanitation services are provided by nongovernmental organizations like Aide Médicale Internationale (AMI), Solidarités, COERR, etc. A field hospital with an inpatient area and two outpatient clinics provide free healthcare to the camp's population, who do not have access to healthcare facilities outside of the camp (TBBC website).

Outbreak of Dengue in Mae La Temporary Shelter

Mae La was facing outbreaks of communicable diseases including Dengue most of the time because of its geographical contexture as well as population dynamic. But the trend of Dengue outbreaks in ML was changing pattern from sporadic then to epidemic and finally endemic during year 2010. The outbreak of Dengue was started during rainy season, mid of June 2009. Altogether 205 Dengue cases were reported in 2009 with overall attack rate of 4.7 per 1,000 refugee populations. All cases of Dengue were diagnosed by clinical methods and confirmed with rapid Dengue test kits.

Again AMI Dengue situational report for Mae La Temporary Shelter on May 2010 stated that altogether 209 Dengue cases were reported from beginning of 2010 until end of May 2010 with overall attack rate of 6.2/ 1,000 refugee population and 1% CFR. Reviewing age specific AR, it was highest in >50 years age group (50.9) followed by >15 -50 years age group (3.6), 5-15 years age group (2.5) and < 5 years age group (1.4) respectfully (AMI, May 2010).

In spite of control and preventive measures by NGOs, 2009 Dengue outbreak was continuing to year 2010 with total reported number of 549 insider (refugee) cases until end of October 2010, attack rate of 12.6 /1,000 targeted population. Moreover there reported 4 deaths due to Dengue Shock Syndrome (DSS). (AMI, Oct 2010)

For diagnosis aspect, case definition criteria were adopted from Guideline of Diseases Surveillance in Displaces Persons Camps Thai-Myanmar border Thailand 2008. All reported Dengue cases were hospitalized for clinical management. Cases received treatment at camp hospital according to AMI protocol. Very severe cases were refereed to Thai Hospital for further interventions and there was 4 case fatalities (including two under 5 deaths).

Regarding control measures for this Dengue outbreak, case investigations were conducted at each case's household and suspected cases from active case finding process were rapidly referred to health facility. Outbreak control activities were instigated by mobile teams comprising home visitors and logisticians. These teams undertook the following activities:

- Fumigation of case households and 10 surrounding households.
- Distribution of health education and hygiene promotion messages

Regarding vector control at camp level; larva treatment (sand abate distribution), camp wide periodic fumigation and bed net distribution were done. (AMI, July 2010)

Despite the above stated outbreak control efforts, cases of Dengue were continuing until end of October 2010. An epidemiological study (on environmental and socio-economic factors) that provides evidence-based recommendations is needed to support the outbreak response, prevention and control measures for further Dengue outbreaks and find out the most possible ways to prevent immature preventable dead.

1.2 Research questions

1) Which environmental risk factors are associated with Dengue outbreak in Mae La Temporary Shelter, Tha Song Yang District, Tak Province, Thailand?

2) Which socio-economic risk factors are associated with Dengue outbreak in Mae La Temporary Shelter, Tha Song Yang District, Tak Province, Thailand?

3) Which Dengue preventive practices are associated with Dengue outbreak in Mae La Temporary Shelter, Tha Song Yang District, Tak Province, Thailand?

1.3 Research Objectives

1.3.1 General Objectives

- To investigate the association among environmental, socio-economic risk factors and Dengue prevention practice with Dengue outbreak in Mae La Temporary Shelter.

1.3.2 Specific Objectives

- To investigate environmental risk factors in Dengue outbreak at Mae La Temporary Shelter Tha Song Yang District, Tak Province, Thailand.
- To investigate socio-economic risk factors in Dengue outbreak at Mae La Temporary Shelter Tha Song Yang District, Tak Province, Thailand.
- To investigate Dengue prevention practice of refugees during Dengue outbreak at Mae La Temporary Shelter Tha Song Yang District, Tak Province, Thailand.
- To investigate the association between environmental, socio-economic risk factors and Dengue prevention practice with 2010 Dengue outbreak among all sex, ethnic groups of refuges who resided more than 6 months in Mae La Temporary Shelter, Tha Song Yang District, Tak Province, Thailand.

1.3 Research Hypotheses

Ho1 - There is no association between the socio-economic and environmental risk factors with Dengue outbreak in Mae La Temporary Shelter.

Ha1 - There is an association between the socio-economic and environmental risk factors with Dengue outbreak in Mae La Temporary Shelter.

Ho2 - There is no association between the Dengue prevention practices of refugees with Dengue outbreak in Mae La Temporary Shelter.

Ha2 - There is an association between the Dengue prevention practices of refugees with Dengue outbreak in Mae La Temporary Shelter.

1.5 Variables of the study

- Independent variables
  - Socio-economic risk factors
    - Age

    - Sex
    - Ethnic group
    - Educational status
    - Occupational status
    - History of travelling outside the camp
    - Monthly income per household
    - Arrival duration in the camp
    - Number of household members
    - Number of household members who are less than 15 years old
    - Number of Dengue infected patient in the household
- Environmental risk factors
    - Lighting condition of the household
    - Drainage system of the household
    - Presence of mosquito breeding places or containers inside and around the household
- Practice for Prevention of Dengue
    - Number of Health Education received during 2010
    - Number of covered water containers in the household
    - Frequency of irrigation of water containers
    - Number of sand abate received during 2010
    - Frequency of sand abate utilization
    - Number of bed net and ITN in the household
    - Use of mosquito nets during sleeping
    - Use of protective measures for prevention of mosquito bite

- Dependent variable
    - Dengue patient

1.6 Operational definitions

- *Suspected case of Dengue Fever* refers to acute onset of fever (less than 7 days) with at least two of the following: headache, pain behind the eyes, myalgia and arthralgia (severe body pain), hemorrhagic signs (purpuric rash, vomiting with blood, cough with blood, blood in stool, epistaxis) including positive tournique test, from 1st Jan 2010 to 31st Oct 2010, for those who lived in MaeLa Temporary Shelter in Tha Song Yang district, Tak province, Thailand. (MOPH, 2008)
- *Confirmed case of Dengue Fever* refers to patient who had above mentioned signs and symptoms with lab confirmed Dengue Antibody (IgM-positive ± IgG positive) by rapid Dengue test kits. (MOPH, 2008)
- *Refugees* mean people who live inside Mae La Temporary Shelter for at least 6 months duration.
- *Household* means a physical structure where a group of people are living with sharing the same cooking facilities on a day-to-day basis.
- *Age* refers to current age of the individual at the time of interview.
- *Sex* refers to gender of the individual.
- *Ethnic* refers to ethnicity of all or major proportion of the household members.
- *Education* means the highest level of education attained during the time of interview.
- *Occupation* means the main work or job performed during past 1 year.
- *Monthly income per household* means total monthly income earned by all family members.
- *Traveling outside history* means those who go out the camp 2 weeks prior onset of illness.
- *Arrival duration* means the time period for staying in Mae La Temporary Shelter since the individual first arrived to Mae La.
- *Number of household members* means the total number of family members who live together in the same household or shelter.

- *Number of under 15 years household members* means the total number of family members who live together in the same household or shelter with the age of below 15 years at the time of interview.
- *Number of Dengue patient in the household* means the total number of patient who infected with Dengue infection during 2010 and lives together in the same household or shelter
- *Environment* means all external conditions and influences, affecting the life and development of man whether physical, chemical, biological, or social. It consists of very basic elements; the *air* we breathe, the *water* we drink, the *food* we eat, the *climate* surrounding our bodies, and the *space* available for our movements.(Park, 1991)
- *Environmental risk factors* means characteristics in a person's surroundings that increase their likelihood of getting Dengue infection; poor lighting, poor drainage system, places or objects favoring breeding of mosquito larva, etc.
- *Good lighting condition* means there was sufficient natural light and no need to use artificial light for reading book clearly inside the house during day time.
- *Moderate lighting condition* means there was sufficient natural light but need to pay some attention for reading book clearly inside the house during day time.
- *Poor lighting condition* means there was no sufficient natural light and need to use artificial light for reading book clearly inside the house during day time.
- *Good drainage condition* means there was a way to drain well of all domestic used water and no water pooled or stagnant inside the household and it's compound.
- *Moderate drainage condition* means there was a way to drain for all domestic used water but some amount of water were pooled or stagnant inside the household and its compound.
- *Poor drainage condition* means there was no way to drain well of all domestic used water and water pooled and stagnant inside the household and it's compound.

- *Mosquito breeding containers or places* means any object or nature of the land which can accept water for a reasonable period to breed mosquito larva.
- *Irrigation of water containers* means change of stored water from the household water containers for domestic use.
- *Number of health education* means total number of heath education related to Dengue received from NGO's at house hold level or with campaign regarding Dengue prevention during 2010.
- *Number of covered water containers* means total number of water container(s) in the household for domestic usage which are covered tight.
- *Frequency of irrigation of water containers* means frequency for irrigation of water from stored water container(s) since 1st Jan 2010 until at the time of interview.
- *Number of sand abate received* means total number of sand abate received from NGO's since during 2010.
- *Frequency of sand abate utilization* means frequency of putting sand abate into water containers at the household level during 2010.
- *Number of bed net and ITN in the household* means total number of bed net and insecticide treated net occupied at the household during 2010.
- *Use of mosquito net* means frequency and patterns of using mosquito net while sleeping.
- *Use of protective measure for mosquito bite* means types and frequency of using personal protective measures (physical as well as chemical) for preventing mosquito bite.

1.7 Conceptual Framework

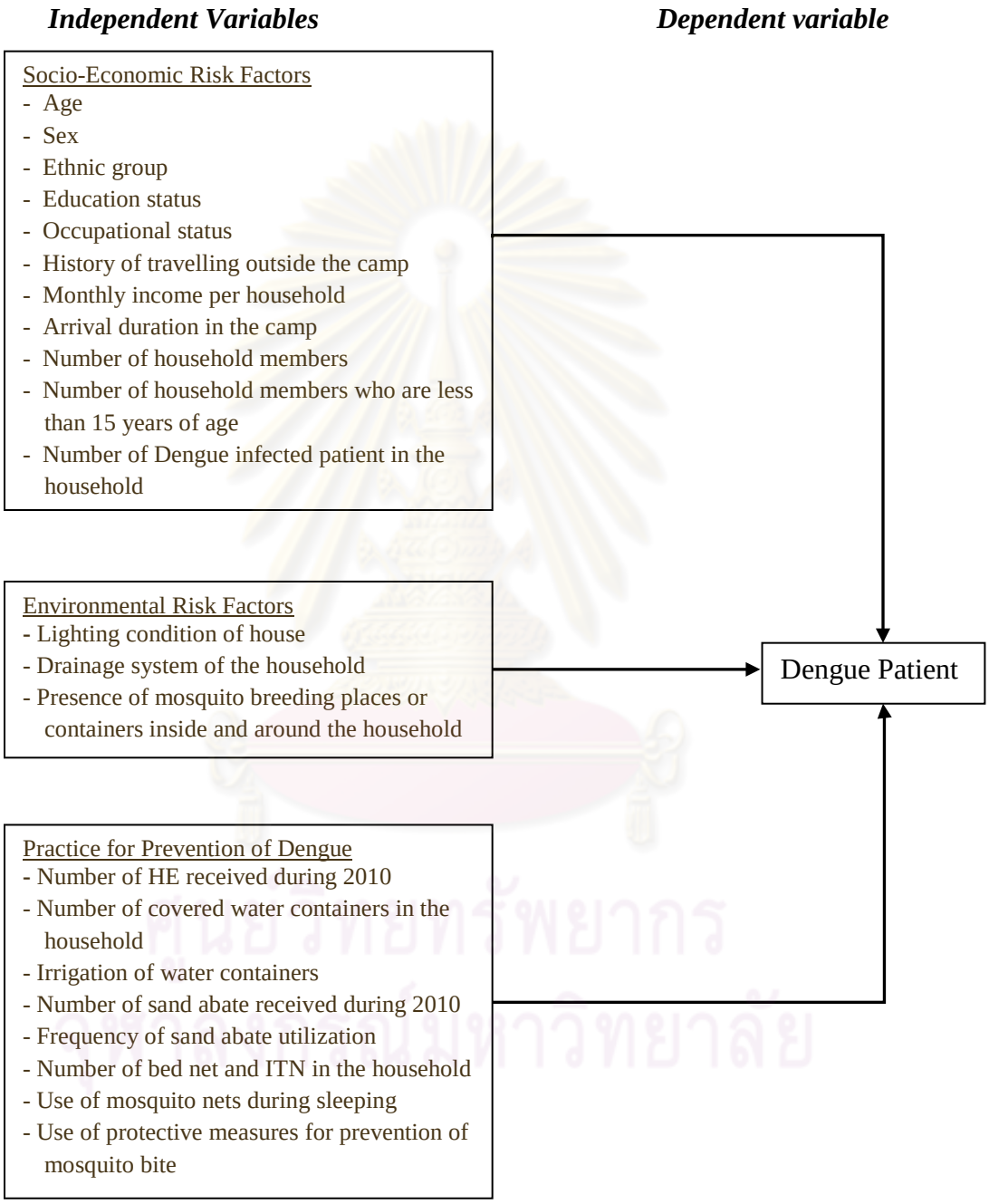

Figure 1: Conceptual Framework

CHAPTER II

LITERATURE REVIEW

2.1 Overview of Dengue

Dengue fever (DF) is an acute febrile viral disease caused by Dengue virus serotypes 1 – 4, frequently presenting with headaches, bone or joint and muscular pains, rash and leukopenia as symptoms. Dengue haemorrhagic fever is characterized by four major clinical manifestations: high fever, haemorrhagic phenomena, often with hepatomegaly and, in severe cases, signs of circulatory failure. Such patients may develop hypovolaemic shock resulting from plasma leakage. This is called Dengue shock syndrome (DSS) and can be fatal.

2.2 Epidemiology of Dengue

Dengue is the rapidly spreading mosquito-borne viral disease in the world. In the last 50 years, incidence has increased 30-fold with increasing geographic expansion to new countries and, in the present decade, from urban to rural settings.

An estimated 50 million Dengue infections occur annually and approximately 2.5 billion people live in Dengue endemic countries. The 2005 World Health Assembly resolution WHA 58.3 on the revision of the International Health Regulations (IHR), which includes Dengue as an example of a disease that may constitute a public health emergency of international concern with implications for health security due to disruption and rapid epidemic spread beyond national borders.

2.2.1 Dengue in Asia and the Pacific

Some 1.8 billion (more than 70%) of the population at risk for Dengue worldwide live in member states of the WHO South-East Asia Region and Western Pacific Region, which bear nearly 75% of the current global disease burden due to Dengue.

Since 2000, epidemic Dengue has spread to new areas and has increased in the already affected areas of the region. In 2003, eight countries - Bangladesh, India, Indonesia, Maldives, Myanmar, Sri Lanka, Thailand and Timor-Leste - reported Dengue cases. Epidemic Dengue is a major public health problem in Indonesia, Myanmar, Sri Lanka, Thailand and Timor-Leste which are in the tropical monsoon and equatorial zone where *Aedes aegypti* is widespread in both urban and rural areas, where multiple virus serotypes are circulating, and where Dengue is a leading cause of hospitalization and death in children. Reported case fatality rates for the region are approximately 1%, but in India, Indonesia and Myanmar, focal outbreaks away from the urban areas have reported case-fatality rates of 3-5%.

2.2.1.1 Dengue in Myanmar

In Myanmar in 2007 the states/divisions that reported the highest number of cases were Ayayarwaddy, Kayin, Magway, Mandalay, Mon, Rakhine, Sagaing, Tanintharyi and Yangon. From January to September 2007, Myanmar reported 9578 cases. The reported case-fatality rate in Myanmar is slightly above 1%.

2.2.1.2 Dengue in Thailand

In Thailand, Dengue is reported from all four regions: Northern, Central, North-Eastern and Southern. In June 2007, outbreaks were reported from Trat province, Bangkok, Chiangrai, Phetchabun, Phitsanulok, Khamkaeng Phet, Nakhon Sawan and Phit Chit. A total of 58 836 cases were reported from January to November 2007. The case-fatality rate in Thailand is below 0.2%. (WHO-TDR, 2009)

Figure 2: Countries/areas at risk of Dengue transmission, 2008 (WHO-TDR, 2009)

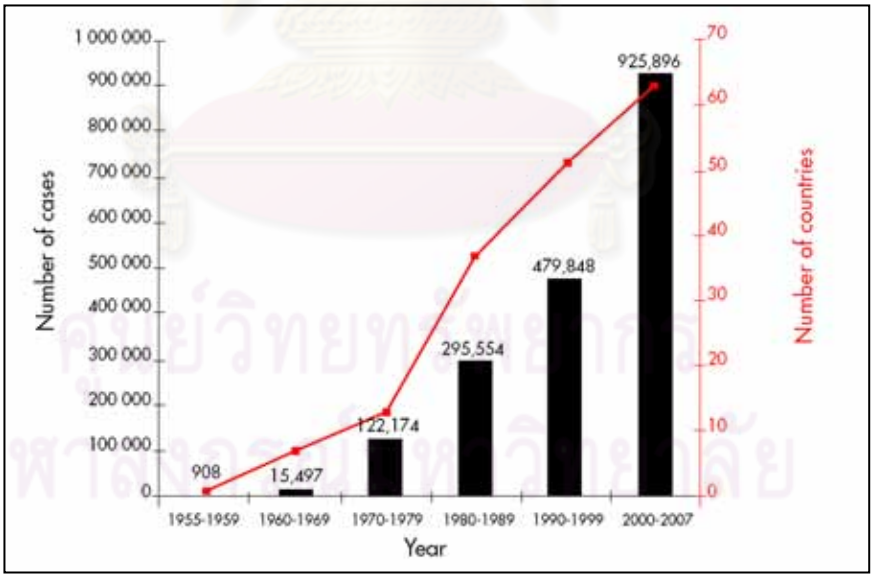

Figure 3: Average reported number of Dengue Fever and Dengue Haemorrhagic Fever to WHO (1955-2007) (WHO-TDR, 2009)

2.3 Burden of Dengue

2.3.1 Dengue and DALYs

Dengue inflicts a significant health, economic and social burden on the populations of endemic areas. Globally the estimated number of disability-adjusted life years (DALYs) lost to Dengue in 2001 was 528.

The number of cases reported annually to WHO ranged from 0.4 to 1.3 million in the decade 1996 - 2005. As an infectious disease, the number of cases varies substantially from year to year. Available data from South-East Asia is largely derived from hospitalized cases among children but the burden due to uncomplicated Dengue fever is also considerable. In a prospective study of schoolchildren in northern Thailand the mean annual burden of Dengue over a five-year period was 465.3 DALYs per million, with non-hospitalized patients with Dengue illness contributing 44 - 73% of the total.

2.3.2 Dengue and cost for treatment and hospitalization

The overall cost of a non-fatal ambulatory case averaged US$ 514, while the cost of a non-fatal hospitalized case averaged US$ 1491. On average, a hospitalized case of Dengue cost three times what an ambulatory case costs. Combining the ambulatory and hospitalized patients and factoring in the risk of death, the overall cost of a Dengue case is US$ 828.

2.3.3 Dengue and social burden

Children are at a higher risk of severe Dengue. Intensive care is required for severely ill patients, including intravenous fluids, blood or plasma transfusion and medicines.

Dengue afflicts all levels of society but the burden may be higher among the poorest who grow up in communities with inadequate water supply and solid waste infrastructure, and where conditions are most favorable for multiplication of the main vector, *Aedes aegypti*.

2.4 Transmission of Dengue

2.4.1 Dengue and vectors

The various serotypes of the Dengue virus are transmitted to humans through the bites of infected *Aedes* mosquitoes, principally *Aedes aegypti*. Once infected, a mosquito remains infected for life, transmitting the virus to susceptible individuals during probing and feeding. *Aedes* mosquitoes cause a serious biting nuisance to people and animals, both in the tropics and in cooler climates. The virus circulates in the blood of infected humans at approximately the time that they have fever, and uninfected mosquito may acquire the virus if they feed on an individual when he or she is viraemic.

Aedes mosquito is a tropical and subtropical species widely distributed around the world, mostly between latitudes 35°N and 35°S. These geographical limits correspond approximately to a winter isotherm of 10°C. *Ae. aegypti* has been found as far north as 45°N, but such invasions have occurred during warmer months and the mosquitoes have not survived the winters. The immature stages are found in water-filled habitats, mostly in artificial containers closely associated with human dwellings and often indoors. Studies suggest that most female *Ae. aegypti* may spend their lifetime in or around the houses where they emerge as adults. This means that people, rather than mosquitoes, rapidly move the virus within and between communities. Dengue outbreaks have also been attributed to *Aedes albopictus*, *Aedes polynesiensis* and several species of the *Aedes scutellaris* complex. The eggs of *Aedes albopictus* can remain viable for many months in the absence of water. (WHO-TDR, 2009)

Aedes mosquitos have a relatively short flight range. It bites mainly in the morning or evening. Most species bite and rest outdoors but in tropical towns *Aedes aegypti* breeds, feeds and rests in and around houses. In areas of high population density, many people may be exposed, even if the mosquito house index is low. Distances between houses may thus be of epidemiological significance, especially in area with single-storey dwellings. (WHO, 1997)

Several factors can influence the dynamics of virus transmission - including environmental and climate factors, host-pathogen interactions and population

immunological factors. Climate directly influences the biology of the vectors and thereby their abundance and distribution. (WHO-TDR, 2009)

2.4.2 Life cycle of Aedes

The eggs are laid singly on damp surfaces just above or near the water line in temporary pools and other habitats where the water level rises and falls. They can withstand desiccation for many months and hatch only when flooded with water. All species of *Aedes* which occur in regions with cold winters survive these periods in the egg stage. Some species breed in coastal salt marshes and swamps that are flooded at intervals by unusually high tides or heavy rains, while others have adapted to agricultural irrigation practices.

Aedes aegypti mainly breeds in the domestic environment: its preferred habitats are water storage tanks and jars inside and outside houses, and roof gutters, leaf axils, bamboo stumps and temporary containers such as jars, drums, used car tyres, tin cans, bottles and plant pots. All these habitats typically contain relatively clean water.

Aedes albopictus originally occurred only in Asia and Madagascar but recently invaded North and South America, as well as West Africa, where it may become important in the transmission of Dengue and other viral diseases. Like *Aedes aegypti*, it breeds in temporary containers but prefers natural ones in forests, such as tree holes, leaf axils, ground pools and coconut shells, and breeds more often outdoors in gardens and less frequently indoors in artificial containers. (WHO, 1997)

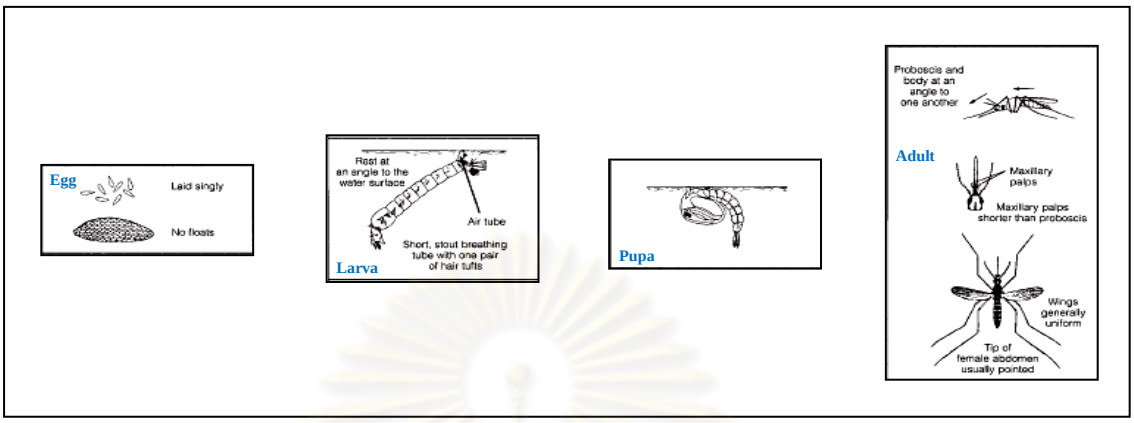

Figure 4: Life cycle of Aedes (Rozendaal, 1997)

2.5 Vector control

2.5.1 Overview of vector control

Preventing or reducing Dengue virus transmission depends entirely on control of the mosquito vectors or interruption of human–vector contact. Activities to control transmission should target *Ae. aegypti* (the main vector) in the habitats of its immature and adult stages in the household and immediate vicinity, as well as other settings where human–vector contact occurs (e.g. schools, hospitals and workplaces).

Integrated vector management (IVM) is the strategic approach to vector control promoted by WHO and it considers five key elements in the management process;

- advocacy, social mobilization and legislation
- collaboration within the health sector and with other sectors
- integrated approach to disease control
- evidence-based decision-making
- capacity-building (WHO-TDR, 2009)

2.5.2 Methods of vector control

Ae. aegypti uses a wide range of confined larval habitats, both man-made and natural. Some man-made container habitats produce large numbers of adult mosquitoes, and thus control efforts should target the habitats that are most productive and hence epidemiologically more important rather than all types of container, especially when there are major resource constraints.

2.5.2.1 Environmental management

Environmental management seeks to change the environment in order to prevent or minimize vector propagation and human contact with the vector-pathogen by destroying, altering, removing or recycling non-essential containers that provide larval habitats. Such actions should be the mainstay of Dengue vector control.

Three types of environmental management are defined:

- *Environmental modification* – long-lasting physical transformations to reduce vector larval habitats, such as installation of a reliable piped water supply to communities, including household connections.
- *Environmental manipulation* - temporary changes to vector habitats involving the management of “essential” containers, such as frequent emptying and cleaning by scrubbing of water-storage vessels, flower vases and desert room coolers; cleaning of gutters; sheltering stored tyres from rainfall; recycling or proper disposal of discarded containers and tyres; management or removal from the vicinity of homes of plants such as ornamental or wild bromeliads that collect water in the leaf axils.
- *Changes to human habitation or behaviour* – actions to reduce human–vector contact, such as installing mosquito screening on windows, doors and other entry points, and using mosquito nets while sleeping during daytime.

The choice of approach should be effective, practicable and appropriate to local circumstances. Actual or potentially important container types that cannot be removed from the area should be dealt with in situ. (WHO-TDR, 2009)

Environmental management should focus on the destruction, alteration, disposal or recycling of containers and natural larval habitats that produce the greatest number of adult *Aedes* mosquitoes in each community. These programmes should be conducted concurrently with health education programmes and communications that encourage community participation in the planning, execution and evaluation of container-management programmes (e.g. regular household sanitation or clean-up campaigns) (WHO, 1997)

2.5.2.1.1 Improvement of water supply and water-storage systems

Improving water supplies is a fundamental method of controlling *Aedes* vectors, especially *Ae. aegypti*. Water piped to households is preferable to water drawn from wells, communal standpipes, rooftop catchments and other water-storage systems. However, potable water must be supplied reliably so that water-storage containers that serve as larval habitats – such as drums, overhead or ground tanks and concrete jars – are not necessary.

2.5.2.1.2 Mosquito-proofing of water-storage containers

Water-storage containers can be designed to prevent access by mosquitoes for oviposition. Containers can be fitted with tight lids or, if rain-filled, tightly-fitted mesh screens can allow for rainwater to be harvested from roofs while keeping mosquitoes out. Removable covers should be replaced every time water is removed and should be well maintained to prevent damage that permits mosquitoes to get in and out.

2.5.2.1.3 Solid waste management

Proper storage, collection and disposal of waste are essential for protecting public health. The basic rule of “reduce, reuse, recycle” is highly applicable. Efforts to reduce solid waste should be directed against discarded or non-essential containers, particularly if they have been identified in the community as important mosquito-producing containers.

Solid waste should be collected in plastic sacks and disposed of regularly. The frequency of collection is important: twice per week is recommended for housefly and rodent control in warm climates. Integration of *Ae. aegypti* control with waste management services is possible and should be encouraged.

2.5.2.1.4 Street cleansing

A reliable and regular street cleansing system that removes discarded water-bearing containers and cleans drains to ensure they do not become stagnant and breed mosquitoes will both help to reduce larval habitats of *Ae. Aegypti*. (WHO-TDR, 2009)

2.5.2.2 Chemical control

Chemicals have been used to control *Ae. aegypti* since the turn of the century. Current methods for applying insecticides include larvicide application, perifocal treatment and space spraying. Three larvicides can be used to treat water containers; 1% temephos sand granules, the insect growth regulator methoprene in the form of briquettes, and BTI (*bacillus thuringiensis* **H-14**), which is considered below in the section on biological control. Perifocal treatment involves the use of hand or power sprayers to apply wettable power or emulsifiable-concentrate formulations of insecticide as a spray to larval habitats and peripheral areas. The insecticides currently used in perifocal treatment are; Malathion, Fenitrothion, Fenthion and some Pyrethroids. Space spraying is the spreading of microscopic droplets of insecticide in the air to kill adult mosquitoes and is used in emergency situations when an outbreak of Dengue fever is already in progress.

Two forms of spray are generally used; ultra-low volume (ULV) aerosols (cold fogs) and mists. (WHO, 1997)

2.5.2.3 Personal protection

Pyrethroid-impregnated bednets or curtains are effective against night feed mosquitoes and useful fir bed-ridden, infants or day sleep persons. Commercially available insect repellents can be used for tourists and short-term visitors to Dengue endemic areas. For residents and those staying longer in endemic areas, clothing can be impregnated with Permethrin.

2.5.2.4 Biological control

Larvivorous fish and the biocide *Bacillus thuringiensis* H-14 (BTI) are the two organisms most frequently employed.

2.5.2.5 Integrate control

Integrated vector control is the combination of available control methods in the most effective, economical and safe manner to maintain vector populations at acceptable levels.

Environmental management of Dengue virus vectors can be successfully combined with health education and public health communication, where source reduction activities are promoted by local health care workers. (WHO, 1997)

Larval habitat	Empty,clean and scrub weekly	Mosquito-proof cover	Store under roof	Modify design, and/or repair and clean	Use expanded polystyrene beads	Fill (with sand, soil or concrete)	Collect, recycle and dispose of	Puncture or drain
Water-storage tank or cistern		+		+	+			
Drums (150–200 litres)	+	+		+				
Flower vase filled with water	+					+		
Potted plants with saucers	+			+				
Roof gutter				+				
Animal water container	+							
Discarded food and drink containers							+	
Hollow fence posts				+		+		
Used tyres			+			+	+	
Discarded large appliances							+	
Discarded buckets (<20 litres)			+				+	+
Tree holes						+		
Rock holes						+		

Figure 5: Environmental management actions to control immature stages of *Aedes aegypti* (WHO-TDR, 2009)

2.6 Related studies

2.6.1 Risk of Dengue in developing countries

A science paper entitled as Changes in Human Ecology and Behavior: Effects on Infectious Diseases revealed that large outbreaks of Dengue was occurred in Thailand (174,285 cases in 1987) with considerable case fatality ratio and Dengue became among ten leading causes of hospitalization and death in children in the tropical Asian countries. As a results, the annual economic burden due to Dengue in Thailand ranges from US$ 19 to 51 million per year. (Thomas, 1994)

2.6.2 Dengue and socio-economic risk factors

A cross sectional study on evaluation of dengue haemorrhagic fever prevention and control program in Nakhonnayok Province, Thailand showed that mean age of household heads was 47.4 years, 62.7% were at a primary school level, 32.7% were farmers and the average number of family members was 4 people. (Kittisoontaropas, 2003)

Another cross sectional study on factors associated with preventive behavior towards dengue haemorrhagic fever among mothers in Dongluong Ward, Dongha, Quangtri Province, Vietnam revealed that maternal age group of 18-35 years, occupation group of officer and high level of education showed higher levels of prevention behavior than others. (Diep, 2004)

An exploratory study from secondary data on ecological study of Rio de Janeiro City DEN-3 Epidemic showed that per capita income was a protective factor for dengue outbreak meaning that low socio-economic status of residents was a risk factor for dengue transmission. (Peena, 2004)

2.6.3 Dengue and environmental risks

A cross sectional study on outbreak of Dengue Fever in Palau, Western Pacific revealed that here has a positive correlation between the presence of Ae. aegypti and affected households; Dengue fever was associated with young age, food and water pans

for animals on the property; the significant positive association between infection and working in taro fields, where one would experience greater exposure to Aedes; the significantly greater infection rates among persons less than 20 years of age (an age group that may spend a greater proportion of time out-of-doors). (David, 2003)

2.6.4 Dengue and physical and climatic factors

An information value based analysis of physical and climatic factors affecting Dengue fever and Dengue haemorrhagic fever incidence in Sukhothai Thailand study revealed that major factors considered for the occurrence of DF/DHF cases were rainfall, temperature, humidity, and land use/land cover types; Dengue outbreak in Thailand coincided with El Nino years. In addition to the rainfall, temperature, and humidity also influence Dengue transmission. Due to high humidity during rainy season mosquito survival is longer and growth is facilitated; it was found that built-up areas have highest influence and constitute the highest risk zones; the agriculture areas offered the second level of high-risk influence. (Kanchana, 2007)

CHAPTER III

RESEARCH METHODOLOGY

3.1 Research Design

A population based on cross sectional study design was used to assess the association between environmental, socio-economic risk factors and Dengue prevention practice with 2010 Dengue outbreak in Mae La Temporary Shelter.

3.2 Study Area

Mae La Temporary Shelter, Tha Song Yang District, Tak Province, Thailand.

3.3 Study Period

From the mid of February to the end of March, 2011.

3.4 Study Population

The study population for this study was adult Myanmar refugees (age 15 years and above) both males and females who resided more than 6 months in 14 most Dengue affected sections of Mae La camp, Tha Song Yang District, Tak Province, Thailand.

3.5 Sampling Size

Sample size for this study was calculated by the following *Taro Yamane Formula* in which;

$$n = \frac{N}{1 + Ne^2}$$

- n is the sample size
- N is the population size (total number of refugee who are ≥ 15 yrs)
- e is the significant level (0.05)

From the above formula;

$$n = \frac{26824}{1 + (26824 \times (0.05)^2)} = 394$$

Sample size = 394

Sample collected = 400

3.6 Sampling Technique

Systemic random sampling method was used to collect the subjects.

Interviewer started from the case household which was selected for participation in the study based on relative proportions of attack rate per section in ML camp. This was done to ensure representation of all highly affected Sections by the outbreak in the study sample.

Then interviewer stood in front of the case house and spanned a bottle to determine a starting direction and went every 5^{th} household to collect data.

When there was no household member who ≥ 15 years of age, then that house was escaped for survey and interviewer jumped to next house and so on.

When there were more than one household members who≥ 15 years of age with Dengue infected patient during 2010, he/she was selected for interview.

When there were more than one household members who≥ 15 years of age with no Dengue patient, random selecting of interviewee by drawing lots.

Inclusion criteria applied in this study is as follows:

- Adult Myanmar refugee who are age ≥ 15 years both males and females and resided in ML for at least 6 months.
- They can speak Burmese language fluently.
- They are willing to participate in this survey.

Exclusion criteria applied in this study is as follows:

- Those refugees who are age < 15 years.
- Those refugees who are age ≥ 15 years but resided in ML for < 6 months.
- Those refugees who are not willing to participate in this survey.

3.7 Measurement Tools

The data was collected by using a structured interview questionnaire with ethical review COA no. 042/2011, issued on 02 March 2011. There were 68 questions in questionnaire and all questions were easy to understand and interviewee could be answered within 25-30 minutes.

A questionnaire set up of 4 parts as follow;

Part 1: Questions related to socio-economic factors and include;

- Name, age, sex, ethnic group, religious status, educational status of interviewee
- Educational status and occupational status of the head of household
- Monthly income and duration of arrive to ML camp of the household
- Number of people live, number of under 5 children and number of people under 15 years in same household
- Number of Dengue patient under 15 years during 2010

All questions in Part 1 was intended to collect baseline information of the study population.

Part 2: Questions related to Dengue patient and include;

- Age, sex, ethnic group, educational status and occupational status of interviewee
- Travelling history of the Dengue patient prior onset of symptoms

Part 3: Questions related to environmental factors and include;

- Lighting condition, drainage condition of the household
- Number of stored water containers
- Number of water containers for domestic usage
- Situation of mosquito breeding places or containers in and around household

Part 4: Questions related to Dengue prevention practice and include;

- Frequency of Dengue health education received
- Number of cover tight water containers
- Habit of water irrigation
- Frequency of sand abate received and frequency of sand abate usage
- Number of bed net (including ITN) and their condition
- Frequency and timing of bed net usage
- Type of personal protective measures against mosquito bite and frequency of usage
- Number of fumigation campaign received.

From all questionnaires, majorities were asking to interviewee but some questionnaires were observation by interviewer.

3.8 Validity

Questionnaires were created and revised according to the reference text books and recommendations of experts. Initially, it was prepared in English language and translated into Karen language

After survey process answers recorded in Karen words were translates into English language by team supervisors (quality controllers) to ensure correspondence between English and Karen word meanings.

Figure 6: Map of Mae La Temporary Shelter

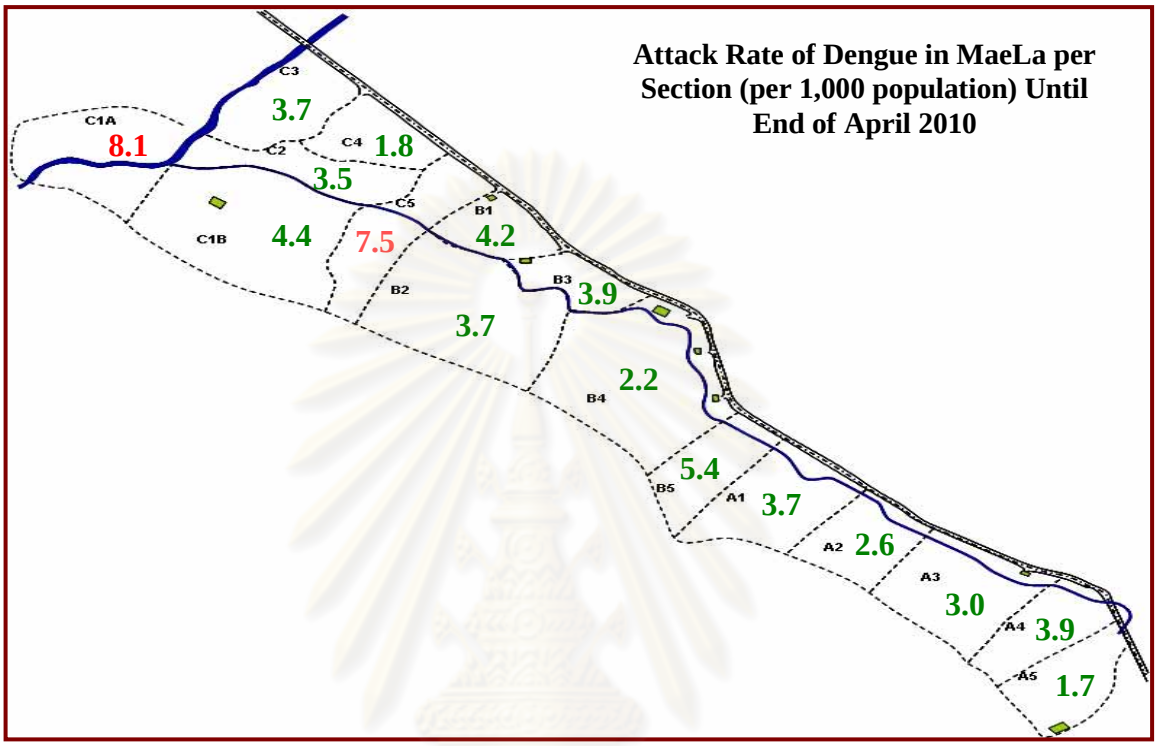

Figure 6: Attack rate of Dengue with Sections in Mae La Temporary Shelter

3.9 Reliability

The pretest was conducted with 30 samples at the beginning of survey process at ML. Cronbach's alpha coefficient was used to test the reliability of the questionnaire which shows 0.75.

3.10 Data Collection

Data collection was done by face-to-face interview with subjects by trained interviewers (Home Visitors) using Karen language translated questionnaires.

Before data collection, altogether 10 interviewers were properly instructed and trained by researcher via using standardized constructed questionnaires. All detail explanation of questionnaires was in Karen language with the help of qualified experienced translator.

We conducted pilot survey about half day period before starting proper interview process in order to test reliability of questionnaires and interviewing method as well. Each interviewer took 1 hour to complete one set of questionnaire (including traveling time, introduction, detail explanation of survey process and requesting for informed consent, etc.)

Altogether 10 interviewers were hired for 5 days (1day estimated 8 questionnaires) with standardized incentive rate according to the Temporary Shelter setting. So, whole data collection process lasted for 7-10 days including compilation of survey forms, data verification and correction.

The respondent was asked first whether any household member who already got or hospitalized with Dengue infection during the period of 1st Jan 2010 to 31st Oct 2010. And then interviewers double checked the information with the patient lema book (medical record book of patient used in camps) and continued the survey process.

Researcher collected back altogether 420 survey forms and check for completeness and correctness. Those unqualified 20 survey questionnaires were excluded for analysis.

3.11 Data Analysis

For Data analysis, Statistical Package of Social Science (SPSS) Software Version 17.0 was used.

Followings were the statistics in use:

Descriptive statistics: the socio-demographic characteristics and general information was presented by frequency, percentage, mean and standard deviation.

Inferential statistics: the relationship between the independent variables and the dependent variable was presented by the use of Pearson's Chi – square and Fisher's Exact tests between two categorical variables with crosstab analysis.

3.12 Ethical Consideration

The research proposal was submitted to Ethical Committee of Chulalongkorn University. COA no. 042/2011 issued on 02 March 2011 was received by the researcher.

Before interviewing, the subjects were explained on the purpose of the study. They signed on the consent form. In case they were not willing to participate in this study, they could deny at any time with no impact on them whatsoever. The name of the subjects was not recorded and their given information kept confidentially. Data used for academic purpose only.

Verbal approval was obtained from AMI, Thailand, health implementing agency, and ML camp committee, authorized organization for the beneficiaries from the Temporary Shelter.

3.13 Limitation

- There might be some bias in this study due to the issue of time constraint and thus the quantitative study was employed in order to identify the risk factors associated with 2010 ML Dengue outbreak. In order to keep balance in focus, the qualitative study should also be included.

- This study conducted with the subjects who were adult refugees in ML camp. As such, the results of the study could not represent the whole population in Tak Province of Thailand .

3.14 Expected Benefit and Application

An identification of environmental and socio-economic risk factors related to 2010 Dengue outbreak in ML may serve as a working principle for future prevention and control measures against Dengue epidemic, particularly in Mae La Temporary Shelter, Tha Song Yang District, Tak Province of Thailand.

CHAPTER IV

RESULTS

This chapter is divided into two parts. Sections 4.1 to 4.4 include the distribution of socio-economic characteristics, attack rate of Dengue and characteristic of Dengue patient, environmental factors and Dengue preventive practice characteristics among Myanmar refugees in ML. Section 4.5 contains the association between socio-economic characteristics, environmental factors and Dengue preventive practice to Dengue infection.

Total number of subjects in this study was 400. The respondents in this study were adult Myanmar refugees aged ≥ 15 years who are residing more than 6 months in ML camp, Tha Song Yang District, Tak Province, Thailand.

4.1 Socio-economic characteristics of adult Myanmar refugees

Table – 1 shows that the socio-economiccharacteristics of adult Myanmar refugees (n=400) such as age, gender, ethnicity, religion, education, occupation, monthly household income, duration of stay in ML camp, number of total household members, number of under 5 children in the household, number of under 15 children in the household, number of under 15 Dengue patients.

4.1.1 Age

The age of all respondents were ranged from 15 to 85 years. The mean age of respondents was 36.9 years, median was 35 years and SD was 13.29. Most of respondents (83.8%) were age group between 15 to 49 years. The age group of ≥ 50 years was 16.2%.

4.1.2 Gender

Among studied population of Myanmar refugees, 35.2% of respondents were males whereas 64.8% were females.

4.1.3 Ethnicity

Concerning the ethnicity of the respondent, most respondents were Karen - 89.0%, 5.0% of the respondents were Indian-Hindu, 3.5% were Muslim. Other ethnic groups were Burma 0.8%, Kachin 0.8%, Shan 0.7% and Mon 0.2% respectively.

4.1.4 Religion

Concerning the religion of the respondents, most respondents were believed in Buddhism – 45.5% and Christian 45.2%, 8.8% were believed in Islam and 0.5% in traditional.

4.1.5 Educational status

Concerning the educational status of the respondents, majority were in low educational status with illiterate 37.2%, just read and write level 18.2% and primary school level 19.0%. Middle school level were 12.5%, high school 11.5%, university graduate level 1.2% and only one correspondent (0.2%) possesses post graduate level of educational status.

4.1.6 Occupational status

Concerning the occupational status of the respondent, majority were jobless 51.5%. 21.2% were daily paid workers, 10.2% possess own small business like storekeeper or running betel shop or tea shop, 5.8% were students, 4.2% working as teachers or staffs of religious organizations. 3.8% of correspondents were working as paid employee in NGOs and CBOs and 2.0% were unpaid voluntary workers. 1.2% (n=5) were fitted in others categories of job in our survey form like working with own plantation.

4.1.7 Educational status of head of household

The educational status of the head of household pattern was closed with that of respondents. Majority of heads of household were in low educational status with illiterate 38.0%, just read and write level 20.2% and primary school level 18.2%. Middle school level were 10.5%, high school 10.5%, university graduate level 1.8% and three heads (0.8%) possesses post graduate level of educational status.

4.1.8 Occupational status of head of household

The occupational status of the head of household pattern was also closed with that of respondents. Majority of heads of household were jobless 43.5%. 27.0% were daily paid workers, 9.8% were working as paid employee in NGOs and CBOs, 9.0% possess own small business like storekeeper or running betel shop or tea shop, 5.8% working as teachers or staffs of religious organizations, 1.8% were unpaid voluntary workers. 1.2% (n=3) of head of household still attending school (student) and 2.0% (n=8) were fitted in others categories of job in our survey form like working with own plantation.

4.1.9 Monthly household income

Concerning the monthly household income status, most of the families (43%) have monthly income of < 1,000 THB/month, 32.8% have no income and 16.8% earns ≥ 1,000 to < 2,000 THB/month. Only 4.0% of the families have regular monthly income of ≥ 3,000 THB/month, most probably were those who possess own business and working in NGOs sectors.

4.1.10 Duration of stay in Mae La Temporary Shelter

Duration of stay in ML camp ranged from very recent arrival (< 1 year) to as long as 30 years. Mean of staying in ML was 10.7 years, median was 11.0 years and SD was 7.171. Most of the respondents (55.2%) were staying in ML for > 10 years. 36.5% of

refugees in study process were residing in ML for 1 to ≤ 5years and 8.2% were residing for > 5 to ≤ 10 years.

4.1.11 Number of people live under the same household (family size)

Number of people live under the same household ranged from 1 to as much as 58 persons (the highest number of family members were from hostels where students lived together). Mean of household members was approximately 7 persons, median was 6.00 and SD was 5.15. The participants were more likely to live in large-sized family (≥ 7 members) - 35.5% and medium-sized family (5-6 members). 30.2% lived in small-sized family (≤ 4 members).

4.1.12 Number of U5 children live under the same household

Number of U5 children under the same household ranged from 0 to 9. Mean was 0.99, median was 1.00 and SD was 1.02. Most of the households in the study have few number of U5 children; no U5 child – 36.5%, one U5 child – 36.2%, two U5 children – 22.2% and 3 and above U5 children was only 4.9%.

4.1.13 Number of U15 children live under the same household

Number of U15 children under the same household ranged from 0 to 39. Mean was 2.62, median was 2.00 and SD was 2.95. Most of the households in the study have one to five U15 children lived together – 80.8%; no U15– 13.2%, six and above U15 children lived together – 6.0%.

4.1.14 Number of Dengue patient U15

31 households in the study (7.8%) have U15 Dengue patient and majorities (92.2%) were absent of U15 Dengue patient in the family.

All families that have U15 Dengue patient possess only one patient in the same household.

Table 1: Distribution of Myanmar refuges in ML Temporary Shelter by socio-economic characteristics (n=400)

Characteristics	Frequency (n=400)	Percentage
Age (n=400)		
15 – 49 yrs	335	83.8
≥ 50 yrs	65	16.2
Mean = 36.90, SD = 13.29, Median = 35.0		
Range = 15 – 85		
Gender (n=400)		
Male	141	35.2
Female	259	64.8
Ethnicity (n=400)		
Bamar	3	0.8
Indian	20	5.0
Kachin	3	0.8
Karen	356	89.0
Mon	1	0.2
Muslin	14	3.5
Shan	3	0.8
Religion (n=400)		
Buddhism	182	45.5
Christian	181	45.2
Islam	35	8.8
Tradition	2	0.5

Table 1: (Continued) Distribution of Myanmar refuges in ML camp by socio-economic characteristics (n=400)

Characteristics	Frequency (n=400)	Percentage
Education (n=400)		
Illiterate	149	37.2
Just read and write	73	18.2
Primary school	76	19.0
Middle school	50	12.5
High school	46	11.5
University graduate	5	1.2
Postgraduate	1	0.2
Occupation (n=400)		
No job	206	51.5
Student	23	5.8
Teacher / organization staff	17	4.2
Own business	41	10.2
Paid job at NGOs or CBOs	15	3.8
Unpaid or volunteer job	8	2.0
Daily worker	85	21.2
Others	5	1.2
Education of head of household (n=400)		
Illiterate	152	38.0
Just read and write	81	20.2
Primary school	73	18.2
Middle school	42	10.5
High school	42	10.5
University graduate	7	1.8
Postgraduate	3	0.8

Table 1: (Continued) Distribution of Myanmar refuges in ML camp by socio-economic characteristics (n=400)

Characteristics	Frequency (n=400)	Percentage
Occupation of head of household (n=400)		
No job	174	43.5
Student	5	1.2
Teacher / organization staff	23	5.8
Own business	36	9.0
Paid job at NGOs or CBOs	39	9.8
Unpaid or volunteer job	7	1.8
Daily worker	108	27.0
Others	8	2.0
Monthly income of household (n=400)		
≥ 3,000 THB/month	16	4.0
≥ 2,000 to < 3,000 THB/month	14	3.5
≥ 1,000 to < 2,000 THB/month	67	16.8
< 1,000 THB/month	172	43.0
No income	131	32.8
Duration of stay in ML camp in years (n=400)		
1 – 5 yrs	146	36.5
5 – 10 yrs	33	8.2
> 10 yrs	221	55.2
Mean = 10.70, SD = 7.17, Median = 11.0		
Range = 0 – 30		

Table 1: (Continued) Distribution of Myanmar refuges in ML camp by socio-economic characteristics (n=400)

Characteristics	Frequency (n=400)	Percentage
People live in same household (n=400)		
≤ 4 members	121	30.2
5 – 6 memebers	137	34.2
≥ 7 memebers	142	35.5
Mean = 6.43, SD = 5.15, Median = 6.0		
Range = 1 – 58		
Under 5 children in same household (n=400)		
No U5 child	145	36.2
1 U5 children	145	36.2
2 U5 children	89	22.2
≥ 3 U5 children	21	4.9
Mean = 0.99, SD = 1.02, Median = 1.0		
Under 15 children in same household (n=400)		
No U15 child	53	13.2
1 to 5 U15 children	323	80.8
≥ 5 U15 children	24	6.0
Mean = 2.62, SD = 2.95, Median = 2.0		
Under 15 Dengue patient in same household (n=400)		
Yes	31	7.8
No	369	92.2

4.2 Socio-economic characteristics of Dengue patient

Table – 2 shows that the socio-economic characteristics of Dengue patient (n=85) such as age, gender, ethnicity, education, occupation and history of travelling outside the camp 2 weeks prior onset of Dengue symptoms.

4.2.1 Age

The age of Dengue patient ranged from 11 months to 70 years in this study. The mean age was 21.13 years, median was 18.0 years and SD was 15.98. Majority of the Dengue patients were > 15 years of age (63.5%) and 22.4% were 5 to 15 years of age, 12.9% age group between 1 to under 5 years and 1.2% of Dengue patients were under 1 year.

4.2.2 Gender

Among Dengue patients, 43.5% were males and 56.5% were females.

4.2.3 Ethnicity

Concerning the ethnicity of Dengue patients, most of them were Karen – 97.6%, and Indian-Hindu and Kachin ethnic groups were 1.2% each respectively.

4.2.4 Religion

Concerning the religion of Dengue patients, 52.9% were Christians, 44.7% Buddhist, 1.2% Islam and another 1.2% were believed in their tradition like believed in spirits.

4.2.5 Occupational status

Concerning the occupational status of Dengue patients in ML, majorities were jobless – 52.9% and 18.8% were daily paid workers. 15.3% were students, 5.9% were working as teachers or staffs of religious organizations. 3.5% possess own small business like storekeeper or running betel shop or tea shop, 2.4% were working as paid employee

in NGOs and CBOs and remaining 1.1% were fitted in others categories of job in our survey form like working with own plantation.

4.2.6 Educational status

Concerning the educational status of Dengue patients in ML, majorities were primary school level 23.5%, 18.8% were illiterate, 17.6% were just read and write. 12.9% were in no schooling age group and middle school levels were 11.8%, high school 14.1%, university graduate level 1.2%.

4.2.7 Household income

Concerning the monthly household income status, 43.5% of Dengue patients lived with monthly household income of < 1,000 THB/month, 38.8% have no income and 10.6% have ≥ 1,000 to < 2,000 THB/month, 3.5% have ≥ 2,000 to < 3,000 THB/month and remaining 3.5% of the families have regular monthly income of ≥ 3,000 THB/month.

4.2.8 Residential status

Regarding residential status, 50.6% of Dengue patients lived in ML for > 10 years, 40% for 1-5 years and 9.4% for 5-10 years.

4.2.9 Travelling history

Concerning history of travelling outside ML camp 2 weeks prior onset of disease symptoms among Dengue patients, most of them (80%) were didn't give history of travelling outside and only 20% gave history of travelling.

Table 2: Distribution of Dengue patient in ML Temporary Shelter by socio-economic characteristics (n=85)

Characteristics	Frequency (n=85)	Percentage
Age		
Under 1 yr	1	1.2
1 to < 5 yrs	11	12.9
5 to 15 yrs	19	22.4
≥ 15 yrs	54	63.5
Mean = 21.13, SD = 15.98, Median = 18.0		
Range = 11 months – 70 years		
Gender		
Male	37	43.5
Female	48	56.5
Ethnicity		
Indian	1	1.2
Kachin	1	1.2
Karen	83	97.6
Religious groups		
Buddhist	38	44.7
Christian	45	52.9
Islam	1	1.2
Tradition	1	1.2

Table 2: (Continued) Distribution of Dengue patient in ML camp by socio-economic characteristics (n=85)

Characteristics	Frequency (n=85)	Percentage
Occupation		
Jobless	45	52.9
Student	13	15.3
Teacher or religious staffs	5	5.9
Own business	3	3.5
Paid job / work in NGOs or CBOs	2	2.4
Unpaid job or volunteer	0	0
Daily paid worker	16	18.8
Others	1	1.1
Education		
No schooling age	11	12.9
Illiterate	16	18.8
Just read and write	15	17.6
Primary school	20	23.5
Middle school	10	11.8
High school	12	14.1
University graduate	1	1.2
Household income (THB/month)		
≥ 3,000	3	3.5
≥ 2,000 to < 3,000	3	3.5
≥ 1,000 to < 2,000	9	10.6
< 1,000	37	43.5
No income	33	38.8

Table 2: (Continued) Distribution of Dengue patient in ML camp by socio-economic characteristics (n=85)

Characteristics	Frequency (n=85)	Percentage
Residential status		
1-5 yrs	34	40
5-10 yrs	8	9.4
> 10 yrs	43	50.6
Travelling outside ML camp		
Yes	17	20.0
No	68	80.0

4.3 Environmental condition of the household

Table – 3 shows the environmental condition of the household (n=400) such as lighting condition, drainage condition, number of water containers and mosquito bleeding places or containers inside and around household.

4.3.1 Lighting condition of household

From the survey data, 46.5% (n=186) of housings have moderate lighting condition, 46.2% (n=185) have good lighting condition and 7.2% (n=29) have poor lighting condition.

4.3.2 Drainage condition of household

44.0% (n=176) of housings in the survey have good drainage condition, 36.5% (n=146) have fair drainage and 19.5% (n=78) of household have poor drainage condition.

4.3.3 Stored water containers

As all household in the study were in Temporary Shelter and they lived with limited facility of water supply, all household included in our study have stored water containers for domestic usage. Number of water containers ranged from 1 to 18. Mean value was 4.13, SD was 2.39 and Median was 4.00.

4.3.4 Mosquito breeding places and containers

53.5% (n=214) of housings in the survey have some mosquito breeding places and containers inside as well as 100 m around the household, 42.8% (n=171) of housings have no breeding places or containers and 3.8%(n=3.8) of studied households have many mosquito breeding places or containers.

Table 3: Distribution of environmental factors of the household (n=400)

Characteristics	Frequency (n=400)	Percentage
Lighting condition		
Good lighting (read clearly with natural light)	185	46.2
Fair lighting (can read but not clearly with natural light)	186	46.5
Poor lighting (can't read with natural light)	29	7.2
Drainage condition		
Good drainage (drain well with no stagnant)	176	44.0
Fair drainage (can drain but with some stagnant)	146	36.5
Poor drainage (can't drain at all)	78	19.5
Stored water containers in household		
Minimum	1	
Maximum	18	
Mean	4.13	
Median	4.00	
SD	2.39	
Mosquito breeding places and containers (n=400)		
No	171	42.8
Some (5 to 10 places)	214	53.5
Many (> 10 places)	15	3.8

4.4 Dengue prevention practice

Table – 4 shows practice for Dengue prevention at individual household level in ML camp (n=400) during 2010 such as frequency of Dengue health education received, proportion of cover tight water containers, frequency of irrigation of water containers, frequency of sand abate and frequency of sand abate usage, number of bed net including ITN and their condition, timing and frequency of bed net usage, usage of personal protective measures against mosquito bite and frequency of utilization, and frequency of fumigation.

4.4.1 Dengue health education

From the survey data, 44.5% of household in the study received ≥ 3 times of Dengue health education during 2010, 32.5% for 2 times, 13.8% for 1 time and 9.2% of households never received Dengue health education during 2010.

4.4.2 Covered tight water containers

From the survey data, 26.5% of household in the study covered tight all water containers, 34.5% of household have cover tight more than half of their containers, 28.2% of household have cover tight less than half of their containers and 10.7% of households didn't cover tight any of their water containers.

4.4.3 Frequency of water containers irrigation

From the survey data, 80.8% of household in the study irrigate water containers whenever larva was found inside, 16.8% once a week, 0.8% once a two weeks and 1.8% once a month.

4.4.4 Frequency of sand abate received and usage

From the survey data, only 0.2% of household in the study received sand abate once a two week and 10.0% once a month, 50.2% once every 2 months, 34.0%

irregularly and 5.5% of households never received sand abate during 2010, at the time of Dengue outbreak.

From the service utilization aspect of community, 88.5% of household (n= 378) that received sand abate always put sand abate into water containers, 2.8% sometimes, 4.0% rarely and 4.7% of households never used sand abate, probably because of not receiving sand abate.

4.4.5 Mosquito bed net

From the study, the number of normal bed net possessed in individual household level ranged from 0 to 18. Approximately 2 ordinary bed nets possessed per household. But there observed some households possessed as much as 18 bed nets and they were hostels many where students lived together for schooling. The number of ITN possessed in individual household level ranged from 0 to 35 (probably maximum numbers at hostels).

From the above statistics 26.2% (n=105) of household in the study didn't have a single ordinary bed net and 60.5% (n=242) of household didn't have a single ITN for Dengue prevention.

Those households that possessed ITNs, 55.7% were poor condition and 44.2% were in good condition for protecting mosquito bite.

60.3% of all households in the study were enough with their bed nets and 39.7% were either not enough with or absence of bed nets.

58.9% of families used bed net in most of their sleeping time, 38.6% used whenever they sleep, 1.3% used sometimes, 0.6 % rarely and 0.6% never used bed nets.

77.2% of bed net possessed families used at night time only and 21.5% in both day and night time, 1.2% in day time only.

4.4.6 Personal protective measures for preventing mosquito bites

From the study, 57.0% of household never used personal protective measures against mosquito bites and 43% used different types of personal protections. Majority of

them used mosquito coils and repellents and adequate clothing. 73.2% of them used personal protective sometimes, 12.3% always, 9.2% rarely and 5.2% irregularly and less than once every three months.

4.4.7 Fumigation received for Dengue prevention and control

From the study, 53.8% of household received ≥ 3 times of fumigation at their household during 2010. 32.8% for 2 times, 10.8% for only one time and 2.7% of households never received fumigation at their household level.

Table 4: Distribution of Dengue preventive practice (n=400)

Characteristics	Frequency	Percentage
Dengue health education received in 2010 (n=400)		
Never	37	9.2
Only 1 time	55	13.8
2 times	130	32.5
≥ 3 times	178	44.5
Proportion of cover tight water containers (n=400)		
0%	43	10.7
< 50%	113	28.2
≥ 50 but < 100%	138	34.5
100%	106	26.5
Frequency of water irrigation (n=400)		
Whenever larva found	323	80.8
Once a week	67	16.8
Once a two week	3	0.8
Once a month	7	1.8

Table 4: (Continued) Distribution of Dengue preventive practice (n= 158 - 400)

Characteristics	Frequency	Percentage
Frequency of sand abate received in 2010 (n=400)		
Once a two weeks	1	0.2
Once a month	40	10.0
Once every two months	201	50.2
Irregularly	136	34.0
Never	22	5.5
Frequency of sand abate utilization (n=378)		
Always	335	88.5
Sometimes	11	2.8
Rarely	15	4.0
Never	17	4.7
Bed net in household (n=400)		
Number of ordinary bed net		
Minimum	0	
Maximum	18	
Number of insecticide treated bed net (ITN)		
Minimum	0	
Maximum	35	
Condition of ITN (n=158)		
Good condition of ITN	70	44.2
Bad condition of ITN	88	55.7
Adequacy of bed net (n=400)		
Enough bed net	241	60.3
Not enough bed net	159	39.7

Table 4: (Continued) Distribution of Dengue preventive practice (n= 158 - 400)

Characteristics	Frequency	Percentage
Frequency of ITN usage (n=158)		
Whenever sleep	61	38.6
Most of sleeping time	93	58.9
Some of sleeping time	2	1.3
Rarely during sleeping	1	0.6
Never used	1	0.6
Timing of ITN usage (n=158)		
Day time sleep only	2	1.2
Night time sleep only	122	77.2
Both day and night time sleep	34	21.5
Personal protective measures (n=400)		
Used	228	57.0
Not used	172	43.0
Frequency of personal protective measures usage (n=228)		
Always	167	73.2
Sometimes	28	12.3
Rarely	21	9.2
irregularly or < once every 3 months	12	5.3
Frequency of fumigation received (n=400)		
Never	11	2.7
Only 1 time	43	10.8
2 times	131	32.8
≥ 3 times	215	53.8

4.5 Association between socio-economic characteristics, environmental factors and Dengue preventive practice with Dengue patients in ML Temporary Shelter

The association between socio-economic characteristics and environmental factors Dengue patients was determined by Pearson Chi-square and Fisher's Exact tests via crosstab analysis under SPSS software. The statistical significant level was considered as < 0.05 and the results were shown in Table – 5.

4.5.1 Dengue patients with age groups

Age groups were compared with the Dengue and non Dengue patients and the results show that there was significant association between age group and dengue patients (p=0.01). 56.6% of Dengue patients were in the age group of 15-49 years, 22.4% in 5-15 years, 12.9% in 1-5 years, 7.1 in ≥ 50 years and 1.2% in < 1 year. 81.3% of non Dengue patients were 15-49 years and 18.7% were ≥ 50 years.

4.5.2 Dengue patients with gender

Gender was compared with the Dengue and non Dengue patients and the results show that there was no significant association between gender and dengue patients (p=0.31). 56.5% of Dengue patients were females and 43.5% were males. 69.4% of non Dengue patients were females and 30.6% were males.

4.5.3 Dengue patients with ethnic groups

Ethnics groups were compared with the Dengue and non Dengue patients and the results show that there was no significant association between gender and dengue patients (p=0.13). 97.6% of Dengue patients were Karen, 1.2% were Kachin and another 1.2% were Indian-Hindu.

86.7% of non Dengue patients were Karen, 6% Indian-Hindu, 4.4% Muslim, 1% Bamar, 1% Shan, 0.6% Kachin and 0.3% Mon respectively.

4.5.4 Dengue patients with religion

Religious groups were compared with the Dengue and non Dengue patients and the results show that there was significant association between religious groups and dengue patients (p=0.023). 52.9% of Dengue patients were believed in Christian, 44.7% in Buddhist, 1.2% in Islam and remaining 1.2% in Tradition like believed in spirits.

45.7% of non Dengue patients were believed in Buddhist, 43.2% in Christian, 10.8% in Islam and remaining 0.3% in Tradition.

4.5.5 Dengue patients with occupation

Occupational status was compared with the Dengue and non Dengue patients and the results show that there was highly significant association between occupational status and dengue patients (p=0.001). 52.9% of Dengue patients were jobless, 18.8% were daily paid workers. 15.3% were students, 5.9% were working as teachers or staffs of religious organizations. 3.5% possess own small business like storekeeper or running betel shop or tea shop, 2.4% were working as paid employee in NGOs and CBOs and remaining 1.1% were fitted in others categories of job in our survey form like working with own plantation.

51.1% of non Dengue patients were jobless, 21.9% were daily paid workers, 12.1% possess own small business like storekeeper or running betel shop or tea shop, 4.1% were working as paid employee in NGOs and CBOs, 3.8% were working as teachers or staffs of religious organizations, 3.2% were students, 2.5% were unpaid or volunteer workers and remaining 1.3% were fitted in others categories of job in our survey form like working with own plantation.

4.5.6 Dengue patients with educational

Educational status was compared with the Dengue and non Dengue patients and the results show that there was no significant association between educational status and dengue patients (p=0.443). Majorities of Dengue patients were in primary school level 23.5%, 18.8% were illiterate, 17.6% were just read and write. 12.9% were in no

schooling age group and middle school levels were 11.8%, high school 14.1%, university graduate level 1.2%.

37.8% of non Dengue patients were illiterate, 20% primary school, 18.4% just read and write, 12.7% middle school, 9.8% high school, 1% university graduate and 0.3% at postgraduate level respectively.

4.5.7 Dengue patients with household income

Household income was compared with the Dengue and non Dengue patients and the results show that there was no significant association between household income and dengue patients (p=0.444). 43.5% of Dengue patients lived with monthly household income of < 1,000 THB/month, 38.8% have no income and 10.6% have ≥ 1,000 to < 2,000 THB/month, 3.5% have ≥ 2,000 to < 3,000 THB/month and remaining 3.5% of the families have regular monthly income of ≥ 3,000 THB/month.

42.9% of non Dengue lived with monthly household income of < 1,000 THB/month, 38.8% have no income and 18.4% have ≥ 1,000 to < 2,000 THB/month, 4.1% have income of ≥ 3,000 THB/month and remaining 3.5% have ≥ 2,000 to < 3,000 THB/month.

4.5.8 Dengue patients with residential status

Duration of stay in ML was compared with the Dengue and non Dengue patients and the results show that there was no significant association between residential status and dengue patients (p=0.618). 50.6% of Dengue patients lived in ML for > 10 years, 40% for 1-5 years and 9.4% for 1-5 years.

56.5% of non Dengue patients lived in ML for > 10 years, 35.6% for 1-5 years and 7.9% for 5-10 years.

4.5.9 Dengue patients with mosquito breeding places of the household

Mosquito breeding place of the household was compared with the Dengue patients and the result shows that there was highly significant association between

mosquito breeding place and Dengue patients (p<0.001). 85.9% of Dengue patients lived in households with some level of mosquito breeding places and 10.6% lived in households with many mosquito breeding places. 53.5% of non Dengue patients lived in households with no mosquito breeding places.

4.5.10 Dengue patients with drainage condition of the household

Drainage condition of the households was compared with the Dengue patients and the result also shows that there was highly significant between drainage condition of the household and Dengue patients (p<0.001). 57.6% of Dengue patients lived in households with fair drainage condition, 37.6% lived in households with poor drainage condition. But 54.6% of non Dengue patients lived in households with good drainage condition.

4.5.11 Dengue patients with lighting condition of the household

Lighting condition of the households was also compared with the Dengue patients and the result shows that there was highly significant between lighting condition of the household and Dengue patients (p<0.001). 68.2% of Dengue patients lived in households with fair lighting condition, 28.2% lived in households with poor drainage condition. But 57.8% of non Dengue patients lived in households with good lighting condition.

4.5.12 Dengue patients with frequency of fumigation received during 2010

Frequency of fumigation received during 2010 was also compared with the Dengue patients and the result shows that there was no significant association between fumigation received during 2010 and dengue patients (p=0.705). 52.9% of Dengue patients received ≥ 3times of fumigation during 2010 and 2.5% never received yet.

4.5.13 Dengue patients with adequacy of bed net in the household

Adequacy of bed net in households was also compared with the Dengue patients and the result shows that there was no significant between adequacy of bed net in

household and dengue patients (p=1.82). 45.9% of Dengue patients' household didn't have enough bed nets and 54.1% had enough bed net.

4.5.14 Dengue patients with timing of bed net usage

Timing of bed net usage was compared with the Dengue patients and the result shows that there was no significant between timing of bed net usage and dengue patients (p=0.841). 78.8% of Dengue patients used bed net in night time and 21.2% in both day and night sleeping time.

4.5.15 Dengue patients with frequency of sand abate received during 2010

Frequency of sand abate received during 2010 was compared with the Dengue patients and the result shows that there was no significant association between frequency of sand abate received and dengue patients (p=0.184). 50.2% of Dengue patients received sand abate once every 2 month and 5.9% never received yet.

4.5.16 Dengue patients with proportion of covered tight water containers

Proportion of covered tight water containers was compared with the Dengue patients and the result shows that there was no significant association between proportion of covered tight water containers and dengue patients (p=0.512). In 29.4% of Dengue patients' households, the numbers of covered tight water containers were <50% of total and in 23.5% all water containers were covered tight (i.e. 100%).

4.5.17 Dengue patients with frequency of Dengue health education received during 2010

Frequency of Dengue health education during 2010 was compared with the Dengue patients and the result shows that there was no significant association between Dengue health education received and dengue patients (p=0.92). 42.4% of Dengue patients received Dengue health education ≥ 3 times during 2010 and 34.1% for 2 times.

4.5.18 Dengue patients with frequency of water irrigation practice

Frequency of water irrigation was compared with the Dengue patients and the result shows that there was no significant association between water irrigation practice and dengue patients (p=0.852). 78.8% of Dengue patients irrigate water whenever mosquito larva was found in the containers, 18.8% once a week, 1.2% once a two weeks and 1.2% once a month.

4.5.19 Dengue patients with frequency of sand abate utilization

Frequency of sand utilization was compared with the Dengue patients and the result shows that there was no significant association between sand abate utilization practice and dengue patients (p=0.696). 87.1% of Dengue patients always put sand abate into the water containers, 3.5% sometimes, 5.9% rarely and 3.5% never.

4.5.20 Dengue patients with frequency of personal protective measures utilization

Frequency of personal protective measures utilization was compared with the Dengue patients and the result shows that there was no significant association between frequency of protective measures utilization and dengue patients (p=0.236). 54.1% of Dengue patients never used personal protective measures for preventing mosquito bite, 37.6% sometimes, 5.9% rarely and 2.4% always.

Table 5: Association between socio-economic characteristics, environmental factors and Dengue preventive practice with Dengue patients (n=400)

Characteristics	No Dengue		Dengue		$\chi 2$	P-value
	n	%	n	%		
Age Group						
< 1 yr	0	0	1	1.2		
1 – 5 yrs	0	0	11	12.9		
5 – 15 yrs	0	0	19	22.4	6.700	0.010*
15 – 49 yrs	256	81.3	48	56.5		
≥ 50 yrs	59	18.7	6	7.1		
Gender						
Male	115	36.5	37	43.5	1.028	0.311
Female	200	63.5	48	56.5		
Ethnic groups						
Bamar	3	1	0	0		
Indian-Hindu	19	6	1	1.2		
Kachin	2	0.6	1	1.2		
Karen	273	86.7	83	97.6	9.991	0.125
Mon	1	0.3	0	0		
Muslim	14	4.4	0	0		
Shan	3	1	0	0		
Religious groups						
Buddhist	144	45.7	38	44.7		
Christian	136	43.2	45	52.9	9.489	0.023*
Islam	34	10.8	1	1.2		
Tradition	1	0.3	1	1.2		

* Statistically significant

Table 5: Association between socio-economic characteristics and environmental factors with Dengue patients (n=400)

Characteristics	No Dengue		Dengue		$\chi 2$	P-value
Occupation						
Jobless	161	51.1	45	52.9	25.6	0.001*
Student	10	3.2	13	15.3		
Teacher or religious staffs	12	3.8	5	5.9		
Own business	38	12.1	3	3.5		
Paid job / work in NGOs or CBOs	13	4.1	2	2.4		
Unpaid job or volunteer	8	2.5	0	0		
Daily paid worker	69	21.9	16	18.8		
Others	4	1.3	1	1.1		
Education						
No schooling age	0	0	11	12.9	5.826	0.443
Illiterate	119	37.8	16	18.8		
Just read and write	56	18.4	15	17.6		
Primary school	63	20	20	23.5		
Middle school	40	12.7	10	11.8		
High school	31	9.8	12	14.1		
University graduate	3	1	1	1.2		
Post graduate	1	0.3	0	0		
Household income, THB/month						
≥ 3,000	13	4.1	3	3.5	3.729	0.444
≥ 2,000 to < 3,000	11	3.5	3	3.5		
≥ 1,000 to < 2,000	58	18.4	9	10.6		
< 1,000	135	42.9	37	43.5		
No income	98	31.1	33	38.8		

* Statistically significant

Table 5: Association between socio-economic characteristics and environmental factors with Dengue patients (n=400)

Characteristics	No Dengue		Dengue		$\chi 2$	P-value
Residential status (n=85)						
1-5 yrs	112	35.6	34	40		
5-10 yrs	25	7.9	8	9.4	0.963	0.618
> 10 yrs	178	56.5	43	50.6		
Mosquito breeding place						
No	168	53.3	3	3.5		
Some	141	44.8	73	85.9	73.454	< 0.001*
Many	6	1.9	9	10.6		
Drainage condition						
Good	172	54.6	4	4.7		
Fair	97	30.8	49	57.6	69.329	< 0.001*
Poor	46	14.6	32	37.6		
Lighting condition						
Good	182	57.8	3	3.5		
Fair	128	40.6	58	68.2	1.191	< 0.001*
Poor	5	1.6	24	28.2		
Fumigation received in 2010						
Never	9	2.9	1	1.2		
Only 1 time	35	11.1	8	9.4	1.402	0.705
2 times	100	31.8	31	36.5		
≥ 3times	171	54.1	45	52.9		

* Statistically significant

Table 5: (Continued) Association between socio-economic characteristics and environmental factors Dengue patients (n=400)

Characteristics	No Dengue		Dengue		$\chi 2$	P-value
	n	%	n	%		
Adequacy of bed net						
Adequate	195	62.1	46	54.1	1.783	0.182
Not adequate	120	37.9	39	45.9		
Timing of bed net usage						
Day time only	2	0.6	0	0		
Night time only	243	77.4	67	78.8	0.837	0.841
Both day and night	70	22	18	21.2		
Sand abate received in 2010						
Once a 2 weeks	1	0.3	0	0		
Once a month	26	8.3	14	16.5		
Once every 2 months	165	52.4	36	42.4	6.210	0.184
Irregularly	106	33.7	30	35.3		
Never	17	5.4	5	5.9		
Proportion of covered tight water containers						
0%	30	9.5	13	15.3	3.278	0.512
< 50%	88	27.9	25	29.4		
> 50% and < 100 %	111	35.2	27	31.8		
100%	86	27.3	20	23.5		

Table 5: (Continued) Association between socio-economic characteristics and environmental factors Dengue patients (n=400)

Characteristics	No Dengue		Dengue		$\chi 2$	P-value
Dengue health education received in 2010						
Never	26	8.3	9	10.6		
Only 1 time	44	14.0	11	12.9	0.934	0.920
2 times	101	32.2	29	34.1		
≥ 3 times	144	45.5	36	42.4		
Frequency of water irrigation						
Whenever lava found	256	81.3	67	78.8		
Once a week	51	16.2	16	18.8	0.791	0.852
Once a two weeks	2	0.6	1	1.2		
Once a month	6	1.9	1	1.2		
Frequency of sand abate utilization						
Always	280	89.2	74	87.1		
Sometimes	8	2.5	3	3.5	1.443	0.696
Rarely	11	3.5	5	5.9		
Never	15	4.8	3	3.5		
Frequency of personal protective measures use						
Never	19	8.3	2	2.4	5.590	0.236
Always	94	29.8	32	37.6		
Sometimes	11	3.5	5	5.9		
Rarely	191	60.6	46	54.1		

CHAPTER V

DISCUSSION, CONCLUSION AND RECOMMENDATION

5.1 Discussion

The main purpose of this research was to investigate the association between environmental, socio-economic risk factors and Dengue prevention practice with 2010 Dengue outbreak among refugees in Mae La camp, Tar Song Yang District, Tak Province, Thailand. The participants in this study were Myanmar refuges who lived in the camp for ≥ 6 months with the age of ≥ 15 years. This study was done with the expectation on utilization of study results in providing necessary technical supports for future Dengue prevention and outbreaks control measures in Mae La Temporary Shelter.

From analysis of general characteristic of studied population, majority of population, more than half, has low level of educational status; illiterate 37.2%, just read and write 18.2% and primary school 19%. This is consistent with the study in Nakhonnayok Province, 2003. And it also was a considerable factor in providing health educational measures not only for Dengue but also for other communicable diseases. Every health educational activities should be followed with regular monitoring system for such community.

More than 50% of the studied community was jobless and this is one of the opportunities for utilizing human resource power in terms of community mobilization for disease control and preventive measures activities in the camp.

Majority of the community were surviving with low level of income and this would influence on spending of household income in health care and preventive aspect. This may be one of the reasons why 43% of community didn't apply personal protective measures for preventing mosquito bite as most of those items had to be paid by community.

55.2% of studied community arrived into Mae La camp for more than 10 years duration and 8.2% were 5 to 10 years. On the other hand, Dengue outbreaks happened

annually in Mae La in spite of preventive measures. This long term residential status of the community figures out to assess the effectiveness of preventive activities like health education for Dengue and distribution of ITN in the camp.

As the study area was a critical situation, Temporary Shelter, more than 50% of the households were middle (34.2%) and large size (35.5%) families. The high population density would one of the precipitation factors for most of the communicable disease outbreaks. Moreover it becomes a challenging issue for controlling of outbreaks in time.

The study results revealed that 63.5% of Dengue patients were in adult age group of ≥ 15 years and also early reports from AMI also indicated that attack rate of Dengue in Mae La 2010 was also the highest in that age group. This also alarm for implementing agencies and organizations in terms of Dengue control and prevention measures.

When reviewing travelling history, 80% of Dengue patients didn't go out of Mae La camp 2 weeks prior onset of disease symptoms. So, we can consider that the 2010 Mae La Dengue outbreak was confined inside the camp. But as our study conducted after the outbreak and almost 1 year back, memory recall from our survey attendants won't be 100% correct. This would be a bias for our study process.

Although service providers implemented blanket approach of disease prevention and control measures in Mae La camp, there remained 9.2% of community in the study who never received Dengue health education. They may be very recent and new arrivals but whatever they may be, we need to take into account of this figure for strengthening of our services.

Similar pattern was noted in survey category of receiving sand abate during 2010. This part of our survey also pointed out that 5.5% of studied community never received sand abate distributed by NGOs.

When reviewing survey section on mosquito nets, out of 400 studied households, 26.2% didn't have any type of bed net and 60.5% of household were lacking of ITN. Among ITN possessed households, only 44.2% (n=70) had ITN in good condition. This

figure reveals that for prevention of future Dengue outbreaks, bed net distribution methods should be reviewed first.

From statistical point of correlation, significant association was observed between Dengue patients with age group, religion, occupational status, mosquito breeding places, household drainage condition and lighting condition of households.

56.6% of Dengue patients were in the age group of 15-49 years, 22.4% in 5-15 years, 12.9% in 1-5 years, 7.1 in ≥ 50 years and 1.2% in < 1 year ($\chi 2 = 6.7$ and $p = 0.01$). This also coincide with the fact that age pattern of Dengue now is changing from schooling age to adult Dengue from WHO recent publication of Dengue epidemiology.

52.9% of Dengue patients were believed in Christian, 44.7% in Buddhist, 1.2% in Islam and remaining 1.2% in Tradition like believed in spirits. ($\chi 2 = 9.489$, $p=0.023$). But in terms of epidemiology, this fact is not relevant with Dengue outbreak as all ethnic groups have equal potential to get the risk.

More than half (52.9%) of Dengue patients were jobless and 18.8% were daily paid workers ($\chi 2 = 25.6$, $p=0.001$). This result is consistent with the study in Vietnam 2004 and another study in Rio de Janeiro City of Brazil 2002.

85.9% of Dengue patients lived in households with some level of mosquito breeding places and 10.6% lived in households with many mosquito breeding places ($\chi 2 = 73.454$ and $p< 0.001$). This result is consistent with the study in Kongrailat District, Sukothai Province, Thailand 2006.

57.6% of Dengue patients lived in households with fair drainage condition, 37.6% lived in households with poor drainage condition. On the other side, 54.6% of non Dengue patients lived in households with good drainage condition ($\chi 2 = 69.329$ and p-vale < 0.001).

68.2% of Dengue patients lived in households with fair lighting condition, 28.2% lived in households with poor drainage condition. But 57.8% of non Dengue patients lived in households with good drainage condition. ($\chi 2 = 1.191$ and p-vale < 0.001)

So, for Dengue preventive and control measures, above stated 3 household conditions related to environmental factors should be modified and prioritized in future programs.

Regarding the hypothesis test, there was an association between socio-economic and environmental factors with Dengue outbreak in Mae La Temporary Shelter, Tha Song Yang Distric, Tak Province of Thailand. But to statistical significant association was observed between socio-economic factors and Dengue outbreak from this study.

5.2 Conclusion

This research was a cross-sectional study to explore the association between environmental, socio-economic risk factors and Dengue prevention practice with 2010 Dengue outbreak among refugees in Mae La camp, Tar Song Yang District, Tak Province, Thailand. Quantitative data were collected from the mid of February until the end of March 2011. General characteristics, socio-economic and environmental factors of Myanmar refuges in Mae La camp in order to find out the factors associated with 2010 Dengue outbreak in Mae La camp.

This study stated that attack rate of 2010 Mae La Dengue outbreak was quite high in adult age group and there was an association between environmental household factors with this Dengue outbreak. To prevent and control future Dengue and other vector born diseases outbreaks in Mae La, there need to pay more attention on living condition of the refugees with providing basic and essential needs like insecticide treated bed nets, promoting their educational status, supporting livelihood opportunity and empowering sense of ownership in community motivation.

5.3 Recommendation

For policy makers level

- Conduct advocacy meetings between Royal Thai Government (RTG) level representatives, NGOs representatives and representatives from CBOs for fighting Dengue and other vector born diseases.

- Find out the most possible ways and supports to control of outbreaks in time and preventing of further spread.

For Community level

- Health education and health promotion program related to vector control should be strengthened at community involvement level.
- All health education activities should be adjunct with regular monitoring system
- Empowering community involvement in all health related activities and provide necessary technical supports to grass root level.
- Strengthening environmental sanitation by conducting regular cleaning days and campaigns supervised by corresponding persons.

For Further Research

- Further qualitative studies are suggested to explore more detail on risk factors and risk behaviors on Dengue and other vector born diseases by experts and experienced researchers.

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APPENDICES

APPENDIX A

Form of
Patient/ Participant Information Sheet

Title of research project …"*Association of environmental and socio-economic risk factors related to Dengue outbreak in Mae La Temporary Shelter, Tak Province, Thailand*"

Principle researcher's name …**THET WIN**.

Position …**HIS Coordinator**

Office address …1028/5 Pong-Amom Building, 2nd Fl., Rama IV Road, Thungmahamek, Sathorn, Bangkok 10120 Thailand

Home address …41 Soi Sodpinsan, Rangnam Rd., Rajthavee, Bangkok 10400 Thailand

Telephone (office) +66(0)2 679 9270

Telephone (home) +66(0)2 246 4939

Cell phone +66(0)83 979 5286

E-mail: chendewen77@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 finding out "the relationship between 2010 Dengue outbreak in Mae La camp and possible factors in environment and society which may lead to Dengue infection, Dengue related complications and Dengue related death"

3. Objective (s) of the project are;
   - To investigate the association between environmental, socio-economic risk factors and Dengue prevention practice with 2010 Dengue outbreak among all sex, ethnic groups of refuges who resided more than 6 months in Mae La Temporary Shelter, Tar Song Yang District, Tak Province, Thailand.
   - To provide technical support for more effective prevention and control measures and guidelines for future Dengue outbreaks in MaeLa Temporary Shelter based on the study results.
4. For this research with above mentioned objectives we need *394* participants from this camp who resided more than six months in this camp, regardless of sex, religion and ethnic groups.
5. But we will ask for those who were ≥15 years of age for answering our questions reasonably and we apologize for those who were under 15 years and can't be involved in this research.

   Inclusion criteria*: those who are≥ 15 years and lived in the Mae La for at least 6 months will be included in this study regardless of their sex, religion and ethnicity.*

   Exclusion criteria*: those who are < 15 years of age will be excluded in this study.*
6. Our questioners will be asked to you by this trained gentleman / lady who you may know as home visitor (community health worker) as he/she come and visit to you frequently before for his previous job. *The entire interview process will probably takes 30 minutes for answering 37 questions in maximum.*
7. You can answer those questions in your convenient way and all those information regarding with you and your family personality and privacy will be keep confidential according to our ethical (personal respect) practice.
8. By answering these questions, we will grantee you that you won't be either harm or socially disrupted.

9. But from your active and voluntary participation, we expected that your experiences and information will help you, your family and your community who live in the camps especially for future Dengue infection and outbreaks.
10. We will provide you necessary and relevant information and feedback of this study after our study results are officially published.
11. So, you are coordinately and respectfully invited to involve in our research study. But participation to this study is **voluntary** and you has the **right to deny** and/or **withdraw** from the study at any time, no need to give any reason, and there will be no bad impact upon you
12. If you have any question or would like to obtain more information, the researcher can be reached at all time. If the researcher has new information regarding benefit on risk/harm, you will be informed as soon as possible

Thanks for your active participation and best regards,

Dr. Thet Win
CCSDPT HIS Coordinator
Student of Chulalongkorn – Master Degree Program for Public Health Science
LWP 5279133553
Mobile: 083 979 5286

APPENDIX B

Form of

Informed Consent Form

Address ……..……
Date ……..……

Code number of participant ……

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

Title "*Association of environmental and socio-economic risk factors related to Dengue outbreak in Mae La Temporary Shelter, Tak Province, Thailand*"

Principle researcher's name: THET WIN

Contact address 1028/5 Pong-Amom Building, 2nd Fl., Rama IV Road, Thungmahamek, Sathorn, Bangkok 10120 Thailand

Telephone +66(0)83 979 5286

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

I willingly **agree** to participate to be interviewed 37 questions about 30 minutes for one time.

I have **the right** to withdraw from this research project at any time as I wish with no need to **give any reason**. This withdrawal **will not have any negative impact upon me (eg: still receive the usual services).**

Researcher has guaranteed that procedure(s) acted upon me would be exactly the same as indicated in the information. Any of my personal information will be **kept confidential.** Results of the study will be reported as total picture. Any of personal information which could be able to identify me will not appear in the report.

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

Sign ……..……

(……..……)
Researcher

Sign ……..……

(……..……)
Participant

Sign ……..……

(……..……)
Witness

APPENDIX C

Dengue Cross Sectional Study
QUESTIONNAIRE

Instructions:

a) *Introduction:* My name is _____.
I am conducting a survey to help find ways to find out the factors for controlling Dengue outbreak currently occurring in Mae La Camp. The study involves a number of questions about household socio-economic and environmental factors. Can you participate in this survey?

b) *If there no responder or refuse to participate for this survey, please jump to next house.*

c) *If the responder is≥ 15 years of age who live in that particular house, interview him/her directly.*

a) Date of interview _____/_____/_____

b) Name of interviewer _____

c) Section _____

d) House number _____

e) Household head (name) _____

Socio-Economic factors

(HOUSEHOLD INFORMATION)

1) **Name** of interviewee _____

2) **Age** of interviewee (in year completed) _____

3) **Sex** of interviewee *(Check box)* □ Male □ Female

4) **Ethnic group** of all/majority of households _____

5) **Religion** of all/majority of households _____

6) Highest level of **education of interviewee** *(Check only one)*

□ Postgraduate □ University graduate □ High school

□ Middle school □ Primary school □ Just read and write

□ Illiterate

7) What is the type of the **main job of interviewee** during past 1 year *(Check only one)*

□ No Job □ Student □ Teacher or Staff from religious organization

□ Open own shop (any shop)/small business □ Paid job with NGO or CBOs

□ Unpaid job/Volunteer with NGO or CBOs □ Daily Worker

□ Others (please specify: ……..……..)

8) Highest level of **education of head of the household** *(Check only one)*

□ Postgraduate □ University graduate □ High school

□ Middle school □ Primary school □ Just read and write

□ Illiterate

9) What is the type of **main job of the head of household** during past 1 year *(Check only one)*

□ No Job □ Student □ Teacher or Staff from religious organization

□ Open own shop (any shop)/small business □ Paid job with NGO or CBOs

□ Unpaid job/Volunteer with NGO or CBOs □ Daily Worker

□ Others (please specify: ……..……..)

10) What is the average **monthly income** of the household?

□ ≥ 3,000 Bath / month □ ≥ 2,000 to < 3,000 Bath / month

□ ≥ 1,000 to < 2,000 Bath / month □ < 1,000 Bath / month

□ No income at all

11) When did your household **first arrive** to the camp? *(mm/yyyy)* _____/_____

12) How many people live in this household? _____

13) How many people **under the age of 5 years** live in this household? _____

14) How many children **under the age of 15 years** live in this house? _____

(have to include number of U5 in Question 13)

15) Is there any child under the age of 15 years who got Dengue Fever (or) Dengue Haemorrhagic Fever (or) Dengue Shock Syndrome during 2010?

□ **Yes** □ **No**

16) If yes, how many children under 15 years infected with Dengue

_____

(INFORMATION Related to Dengue Patient)

17) Is there **any Dengue patient** in the household since 1st January 2010? *(Check box)*

(If 'NO', escape to Question 19) □ Yes □ No

18) Personal Information of the Dengue Patient:

	Patient 1	***Patient 2***	***Patient 3***
Age (completed year)			
Sex (**M =** Male, **F** = Female)			
Ethnic Group			
Highest Level of Education: *(write only 1, 2, 3, etc.)* 1) Postgraduate 2) University graduate 3) High school 4) Middle school 5) Primary school 6) Just read and write 7) Illiterate			
Main job during past 1 year *(write only 1, 2, 3, etc.)* 1) No Job 2) Student			

3) Teacher or Staff from religious organization 4) Open own shop (any shop)/small business 5) Paid job with NGO or CBOs 6) Unpaid job/Volunteer with NGO or CBOs 7) Daily Worker 8) Others (please specify:)			
Travel outside the camp 2 weeks prior onset of illness (**Y** = Yes, **N** = No)			

Environmental Factors

(OBSERVE for those questions with * sign and ASK for those without * sign)

19) * The **natural light inside the household** make interviewer to read well and clearly all these questionnaires?

□ Agree □ Somewhat Agree □ Not Agree

20) * There was a **good drainage system** inside and compound of the household (no water was logged inside the household as well as it's surrounding)?

□ Agree □ Somewhat Agree □ Not Agree

21) * Did the house have **stored water containers**?

□ Yes □ No

22) **How many** water container(s) did they have for domestic use?

_____

23) * There is/are **mosquito breeding place(s) or container(s)** inside the household, its compound and 100 m around?

□ No □ Some □ Many

Practice for Prevention of Dengue

(OBSERVE for those questions with * sign and ASK for those without * sign)

24) During 2010, how many times did the house **receive health education** about Dengue?

□ Never □ Only 1 times □ 2 times □ ≥ 3 times

25) * How many above mentioned water container(s) were **covered tightly**?

_____

26) How often did they **change water in the container(s)**? *(check only one)*

□ Whenever mosquito lava found in the container □ Once a week

□ Once a two week □ Once a month □ Once every 2 month

□ Once > 2 months (or) Irregularly □ Never

27) How often did the household **receive sand abate**? *(If 'No' escape to Question 43)*

□ Once a week □ Once a two week □ Once a month

□ Once every 2 month □ Irregularly □ Never

28) How often did they **put sand abate into water containers** after receiving from NGO?

□ Always □ Sometimes □ Rarely □ Never

29) A. Did the house have **bed net**? □ Yes □ No

B. Did the house have **insecticide treated bed net**? □ Yes □ No

30) A. **How many** beds net did the household have?

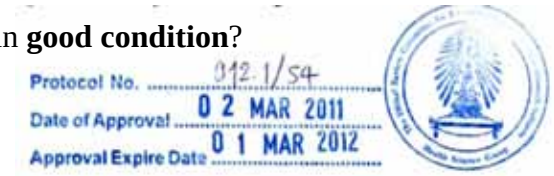
_____

B. **How many** insecticide treated bed net did the household have?

_____

31) * Was/Were insecticide treated bed net(s) in **good condition**?

□ Yes □ No



32) Was/Were the **bed net(s) enough** for all household members?

□ Yes □ No

33) **How often** the household members use these bed net(s)? *(check only one)*

□ Always when they sleep □ Most of the time when they sleep

□ Sometimes when they sleep □ Rarely when they sleep □ Never use

34) **Which part of the day** the household members use these bed net(s)? *(check only one)*

□ Day time sleep only □ Night time sleep only

□ Both day and night time sleep

35) Other than bed net, did the household members use the following type(s) of **personal protective measures** for preventing mosquito bite, during 2010? ***(can choose more than one!)***

□ Using mosquito coils and repellents □ Wearing long clothes

□ Wearing long clothes for children whenever going to school

□ Others methods *(Please specify :_____)*

36) **How often** did the household members use above mentioned method(s)? *(check only one)*

□ Always □ Sometimes □ Rarely □ Never

37) During 2010, how many times did the household **receive fumigation** from NGOs?

□ Never □ Only 1 times □ 2 times □ ≥ 3 times

End of Questionnaires and Please Say "Thanks you for your kind participation!"

Signature and Name (in bracket) of the interviewer:

_____

Signature and Name (in bracket) of the Quality Controller

_____

APPENDIX D

BUDGET

No	Activities	Unit Price (THB)	Quantity	Total (THB)
1	**Pretesting** Photocopy	10	30 sets	300
2	**Data collection** Photocopy Quest.	10	450 sets	4,500
	Interviewers per diem	150	10 x 10 D	15,000
	Accommodation	800	5 days	4,000
	Transportation cost	1200	2 trips	2,400
3	**Document printing** Paper + printing	4	900 pages	3,600
	Photocopy (exam + final submit)	0.5	12 x 400 pages	2,400
	Stationary	500	1 set	500
	Binding Paper (exam)	150	7 set	1,050
	Binding Paper (submit)	150	7 set	1,050
Whole Thesis Document Process				**34,800**

APPENDIX E

TIME SCHEDULE

Research Activities	Time Frame (Months during 2010-2011)					
	Nov	Dec	Jan	Feb	Mar	Apr
Literature review and Conduct draft tool for data collection						
Tools development for data collection Try out research tool Content validity by experts and Ethical Consideration						
Field preparation and data collection and Data analysis and interpretation						
Report writing, Presentation and Publication						

VITAE

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Place of Birth	: Mandalay, Myanmar
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Education	: M.B., B.S Institute of Medicine, Mandalay, Myanmar in 2004.
Working Experiences	: April 2004 – May 2008 Lecturer, Department of Preventive and Social Medicine, Institute of Medicine, Mandalay, Myanmar. February 2009 – October 2010 Epidemiologist and HIS Officer Aide Medicale Internationalae, Mae Sod, Thailand. November 2010 – Now Health Information System Coordinator Committee for Coordination of Services to Displaced Persons in Thailand (CCSDPT), Bangkok, Thailand.