



Faculty of Medicine and Health Sciences

**COMPARISON OF SOCIO-ECONOMIC STATUS AND HUMAN
RELATED FACTORS AMONG ADULTS BETWEEN HOTSPOT
AND NON-HOTSPOT AREAS OF DENGUE IN KUCHING
AND SAMARAHAN, SARAWAK**

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Master of Public Health

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TABLE OF CONTENT

DECLARATION OF ORIGINALITY ii

ACKNOWLEDGEMENT iv

TABLE OF CONTENT v

LIST OF TABLES x

LIST OF FIGURES xii

LIST OF ABBREVIATIONS xiii

LIST OF APPENDICES xiv

ABSTRACT xv

ABSTRAK xvi

CHAPTER 1: INTRODUCTION 1

1.1 Background 1

1.2 Problem Statement 2

1.3 Objective 5

1.3.1 General objective 5

1.3.2 Specific objective..... 5

1.4 Research Questions 5

1.5 Research Hypothesis 6

1.6 Conceptual Framework 6

CHAPTER 2: LITERATURE REVIEW 8

2.1 Introduction 8

2.2	Transmission	9
2.3	Clinical Manifestations.....	11
2.3.1	Febrile Phase.....	12
2.3.2	Critical Phase	13
2.3.3	Recovery/Reabsorption Phase	14
2.4	Factors Contributing to the Increasing of Dengue Incidence	14
2.5	Factor Affecting Dengue Prevention Behaviour	16
2.6	Human Related Factors	17
2.7	Impact of Dengue Virus infections	18
2.7.1	Public Health Impact	18
2.7.2	Social Impact	19
2.7.3	Economic Impact	20
2.8	Community involvement in the control of dengue.....	21
2.8.1	COMBI	23
2.8.2	Environmental management	24
2.8.3	Solid waste management	25
2.8.4	Individual and household protection.....	25
2.8.5	Chemical Control.....	26
2.8.6	Biological Control.....	28
2.9	Dengue Vaccine	28
2.9.1	Vaccine characteristics	29

2.9.2	Adverse outcomes in the vaccinated seronegative persons	29
2.9.3	Challenges to vaccine development.....	32
2.10	Instrument Used to Measure Knowledge, Attitude, and Practices Towards Dengue	32
CHAPTER 3: METHODOLOGY		37
3.1	Study Area	37
3.2	Research Design	38
3.3	Study Population and Sample.....	39
3.4	Study Duration	39
3.5	Inclusion and Exclusion Criteria	39
3.5.1	Inclusion Criteria	39
3.5.2	Exclusion Criteria	39
3.6	Sample Size and Sampling Method.....	40
3.7	Data Collection Procedure.....	41
3.8	Data Collection Instrument	41
3.9	Pilot / Pre-test	43
3.10	Operational definitions	44
3.11	Statistical Analysis	45
3.12	Ethical Consideration	45
CHAPTER 4: STUDY RESULTS.....		46
4.1	Sociodemographic characteristics of the participants	46
4.2	Risk perception, knowledge, attitude, and practice towards dengue.....	48

4.2.1	Risk perception of dengue fever	48
4.2.2	Knowledge of dengue fever	51
4.2.3	Attitude towards dengue fever	55
4.2.4	Practice towards dengue fever	57
4.3	Relationship between risk perception, knowledge, attitude, and practice with the selected sociodemographic characteristics	60
4.3.1	Relationship between risk perception, knowledge, attitude, and practice with gender	60
4.3.2	Relationship between risk perception, knowledge, attitude, and practice with the level of household income	61
4.3.3	Relationship between risk perception, knowledge, attitude, and practice between the level of education	64
4.4	Comparison of risk perception, knowledge, attitude, and practice between the hotspot and non-hotspot area	66
4.5	Correlation between risk perception, knowledge, attitude, and practice towards dengue fever	68
CHAPTER 5: DISCUSSION		70
5.1	Comparison of socioeconomic status, risk perception, knowledge, attitude, and practices between the areas of dengue hotspot and non-hotspot	70
5.1.1	Comparison of household income between the areas of hotspot and non-hotspot	70
5.1.2	Comparison of education level between the hotspot and non-hotspot areas	71
5.1.3	Comparison of risk perception, knowledge, attitude and practices between the hotspot and non-hotspot areas	71

5.2 Relationship between socioeconomic status, risk perception, knowledge, attitude, and practices related to dengue 72

5.2.1 Relationship of gender to risk perception, knowledge, attitude, and practices related to dengue 72

5.2.2 Relationship of household income to risk perception, knowledge, attitude, and practices related to dengue 73

5.2.3 Relationship of education level to risk perception, knowledge, attitude, and practices related to dengue 74

5.2.4 Relationship between risk perception, knowledge, attitude, and practices related to dengue 75

5.3 Strength of study 76

5.4 Limitation of this study 76

5.5 Recommendation..... 77

CHAPTER 6: CONCLUSION..... 79

REFERENCES..... 81

APPENDICES 91

LIST OF TABLES

Table 4.1 Sociodemographic characteristics of the participants	47
Table 4.2 Percentage distribution of respondent's risk perception towards dengue fever (N-102).....	49
Table 4.3 Distribution of respondent's risk perception towards dengue fever in hotspot and non-hotspot area (N-102)	50
Table 4.4 Percentage distribution of respondent's knowledge towards dengue fever (N-102)	52
Table 4.5 Distribution of respondent's knowledge towards dengue fever in hotspot and non-hotspot area (N-102)	53
Table 4.6 Percentage distribution of respondent's attitude towards dengue fever (N-102)	55
Table 4.7 Distribution of respondent's attitude towards dengue fever in hotspot and non-hotspot area (N-102)	56
Table 4.8 Percentage distribution of respondent's practice towards dengue prevention (N-102).....	58
Table 4.9 Distribution of respondent's practice towards dengue fever in hotspot and non-hotspot area (N-102)	59
Table 4.10 t-test for comparison of mean marks in risk perception, knowledge, attitude and preventive practice between male and female.....	61
Table 4.11 ANOVA for significant difference of mean marks in risk perception, knowledge, attitude, and practice between levels of household income.....	62
Table 4.12 ANOVA for significant difference of mean marks in risk perception, knowledge, attitude, and practice between level education	65

Table 4.13 Score difference of risk perception, knowledge, attitude, and preventive practice level on Dengue between Hotspot and Non-hotspot Communities 67

Table 4.14 t-test for comparison of mean marks in risk perception, knowledge, attitude, and preventive practice between the hotspot and non-hotspot..... 68

Table 4.15 Correlations of risk perception, knowledge, attitude, and preventive practice towards dengue..... 69

LIST OF FIGURES

Figure 1.1: Conceptual framework for the relationship between socioeconomic status, risk perception, knowledge, attitude, and practices. 7

Figure 2.1: The urban dengue virus cycle in humans and mosquitoes(Guzman et al., 2016). 11

Figure 3.1: Location of Kampung Pasir Pandak and Kampung Meranek (Google, n.d) 38

LIST OF ABBREVIATIONS

COMBI	Communication for Behavioural Impact
MOH	Ministry of Health
SAGE	Strategic Advisory Group of Experts
WHO	World Health Organization

LIST OF APPENDICES

APPENDIX A: QUESTIONNAIRE (ENGLISH VERSION).....	91
APPENDIX B: QUESTIONNAIRE (MALAY VERSION)	95
APPENDIX C: INFORMED CONSENT FORM (ENGLISH VERSION)	99
APPENDIX D: INFORMED CONSENT FORM (MALAY VERSION).....	103
APPENDIX E: GANTT CHART	107
APPENDIX F: UNIVERSITY MALAYSIA SARAWAK (UNIMAS) ETHIC COMMITTEE APPROVAL LETTER.....	109

ABSTRACT

Introduction: Despite the ongoing efforts by the Ministry of Health in dengue control, it remains a public health issue in Kuching and Samarahan as the surge of the outbreak and increased number of hotspot areas. Human behaviour had contributed to the rising number of dengue cases. This study aims to compare socioeconomic status, risk perception, knowledge, attitude, and practice among the communities in dengue hotspot and non-hotspot areas. **Methodology:** A community-based cross-sectional study was conducted in the hotspot and non-hotspot areas in Kuching and Samarahan. One-hundred-and-two respondents were randomly selected to answer the self-administered questionnaire. Desired socioeconomic characteristics, risk perception, knowledge, attitude, and practices towards dengue prevention were compared using Chi-Square test, independent sample t-test, and one-way analysis of variance (ANOVA) as appropriate. Finally, risk perception, knowledge, attitude, and practice were correlated using Pearson correlation. **Results:** People living in the hotspot area had lower household income and education levels compared to people living in the non-hotspot area; still, they have a better attitude (p-value: <0.05). In this study, females showed better in prevention practice than males (p-value: <0.05) but no significant differences in risk perception, knowledge, and attitude. Concerning the level of education, this study findings show a better attitude among people with a higher education level than people with lower education levels (p-value: <0.01). Also, people with higher risk perception tend to have better knowledge and attitude towards dengue (p-value: <0.01). Similarly, people with higher education will also show a better attitude (p-value: <0.01). However, there is no correlation between risk perception, knowledge, and attitude toward dengue preventive practices. **Conclusion:** Therefore, dengue prevention activities should focus on communities with lower household income and lower education levels. Strengthening intersectoral collaboration is suggested to increase the economic status and level of education of the communities.

ABSTRAK

Pendahuluan: Denggi masih menjadi isu kesihatan awam di Kawasan Kuching dan Samarahan walaupun pelbagai inisiatif telah dilaksanakan oleh pihak Kementerian Kesihatan. Ini dapat dilihat dengan lonjakan bilangan wabak serta peningkatan kawasan yang diisytiharkan sebagai hotspot. Tingkah laku manusia merupakan faktor utama kepada peningkatan jumlah kes denggi. Kajian ini bertujuan untuk membandingkan persepsi risiko, pengetahuan, sikap dan tingkah laku masyarakat di antara kawasan hotspot dan bukan hotspot denggi. **Metodologi:** Ini merupakan kajian keratan rentas yang dijalankan di kawasan hotspot dan bukan hotspot di Kuching dan Samarahan. Seratus dua responden telah dipilih secara rawak untuk menjawab soalan kaji selidik. Ciri-ciri sosioekonomi, persepsi risiko, pengetahuan, sikap dan tingkah laku terhadap pencegahan denggi dibandingkan dengan menggunakan ujian Chi Square, Uji t sampel bebas dan analisis varians satu arah (ANOVA) mengikut kesesuaian. Akhirnya, hubungan antara persepsi risiko, pengetahuan, sikap dan tingkahlaku dianalisa menggunakan korelasi Pearson. **Hasil:** Penduduk yang tinggal di kawasan hotspot mempunyai pendapatan isi rumah dan tahap pendidikan yang lebih rendah berbanding penduduk yang tinggal di kawasan bukan hotspot; namun mereka mempunyai sikap yang lebih baik (nilai p : <0.05). Dalam kajian ini, wanita menunjukkan tingkah laku terhadap pencegahan denggi yang lebih baik berbanding lelaki (nilai p : <0.05) namun tidak terdapat perbezaan yang ketara dalam persepsi risiko, pengetahuan dan sikap. Disamping itu, kajian ini juga mendapati individu yang berpendidikan tinggi menunjukkan sikap yang lebih baik berbanding individu yang berpendidikan lebih rendah (p -value: <0.01). Selain itu, individu yang mempunyai persepsi risiko yang lebih tinggi cenderung mempunyai pengetahuan dan sikap yang lebih baik terhadap denggi (nilai p : <0.01). Begitu juga, individu yang berpengetahuan tinggi juga akan menunjukkan sikap yang lebih baik (nilai p : <0.01). Namun, tidak ada hubungan kait antara persepsi risiko, pengetahuan dan sikap terhadap tingkah laku pencegahan denggi. **Kesimpulan:** Oleh itu, program pencegahan denggi perlu diberikan penekanan terhadap masyarakat yang mempunyai latar belakang pendidikan dan pendapatan yang rendah. Pengukuhan kerjasama antara pelbagai agensi juga disarankan bagi meningkatkan taraf ekonomi dan tahap pendidikan masyarakat.

CHAPTER 1: INTRODUCTION

1.1 Background

Dengue is one of the most rapidly expanding mosquito-borne viral diseases over the past few decades and becoming endemic in more than 100 countries worldwide. The figure of Dengue cases is not only increasing but also surging into outbreaks. Among the endemic regions are the Western Pacific, South-East Asian, African, Eastern Mediterranean, and the Americas (World Health Organization, 2019b). The number of dengue cases is estimated to be around 390 million every year, with about 96 million developing a different level of severity in the disease symptoms(Bhatt et al., 2013).

Malaysia is also facing an excessive number of dengue cases, that is fluctuating each year. In 2013, there were 43,436 dengue cases reported, and that number significantly increased to 108,698 and 120,836 in 2014 and 2015, respectively. The number of cases decreased slightly to 101,357 cases in 2016. There was a further reduction in the number of cases to 83,849 and 80,615 in 2017 and 2018, respectively, but it is still very high compared to those before 2014(Ministry of Health Malaysia, 2019).

Sarawak has also experienced a surge in the number of dengue cases. Its capital city, Kuching, had a sudden increase in the number (nine) of hotspots in 2019, compared to two hotspots in 2018. Kuching city has an area of 431 square kilometres. It is divided into Kuching North administrative region and Kuching South administrative region with a total population of 570,407 and 754.33/km² in density(Kementerian Hal Ehwal Ekonomi, 2019).

Even though the Ministry of Health and the Local Authorities had put a lot of effort into the activities of dengue prevention and control, still those number of cases continued to rise. At least five significant factors that contribute to the spread of dengue fever, namely the dengue virus as the agent, human as a host, vectors or mosquitoes behaviour, environmental factors, and also climate change. Other than that, factors like rapid urbanisation, population growth, human behaviour, and movement make the control of dengue very challenging(Rose Nani Mudin, 2015). Since dengue control is a behavioural problem(Karimah Hanim et al., 2017), this study was conducted to describe the human-related factors, which are socioeconomic status, risk perception, knowledge, attitude, and practices that are important in dengue transmission. All these modifiable factors are compared between the hotspot and also non-hotspot areas in Kuching and Samarahan. From the literature search, the author did not find any previous study comparing socioeconomic status, risk perception, knowledge, attitude, and practice between communities residing in hotspot and non-hotspot areas in Sarawak. Therefore, there is a need to do the study to fill in the gap in knowledge of those factors in Sarawak. Additionally, the study findings will assist the local authorities to formulate policies on suitable infection prevention practices and vector control programmes based on the related factors in the study.

1.2 Problem Statement

Active community participation is especially important in the control of *Aedes* mosquitoes, the vectors of the dengue virus. Toledo (2007) showed that the entomological indices reduced when the community participated in the intervention and control activities. The study also showed a similar effect between strategy involving the community and the routine intensive vector control(Toledo et al., 2007).

In sustaining the disease control programme, it needs a sense of belonging among the community, use of their resources, idea, and leadership in designing and setting the direction of the programme(Gubler & Clark, 1996). Gubler had proposed that an effective ethnic-geographic study be conducted to understand better the community values and diversity and then use this information to develop targeted educational messages and design intervention strategies(Gubler & Clark, 1996).

Prevention and control by including the community in the programme are crucial as dengue is rapidly spreading globally. It affects people mainly in tropical and subtropical countries, primarily in developing countries around the world. Seventy to eighty per cent of reported dengue cases occur in urban areas. Among the factors that favour dengue transmission are high population density and rapid development of the regions(Ministry Of Health Malaysia, 2015; World Health Organization, 2009).

Dengue imposes a burden on endemic populations in medically, economically, and socially. In 2001, the disability-adjusted life years (DALYs) lost due to dengue fever were estimated to be 528 per 1000 globally (Cattand et al., 2006). In addition, other family members who took care of the dengue patients were also affected by dengue, and an average of burden was 14.8 days lost to outpatients and 18.9 days lost for inpatients care. On average, about USD 514 were spent for the non-fatal outpatient case, meanwhile, USD 1491 for a non-fatal hospitalised case(World Health Organization, 2009).

Dengue is one of the significant public health problems because of its high burden on morbidity and mortality(Ministry Of Health Malaysia, 2015). For the time being, there is no approved safe vaccine for all or specific medicine on this life-threatening disease. There is also no significant vector control effort in preventing its

rapid emergence and global spread(Tatem, Hay, & Rogers, 2006; World Health Organization, 2009).

Since 2011, the Ministry of Health Malaysia has adopted an integrated plan in the National Dengue Strategic Plan (NDSP) for dengue disease control and prevention. It includes the following approaches:(i) enhance dengue surveillance, (ii) implement integrated vector control, (iii) emphasis on treating dengue cases, (iv) preventive activities by social and community empowerment, (v) ensure quick response in the dengue outbreaks management and (vi) initiate dengue research in developing new innovative methods (Rose Nani Mudin, 2015). With the assistance of the World Health Organization in 2001, a new approach in planning and implementation of social mobilisation was piloted in Johor Bahru. It was known as Communication for Behavioural Impact (COMBI)(Suhaili et al., 2004). Currently, COMBI is implemented in the whole of Malaysia. A study done in 2008 in Selangor, Malaysia, showed that COMBI programme was unsuccessful in bringing the expected behavioural impact base on qualitative and quantitative studies, together with epidemiological and entomological assessments(Ismail, Nawi, & Mohamed, 2015).

Despite the ongoing efforts by the Ministry of Health in dengue control, dengue remains a public health problem in Kuching, as evidenced by the surge in the number of outbreaks and increased number of hotspot areas. Human behaviour contributes to the rise of dengue cases, which lead to dengue outbreak and then become a hotspot. Thus, this study will compare the socioeconomic status, risk perception, knowledge, attitude, and practice between the hotspot and the non-hotspot area. The results will benefit dengue control activities specifically by finding a better approach in reducing dengue cases in Kuching and Samarahan areas.

1.3 Objective

1.3.1 General objective

To compare the socioeconomic status, risk perception, knowledge, attitude, and practices between communities living in the hotspot and non-hotspot areas in Kuching and Samarahan.

1.3.2 Specific objective

- i. To describe the socioeconomic status, risk perception, knowledge, attitudes, and practices towards dengue among communities in the hotspot and non-hotspot areas in Kuching and Samarahan.
- ii. To determine the relationship between socioeconomic status, risk perception, knowledge, attitude, and practices towards dengue.

1.4 Research Questions

The general research question is:

Are there any differences between socioeconomic status, risk perception, knowledge, attitude, and practices that contribute to dengue outbreaks in hotspot and non-hotspot areas in Kuching and Samarahan?

The specific research questions are:

- i. Is there any association between socioeconomic status and knowledge of dengue?
- ii. Is there any association between risk perception and practice towards Dengue vector control?

- iii. Is there any association between knowledge of dengue with risk perception, attitude, and practices towards Dengue vector control?
- iv. Is there any association between practice toward dengue control with risk perception and the right attitude?

1.5 Research Hypothesis

Null Hypothesis:

There is no difference in socioeconomic status, risk perception, knowledge, attitudes, and practices towards dengue between the communities in the hotspot and non-hotspot areas in Kuching and Samarahan.

Alternative Hypothesis:

There is a difference in socioeconomic status, risk perception, knowledge, attitudes, and practices towards dengue between the communities in the hotspot and non-hotspot areas in Kuching and Samarahan.

1.6 Conceptual Framework

According to the objective of the study, the outcome variable is the practices related to dengue. This study will also determine the relationship between socioeconomic status, risk perception, knowledge, attitude, and practices related to dengue and to compare those factors between the hotspot and non-hotspot areas in Kuching and Samarahan.

Previous researches on socioeconomic status, risk perception, knowledge on dengue, attitudes, and practices for dengue were reviewed (Abdul Rahim, Hamizah,

Olivia, Anita, & Mohd Rafee, 2016; Castro et al., 2013; Harapan, Anwar, Setiawan, & Sasmono, 2016; Leong, 2014; Lugova & Wallis, 2017). The hypothesis was that higher economic status is directly associated with higher knowledge on dengue, increased risk perception on dengue will reduce the risk practices for dengue. Higher knowledge of dengue is associated with higher risk perception, better attitude, and practices. Finally, higher risk perception and the right attitude are also associated with a decrease in risk practices (Figure 1.1).

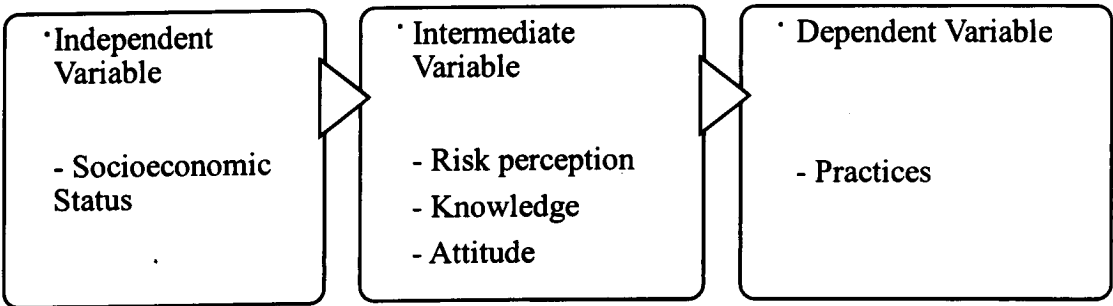


Figure 1.1: Conceptual framework for the relationship between socioeconomic status, risk perception, knowledge, attitude, and practices.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Dengue virus is a mosquito-borne flavivirus that causes dengue infection (Ministry Of Health Malaysia, 2015). Dengue virus is in the Flaviviridae family and under the genus of Flavivirus. Most of the flaviviruses are significant pathogens for humans and are host-specific. The Flaviviridae is a family of small wrapped or enveloped viruses with 9,000–13,000 bases of RNA genomes. The majority of known members of the genus Flavivirus are borne by mosquitoes or ticks. Mammals and birds affected by the diseases varied in the presentations, from without symptom to severe with fatal haemorrhagic or neurological symptoms (Simmonds et al., 2017).

The earliest documentation about this disease was found in the Chinese encyclopaedia, and it was believed linked to water-related flying insects. The symptoms and cures were recorded in this encyclopaedia which was published during the Chin Dynasty (265-420 A.D.) for the first time and formally edited in 610 A.D. during the Tang Dynasty and again in 992 A.D. during the Northern Sung Dynasty (Gubler, 1998).

The advent of endemic DENV is a relatively recent occurrence that has probably occurred in the last 2,000 years after populations have achieved densities and sizes that can provide continuing transmission. The sudden surge in DENV occurrence and the geographical distribution was probably caused primarily by the colonisation of most tropical regions with *Aedes aegypti*, an anthropophilic and efficient vector,

and the growth of urbanisation after the Second World War(Vasilakis & Weaver, 2008).

Global trends, such as urbanisation and international travel, make it easier to spread dengue. Four types, DENV-1,2,3, and 4 have been identified since 1943 after the first dengue virus (DENV) was isolated(Messina et al., 2014). *Aedes aegypti* and also *Aedes albopictus* mosquitoes are the vectors that spread the disease. A lifetime protective immunity to the homologous serotype is induced after each episode of infection, but it only partially and temporarily protects against other serotypes. Unfortunately, due to the enhancement of antibody response, a subsequent dengue infection becomes a significant risk factor for severe dengue. Virus virulence, viral load, host genetic background, T-cell activation, and individual auto-antibodies are other important contributing factors. At any time, all four dengue serotypes can be isolated in Malaysia. Nonetheless, for at least two years, a specific dengue virus serotype can predominate before another serotype become dominant(Ministry Of Health Malaysia, 2015).

2.2 Transmission

In dense tropical urban centres, dengue viruses are sustained in an endemic-epidemic loop that involved both humans and mosquitoes. These viruses have long emerged from sylvatic cycles involving non-human primates and *Aedes* mosquitoes in the Asian and African rainforests. It fully adapted to humans, and the main vector is the highly domesticated *Aedes aegypti* mosquito(Gubler, 1998). In the 1600s, during the slave trade, *Aedes aegypti* was imported to America. Since then, it has spread throughout the world simultaneously with the growth of the shipping industry. A female *Aedes* mosquito can live for about one to two weeks. These mosquitoes live

closely with humans. They feed on humans, houses as their shelter, and breed in human-made water containers. (Southwood, Murdie, Yasuno, Tonn, & Reader, 1972). The female mosquito will get infected if she feeds on blood during the acute febrile and viraemic stage of the disease. Firstly, the virus infects the midgut cells and then multiplies in various mosquito tissues during its extrinsic incubation period (Figure 2.1). They then infect the salivary glands 5–12 (typically 8–10) days later. This cycle is determined by ambient temperature, viral strain, and abilities of the mosquito. Once the salivary glands are infected, the mosquito becomes infective and can transmit the virus to another human during blood-feeding (Gubler, 1998). The mosquito remains infective for life and can infect anyone on subsequent probes while trying to feed. The duration of the intrinsic incubation (the period from exposure to the appearance of symptoms) for humans varies from 3 to 14 days, but mostly 4–7 days. The virus may be transmitted by an infected female mosquito to her offspring through the eggs vertically, but this transmission mode is of uncertain epidemiological significance (Gubler, 1998; Guzman, Gubler, Izquierdo, Martinez, & Halstead, 2016).

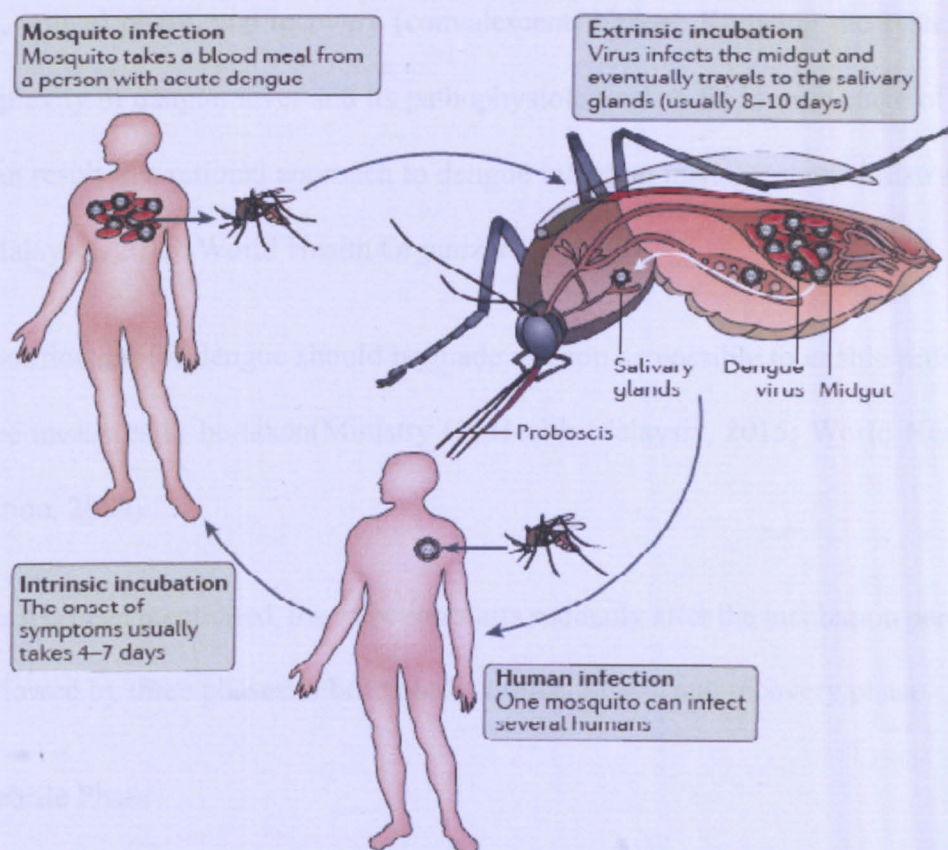


Figure 2.1: The urban dengue virus cycle in humans and mosquitoes(Guzman et al., 2016).

2.3 Clinical Manifestations

Despite the short period of the disease (almost 90% of cases resolved less than one week), dengue is very dynamic. Its clinical expression may change as the days pass by and deteriorate unexpectedly. The dengue disease incubation period is 4 to 7 days (range 3-14). The presentation might be asymptomatic, or its presentation can mimic a range of diseases. Its severity could range from undifferentiated minor febrile illness to severe illness with or without plasma leakage and organ damage. Symptomatic dengue fever is a systemic and complex illness. It changes in clinical, haematological, and serological profiles daily. These changes escalate within hours, or even minutes, in the critical phase, especially in those with plasma leakage. Dengue

disease can develop into three phases, starting with the acute febrile phase (in most patients), critical phase, and recovery (convalescent) phases. Knowing the systemic and complexity of dengue fever and its pathophysiological shifts in each stage of the illness can result in a rational approach to dengue infection management (Ministry Of Health Malaysia, 2015; World Health Organization, 2009).

Notification for dengue should be made as soon as possible to enable prompt preventive measures to be taken (Ministry Of Health Malaysia, 2015; World Health Organization, 2009)

As has been mentioned, the infection starts suddenly after the incubation period and is followed by three phases: febrile phase, critical phase, and recovery phase.

2.3.1 Febrile Phase

Patients might suddenly develop high-grade fever, ranging typically from 2 to 7 days. Fever is often the only medical sign in children or is accompanying with rash or non-specific digestion symptoms. In teenagers and adults, most of the time, they have a 'flu-like syndrome' with more visible gastrointestinal symptoms relative to children (Guzman et al., 2016). Rashes, facial flushing, body ache, headache, and vomiting often go together in adults. Some of the patients may present with conjunctival injection, a pharyngeal injection, and a sore throat. Mild haemorrhagic manifestations can be seen during the disease, such as petechiae and bleeding of the mucosal membrane. Even though per vaginal bleed may happen, but it seldomly major.

A gradual drop in the total white cells is the first derangement to appear in the full blood count and then a decline of platelets. These features should alert the doctor to a high possibility of severe dengue disease.

2.3.2 Critical Phase

Typically, after day three of fever, the critical phase starts or around defervescence (may occur earlier). A sudden temperature drop suggests it. The permeability of the capillaries may increase in some patients. In contrast to other virus-related infections; the condition of a patient may improve as the fever subside. Still, in severe dengue infection, the patient's condition may worsen and show plasma leakage in the third space or organ impairment.

The critical phase will last 24 to 48 hours approximately. There may be various circulatory disturbances. These changes are minimal and transient in less serious cases. Most of the dengue patients may resolve spontaneously. Some of them may need a short period of fluid and electrolyte therapy. However, patients may progress to compensated or decompensated shock in more severe conditions of plasma leakage. The severe dengue fever warning signs are abdominal ache, frequent vomiting, diarrhoea, restlessness, change of consciousness, fluid retention, mucosal bleed, or tenderness on the liver. The occurrence of these warning signs increases the likelihood of severe complications. Dysfunctions in organs such as myocarditis, encephalitis, and hepatitis usually occur during this phase, but not necessarily.

Haemoconcentration and thrombocytopaenia usually can be detected in this phase. The rate of haematocrit (HCT) corresponds well with the reduction of plasma volume and extent of the illness. However, the analysis of haematocrit may be challenging if there are confounding factors, for example, too much fluid replacement, haemorrhage, or haemodilution. Other indicators that are usually seen are leukopenia with relative lymphocytosis, the elevation of transaminases, clotting anomalies,

hypoproteinaemia and hypoalbuminaemia(Guzman et al., 2016; Ministry Of Health Malaysia, 2015; World Health Organization, 2009).

2.3.3 Recovery/Reabsorption Phase

After the 24 to 48 hours of the critical phase, the plasma leakage will usually stop. Then it will be followed by reabsorption of extravascular fluid. The overall conditions of the patient will also improve, symptoms of gastrointestinal reduce, the appetite improves, the haemodynamic condition stabilises and ends in diuresis. Classic rash of “isles of white in the red sea” may occur in several patients with generalised pruritus.

During the extravascular fluid reabsorption, it is important to note that HCT levels stabilise and decrease more due to haemodilution. Recovery of platelet counts is typically preceded by the recovery of white cell count (WCC). However, as the patient reaches the reabsorption phase, organ dysfunctions can get worse in some cases (can cause encephalitis, hepatitis, and intracranial bleed)(Ministry Of Health Malaysia, 2015; World Health Organization, 2009).

2.4 Factors Contributing to the Increasing of Dengue Incidence

Gubler & Clark (1996) had described the factors that influenced dengue epidemiology. First, the world faces an extraordinary rate of population growth, mostly in tropical developing countries, which culminated in unplanned and unregulated urbanisation. This resulted in decaying infrastructure and insufficient irrigation, and poor sewage and waste management services. Those conditions eventually increase the numbers of mosquitoes, rats, and other animals living in close contact with dense human populations. Second, there is an increase in human-made breeding places for

the mosquito due to the scattering of non-biodegradable plastic packaging. This has led to the extension of the geographic distribution of *Aedes Aegypti* and increased its population densities. Third, the rapid movement of contagious travellers due to the increase in commercial air travel has provided the perfect vehicle for spreading dengue viruses between tropical populations. Finally, the measures taken to control mosquitoes that have been used since 1970, are not effective anymore in reducing mosquito populations to the levels that can interrupt the dengue transmission.

Repeated introduction and transfer of new strains of the virus or different serotypes into or across the tropical urban region can significantly increase the dengue transmission. These are responsible for expanding the spread, increased outbreak occurrence, and introduction of Dengue Haemorrhagic Fever to new geographical areas (Gubler & Clark, 1996).

Studies were done by Khalid & Ghaffar (2015) in four big cities of Pakistan also give almost the same findings regarding factors affecting the spatio-temporal distribution of dengue. These are interconnected stream patterns, the density of drainage, density of the population, local area, climatic and geomorphology conditions. All these play an essential role in the spread of dengue in urban and peri-urban areas. The other indirect factors contributing to the surge of dengue include travel patterns between large cities, migration leading to a rapid increase in population density, and unplanned urbanisation (Khalid & Ghaffar, 2015).

Apart from the shift in serotypes, other contributing factors also play an important role in Malaysia's epidemic peak. The most significant contributing factors in dengue frequency and transmission in Malaysia are climate changes, including the rising temperature, higher rainfall, and relative humidity. Over the past several

decades, Malaysia is having rapid industrialisation and economic growth. This massive infrastructure development has contributed to the transmission of the dengue disease. A few findings proved this current urbanisation process in Malaysia has further increased the dengue incidence. Human mobility is more common, particularly for patients with dengue virus infection who may spread the virus very quickly to another location as they travel to new places. The high Aedes breeding index is an indicator of the increasing incidence of dengue cases. In many countries, including Malaysia, the main issue is poor environmental cleanliness due to community littering and inappropriate disposal of solid waste(Rose Nani Mudin, 2015).

2.5 Factor Affecting Dengue Prevention Behaviour

Numerous studies have revealed that many factors influence dengue prevention practices. A study on housewives in Colombo, Sri Lanka shows that income, knowledge, attitude, adequate water storage container covers, availability of adequate resources, and assistance from public health offices remained the best predictors for the probability of taking preventive measures against dengue infection among housewives(Chanyasanha, Guruge, & Sujirarat, 2015). Meanwhile, a study on the Orang Asli in Peninsular Malaysia revealed that dengue knowledge, perceived barriers to performing dengue prevention, fogging frequency, and perceived susceptibility to dengue fever were significant factors associated with dengue prevention practices(Chandren, Wong, & AbuBakar, 2015).

A more general study to identify the factor associated with dengue prevention behaviour in Lowokwaru, Malang, Indonesia found that age, gender, duration of stay in those areas, and the number of family members were associated with dengue prevention behaviour. The result also shows that those who had a positive perception

showed better dengue prevention behaviour than those with a moderate perception(Rakhmani, Limpanont, Kaewkungwal, & Okanurak, 2018). Surprisingly, a survey on the Malaysian public by Wong et al. (2015) revealed that households with lower income, unemployed and unskilled workers carry out more dengue prevention practices. From the Health Believe Model, this study also found that higher perceived susceptibility of contracting dengue is associated with higher dengue prevention practices. Furthermore, neighbourhoods with no significant presence or low density of mosquitoes were less likely to practice dengue prevention. Lastly, higher dengue knowledge leads to higher dengue prevention practices(Wong, Shakir, Atefi, & AbuBakar, 2015).

2.6 Human Related Factors

Public awareness of dengue problem, perception, and dengue prevention are vital factors in dengue epidemiology(Siregar et al., 2015). Perception of the dengue problem was associated with prevention behaviour towards dengue. Studies done in Malang, Indonesia, demonstrate that respondents with higher perception had better behaviour in dengue prevention compared to those with moderate perception (Rakhmani et al., 2018). Ryan et al. (2019) found several significant variables, including conditions of the houses, risk perception towards dengue, and practices on dengue prevention, when analysing an *Aedes Aegypti* presence model. *Aedes Aegypti* were more likely to be found at homes where their occupants did not install window or door screens, did not cover their water containers, and perceived that dengue was hard to prevent(Ryan et al., 2019).

Studies on knowledge, attitude, and practice (KAP) are the primary tool for situational analysis on the literacy of the population on dengue and its

manifestation(Yussof et al., 2018). There were conflicting results in previous KAP studies on dengue. Some claimed that improving in knowledge does not contribute to the changing of practices(Banneheke, Paronavitane, Jayasuriya, & Banneheka, 2016). Other authors provided evidence of a relationship between knowledge and good dengue preventive practices(Alhoot et al., 2017; Ghani et al., 2019; Lugova & Wallis, 2017; Moe Thwe Aung et al., 2016; Othman et al., 2019; Wan Rosli, Abdul Rahman, Parhar, & Suhaimi, 2019; Yussof et al., 2018). It should be mentioned that the studies cited vary in methodology. The significant variables were operationalised in several ways. The variable 'knowledge of dengue' was determined by some of the authors as knowledge of 'type of mosquito', 'biting habits', and 'possible preventive measures'(Banneheke et al., 2016). Other authors included knowledge on prevention of dengue fever with the possible cause of dengue, transmission, symptoms, treatment and prevention, the importance of dengue precaution, and good preventive practices (Wan Rosli et al., 2019).

Previous studies also showed different results regarding attitude and its relation to practices. Some studies showed that attitude had a relationship with practice(Ghani et al., 2019; Moe Thwe Aung et al., 2016; Yussof et al., 2018), but other studies showed otherwise. However, the percentage of those who carried out good practices was low(Alhoot et al., 2017; Said, Abdullah, & Abdul Ghafar, 2018).

2.7 Impact of Dengue Virus infections

2.7.1 Public Health Impact

The actual impact of Dengue Fever or Dengue Haemorrhagic Fever on public health arises during this disease epidemics. Early disease transmission is typically not

detected since surveillance is weak. Therefore, cases have been mostly under-reported until realised it is a dengue outbreak in which the transmission is already near the peak. The cases then become overreported. Urgent control of mosquitoes is usually conducted at that moment, but these actions are usually misdirected, not enough, or too late to affect the epidemic. Thus, the effect of the Dengue Fever epidemic on public health is exacerbated due to inadequate surveillance, poor public health management, and no properly executed emergency response plans(Gulber, 2002).

2.7.2 Social Impact

Dengue affects every level of social background. But the pressure may be more significant among the poor people who grew up in the living areas with limited clean water supply, poor solid waste management, and where the environmental conditions are most suitable for the Aedes to breed. Dengue Haemorrhagic Fever can occur suddenly—a patient may have a non-specific viral infection symptom, and within a few hours, it can lead to severe shock and death. The sudden deterioration is often scary and is seldom forgotten by patients or family members who have experienced this rapid worsening, leading to misunderstanding and congestion in health facilities. Inefficient emergency response by highly visible mosquito sprays, and the government's reassurance that they contain the outbreak, contribute to a false sense of security for the public who then choose not to do anything to prevent the mosquitoes in and around their houses, thereby perpetuating the cycles of epidemics. Eventually, neither the government nor the public is doing anything to avoid the social disruption following the Dengue outbreak. They survive instead from epidemic to epidemic under the misguided belief that outbreak prevention is beyond their ability(Gulber, 2002).

2.7.3 Economic Impact

Besides the physical pain, dengue also causes a substantial burden on economic hardship for patients and their families due to visits to health clinics, travel expenses, medications, hospitalisation, and time-consuming parents seeking to treat their children and disrupting the earning potential. The government must also devote large sums of money for medical services, public awareness campaigns, and efforts to eradicate vectors. Another related cost comes from a loss of revenue due to reduced tourism.

Although the economic impact of the Dengue Fever epidemic on a population is difficult to measure, some studies and estimation have been done. In Thailand, the estimate for their country's financial burden on dengue was a range of US\$ 31.5 million to US\$ 51.5 million annually, depending on the disease. Patients and their families pay around 45 percent of these expenses; this economic burden significantly contributes to the social effects of the Dengue epidemic.

A non-monetary composite index named 'Disability-adjusted Life Years' (DALYs) was established by The World Bank. The aims are to estimate the overall impact of the disease on the population from both morbidity and mortality. A study using the DALYs approach shows that besides the epidemic periods, there is a substantial burden of disease during inter-epidemic times, mostly in the context of uncounted indirect costs, including the loss of productivity and absenteeism from work or school due to illness. The study also showed that dengue disease has the same order of magnitude on the total impact as other major infectious diseases, including malaria, tuberculosis, bacterial meningitis, hepatitis, and others (Gulber, 2002).

2.8 Community involvement in the control of dengue

For effective vector-borne disease transmission control it needs greater improvements in individual behaviour, compared to chronic diseases or sexually transmitted diseases. Dengue virus transmission prevention requires both personal and community level behavioural changes to minimise the habitats of vector larval effectively and further reduce the number of adults mosquitoes. Fully integrated social mobilisation and communication activities were emphasised to prevent and control dengue disease (World Health Organization, 2009).

Most public health experts generally recognise community-based, integrated *Aedes aegypti* management as the only cost-effective approach. These activities are sustainable and will provide efficient long-term disease control. The rationale of this approach is that by involving those individuals who are responsible for creating an *Aedes* larval habitat to participate with other members of their community, they will learn that it is in their best interest and also will create community ownership of the program. Local-level community organisations should provide direction, governance, and implementation standards for the community, define what is reasonable and what is not appropriate in a specific geographical environment to make it effective and sustainable. As noted above, it may take many years to make a change in attitude and behaviour. Therefore, the apparent lack of effectiveness shown by these community-based programs in the short-term should not bother us too much. Recognising that community involvement will not provide success in the control and prevention of Dengue Fever or Dengue Haemorrhagic Fever in the short term, we need to create a temporary approach that will give a fast result during the preparation for the community to take up greater responsibility in the long run, thereby ensuring that

programme will be sustainable. Integrated management mechanisms which use both vertically organised (top-down) and community-based (bottom-up) are required in the programme's initial stages, and gradually focus on community involvement as the programme develops and matures. Early success would need substantial policy support and advice. However, attention should be taken to avoid another government-funded, directed programme that will fail as soon as administrative and financial assistance wavers. At the initial stages of the project, efforts must be made to grow solid and effective vector control programs. Social scientists should be included among the staff. They can perform effective ethno-geographic research to understand community values and heterogeneity better. This knowledge is used to create and promote outreach campaigns and also plan action strategies. As community members, marketing experts should be involved in helping develop educational materials, programmes, and market community programs. Entomologists and public health doctors are expected to control the activities directly and analyse approaches to assess the effectiveness of the system. The ultimate goal should be to build an effective government-to-public partnership, with the transition of programme ownership to society as soon as possible. The timeframe for the transition of "power" and responsibility will vary greatly, according to the culture, economy, and type of government. Nonetheless, it should be noted that public participation and their sustainability can only be accomplished if they are officially committed to this form of relationship and implement policies to promote community participation in Aedes control (Gubler & Clark, 1996).

2.8.1 COMBI

An initiative of the World Health Organization (WHO), the Communication for Behavioural Impact (COMBI) approach, was introduced by Everold Hosein during a course at New York University (United States of America) on integrated marketing communication for behavioural impact in health and social development. COMBI is a planning framework and method of implementation for systematically utilising communication to achieve positive behavioural and social outcomes. Since 2001, COMBI has been implemented for multiple issues in public health.

With assistance from the WHO, (COMBI) was piloted in 2001 in Johor Bahru District, Johore State. COMBI is an innovative approach to planning and implementing social mobilisation. Currently, COMBI has been implemented as the national method of social mobilisation and communication for dengue control and prevention measures(Suhaili et al., 2004).

COMBI can be implemented by staff involved in health promotion, health education, communication, information, education and communication, and social mobilisation. They will adopt a well-defined, rigorous, and systematic framework. COMBI ensures that communication is applied appropriately and can produce tangible results(World Health Organization, 2012).

The COMBI Program has helped achieve positive behavioural results(Health & Selangor, 2006; Suhaili et al., 2004). However, an evaluation in Hulu Langat showed that the programme did not provide the expected impact on behaviour(Ismail et al., 2015). This could have been due to poor implementation and follow up. It is crucial to maintain the commitment of the volunteers. In places where volunteers are active, there were noticeable differences compared to those where they were less

active(Suhaili et al., 2004). COMBI Programme requires full community commitment, and the behavioural changes should be continuously practised by the community together with a strengthening of community participation in preventing and controlling dengue(Ismail et al., 2015).

2.8.2 Environmental management

Environmental management is a key component of dengue control and prevention. It includes cleaning-up campaigns, frequent cleaning and emptying of water containers, providing clean water supply to the community, good management of solid waste, and proper plan on the urban expansion(Cattand et al., 2006).

The aim of environmental management is to alter the environment, to deter or reduce the spread of vectors and also contact between vector-pathogen and human. Steps to achieve those goals are destroying, modifying, eliminating, or recycling non-essential containers that become habitats for mosquito larvae. Environmental management must be the root of vector control for dengue. There are three forms of environmental management(World Health Organization, 2009):

- a. Environmental change: long-term physical transformations, such as installing safe water supply to communities, as an initiative to reduce larval habitats.
- b. Environmental manipulation: Temporary vector-environment manipulation requiring the maintenance of ‘important’ containers such as by: (i) regular scrubbing, cleaning, and emptying of water storage tanks, flower vases, and coolers in rooms; (ii) cleaning gutters; (iii) covering tyres from rainfall; (iv) recycling or proper disposal of

discarded drums and tyres; and (v) handling or removal of plant that collect water in the axils of their leaves.

- c. Alteration of human habitation or behaviour: Reducing contact between humans and vectors, such as installing mosquito screens on doors, windows, and other entry points; and utilising mosquito nets during daytime sleep.

2.8.3 Solid waste management

In the management of dengue vector control, the definition of “solid waste” refers primarily to non-biodegradable matters of households and the community and industrial wastes. The advantages of reducing solid waste in urban environments go beyond vector control, and the implementation of the basic principles will contribute significantly to reduce the number of larval habitats in *Aedes Aegypti*. To protect public health, proper storage, recycling, and disposal of waste are necessary. It is recommended to apply the rule of “reduce, reuse, and recycle”. The efforts to reduce solid waste should be directed against discarded or non-essential containers, especially when those are identified as a significant mosquito breeding site in the community (World Health Organization, 2009).

2.8.4 Individual and household protection

Wearing clothes that minimise the exposure of skin during daylight hours when mosquitoes are most aggressive provides some protection against *Aedes* bites and is encouraged especially during the outbreaks. Repellents can be used on exposed skin or clothing. The usage of repellents should comply strictly with the label instructions. Mosquito nets treated with insecticides provide adequate protection for those who sleep in the daytime (such as infants, the bedridden, and night-shift workers).

Household appliances such as air conditioners and screens for windows and doors can minimise mosquito biting. Mosquito coils, aerosol products, and other insecticide vaporisers can also reduce the mosquito biting activity indoors (World Health Organization, 2009).

At the household and community levels, where the majority of resources for vector control are concentrated, greater attention is paid to ensuring that rainwater does not collect in unused containers. The activities include covering or cleaning water storage vessels periodically, removal and disposal of unused food and drink containers, and the storage or disposal of used tyres. Such activities tend to be well-tailored for community engagement and straightforward, but for some reason, the results have been unspectacular so far. However, these community-based initiatives are commonly seen as the most effective way to achieve sustainable control through behaviour change (Parks & Lloyd, 2004).

2.8.5 Chemical Control

i. Larvicides

Chemicals are widely used in controlling *Aedes aegypti* larval habitats. However, larviciding should be treated as complementary to environmental management and should be limited to containers that cannot be removed or handled. The use of larvicides in the hard-to-reach natural areas such as leaf axils, tree holes, or in deep wells, which are common habitats of *Aedes albopictus* may not be practicable. The problem with the use of larvicides in many urban contexts is the difficulty in accessing the indoor larval habitats of *Aedes aegypti*, such as water storage containers, plant vases, and saucers. Because of *Aedes aegypti* frequently breed in water storage containers,

larvicides should not change the colour, odour, or taste of water significantly and should be low in toxicity to other species(World Health Organization, 2009).

ii. Adulticides

Chemical control methods are aimed at adult vectors, thus impacting mosquito longevity, densities, and other parameters of transmission. Adulticides are used either for the treatment of residual surfaces or as the treatment of space.

Space spray is only recommended in emergency situations to control an existing outbreak or to avoid an emerging one. Space spraying helps to destroy the adult mosquitoes massively and rapidly. There is considerable debate regarding the effectiveness of aerosol insecticide applications during yellow fever and dengue epidemics.

Even for a short period, each control method that potentially can decrease the amount of infective adult mosquitoes is expected to reduce the transmission of the virus. Still, it remains uncertain whether the temporary effect of space treatments is epidemiologically significant in the long term. There is no well-documented example of how this approach works to prevent an outbreak. Nonetheless, if space spraying is used early and on a sufficiently large scale during the epidemic, the transmission intensity can be reduced. Therefore, more time can be allocated for applying other vector control measures, which can provide long-term effects such as reduction of community-based sources of the breeding site and larviciding. Emergency space spraying can be started simultaneously with intensive source reduction and larviciding measures if disease surveillance systems are sensitive enough to identify cases in the

early phases of an epidemic and adequate resources are accessible (World Health Organization, 2009).

2.8.6 Biological Control

Biological control is achieved through the use of parasites, predators, pathogens, and mosquito symbionts. Fish and bacteria called “*Bacillus Thuringiensis Israelensis*” (Bti), and “*Bacillus Sphaericus*” (Bs), are the most successful biocontrol agents to date. Biological control has environmental and non-target-organisms safety benefits and is far less likely to develop mosquito resistance. Wolbachia is included in this Biological control (Wolbadmin, 2017).

2.9 Dengue Vaccine

The recent vaccine initiative for dengue has brought a new method to prevent infection of dengue. Dengvaxia (CYD-TDV), a vaccine developed by Sanofi Pasteur, was the earliest dengue vaccine. It was initially approved in Mexico in December 2015. This vaccine has been licensed for administered in people living in endemic areas between the ages of nine and forty-five years. CYD-TDV is based on the backbone of yellow fever 17d. This tetravalent live recombinant vaccine is registered as a 3-dose vaccine given at 0, 6, and 12 months. At present, several other ongoing vaccine products are in clinical or pre-clinical phase (World Health Organization, 2016).

WHO-SAGE (Strategic Advisory Group of Experts) had published a report in 2016, which acted as the original position paper on dengue vaccine. This report was proposing initiation of the first dengue vaccine (Dengvaxia®) in specific geographical locations, wherever epidemiological data perceived high disease prevalence in the

vaccine-targeted age group. In a moment, around fourteen countries already approved Dengvaxia ® to be available in the market; this includes four countries in South East Asia. However, this vaccine is still not marketed in Malaysia yet as it has been licensed for use only for Phase IV clinical trials(Yeo & Shafie, 2018).

2.9.1 Vaccine characteristics

CYD-TDV with the brand name Dengvaxia is a tetravalent, live attenuated, prophylactic viral vaccine. Four serotypes live attenuated recombinant dengue viruses were the active elements contained in this vaccine. Every monovalent CYD recombinant is obtained separately by replacing the genes encoding the prM and E proteins of the YF 17D attenuated vaccine genome with the respective genes of the four wild - type dengue viruses. The end formulation contains each of the four live dengue attenuated vaccine viruses with 4.5–6.0 log₁₀ median cell-culture infectious doses (CCID₅₀)(World Health Organization, 2018a).

In clinical trials, the live attenuated dengue vaccine CYD-TDV was found to be safe and effective in individuals who previously had been infected by dengue virus before (seropositive individuals). Still, individuals acquire their first typical dengue infection following vaccination (seronegative individuals) carries a higher risk of severe dengue. The government should assure that they could minimise the risk amongst seronegative persons before thinking in introducing the dengue vaccine CYD-TDV(World Health Organization, 2019a).

2.9.2 Adverse outcomes in the vaccinated seronegative persons

There are no clear explanations of the higher number of admission and severe dengue cases in vaccinated seronegative individuals compared to unvaccinated

individuals who are seronegative. Even so, a probable hypothesis is that the vaccination may trigger a similar immune response caused by a typical first-time infection. By this assumption, a following first wild-type dengue infection in a seronegative vaccine receiver would be equivalent to a second natural dengue infection. It was resulting in an increased risk of severe presentation, similar to the second time natural infections in those unvaccinated persons. The reason is, the vaccination will trigger an immune response at the time of the first normal dengue infection, which increases the risk of severe dengue. This hypothesis could suggest the reason for a first dengue infection following vaccination is linked with an increased risk for severe dengue(World Health Organization, 2018a).

Sanofi Pasteur revealed the findings on 29 November 2017 on the new research for a better explanation for the benefit and risk in individuals with seronegative status. The study could be possible by using a newly developed NS1-based antibody assay. It was tested on blood samples taken after thirteen months post-vaccination to predict the dengue serostatus retrospectively during the first time of vaccination.

The latest long-term safety follow-up analyses showed that:

- General vaccination's advantage on population remains beneficial, but this dengue vaccine acts differently between seropositive and seronegative people.
- Within the initial 25 months after the first dose of vaccination for individuals at the age of nine years old and above, the efficacy of the vaccine against symptomatic virologically Dengue patients was high among inferred baseline seropositive, but significantly lower among the baseline seronegative.
- In seronegative individuals, there is an escalated risk of hospitalised and severe dengue, beginning around 30 months after the first injection.

Over a 5-year follow-up in areas with 70 per cent dengue seroprevalence, there would be one excess severe case in seronegative per 1,000 vaccinated person for every four severe cases prevented in seropositive. Meanwhile, for every 13 hospitalisations prevented in seropositive vaccinated persons, one excess hospitalisation in seronegative per 1,000 vaccinated persons will occur.

Given the latest data in seronegative individuals on the long-term safety issues, considering the reported efficacy and safety in individuals with seropositive, SAGE carefully considered two approaches: community seroprevalence requirements versus screening prior to vaccination

SAGE realised that both the “community seroprevalence criterion” and the “pre-vaccination screening” are programmatically challenging strategies to achieve maximum dengue infection protection(World Health Organization, 2018b)

Screening before vaccination is a recommended approach for each state. With this practice, individuals with proof of previous dengue infection may or may not be vaccinated depending on antibody test results or a documented past dengue infection by a laboratory record.

In case the screening prior to vaccination is not practicable, vaccination may be considered to be done without screening for the area with at least 80 per cent seroprevalence rates by age nine years. Highly specific screening tests are required to prevent a truly seronegative person from being vaccinated. At the same time, it should have a high sensitivity to make sure a high percentage of seropositive individuals are vaccinated(World Health Organization, 2019a).

2.9.3 Challenges to vaccine development

Infection with one of the four dengue virus serotypes offers lasting protection against homotypic reinfection. But it only has temporary protection against secondary heterotypic infection. Secondary heterotypic infection is also linked with an increased risk of severe illness. This condition and other observations suggest an immunopathological factor of dengue pathogenesis, called disease immune enhancement. Because of these dengue-specific complexities, generating a tetravalent vaccine becomes the main focus in vaccine development with the intention to provide long-term protection against all serotypes of viruses. Inadequate animal disease models and the ambiguity results of protective correlations pose additional challenges. Despite all these obstacles, the recent development of vaccines showed significant progress and overall are promising (World Health Organization, 2016).

2.10 Instrument Used to Measure Knowledge, Attitude, and Practices Towards Dengue

Knowledge, attitude, and practice (KAP) survey provides a suitable format to evaluate existing health programs. Therefore, a validated and reliable instrument that is sensitive to change in knowledge, attitude, and practice of dengue fever is required to assess the psychosocial dengue fever in Malaysia. Several studies had focused on assessing the relationship and description of the level of knowledge, attitude, and preventive practices regarding dengue in some countries involving different districts, different sets of people living in rural, semi-urban, and urban areas over the years. The exploration of the influence of risk factors of KAP studies regarding dengue may depend on the applicable instrument used for data collection from a particular population and the analytic approach.

Castro et al. (2013) used a validated questionnaire, and an observation guide elaborated to assess risk behaviour associated with *Ae. aegypti* breeding sites in a study of the relationship between economic status, knowledge on dengue, risk perceptions, and practices. The questionnaire covered socio-demographic information (age, education), knowledge on dengue symptoms with six items, knowledge of preventive measures with 4 items, and risk perception with two items, which are scaled as none (1), moderate (2), or high (3). In addition, the study also ascertained the respondent's number of information sources on dengue. Finally, a scale was developed for owning items related to economic status to obtain a household asset score. The practices related to dengue that were observed were the number of water storage containers that were poorly covered or in bad condition, the number of other small containers outside the house, and the number of useless containers in the backyard.

A Study by Siregar et al. (2015) on Social and Environmental Determinants of Dengue Infection Risk in North Sumatera Province, Indonesia had adapted and adopted the questionnaires from published research by Matta et al. (2006), Siqueira et al. (2004), and Van Benthem et al. (2002). The socio-demographic factors included age, sex, marital status, ethnicity, education level, occupational status, income, length of stay, number of family members in the house, number of children under 15 years in the house, and incidence of DHF in the family. The socio-cultural factors included travel history of family members, hang-drying of clothes, frequency of water container cleaning, frequency of garbage disposal, and frequency of cleaning of the refrigerator water tray. Knowledge was assessed via 20 questions regarding cause, symptoms, mode of transmission, mosquito bites, breeding sites of mosquitoes, re-infection, and practice measures. The correct answer was coded 1, incorrect, and "not sure" options were coded as 0. For attitude, 11 questions were asked regarding the perception of

dengue, including the severity of the disease, re-infection, impact of mosquito bites, preventive measures, control of DHF, and responsibility. A five-point scale was used to measure attitude ranging from 1 to 5. Knowledge and attitude were classified as good for 80% marks; moderate, 60-80%; and low, less than 60%. For the practice factor, 14 preventive measures were assessed with scoring for answers as always (4 points), usually (3 points), sometimes (2 points), seldom (1 point), and never/unavailable (0 points). Then, using a similar range, the results were classified as taking maximal, moderate, or minimal preventive measures. The environmental data include house construction, house style, cleanliness around the house, presence of garbage, source of drinking water, presence of window and door screens, presence of gutters, and presence of water containers with larvae were collected by observation using a structured check-list(Siregar et al., 2015).

Lugova and Wallis (2016) used 17 items to evaluate knowledge on dengue, 10 items for attitude towards dengue, and 11 items for preventive practices. For knowledge, the correct answer was coded 1, incorrect, and “not sure” options were coded as 0. A five-point scale was used to measure attitude ranging from 0 to 4. Practices options were either ‘yes’ or ‘no’, with ‘yes’ coded as 1 and ‘no’ as 0. Knowledge, attitude, and practices were categorized into two different levels; good, and moderate to poor. Scores >75% were considered as good, and scores <75% were considered to be “moderate to poor.”(Lugova & Wallis, 2017).

Mahdi et al. (2015) measured knowledge with 15 items, attitude with 10 items, and practices with 11 items. Correct answers were coded as 1, and wrong answers were coded as 0, to obtain the scores for knowledge, attitude, and practice. The categorisation into good knowledge, good attitude, and good practices was done based

on an arbitrary cut-off score of ≥ 12 , ≥ 8 , and ≥ 6 . Scores less than the arbitrary cut-off were categorized as moderate and poor (Mahdi et al., 2015).

A cross-sectional study was conducted to design and validate the 'Knowledge, Attitude, and Practice on dengue fever' questionnaire in Perak Tengah District, Perak. Forty-three items of the knowledge, attitude, and practice questionnaire were designed based on the literature and expert opinions. The items on the questionnaire developed for this study were divided into four main sections: 1) demographic factors, to determine the demographic and socio-economic characteristics. 2) Knowledge, to determine knowledge about dengue fever prevention, including the possible causes of dengue fever recurrence, symptoms, transmission, treatment and prevention, the necessity of dengue precaution, and recommended/non-recommended practice of action. This domain consisted of sixteen true/false with "don't know" category provided for each question. Correct answers received one point; incorrect and 'don't know' answers received zero points. 3) Attitude, to determine the respondent's opinions about dengue fever prevention, awareness, daily care, and socio-cultural perspectives. This domain contained fourteen items of agree/disagree with "don't know" category in each question. Acceptable good attitude responses by the respondent were awarded one point and else zero points. 4) Practice, to determine a respondent's practice towards dengue fever prevention such as actions taken to avoid dengue fever occurrence. This domain consists of thirteen items assessed by yes/no and "do not have" category. A score of 1 was given good practice and 0 for poor practice. If "do not have" was answered by respondents, then the answer was not counted into the cumulative score, and the total score (denominator) was also reduced. Data from the knowledge, attitude, and practice domains were summed into a percentage score to treat the variable as continuous data. This study demonstrated that

the three scales of knowledge, attitude, and practice were reliable and valid for assessing the dengue fever prevention in Malaysia(Mohammad Nasir, Wan Nor Hazimah, Mohd Fauzi, & Muhamad Addin, 2013).

CHAPTER 3: METHODOLOGY

3.1 Study Area

This study was conducted in a residential area in Kampung Pasir Pandak, which is located in Northern Kuching, and Kampung Meranek in Samarahan. The locations were selected based on the history of dengue outbreaks in 2019. Kampung Pasir Pandak was declared a hotspot area in 2019, while Kampung Meranek had an episode of non-hotspot dengue outbreak in the same year. The two villages were also selected as they had comparable population sizes, thus giving almost equal numbers of the respondents from the hotspot and non-hotspot areas. They were also similar in terms of economic development.

Sarawak is one of the largest states in Malaysia, with 124,450 km² of the area. It has approximately 2.6 million population. Sarawak is divided into 12 administrative divisions, and Kuching is the capital city. On 1st August 1988, Kuching was conferred a city status, making it the second Malaysian city after Kuala Lumpur. The city was divided into two administrative areas: namely north and south. The City of Kuching North Commission or *Dewan Bandaraya Kuching Utara* (DBKU), in Malay, administers the northern part and the Council of Kuching South or *Majlis Bandaraya Kuching Selatan* (MBKS) the southern part. Samarahan Division, on the other hand, has a population of 159,023. It consists of three administrative districts; Samarahan, Asajaya, and Simunjan, and one subdistrict; Sebuyau.

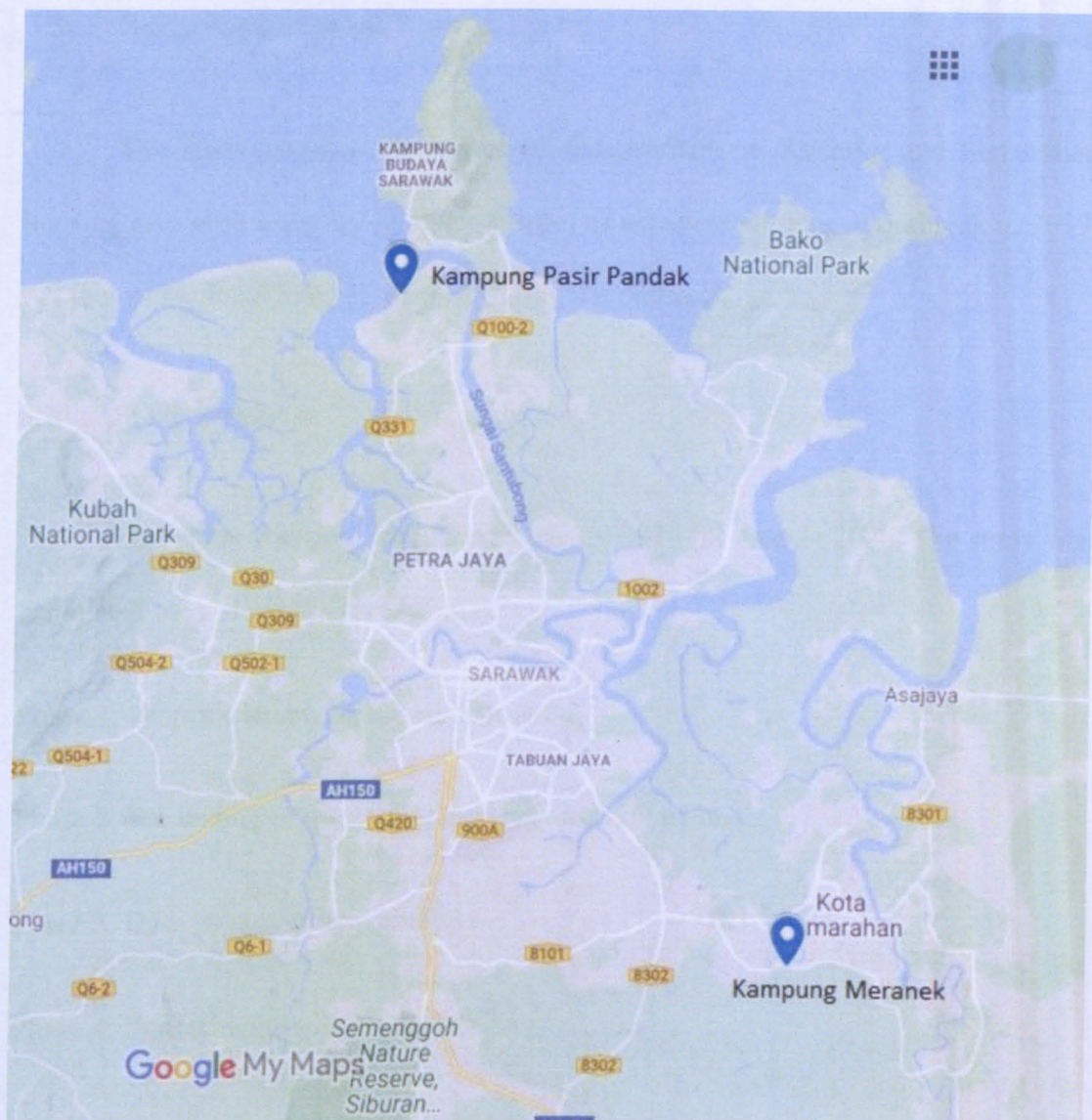


Figure 3.1: Location of Kampung Pasir Pandak and Kampung Meranek (Google, n.d)

3.2 Research Design

A cross-sectional study was carried out among the community residents aged 18 years old and above in the dengue hotspot area and non-hotspot area located in Kuching and Samarahan district in Sarawak.

3.3 Study Population and Sample

The study populations consist of the residents in Kuching and Samarahan housing area with a history of either hotspot or non-hotspot dengue outbreak in 2019. All the respondents lived in the area during the outbreak.

3.4 Study Duration

This study was conducted from January 2020 till August 2020. The study was conducted over 4 phases consisting of:

Phase 1: Proposal preparation and approval

Phase 2: Pre-testing of questionnaires and data collection

Phase 3: Data entry and data analysis

Phase 4: Report writing and presentation

A Gantt chart is attached (Refer Appendix: Gantt chart).

3.5 Inclusion and Exclusion Criteria

3.5.1 Inclusion Criteria

- a. Residents age 18 years and above
- b. Residents staying in the area during the outbreak

3.5.2 Exclusion Criteria

- a. Those who disagreed to participate in this study
- b. Those with difficulty in communication.

- c. Those who were absent during the data collection process.

3.6 Sample Size and Sampling Method

The study was planned to compare between hotspot and non-hotspot with one to one ratio. Prior data indicate that 33.2% had good anti-dengue practices in an outbreak area(Mohamad, Selamat, & Ismail, 2014) and 56.1% in a hotspot area(Said et al., 2018). A two-sided test with a significance level of 0.05 was used, and a power of 80% was desired. Applying that to the “Power and Sample Size Program” we determined that we needed to study 73 respondents from the hotspot area and 73 respondents from the non-hotspot area to be able to reject the null hypothesis. Thus, the required sample size was 146. In anticipation of a 20% non-response rate, a total of 175 cases was chosen as the sample size for this study.

The sample size was calculated using the “Power and Sample Size Program”.

The formula that was used is as below:

$$n1 = \frac{\left[\sqrt{\bar{p}\bar{q} \left(1 + \frac{1}{k}\right)} z_{1-\frac{\alpha}{2}} + \sqrt{p1q1 + \frac{p2q2}{k}} z_{1-\beta} \right]^2}{\Delta^2}$$

$$n2 = kn1$$

$$q1, q2 = 1 - p1, 1 - p2$$

$$\Delta = |p2 - p1|$$

$$\bar{p} = \frac{p1 + kp2}{1 + k}$$

$$\bar{q} = 1 - \bar{p}$$

The sampling method used in this study is systematic random sampling. During the data collection, one respondent in every three houses that researchers passed by was selected to answer the questionnaire, with their consent.

3.7 Data Collection Procedure

The researcher gave a brief introduction about the study and explained the questionnaire to all of the respondents. Subsequently, signed informed consent was taken from each of the respondents before they answered the questionnaire. All data obtained from this study were stored in soft copy except for the personal data of the respondents, and they remain confidential. Access to this data is only by the study team. The subject's data will not be published.

3.8 Data Collection Instrument

This research project had used an improved version of the validated questionnaire by Mohammad Nasir et al. (2013). This questionnaire set was the most appropriate instrument for our study. The items in the questionnaire were aligning with our study objectives and could provide the required information. This instrument was developed in Malaysia, had better quality and was trustworthy. The selected scales in the knowledge, attitude, and practices showed acceptable and satisfactory internal consistencies. Cronbach's alpha coefficients for knowledge, attitude, and practice were 0.968, 0.638, and 0.790, respectively, thereby confirming the adequacy of the internal consistencies of these scales. The results of an exploratory factor analysis showed that three factors were associated with the dimensions of knowledge, attitude, and practice. The results demonstrated that the three scales of knowledge, attitude, and practice were reliable and valid for assessing dengue fever prevention in Malaysia.

Even though this instrument is available free of charge, we still contacted the test author to request permission to utilise it. We still ran a pilot study before the actual research to pre-test the questionnaire to ensure that it was sufficient, efficient, valid, and reliable in our research area.

The questionnaire was divided into four parts:

- i. Section A consists of sociodemographic characteristics. This part had ten questions intended to discover age, gender, race, household income, housing type, educational level, sources of dengue information, and history of having dengue before.
- ii. Section B consisted of seven questions to assess the risk perception towards dengue, which are the risk of being bitten by the vector, to get sick with dengue fever, risk of dengue in their residential area, and whether dengue infection could be fatal. Respondents were given choices between highly disagree, disagree, agree, and highly agree to show their risk perception with a respective score of '1', '2', '3' and '4'.
- iii. Section C was used to measure the knowledge of respondents. It is defined as the respondent's knowledge about the possible cause of dengue fever, symptoms, transmission, treatment, dengue fever prevention, and recommended practice of action. This domain consisted of nineteen 'yes', 'no', and 'don't know' category provided for each question. Correct answers received one point; incorrect and "don't know" answers received zero points.
- iv. Section D was used to assess attitude, which was defined as the respondent's opinions about dengue fever prevention, awareness, daily care, and socio-cultural perspective. This domain uses the Likert scale, and respondents were

given choices between highly disagree, disagree, agree, and highly agree with a respective score of '1', '2', '3' and '4'.

- v. Section E was used to assess the practice, which was defined as the respondent's actions taken to avoid dengue fever occurrence. This domain consisted of ten items assessed by 'yes', 'no', and 'not applicable' category. A score of 1 was given for good practice and 0 for poor practice. If 'not applicable' was the answer given by respondents, it would not count into the cumulative score, and the total score (denominator) was also reduced.

3.9 Pilot / Pre-test

A questionnaire used in this study was the improved version base on a questionnaire validated by Mohammad Nasir et al. (Mohammad Nasir et al., 2013). A pilot study was done before the proper study because some changes were made to the original questionnaire to adapt it to the local situation. The pilot study of the questionnaire was conducted in a dengue-prone area. Three pilot studies were conducted, involving 31, 32, and 32 respondents until the results suggested that the questionnaire was reliable. Three sites were selected, namely: Kampung Baru, Desa Ilmu, and Kampung Meranek in Samarahan. Respondents were selected via convenience sampling. The objective of this pre-test was to assess the quality of the questions in terms of logical sequence, understandability, and average duration of time to answer the questionnaire. Generally, it was conducted to test for reliability of the instrument at the local setting. Minor changes in the questionnaire were made following the pre-test. The final Cronbach's alpha for reliability was 0.747, 0.724, 0.767, and 0.851 for part B, part C, part D, and part E, respectively.

3.10 Operational definitions

- i. Dengue outbreak: a dengue outbreak was defined as two or more cases reported in the same housing area within a 200-meter radius from the index case and within 14 days from notification of the index case. An outbreak ended 14 days after the last notification(Ministry of Health Malaysia, 2019).
- ii. Hotspot: a dengue hotspot area was defined as an area that had a dengue outbreak for more than 30 days(Ministry of Health Malaysia, 2019).
- iii. Non-Hotspot: a non-hotspot area was an outbreak area free from dengue cases within 30 days(Ministry of Health Malaysia, 2019).
- iv. Risk perception: defined as perception on the probability that one would be harmed by dengue, vulnerability to dengue infection, and extent of harm caused by dengue infection(Brewer et al., 2007).
- v. Knowledge: defined as a respondent's knowledge about dengue fever, including the possible cause of dengue fever recurrence, symptoms, transmission, treatment and prevention, the necessity of dengue precaution, and recommended practice of action(Mohammad Nasir et al., 2013).
- vi. Attitude: defined as the respondent's opinions about dengue fever prevention, awareness, daily care, and socio-cultural perspective(Mohammad Nasir et al., 2013).
- vii. Practice: defined as the respondent's practice towards dengue fever prevention such as actions taken to avoid dengue fever occurrence(Mohammad Nasir et al., 2013).

3.11 Statistical Analysis

Descriptive analysis was carried out and presented in tables, which included frequencies, means, and standard deviations. For inferential statistics, the summative scores obtained from the measurement of risk perception, knowledge, attitude, and practice were correlated using Pearson correlation. Independent sample t-test and one-way analysis of variance (ANOVA) were used to determine the relationship between risk perception, knowledge, attitude, and practice with selected sociodemographic characteristics. Finally, an independent sample t-test was used to compare those variables between the hotspot and non-hotspot areas. A p-value of less than 0.05 was considered statistically significant. The collected data were coded and analysed using IBM SPSS version 20.0 (IBM SPSS Statistics).

3.12 Ethical Consideration

The ethical approval for this study was obtained from the Ethics Committee of Universiti Malaysia Sarawak (UNIMAS). The respondents were provided with a verbal and written explanation and objectives of the study and written 'Informed consent' derived from the respondents before data collection. The questionnaire did not contain any personal identifiers; thus, all the respondents were anonymous. Participation in the study was voluntary; no incentives were given to those who participated in the study. Since it was a questionnaire-based study, it did not involve any risk to the respondents.

CHAPTER 4: STUDY RESULTS

A total of 102 respondents answered the questionnaire during the study period, and all were included in the analyses. In this chapter, the results of the data analyses are presented according to the research objectives in the following sections:

4.1 Sociodemographic characteristics of the participants.

4.2 Risk perception, knowledge, attitude, and practice toward dengue fever.

4.3 Relationship between risk perception, knowledge, attitude, and practice with the selected sociodemographic characteristics.

4.4 Comparison of risk perception, knowledge, attitude, and practice between the hotspot and non-hotspot areas.

4.5 Correlation between risk perception, knowledge, attitude, and practice towards dengue fever.

4.1 Sociodemographic characteristics of the participants

Gender: Overall, there were slightly more male respondents than females, with 55.9% male and 45% female. From the hotspot area, 57.1% of respondents were male, and 42.9% were female. From the non-hotspot area, 53.1% of the respondents were male, and another 46.9% were female.

Race: Most of the respondents were Malay (94.1%). The other ethnicities involved in this study were Melanau (3.9%), Chinese (1%), and Iban (1%).

Household income: The highest percentage (66.7%) of the respondent's household income was within the RM 1500 or less per month group, followed by the RM1501 to

RM3000 per month (18.6%). Other respondents earn between RM3001 to RM5000 per month (9.8%) and between RM5001 to RM7500 per month (4.9%).

Housing Type: The majority of the respondents lived in a single kampung house (91.2%). There were only a few living in a condominium (1%), terrace house (3.9%), and bungalow (1%).

Level of education: Most (75.5%) of the participants hold an education status of SPM or less. The highest percentage of the respondents (45.1%) completed SPM followed by those who completed primary school (15.7%) and lower secondary school (14.7%). Only a few respondents had bachelor's degrees (10.8%), diploma (6.9%), and STPM (3.9%).

Most of them did not have a history of dengue before (98%), and only 2% had a history of dengue infection. The main source of information for dengue among the respondents was the television (80.4%), followed by healthcare centres (62.7%) and radio (56.9%). The details are shown in Table 4.1.

Table 4.1 Sociodemographic characteristics of the participants

Variables	Hotspot (%)	Non-Hotspot (%)	Total (%)
Gender			
Male	40 (57.1)	17 (53.1)	57 (55.9)
Female	30 (42.9)	15 (46.9)	45 (44.1)
Race			
Chinese	1 (1.4)	0 (0)	1 (1.0)
Melanau	4 (5.7)	0 (0)	4 (3.9)
Malay	64 (91.4)	32 (100)	96 (94.1)
Iban	1 (1.4)	0 (0)	1 (1.0)
Household income			
<RM1500	56 (80)	12 (37.5)	68 (66.7)
RM1501–RM3000	9 (12.9)	10 (31.3)	19 (18.6)
RM3001–RM5000	5 (7.1)	5 (15.6)	10 (9.8)
RM5001–RM7500	0 (0)	5 (15.6)	5 (4.9)
>RM7500	0 (0)	0 (0)	0 (0)
Housing type			
Kampung House	63 (90)	30 (93.8)	93 (91.2)

Table 1 Continued

Variables	Hotspot (%)	Non-Hotspot (%)	Total (%)
Condominium	1 (1.4)	0 (0)	1 (1.0)
Terrace	2 (2.9)	2 (6.3)	4 (3.9)
Bungalow	1 (1.4)	0 (0)	1 (1.0)
Others	3 (4.3)	0 (0)	3 (2.9)
Education level			
UPSR (primary)	11 (15.7)	5 (15.6)	16 (15.7)
PMR (lower secondary)	13 (18.6)	2 (6.3)	15 (14.7)
SPM (high secondary)	33 (47.1)	13 (40.6)	46 (45.1)
STPM (A level / equivalent)	3 (4.3)	1 (3.1)	4 (3.9)
Diploma	4 (5.7)	3 (9.4)	7 (6.9)
Degree	3 (4.3)	8 (25.0)	11 (10.8)
Others	3 (4.3)	0 (0)	3 (2.9)
*Source of Dengue Information			
Newspaper	37 (52.9)	19 (59.4)	56 (54.9)
Radio	39 (55.7)	19 (59.4)	58 (56.9)
Friends	31 (44.3)	15 (46.9)	46 (45.1)
Poster	34 (48.6)	11 (34.4)	45 (44.1)
Health centre	42 (60.0)	22 (68.8)	64 (62.7)
Magazine	15 (21.4)	10 (31.3)	25 (24.5)
Family	31 (44.3)	11 (34.4)	42 (41.2)
School	30 (42.9)	13 (40.6)	43 (42.2)
Television	58 (82.9)	24 (75.0)	82 (80.4)
Internet	41 (58.6)	16 (50.0)	57 (55.9)
Doctor	26 (37.1)	15 (46.9)	41 (40.2)
Infected by Dengue before			
No	68 (97.1)	32 (100)	100 (98.0)
Yes	2 (2.9)	0 (0)	2 (2.0)

The figure within parentheses indicate the percentage

*multiple responses

4.2 Risk perception, knowledge, attitude, and practice towards dengue

4.2.1 Risk perception of dengue fever

Table 4.2 shows the respondents' risk perception of dengue. There was a total of seven statements regarding the risk perception towards dengue. Respondents were given choices between highly disagree, disagree, agree, and highly agree to show their risk perception with a respective score of '1', '2', '3' and '4'. Thus, the maximum score for each statement was four.

The statement '*Dengue infection could be fatal*' had the highest score (mean=3.52, SD=0.52). It had the highest percentage of respondents who 'strongly agree' (52.9) and 'agree' (35.3). None of them chose 'highly disagree', and only one per cent chose 'disagree'. The second-highest score (mean=3.50, SD=0.58) was '*Dengue fever is a preventable disease*' statement with a 52.9 per cent 'highly agree', and 45.1 per cent 'disagree'. One (1) respondent answered 'disagree', and another one answered 'highly disagree'. These were followed by '*I am at risk of being bitten by mosquito*' (mean=3.00, SD=0.82), and '*Dengue is an infectious disease*' statement (mean=2.71, SD=0.93). The lowest score was for the statement, '*I am at risk of dengue*' (mean=2.46, SD=0.96) with the highest percentage of respondents answering 'highly disagree' (18.6). The second-lowest score was '*I am at risk of being bitten by Aedes mosquito*' (mean=2.68, SD=0.81).

Table 4.2 Percentage distribution of respondent's risk perception towards dengue fever (N-102)

	Highly disagree	Disagree	Agree	Highly agree	Mean (out of 4)	SD
Dengue is an infectious disease	9.8	32.4	35.3	22.5	2.71	0.93
I am at risk of dengue	18.6	31.4	35.3	14.7	2.46	0.96
Dengue infection could be fatal	0.0	1.0	46.1	52.9	3.52	0.52
My housing area is a Dengue prone area	6.9	34.3	48.0	10.8	2.63	0.77
Dengue fever is a preventable disease	1.0	1.0	45.1	52.9	3.50	0.58
I am at risk of being bitten by a mosquito	2.9	24.5	42.2	30.4	3.00	0.82
I am at risk of being bitten by Aedes mosquito	6.9	33.3	45.1	14.7	2.68	0.81

Table 4.3 shows the respondents' risk perception of dengue. Most people living in the hotspot area agreed that dengue is an infectious disease, and they were at risk of being infected with dengue. Meanwhile, most of the respondents in the non-hotspot area did not agree. Almost all of the respondents in both areas agreed that dengue could be fatal, but it is a preventable disease. A higher percentage of respondents in those two areas believed that they were living in dengue-prone areas and were at risk of being bitten by mosquito or Aedes.

Table 4.3 Distribution of respondent's risk perception towards dengue fever in hotspot and non-hotspot area (N-102)

Risk Perception Items	Hotspot (%)				Non-Hotspot (%)			
	1	2	3	4	1	2	3	4
Dengue is an infectious disease	5 (7.1)	19 (27.1)	27 (38.6)	19 (27.1)	5 (15.6)	14 (43.8)	9 (28.1)	4 (12.5)
I am at risk being infected of Dengue	15 (21.4)	19 (27.1)	24 (34.3)	12 (17.1)	4 (12.5)	13 (40.6)	12 (37.5)	3 (9.4)
Dengue infection could be fatal	0 (0)	1 (1.4)	29 (41.4)	40 (57.1)	0 (0)	0 (0)	18 (56.3)	14 (43.8)
My housing area is a Dengue prone area	5 (7.1)	23 (32.9)	34 (48.6)	8 (11.4)	2 (6.3)	12 (37.5)	15 (46.9)	3 (9.4)
Dengue fever is a preventable disease	0 (0)	1 (1.4)	32 (45.7)	37 (52.9)	1 (3.1)	0 (0)	14 (43.8)	17 (53.1)
I am at risk of being bitten by a mosquito	2 (2.9)	15 (21.4)	28 (40.0)	25 (35.7)	1 (3.1)	10 (31.3)	15 (46.9)	6 (18.8)
I am at risk of being bitten by Aedes mosquito	6 (8.6)	22 (31.4)	31 (44.3)	11 (15.7)	1 (3.1)	12 (37.5)	15 (46.9)	4 (12.5)

1 = Highly disagree, 2 = Disagree, 3 = Agree, 4 = Highly agree

4.2.2 Knowledge of dengue fever

Table 4.4 shows the respondent's knowledge of dengue fever. It was defined as the respondent's knowledge about the possible cause of dengue fever recurrence, symptoms, transmission, and recommended prevention practices. This domain consisted of nineteen 'yes', 'no', and "don't know" category provided for each question. Correct answers received one mark and zero marks for incorrect and 'don't know' answers.

All the respondents correctly answered the question '*Aedes mosquito breeds in clean water in old tires, rubbish bins, and flowerpots.*' The other items that also had a high percentage of respondents answered correctly are '*Larvicides can help in killing Aedes larvae*' (95.1%), and '*Water containers and tanks without lids should be cleaned every seven days*' (95.1%). '*The only way to combat Dengue is to fight Aedes mosquitoes*' (94.1%), and '*Aedes mosquitoes bite early in the morning or late in the afternoon*' (92.2%) were also answered correctly by most of the respondents. Two questions had a lower percentage of respondents answering correctly '*Dengue outbreak only happens during rainy season*' (62%) and '*Dengue fever is a severe flu disease that can affect babies, kids, and adults*' (48%).

For the symptom's domain, most of the respondents were able to answer correctly except the '*pain behind eyes*' (69.6%) and '*cough*' (63.7%), which showed the lowest percentage.

Table 4.4 Percentage distribution of respondent's knowledge towards dengue fever (N-102)

	Yes	No	Don't know
Dengue is spread by Aedes aegypti or Aedes albopictus	88.2	2.0	9.8
A person can get dengue more than once	83.3	3.9	12.7
Dengue fever is a severe flu disease that can affect babies, kids, and adults	48.0	36.3	15.7
Dengue outbreak only happens during the rainy season	20.6	62.7	16.6
Symptoms of dengue include:			
High fever	92.2	0.00	7.8
Cough	63.7	14.7	21.6
Joint, muscle, bone pain	94.1	1.0	4.9
Pain behind eyes	69.6	8.8	21.6
Vomiting	80.4	4.9	14.7
Loss of appetite	89.2	2.9	7.8
Rashes	94.1	2.0	3.9
Headache	87.3	2.9	9.8
Aedes mosquito breeds in clean water in old tyres, rubbish bins, and flowerpots.	100.0	0.0	0.0
Dengue virus spread among humans via infected female Aedes mosquito bites	77.5	2.9	19.6
The only way to combat dengue is to fight Aedes mosquitoes	94.1	1.0	4.9
Aedes mosquitoes bite early in the morning or late in the afternoon	92.2	2.0	5.9
Larvicides can help in killing Aedes larvae	95.1	2.0	2.9
Water containers and tanks without lids should be cleaned every seven days	95.1	3.9	1.0
Insecticides can kill adult Aedes Mosquitoes	71.6	8.8	19.6

Table 4.5 shows the respondent's knowledge of dengue fever. Most of the respondents in both hotspot and non-hotspot areas knew that *Aedes aegypti* and *albopictus* are the vectors of dengue fever, and a person can get dengue more than once. They also understood that the dengue outbreak not only happens during rainy seasons. There is little difference between both areas in their knowledge of dengue symptoms. Respondents from the hotspot and non-hotspot areas have equivalent knowledge on *Aedes* breeding spots, the way dengue spread to humans and precaution to prevent dengue outbreak.

Table 4.5 Distribution of respondent's knowledge towards dengue fever in hotspot and non-hotspot area (N-102)

Knowledge Items	Hotspot			Non-Hotspot		
	Yes (%)	No (%)	Don't Know (%)	Yes (%)	No (%)	Don't Know (%)
Dengue is spread by <i>Aedes aegypti</i> or <i>Aedes albopictus</i>	62 (88.6)	1 (1.40)	7 (10.0)	28 (87.5)	1 (3.10)	3 (9.40)
A person can get Dengue more than once	59 (84.3)	2 (2.90)	9 (12.9)	26 (81.3)	2 (6.30)	4 (12.5)
Dengue fever is a severe flu disease that can affect babies, kids, and adults	34 (48.6)	24 (34.3)	12 (17.1)	15 (46.9)	13 (40.6)	4 (12.5)
Dengue outbreak only happens during the rainy season	17 (24.3)	42 (60.0)	11 (15.7)	4 (12.5)	22 (68.8)	6 (18.8)
Symptoms of Dengue include:						
High fever	64 (91.4)	0 (0)	6 (8.60)	30 (93.8)	0 (0)	2 (6.30)
Cough	46 (65.7)	11 (15.7)	13 (18.6)	19 (59.4)	4 (12.5)	9 (28.1)
Joint, muscle, bone pain	65 (92.9)	1 (1.40)	4 (5.70)	31 (96.9)	0 (0)	1 (3.10)

Table 4.5 Continued

Knowledge Items	Hotspot			Non-Hotspot		
	Yes (%)	No (%)	Don't Know (%)	Yes (%)	No (%)	Don't Know (%)
Pain behind eyes	47 (67.1)	8 (11.4)	15 (21.4)	24 (75.0)	1 (3.10)	7 (21.9)
Vomiting	60 (85.7)	3 (4.30)	7 (10.0)	22 (68.8)	2 (6.30)	8 (25.0)
Loss of appetite	65 (92.9)	2 (2.90)	3 (4.30)	26 (81.3)	1 (3.10)	5 (15.6)
Rashes	66 (94.3)	1 (1.40)	3 (4.30)	30 (93.8)	1 (3.10)	1 (3.10)
Headache	64 (91.4)	2 (2.90)	4 (5.70)	25 (78.1)	1 (3.10)	6 (18.8)
Aedes mosquito breeds in clean water in old tires, rubbish bins, and flower pots.	70 (100)	0 (0)	0 (0)	32 (100)	0 (0)	0 (0)
Dengue virus spread among humans via infected female Aedes bites	56 (80.0)	0 (0)	14 (20.0)	23 (71.9)	3 (9.40)	6 (18.8)
The only way to combat Dengue is to fight Aedes mosquitoes	68 (97.1)	1 (1.40)	1 (1.40)	28 (87.5)	0 (0)	4 (12.5)
Aedes mosquitoes bite early in the morning or late in the afternoon	66 (94.3)	1 (1.40)	3 (4.30)	28 (87.5)	1 (3.10)	3 (9.40)
Larvae killer can help in killing Aedes larvae	66 (94.3)	2 (2.90)	2 (2.90)	31 (96.9)	0 (0)	1 (3.10)
Water containers and tanks without lids should be cleaned every seven days	67 (95.7)	2 (2.90)	1 (1.40)	30 (93.8)	2 (6.3)	0 (0)
Insecticides can kill adult Aedes Mosquitoes	51 (72.9)	6 (8.60)	13 (18.6)	22 (68.8)	3 (9.40)	7 (21.9)

4.2.3 Attitude towards dengue fever

Table 4.6 displays the attitude of respondents towards dengue. There was a total of six questions asked to assess the attitude of respondents towards dengue. Respondents were given choices between highly disagree, disagree, agree, and highly agree to show their attitude with a respective score of '1', '2', '3' and '4'.

'I feel scared when infected with dengue fever' statement had the highest score (mean=3.54, SD=0.56), none of the respondents answered highly disagree, and only 2.9% disagree. The second highest score was for the statement *'The only method of controlling or preventing Dengue is to destroy Aedes mosquitoes'* (mean=3.53, SD0.66), it had the highest percentage of respondents who answered 'highly agree', and 32.4% answered 'agree'. Those were followed by *'I would immediately see a doctor if I experience signs and symptoms of dengue fever'* (mean=3.50, SD 0.58) and *'I am the key individuals in preventing Dengue'* (mean=3.48, SD=0.59). The lowest score belonged to *'Everyone has a chance to be infected by dengue virus'* statement (mean=3.40, SD=0.60), with 5.9% disagree with this statement.

Table 4.6 Percentage distribution of respondent's attitude towards dengue fever (N-102)

	Highly disagree	Disagree	Agree	Highly agree	Mean	SD
The only method of controlling or preventing dengue is to destroy Aedes mosquitoes.	1.0	5.9	32.4	60.8	3.53	0.66
Everyone has a chance to be infected by the dengue virus.	0.0	5.9	48.0	46.1	3.40	0.60

Table 4.6 Continued

	Highly disagree	Disagree	Agree	Highly agree	Mean	SD
I would immediately see a doctor if I experience signs and symptoms of dengue fever.	1.0	1.0	45.1	52.9	3.50	0.58
I feel scared when infected with dengue fever.	0.0	2.9	40.2	56.9	3.54	0.56
I am the key individual in preventing dengue.	1.0	2.0	45.1	52.0	3.48	0.59
All dengue patients have a chance for a full recovery.	1.0	2.9	50.0	46.1	3.41	0.60

Table 4.7 shows the respondents' attitude towards dengue. Most of the respondents believed combating Aedes was the way to prevent dengue, anyone could be infected by dengue, and they played an important role in preventing dengue. Almost all the respondent were scared if they were infected by dengue and would seek treatment immediately, even though they believed that dengue patient could recover. Overall, the respondents in the hotspot and non-hotspot area had a positive attitude.

Table 4.7 Distribution of respondent's attitude towards dengue fever in hotspot and non-hotspot area (N-102)

Item	Hotspot				Non-Hotspot			
	1	2	3	4	1	2	3	4
The only method of controlling or preventing Dengue is to destroy Aedes mosquitoes.	0 (0)	2 (2.9)	20 (28.6)	48 (68.6)	1 (3.1)	4 (12.5)	13 (40.6)	14 (43.8)
Everyone has a chance to be infected by dengue virus.	0 (0)	3 (4.3)	28 (40.0)	39 (55.7)	0 (0)	3 (9.4)	21 (65.6)	8 (25.0)

Table 4.7 Continued

Item	Hotspot				Non-Hotspot			
	1	2	3	4	1	2	3	4
I would immediately see a doctor if I experience signs and symptoms of dengue fever.	1 (1.4)	1 (1.4)	27 (38.6)	41 (58.6)	0 (0)	0 (0)	19 (59.4)	13 (40.6)
I feel scared when infected with dengue fever.	0 (0)	3 (4.3)	26 (37.1)	41 (58.6)	0 (0)	0 (0)	15 (46.9)	17 (53.1)
I am the key individual in preventing Dengue.	1 (1.4)	1 (1.4)	29 (41.4)	39 (55.7)	0 (0)	1 (3.1)	17 (53.1)	14 (43.8)
All dengue patients have a chance for a full recovery.	1 (1.4)	1 (1.4)	32 (45.7)	36 (51.4)	0 (0)	2 (6.3)	19 (59.4)	11 (34.4)

1 = Highly disagree, 2 = Disagree, 3 = Agree, 4 = Highly agree

4.2.4 Practice towards dengue fever

There were ten questions in the questionnaire to assess the respondent's practice towards dengue fever prevention (Table 4.8). This domain consisted of items that were assessed by 'yes', 'no', and "not applicable" category. The statement with the highest score was '*I put the waste/garbage in the trash or dispose of it*' (98%). That was followed by '*I clean the water tank which contained Aedes mosquito larvae*' (97.1%), '*I frequently check the waste/garbage that can block the water flow around my house*' (96.1%), and '*I check the Aedes mosquito larvae in the toilet tank regularly or frequently*' (96.1%). The lowest score was '*I participate in the dengue infection campaign in my housing area*' (76.5%).

Table 4.8 Percentage distribution of respondent's practice towards dengue prevention (N-102)

	Yes	No	Not Applicable
I immediately close the water container after using it.	93.1	4.9	2.0
I clean the water tank, which contained Aedes mosquito larvae.	97.1	2.0	1.0
I change the water plant containers in the house every week.	88.2	3.9	7.8
I change the water in flower containers frequently.	83.3	4.9	11.8
I check the mosquito larvae in a flowerpot frequently	87.3	2.9	9.8
I frequently check the waste/garbage that can block the water flow around my house.	96.1	2.0	2.0
I put the waste/garbage in the trash or dispose of it.	98.0	0.00	2.0
I participate in the dengue infection campaign in my housing area.	76.5	14.7	8.8
I check the Aedes mosquito larvae in the toilet tank regularly or frequently.	96.1	2.9	1.0
I check and clean the drains/gutters roofs of the rainy season.	79.4	7.8	12.7

Table 4.9 shows the respondents' practice towards dengue control. There was little difference in practice in controlling dengue vectors. Those practice questions illustrated a positive practice from both hot-spot and non-hotspot areas. However, a higher percentage of respondents in the non-hotspot area reported that they immediately closed the water contained after using them, frequently checked the mosquito larvae in the flower pots, frequently checked the garbage that can block the water flow around the house, disposed or put the garbage in the trash, participated in

the dengue infection campaign, and cleaned the drains and roof gutters during the rainy season.

Table 4.9 Distribution of respondent’s practice towards dengue fever in hotspot and non-hotspot area (N-102)

Practice Items	Hotspot			Non-Hotspot		
	Yes	No	Not Applicable	Yes	No	Not Applicable
I immediately close the water container after using it.	65 (92.9)	4 (5.7)	1 (1.4)	30 (93.8)	1 (3.1)	1 (3.1)
I clean the water tank which contained Aedes mosquito larvae.	69 (98.6)	1 (1.4)	0 (0)	30 (93.8)	1 (3.1)	1 (3.1)
I change the water plant containers in the house every week.	62 (88.6)	4 (5.7)	4 (5.7)	28 (87.5)	0 (0)	4 (12.5)
I change the water in flower containers frequently.	60 (85.7)	3 (4.3)	7 (10.0)	25 (78.1)	2 (6.3)	5 (15.6)
I check the mosquito larvae in a flower pot frequently	60 (85.7)	2 (2.9)	8 (11.4)	29 (90.6)	1 (3.1)	2 (6.3)
I frequently check the waste/garbage that can block the water flow around my house.	67 (95.7)	2 (2.9)	1 (1.4)	31 (96.9)	0 (0)	1 (3.1)
I put the waste/garbage in the trash or dispose of it.	68 (97.1)	0 (0)	2 (2.9)	32 (100)	0 (0)	0 (0)
I participate in the dengue infection campaign in my housing area.	53 (75.7)	10 (14.3)	7 (10.0)	25 (78.1)	5 (15.6)	2 (6.3)

Table 4.9 Continued

Practice Items	Hotspot			Non-Hotspot		
	Yes	No	Not Applicable	Yes	No	Not Applicable
I check the Aedes mosquito larvae in the toilet tank regularly or frequently.	70 (100)	0 (0)	0 (0)	28 (87.5)	3 (9.4)	1 (3.1)
I check and clean the drains/gutters roofs of the rainy season.	52 (74.3)	7 (10.0)	11 (15.7)	29 (90.6)	1 (3.1)	2 (6.3)

4.3 Relationship between risk perception, knowledge, attitude, and practice with the selected sociodemographic characteristics

4.3.1 Relationship between risk perception, knowledge, attitude, and practice with gender

Table 4.10 shows the results of t-test analysis comparing the mean mark between males and females for their risk perception, knowledge, attitude, and practice towards dengue. The analysis found that there was no statistically significant difference in the mean mark of risk perception, knowledge, and attitude between males and females ($p>0.05$) except the preventive practice between males and females ($p<0.05$). Though there were no statistically significant mean differences, the analysis showed that males (mean=2.94, SD=0.51) (mean=0.84, SD=0.15) had higher mean in risk perception and knowledge compared to females (mean=2.90, SD=0.47) (mean=0.82, SD=0.13). The difference in their attitude was also not statistically significant, but a higher mean score was found in females (mean=3.52, SD=0.39) compared to males (mean=3.44, SD=0.48).

The analysis revealed that females (mean=0.97, SD=0.07) had higher mean marks in practice compared to males (mean=0.93, SD=0.12) with a statistically significant p-value less than 0.05.

Table 4.10 t-test for comparison of mean marks in risk perception, knowledge, attitude, and preventive practice between male and female

	Male (SD)	Female (SD)	Mean score difference (95% CI)	t-statistic (df)	P-value
Risk Perception	2.94 (0.51)	2.90 (0.47)	0.04 (-0.15, 0.23)	0.408 (100)	0.684
Knowledge	0.84 (0.15)	0.82 (0.13)	0.02 (-0.04, 0.07)	0.620 (100)	0.536
Attitude	3.44 (0.48)	3.52 (0.39)	-0.07 (-0.24, 0.10)	-0.864 (99.91)	0.390
Practice	0.93 (0.12)	0.97 (0.07)	-0.04 (-0.08, -0.002)	-2.097 (96.29)	0.039

*P-value is obtained from independent sample t-test

4.3.2 Relationship between risk perception, knowledge, attitude, and practice with the level of household income.

Analysis using one-way Analysis Of Variance (ANOVA) found that there was no statistically significant ($p>0.05$) difference between the mean scores of risk perception, knowledge, attitude, and practice between the level of household income (Table 4.11). The analysis revealed that the highest mean score for risk perception was among household income between RM3001 to RM5000 (mean=3.13, SD=0.44), and the lowest mean was among household income between RM 1501 to 3000 (mean=2.71, SD=0.40). Even though not statistically significant ($p>0.05$), analysis found that respondents with household income less than RM1500 (mean=0.83,

SD=0.15) and RM1501 to RM3000 (mean=0.83, SD=0.12), had higher knowledge compared to other groups, RM3001 to RM5000 (mean=0.82, SD=0.10) and RM5001 to RM7500 (mean=0.80, SD=0.11). Mean score for attitude was found higher among respondent with household income RM3001 to RM5000 (mean=3.58, SD=0.47) compared to other groups, less than RM1500 (mean=3.47, SD=0.44), RM1501 to RM3000 (mean=3.47, SD=0.44) and RM5001 to RM7500 (mean=3.33, SD=0.39). There was no statistically significant difference in mean score for the preventive practice among the respondents. Still, the analysis showed that respondents with household income RM1501 to RM3000 (mean=0.98, SD=0.04) had higher score compared to other groups, RM5001 to RM7500 (mean=0.96, SD=0.06), income less than RM1500 (mean=0.95, SD=0.10) and RM3001 to RM5000 (mean=0.90, SD=0.15).

Table 4.11 ANOVA for significant difference of mean marks in risk perception, knowledge, attitude, and practice between levels of household income

				95% CI				F(df); p-value
N	Mean	SD	Lower Bound	Upper Bound	Min	Max		
Risk Perception								
<RM1500	68	2.95	0.51	2.82	3.07	2.00	4.00	1.968 (3); 0.124
RM1501–RM3000	19	2.71	0.40	2.52	2.91	1.86	3.71	
RM3001–RM5000	10	3.13	0.44	2.81	3.44	2.57	4.00	
RM5001–RM7500	5	3.06	0.41	2.55	3.57	2.57	3.57	
Total	102	2.93	0.49	2.83	3.02	1.86	4.00	

Table 4.11 Continued

	N	Mean	SD	95% CI		Min	Max	F(df); p-value
				Lower Bound	Upper Bound			
Knowledge								
<RM1500	68	0.83	0.15	0.80	0.87	0.21	1.00	0.133 (3); 0.940
RM1501– RM3000	19	0.83	0.12	0.78	0.89	0.53	1.00	
RM3001– RM5000	10	0.82	0.10	0.75	0.89	0.68	0.95	
RM5001– RM7500	5	0.80	0.11	0.66	0.94	0.74	1.00	
Total	102	0.83	0.14	0.80	0.86	0.21	1.00	
Attitude								
<RM1500	68	3.47	0.44	3.37	3.58	2.00	4.00	0.367 (3); 0.777
RM1501– RM3000	19	3.47	0.44	3.26	3.69	2.83	4.00	
RM3001– RM5000	10	3.58	0.47	3.24	3.92	2.83	4.00	
RM5001– RM7500	5	3.33	0.39	2.85	3.82	3.00	4.00	
Total	102	3.48	0.44	3.39	3.56	2.00	4.00	
Practice								
<RM1500	68	0.95	0.10	0.92	0.97	0.60	1.00	1.585 (3); 0.198
RM1501– RM3000	19	0.98	0.04	0.96	1.00	0.88	1.00	
RM3001– RM5000	10	0.90	0.15	0.79	1.00	0.57	1.00	
RM5001– RM7500	5	0.96	0.06	0.89	1.03	0.89	1.00	
Total	102	0.95	0.10	0.93	0.97	0.57	1.00	

P-values obtained from ANOVA (analysis of variance)

4.3.3 Relationship between risk perception, knowledge, attitude, and practice between the level of education

Analysis using one-way Analysis of Variance (ANOVA) found that there was no statistically significant mean difference in terms of risk perception, knowledge, and practice on the level of education ($p>0.05$) except attitude towards dengue fever ($p<0.01$). Though there was no statistically significant difference in risk perception score on the level of education, the analysis revealed that respondents with higher education levels had better risk perception towards dengue. It showed that respondents with degree (mean=3.06, SD=0.38) and diploma (mean=3.10, SD=0.41) had higher scores compared to STPM (mean=2.75, SD=0.41), SPM (mean=2.92, SD=0.47), PMR (mean=2.73, SD=0.58) and UPSR (mean=2.99, SD=0.60). The analysis found that respondents with a degree (mean=0.86, SD=0.11) had the highest score in the knowledge of dengue, and respondents with a diploma (mean=0.80, SD=0.15) had the lowest score though it was not statistically significant. Meanwhile, in terms of practice, respondents with a degree (mean=0.91, SD=0.14) had the lowest mean score compared to others. Tukey's honestly significant difference (HSD) post hoc test found that no statistically significant difference was found between the level of education for respondents' attitudes except diploma (mean=3.83, SD=0.32) and PMR (mean=3.19, SD=0.37) ($p<0.05$).

Table 4.12 ANOVA for significant difference of mean marks in risk perception, knowledge, attitude, and practice between level education

	N	Mean	SD	95% CI		Min	Max	F(df); p-value
				Lower	Upper			
				Bound	Bound			
Risk Perception								
UPSR (primary)	16.00	2.99	0.60	2.67	3.31	1.86	4.00	0.809
PMR (lower secondary)	15.00	2.73	0.58	2.41	3.05	2.00	4.00	(6);
SPM (high secondary)	46.00	2.92	0.47	2.78	3.06	2.00	4.00	0.565
STPM (equivalent)	4.00	2.75	0.41	2.10	3.40	2.29	3.29	
Diploma	7.00	3.10	0.41	2.72	3.48	2.57	3.57	
Degree	11.00	3.06	0.38	2.81	3.32	2.57	3.71	
Others	3.00	2.95	0.36	2.06	3.85	2.57	3.29	
Total	102.00	2.93	0.49	2.83	3.02	1.86	4.00	
Knowledge								
UPSR (primary)	16.00	0.85	0.12	0.78	0.91	0.53	1.00	0.563
PMR (lower secondary)	15.00	0.78	0.15	0.70	0.86	0.47	0.95	(6);
SPM (high secondary)	46.00	0.84	0.16	0.79	0.89	0.21	1.00	0.758
STPM (equivalent)	4.00	0.80	0.07	0.70	0.91	0.74	0.89	
Diploma	7.00	0.80	0.15	0.66	0.93	0.63	0.95	
Degree	11.00	0.86	0.11	0.78	0.93	0.74	1.00	
Others	3.00	0.88	0.03	0.80	0.95	0.84	0.89	
Total	102.00	0.83	0.14	0.80	0.86	0.21	1.00	
Attitude								
UPSR (primary)	16.00	3.52	0.44	3.29	3.76	2.83	4.00	3.455
*PMR (lower secondary)	15.00	3.19	0.37	2.99	3.39	2.50	4.00	(6);
SPM (high secondary)	46.00	3.49	0.43	3.36	3.62	2.00	4.00	0.004
STPM (equivalent)	4.00	3.13	0.37	2.54	3.71	2.83	3.67	
*Diploma	7.00	3.83	0.32	3.54	4.13	3.17	4.00	
Degree	11.00	3.52	0.42	3.23	3.80	3.00	4.00	
Others	3.00	4.00	0.00	4.00	4.00	4.00	4.00	
Total	102.00	3.48	0.44	3.39	3.56	2.00	4.00	
Practice								
UPSR (primary)	16.00	0.94	0.14	0.87	1.01	0.60	1.00	0.646
PMR (lower secondary)	15.00	0.95	0.07	0.91	0.99	0.78	1.00	(6);
SPM (high secondary)	46.00	0.95	0.09	0.92	0.98	0.60	1.00	0.693
STPM (equivalent)	4.00	0.98	0.05	0.90	1.05	0.90	1.00	
Diploma	7.00	0.98	0.05	0.94	1.03	0.88	1.00	
Degree	11.00	0.91	0.14	0.81	1.00	0.57	1.00	
Others	3.00	1.00	0.00	1.00	1.00	1.00	1.00	
Total	102.00	0.95	0.10	0.93	0.97	0.57	1.00	

P-values obtained from ANOVA (analysis of variance)

*Post Hoc significantly difference with $p < 0.05$

4.4 Comparison of risk perception, knowledge, attitude, and practice between the hotspot and non-hotspot area

The score for each variable was separated into four ranges: very low, low, medium, and high, according to one standard deviation using visual binning in SPSS. A chi-square test of independence was performed to compare between hotspot and non-hotspot for their risk perception, knowledge, attitude, and practice towards dengue. There was no statistically significant difference between the hotspot and non-hotspot respondents ($p>0.05$).

According to the scoring system, it was found that respondents from hotspot areas had a higher score in their risk perception, with 32.9% had the medium mark, and 24.3% had high marks compared to non-hotspot with 31.3% had the medium mark and 12.5% had the high mark. The analysis revealed that more than half (57.2%) of respondents in the hotspot area had medium to high scores; while more than half (56.3%) of respondents in the non-hotspot area had 'very low' to the 'low' score. Even though not statistically significant, the analysis showed that respondents in hotspot area had better score, (medium=31.4%) (high=31.4%) compared to non-hotspot (medium=25%) (high=12.5%). Seventy-three per cent of the respondents in the hotspot area had a good score for the practice domain, which was higher compared to respondents in the non-hotspot area (68.8%) (Table 4.13).

Table 4.13 Score difference of risk perception, knowledge, attitude, and preventive practice level on Dengue between Hotspot and Non-hotspot Communities

Variables	Hotspot (n=70)	Non-Hotspot (n=32)	X ₂ (df) P-value
Risk perception level of respondents regarding Dengue infection.			
Very low (13.0-17.06 scores)	14 (20.0)	7 (21.9)	2.637 (3)
Low (17.07-20.49 scores)	16 (22.9)	11 (34.4)	0.451
Medium (20.50-23.92 scores)	23 (32.9)	10 (31.3)	
High (23.93-28.0 scores)	17 (24.3)	4 (12.5)	
Knowledge level of respondents regarding Dengue infection			
Very low (4-13 scores)	10 (14.3)	5 (15.6)	6.217 (3)
Low (14-16 scores)	14 (20.0)	13 (40.6)	0.101
Medium (17-18 scores)	41 (58.6)	11 (34.4)	
High (≥ 19 scores)	5 (7.1)	3 (9.4)	
The attitude of respondents towards Dengue infection			
Very low (12-18 scores)	17 (24.3)	11 (34.4)	7.111 (3)
Low (19-21 scores)	9 (12.9)	9 (28.1)	0.063
Medium (22-24 scores)	22 (31.4)	8 (25.0)	
High (≥ 25 scores)	22 (31.4)	4 (12.5)	
The practice of respondents on Dengue infection			
Very poor (0.57-0.85 scores)	7 (10.0)	3 (9.4)	0.325 (3)
Poor (0.86-0.95 scores)	12 (17.1)	7 (21.9)	0.850
Good (0.96-1.05 scores)	51 (72.9)	22 (68.8)	
Very good (≥ 1.06 scores)	0 (0)	0 (0)	

The figure within parentheses indicate column percentage

P-values obtained from Chi-square test

Table 4.14 shows the results of t-test analysis comparing the mean marks of risk perception, knowledge, attitude, and practice towards dengue between respondents in hotspot and non-hotspot areas. There was no significant difference in the mean scores of risk perception, knowledge, and practice between both areas. Nevertheless, it showed the respondents in the hotspot area had a better attitude towards dengue compared to respondents living in the non-hotspot area, as the p-value was less than 0.05. Even though not statistically significant differences, the analysis showed risk perception among respondents from the hotspot area (mean=2.97, SD=0.49) was higher compared to respondents from the non-hotspot area (mean=2.83, SD=0.47). Similar results were found in their knowledge, with respondents from the

hotspot area had a higher score (mean=0.84, SD=0.14) compared to respondents from the non-hotspot area (mean=0.81, SD=0.14). Meanwhile, their mean score for practice was equal for both areas. Independent sample t-test revealed that the mean difference in scores for attitude among the respondents from the hotspot area (mean=3.54, SD=0.44) and non-hotspot area (mean=3.34, SD=0.40) was statistically significant ($t(df) = -2.19(100); p < 0.05$).

Table 4.14 t-test for comparison of mean marks in risk perception, knowledge, attitude, and preventive practice between the hotspot and non-hotspot

Variables	Hotspot Mean (SD)	Non-Hotspot Mean (SD)	Mean score difference (95% CI)	t-statistic (df)	P-value
Risk perception	2.97 (0.49)	2.83 (0.47)	-0.14 (-0.35, 0.07)	-1.35 (100)	0.179
Knowledge	0.84 (0.14)	0.81 (0.14)	-0.03 (-0.09, 0.03)	-1.052 (100)	0.295
Attitude	3.54 (0.44)	3.34 (0.40)	-0.20 (-0.38, 0.02)	-2.19 (100)	0.031
Practice	0.95 (0.10)	0.95 (0.09)	0.002 (-0.041, 0.045)	0.092 (100)	0.927

*P-value is obtained from independent sample t-test

4.5 Correlation between risk perception, knowledge, attitude, and practice towards dengue fever

Pearson correlation coefficient was calculated for the relationship between risk perception, knowledge, attitude, and practice towards dengue. A fair level of positive correlation was found ($r=0.418; p < 0.01$), indicating a significant linear relationship between risk perception and knowledge. Respondents with a high score on risk

perception tended to have a high score in knowledge. The analysis also found a fair level of positive correlation ($r=0.508$; $p<0.01$) between risk perception and attitude towards dengue. There was also a positive correlation ($r=0.432$; $p<0.01$) found between knowledge and attitude towards dengue; however, there was only a fair level of correlation. The analysis revealed that there was no correlation between practice with risk perception, knowledge, and attitude.

Table 4.15 Correlations of risk perception, knowledge, attitude, and preventive practice towards dengue

			1	2	3	4
1.	Risk Perception	Pearson Correlation	1			
2.	Knowledge	Pearson Correlation	0.418**	1		
3.	Attitude	Pearson Correlation	0.508**	0.432**	1	
4.	Practice	Pearson Correlation	0.042	-0.034	-0.013	1

** . Correlation is significant at the 0.01 level (2-tailed).

CHAPTER 5: DISCUSSION

This research project was conducted to compare the socioeconomic status, level of risk perception, knowledge of dengue, attitude, and prevention practices towards dengue fever, specifically between dengue hotspot and non-hotspot outbreak areas. All those variables were also analysed to determine the relationships between them. This chapter represents a general discussion of the research findings, limitations of the study, and also some recommendations in dealing with dengue from the public health perspective.

5.1 Comparison of socioeconomic status, risk perception, knowledge, attitude, and practices between the areas of dengue hotspot and non-hotspot

5.1.1 Comparison of household income between the areas of hotspot and non-hotspot

In this study, respondents residing in the non-hotspot area had higher earning compared to respondents in the hotspot area. This finding was similar to the study carried out in Selangor, which also made the comparison between communities living in dengue hotspot and also non-hotspot locations (Ghani et al., 2019). Low household income usually comes together with a low education level; without adequate information about dengue, they will not emphasise prevention practice, which leads to an uncontrolled outbreak and subsequently becoming a hotspot. People with better financial status may have more access to multiple channels of information such as newspapers, radio, and television. Together with better educational background, this

could ensure that the community can understand better the information that they get(Castro et al., 2013).

5.1.2 Comparison of education level between the hotspot and non-hotspot areas

According to the previous study in Selangor, respondents staying in the hotspot areas showed a more inferior education background than respondents in non-hotspot areas(Ghani et al., 2019). We had similar findings, which showed that 34.4% of respondents in the non-hotspot area had a diploma to degree qualifications compared to only 10% of those living in the hotspot area. For this reason, more frequent hygiene inspection concurrent with public health education should be carried for people with a less educated and low household income, especially in hotspot areas. This public health intervention is crucial to alert and educate the communities regarding the dangers of dengue outbreaks. This initiative may help in reducing the dengue cases and preventing an outbreak in their areas(Ghani et al., 2019).

5.1.3 Comparison of risk perception, knowledge, attitude and practices between the hotspot and non-hotspot areas

It is essential to have adequate knowledge and the right attitude on prevention of dengue in reducing the risk of exposure to dengue vector or *Aedes* mosquitoes. This circumstance will subsequently help in lower the possibility of being infected by the virus of dengue (Ghani et al., 2019). Although this may be true, our study found that people residing in the hotspot dengue outbreak area shows a better attitude towards dengue compared to the people staying in the non-hotspot area. Our study findings also showed that there was no statistically significant difference was found for their risk perception, knowledge, and practice. A probable explanation for the greater levels of attitude among the respondents in the hotspot area could be related to their previous

day experience with the high number of dengue cases occur in their community and frequent intervention by public health personnel compared to non-hotspot. Our study results are in contrast to the findings from a previous study, which showed that people staying in non-hotspot areas had better knowledge and attitude compared to those people staying in the hotspot areas (Ghani et al., 2019). However, my study results shared a similarity with the finding of Ghani et al. (2019), which showed no difference in practice between these two areas. These results proved that even though people have higher risk perception, better knowledge, and a good attitude, but it was not translated into them practising the right preventive action towards dengue. Nonetheless, education related to dengue prevention practices should still be emphasized in each area to ensure communities have a better understanding about dengue and they could do their part effectively in anticipating an outbreak of dengue (Ghani et al., 2019).

5.2 Relationship between socioeconomic status, risk perception, knowledge, attitude, and practices related to dengue

5.2.1 Relationship of gender to risk perception, knowledge, attitude, and practices related to dengue

Previous studies on knowledge, attitude, and practices towards preventions on dengue provided evidence that gender had an insignificant association with knowledge, attitude, and practice (Alhoot et al., 2017; Syed et al., 2010). My study had similar findings, which showed no significant association in risk perception, knowledge, and attitude with gender. However, my study revealed that females (mean=0.97, SD=0.07) showed better preventive practice towards dengue compared to males (mean=0.93, SD=0.12) with a statistically significant p-value which less than 0.05. A study carried out among international students in University Putra Malaysia,

found that there was a significant association between dengue prevention practices and gender(Rao, Minhat, & Hayati, 2016). A possible explanation for this is that females seemed to be more concerned about dengue fever prevention as most of the household chores were handled by women(Rao et al., 2016).

5.2.2 Relationship of household income to risk perception, knowledge, attitude, and practices related to dengue

There are conflicting results from previous studies regarding the relationship between household income and dengue. Some studies showed people with a higher household earning had higher knowledge level towards dengue(Castro et al., 2013; Ghani et al., 2019; Lugova & Wallis, 2017) while others found no relationship between household income and knowledge(Alhoot et al., 2017). While some studies found that there was no association between risk perception and economic status(Castro et al., 2013) others found that high socioeconomic groups showed better preventive practices(Syed et al., 2010). Furthermore, while some studies found that there was no significant association can be seen between practices and household income variables towards dengue fever prevention(Alhoot et al., 2017; Castro et al., 2013; Ghani et al., 2019). At the same times, most of the studies showed that household income did affect the attitude towards dengue(Alhoot et al., 2017; Ghani et al., 2019; Lugova & Wallis, 2017).

Compared to the results of the preceding studies, our study showed that there was no statistically significant difference in risk perception, knowledge, attitude, and practice between the level of household income ($p>0.05$). The way we assessed the economic status could be considered as a limitation. Income only gives a picture of resources over a specified period. Still, there are more particular variables to be

considered, for example, the ownership of houses or motor vehicles, employment benefits, amount of savings, and other assets such as inherited wealth.

5.2.3 Relationship of education level to risk perception, knowledge, attitude, and practices related to dengue

In my study, individuals with higher education levels were more likely to have good attitudes compared to those with less educated. Still, there is no significant association between risk perception, knowledge, and practice on education level. Several earlier studies conducted in other parts of Malaysia similarly found that level of education was an essential determinant of attitudes towards dengue (Ghani et al., 2019) (Lugova & Wallis, 2017) (Alhoot et al., 2017) (Leong, 2014). In addition, some studies showed that individual with a higher educational background had better knowledge towards dengue (Alhoot et al., 2017; Castro et al., 2013; Ghani et al., 2019; Leong, 2014; Lugova & Wallis, 2017; Syed et al., 2010).

A study conducted among patients in Taiping Hospital found that there was no significant association between practice and socio-demographic variables towards dengue fever prevention (Alhoot et al., 2017). In contrast, a study conducted among students in Universiti Sultan Zainal Abidin (Unisza), Terengganu found a significant association between preventive practice regarding dengue and socio-demographic characteristics comprising age of respondents, level of educational, marital status and duration of living in the survey area (Yussof et al., 2018).

5.2.4 Relationship between risk perception, knowledge, attitude, and practices related to dengue

In our study, it was found that respondents with a high score on risk perception tended to have a higher knowledge of dengue and also showed a better attitude. Our study also found that attitude also increased with better knowledge of dengue which was similar to the findings from a previous study conducted in Negeri Sembilan (Leong, 2014). Similar results are not seen in other studies, which found no significant association between knowledge and attitude (Alhoot et al., 2017; Karimah Hanim et al., 2017). Most of the previous study found that knowledge was a significantly associated factor for having good practice on dengue prevention (Alhoot et al., 2017; Castro et al., 2013; Lugova & Wallis, 2017; Moe Thwe Aung et al., 2016; Yussof et al., 2018). Some authors also showed evidence that good practices were also associated with a good attitude towards dengue (Lugova & Wallis, 2017) (Moe Thwe Aung et al., 2016).

In contrast, another study found no significant association between knowledge with practice and attitude with practice (Leong, 2014). Those results are almost similar to our findings which showed no correlation between risk perception with practice, knowledge with practice, and attitude with practice. However, we must be more realistic; in real life, all good in knowledge does not always lead to all good in practices. As an example, water storage practice for domestic use was normal practice in the community and essential for them. It may not be easily eliminated or modified through education (Syed et al., 2010).

5.3 Strength of study

This study has high homogeneity as 96% of the respondents are Malays. So, this study is expected to have high internal validity. However, it may not be transferable to other parts of Sarawak as it is not representative of various other ethnicities.

The distance between the two study locations was far. Thus, it was most unlikely that there was close communication between people in those two areas. Under those circumstances, the diffusion of knowledge between the respondents in the two study areas was unlikely to have occurred.

5.4 Limitation of this study

We used self-administered questionnaires that relied on face-to-face interaction for data collection. There was a constraint during the SARS-CoV-2 pandemic, where we needed to maintain movement restriction and social distancing. It was a big struggle to ensure that our sample was adequate as the Movement Control Order (MCO) was enforced to curb the spread of SARS-CoV-2. However, we managed to get a fair number of samples for analysis (102 respondents) even though we needed at least 146 samples.

Most of our results turned out to be non-significant, so we calculate the statistical power according to the number of samples available, and we only reach 56.8% (power). This illustrated that the non-significance results were either due to an actual lack of relationship between the groups or due to a lack of statistical power, which seemed more likely.

A questionnaire that had been used in this study was the adopted and adapted version based on the questionnaire developed and validated by Mohammad Nasir et al., (2013). Unfortunately, that set of questionnaires did not have a risk perception domain which we needed to develop. We did a pilot study and checked by the content expert before we proceeded with the study to reduce this limitation. We also changed the answer choices in the attitude domain from “agree”, “disagree” and “don’t know” to a Likert scale choice between “highly disagree”, “disagree”, “agree”, and “highly agree” for better analysis. The final Cronbach's alpha for reliability was acceptable to good for all four domains.

Another major limitation of this study was that all the respondents were from rural areas with the majority of them staying in single kampung houses, which gave homogenous in the socio-demographic characteristics of the sample. There are concerns about whether the findings conclusions can be generalized to all populations at large, particularly urban people, or to different sociodemographic backgrounds.

5.5 Recommendation

This study found that television was the primary source of information on dengue for most of the communities (80%). Therefore, we need a systematic engagement between the Ministry of Health and the mainstream media to raise dengue issues and views influencing positive behaviour. More exciting and simple advertisements with credible or famous spokesperson suggested to promote COMBI to the community.

Most of the people in the hotspot area came from a low educational background and also low household income. For this reason, more frequent public health

education, together with hygiene inspection, should be done focusing on people with lack of education background and low-income community, especially in the area of the hotspot. The purposes are to increase their knowledge and remind them about the danger of dengue outbreaks, encourage them to practice simple preventive actions and which subsequently the number of dengue cases could be reduced in the community.

It is important to realize from all of these findings that intervention to create good practice on dengue prevention is very crucial. A COMBI (Communication for Behavioural Impact) programme is an effective strategy which applies communication technique in empowering the community to control and prevent dengue diseases. This programme will tackle the community's knowledge, attitude, and practice in empowering the community doing a household survey on dengue. Even though the WHO recommends COMBI, but the outcome of the program is not so good in Malaysia since COMBI does not focus on poverty and education, which are the main key factor in the increasing number of an outbreak. Therefore as the longterm approach, strengthening intersectoral collaboration is suggested to increase the communities economic status and level of education. For the short term approach, the prevention and control of dengue program should be focusing on in poverty area and low educated community during the outbreak.

Future studies should be done in the diverse sociodemographic background and during the outbreak itself with enough sample size to validate the results of this study.

CHAPTER 6: CONCLUSION

People living in the hotspot area had lower household income and education level compared to people residing in the area of non-hotspot. Still, they showed a better attitude towards dengue. Our findings also concluded that the difference in the risk perception, knowledge, and practice score between people living in those two areas was not significant. Therefore, more attention should be given on dengue preventive activities among communities with low household earnings and less academic background.

In our study, females showed better in prevention practice than males but no significant differences in risk perception, knowledge, and attitude. Concerning household income, it did not have any difference between those variables. Concerning the level of educations, our study showed that there was a better attitude among individuals holding higher education status compared to those individuals with minimal qualifications. On the other hand, there was no difference between levels of education and risk perception, knowledge, and practices.

Furthermore, our study also described the relationship between risk perception, knowledge of dengue, attitude, and prevention practice towards dengue. A good risk perception person tended to have higher knowledge and a better attitude towards dengue. Similarly, people with higher education also showed a better attitude. However, no correlation can be seen between risk perception, knowledge, and attitude toward positive practices on dengue prevention.

Overall, our study could provide a useful insight to the local authorities and district health officers in planning and implementing the public health activities for

controlling and preventing dengue in Kuching and Samarahan areas. The suggested evidence-based recommendations in our study might reduce the burdens of dengue outbreaks on the communities and the government.

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APPENDICES

APPENDIX A: QUESTIONNAIRE (ENGLISH VERSION)

A. Personal Details:

A1. Age: _____

A2. Gender: _____

A3. Race: _____

A4. Occupation: _____

Place an “X” mark in the box of your answers.

A5	Household income	
1	<RM1500	
2	RM1501–RM3000	
3	RM3001–RM5000	
4	RM5001–RM7500	
5	>RM7500	
A6	Housing type	
1	Flat	
2	Condominium	
3	Terrace	
4	Semi-D	
5	Bungalow	
6	Single Kampung House	
7	Others	
A7	Education level	
1	UPSR (primary)	
2	PMR (lower secondary)	
3	SPM (high secondary)	
4	STPM (A level/equivalent)	
5	Diploma	
6	Degree	
7	Others	
A8	Have you ever heard about dengue?	
1	Yes	
2	No	
	Source of Information	
A9	Newspaper	
A10	Radio	
A11	Friends	
A12	Poster	
A13	Health centre	
A14	Magazine	
A15	Family	
A16	School	
A17	Television	
A18	Internet	
A19	Doctor	
A20	Have you ever infected by dengue before?	
1	Yes	
2	No	

Section B. Please circle the answer that best applies to you

B1	Dengue is an infectious disease	Highly disagree / Disagree / Agree / Highly agree
B2	I am at risk of Dengue	Highly disagree / Disagree / Agree / Highly agree
B3	Dengue infection could be fatal	Highly disagree / Disagree / Agree / Highly agree
B4	My housing area is a Dengue prone area	Highly disagree / Disagree / Agree / Highly agree
B5	Dengue fever is a preventable disease	Highly disagree / Disagree / Agree / Highly agree
B6	I am at risk of being bitten by a mosquito	Highly disagree / Disagree / Agree / Highly agree
B7	I am at risk of being bitten by Aedes mosquito	Highly disagree / Disagree / Agree / Highly agree

Section C. Place an “X” mark in the box of your answers.

Variable code	Item	Yes	No	Don't know
C1	Dengue is spread by Aedes aegypti or Aedes albopictus			
C2	A person can get dengue more than once			
C3	Dengue fever is a severe flu disease that can affect babies, kids, and adults			
C4	Dengue outbreak only happens during the rainy season			
	Symptoms of Dengue include:			
C5	High fever			
C6	Cough			
C7	Joint, muscle, bone pain			
C8	Pain behind eyes			
C9	Vomiting			
C10	Loss of appetite			
C11	Rashes			
C12	Headache			
C13	Aedes reproduce in clean water found in old tires, rubbish bins, and flower pots			
C14	Dengue virus spread among humans via infected female Aedes bites			
C15	The only way to combat dengue is to fight Aedes mosquitoes			
C16	Aedes mosquitoes bite early in the morning, or late in the afternoon			
C17	Larvae killer can help in killing Aedes larvae			
C18	Water containers and tanks without lids should be cleaned every seven days			
C19	Insecticides can kill adult Aedes Mosquitoes			

Section D.**Please circle the answer that best applies to you.**

D1	The only method of controlling or preventing dengue is to eliminate Aedes mosquitoes.	Highly disagree / Disagree / Agree / Highly agree
D2	Everyone has a chance to dengue virus.	Highly disagree / Disagree / Agree / Highly agree
D3	I would immediately see a doctor if I experience signs and symptoms of dengue fever.	Highly disagree / Disagree / Agree / Highly agree
D4	I feel scared when infected with dengue fever.	Highly disagree / Disagree / Agree / Highly agree
D5	I am the key individuals in preventing dengue.	Highly disagree / Disagree / Agree / Highly agree
D6	All dengue patients have a chance for a full recovery.	Highly disagree / Disagree / Agree / Highly agree

Section E.**Place an "X" mark in the box of your answers.**

Variable code	Item	Yes	No	Don't have
E1	I immediately close the water container after using it.			
E2	I clean the water tank which contained Aedes mosquito larvae.			
E3	I change the water plant containers in the house every week.			
E4	I change the water in flower containers.			
E5	I check the mosquito larvae in a flower pot.			
E6	I check the waste/garbage which can block the flow of water around my house.			
E7	I put the waste/garbage in the trash or dispose of it.			
E8	I participate in the dengue infection campaign in my housing area.			
E9	I check the Aedes mosquito larvae in the toilet tank.			
E10	I check and clean the drains/gutters roofs of the rainy season.			

APPENDIX B: QUESTIONNAIRE (MALAY VERSION)

A. Maklumat Peribadi:**A1. Umur:** _____**A2. Jantina:** Lelaki / Perempuan**A3. Keturunan:** Melayu / Iban / Cina / Melanau / _____**A4. Pekerjaan:** _____**Tandakan “X” pada pilihan jawapan anda.**

Kod	Item	
A5	Pendapatan isi rumah	
1	<RM1500	
2	RM1501–RM3000	
3	RM3001–RM5000	
4	RM5001–RM7500	
5	>RM7500	
A6	Jenis kediaman	
1	Flat	
2	Kondominium	
3	Teres	
4	Semi-D	
5	Banglo	
6	Rumah kampung	
7	Lain-lain	
A7	Tahap pendidikan	
1	UPSR (sekolah rendah)	
2	PMR (menengah rendah)	
3	SPM (menengah atas)	
4	STPM (A level/setara)	
5	Diploma	
6	Ijazah	
7	Lain-lain	
A8	Pernahkah anda mendengar tentang Demam Denggi	
1	Ya	
2	Tidak	
	Dari manakah anda mendapat maklumat tentang Demam Denggi	
A9	Surat khabar	
A10	Radio	
A11	Kawan-kawan	
A12	Poster	
A13	Pusat Kesihatan	
A14	Majalah	
A15	Keluarga	
A16	Sekolah	
A17	Televisyen	
A18	Internet	
A19	Doktor	
A20	Pernahkah anda dijangkiti Demam Denggi	
1	Ya	
2	Tidak	

Bahagian B. Bulatkan pilihan jawapan anda

B1	Demam Denggi merupakan penyakit berjangkit.	Sangat Tidak Setuju / Tidak Setuju / Setuju / Sangat Setuju
B2	Saya berisiko dijangkiti Demam Denggi.	Sangat Tidak Setuju / Tidak Setuju / Setuju / Sangat Setuju
B3	Demam Denggi boleh menyebabkan kematian.	Sangat Tidak Setuju / Tidak Setuju / Setuju / Sangat Setuju
B4	Kawasan perumahan saya berisiko berlakunya wabak Denggi.	Sangat Tidak Setuju / Tidak Setuju / Setuju / Sangat Setuju
B5	Penularan Demam Denggi dapat dicegah.	Sangat Tidak Setuju / Tidak Setuju / Setuju / Sangat Setuju
B6	Saya berisiko digigit oleh nyamuk.	Sangat Tidak Setuju / Tidak Setuju / Setuju / Sangat Setuju
B7	Saya berisiko digigit oleh nyamuk Aedes.	Sangat Tidak Setuju / Tidak Setuju / Setuju / Sangat Setuju

Bahagian C. Tandakan “X” pada pilihan jawapan anda.

Kod	Item	Ya	Tidak	Tidak tahu
C1	Jangkitan Demam Denggi adalah melalui gigitan nyamuk <i>Aedes aegypti</i> atau <i>Aedes albopictus</i> .			
C2	Jangkitan demam denggi boleh terjadi lebih daripada satu kali.			
C3	Demam denggi adalah demam selsema tahap serius yang boleh menjangkiti bayi, kanak-kanak dan dewasa.			
C4	Wabak denggi hanya berlaku semasa musim hujan.			
	Gejala demam denggi adalah:			
C5	Demam tinggi			
C6	Batuk			
C7	Sakit sendi, otot dan tulang			
C8	Sakit belakang mata			
C9	Muntah-muntah			
C10	Hilang selera makan			
C11	Bintik-bintik merah			
C12	Sakit kepala			
C13	Nyamuk Aedes membiak dalam air jernih yang bertakung dalam tayar bekas, bekas sampah, dan pasu bunga.			
C14	Virus Denggi menjangkiti manusia melalui gigitan nyamuk Aedes betina.			
C15	Satu satunya cara memerangi Denggi adalah dengan menghapuskan nyamuk Aedes.			
C16	Nyamuk Aedes menggigit pada awal pagi dan lewat petang			
C17	Ubat jentik-jentik berkesan membunuh jentik-jentik.			

C18	Bekas penyimpanan air yang tidak bertutup perlu dibersihkan setiap 7 hari.			
C19	Racun serangga berkesan membunuh nyamuk Aedes dewasa.			

Bahagian D. Bulatkan pilihan jawapan anda

D1	Satu satunya cara mencegah dan mengawal Demam Denggi adalah dengan menghapuskan nyamuk Aedes.	Sangat Tidak Setuju / Tidak Setuju / Setuju / Sangat Setuju
D2	Setiap orang berisiko dijangkiti virus Denggi.	Sangat Tidak Setuju / Tidak Setuju / Setuju / Sangat Setuju
D3	Saya akan segera mendapatkan rawatan doktor sekiranya mempunyai tanda dan gejala Demam Denggi,	Sangat Tidak Setuju / Tidak Setuju / Setuju / Sangat Setuju
D4	Saya berasa takut dijangkiti Demam Denggi.	Sangat Tidak Setuju / Tidak Setuju / Setuju / Sangat Setuju
D5	Saya mempunyai peranan yang sangat penting dalam pencegahan Denggi.	Sangat Tidak Setuju / Tidak Setuju / Setuju / Sangat Setuju
D6	Pesakit Denggi boleh sembuh dengan sempurna.	Sangat Tidak Setuju / Tidak Setuju / Setuju / Sangat Setuju

Bahagian E. Tandakan “X” pada pilihan jawapan anda.

Kod	Item	Ya	Tidak	Tidak berkenaan
E1	Saya segera menutup bekas penyimpanan air selepas digunakan.			
E2	Saya membersihkan bekas takungan air yang mempunyai jentik-jentik.			
E3	Saya menukar air di dalam bekas tanaman dalam rumah setiap minggu.			
E4	Saya menukar air didalam bekas bunga hiasan.			
E5	Saya memeriksa jentik-jentik pada pasu bunga.			
E6	Saya memeriksa sampah yang boleh menyekat aliran air dalam longkang sekitar rumah saya.			
E7	Saya mengutip sampah dan membuang di dalam tong sampah.			
E8	Saya melibatkan diri dalam program pencegahan Denggi di kawasan saya.			
E9	Saya memeriksa jentik-jentik di dalam tangki air di dalam tandas rumah saya.			
E10	Saya memeriksa dan membersihkan longkang serta saluran air di bumbung pada musim hujan.			

APPENDIX C: INFORMED CONSENT FORM (ENGLISH VERSION)



PARTICIPANT INFORMATION SHEET AND INFORMED CONSENT FORM

1. Research Title:

Comparison of Socioeconomic Status and Human Related Factors Among Adults Between Hotspot and Non-Hotspot Areas of Dengue in Kuching and Samarahan, Sarawak

2. Name of investigator and institution

Dr Ahmad Salimi Bin Abu Bakar
Master of Public Health
University Malaysia Sarawak

3. Introduction

Dengue imposes a significant medical, economic and social burden in our country. Thus, you are invited to participate in research comparing socioeconomic status, dengue risk perception and human-related factors among adults in hotspot and non-hotspot areas in Kuching and Samarahan, Sarawak. This study has been approved by the Ethical Committee of University Malaysia Sarawak (UNIMAS) and permission to conduct this research has been granted by the university. Your participation in this study is voluntary. You are free to opt-out of this study if you do not want to participate. You also have the right to withdraw from this study at any time without any way affecting your current situation. The details of the research are described in this document. It is important that you understand the reasons for the research and what it will involve. Please take your time to read through and consider the information carefully before deciding to participate in this survey. Please do not hesitate to contact me should you need any clarification or if you would like more information. Once you are satisfied that you understand this study

and that you wish to participate in this study, kindly sign the 'Informed Consent Form'.

4. What is the purpose of the study?

The purpose of this research is to compare the socioeconomic status and human-related factors among adults in hotspot and non-hotspot areas in Kuching and Samarahan, Sarawak. This research will benefit in dengue control specifically to find a better approach in reducing dengue cases in Kuching and Samarahan area. A total of 175 adults will be participating in this study.

5. What are my responsibilities when taking part in this study?

If you agree to participate in the study, I will provide you with one questionnaire to answer. It is important that you answer all of the questions as accurately and completely as possible.

6. What are the benefits of being in this study?

This study may be beneficial or does not give you any benefit. However, information obtained from this study will help in developing more effective intervention in addressing dengue-related factor in Kuching and Samarahan. All your information obtained in this study will be kept and handled in a confidential manner, in accordance with applicable laws and/or regulations. When publishing or presenting the study results, your identity will not be revealed without your expressed consent.

7. Who should I call if I have questions?

If you have any questions about the study, please contact me, Ahmad Salimi Bin Abu Bakar (019-4636609) or via email asalimi79@gmail.com.

INFORMED CONSENT FORM

Title of Study: Comparison of Socioeconomic Status and Human Related Factors Among Adults Between Hotspot and Non-Hotspot Areas of Dengue in Kuching and Samarahan, Sarawak

By signing below, I confirm the following:

- I have been given oral and written information for the above study and have read and understood the information provided.
- I have had sufficient time to consider my participation in the study and have had the opportunity to ask questions, and all my questions have been answered satisfactorily.
- I understand that my participation is voluntary, and I can at any time freely withdraw my participation from the study without giving any reason.
- I understand that all of my personal details will be treated as STRICTLY CONFIDENTIAL.
- I will receive a copy of this 'Informed Consent Form' for my personal retention.

Subject:

Signature:

I/C number:

Name:

Date:

Witness:

Signature:

I/C number:

Name:

Date:

An investigator conducting informed consent:

Signature:

I/C number:

Name:

Date:

APPENDIX D: INFORMED CONSENT FORM (MALAY VERSION)



RISALAH MAKLUMAT PESERTA DAN BORANG PERSETUJUAN PESERTA

1. Tajuk Kajian:

Perbandingan status sosioekonomi dan faktor-faktor yang berkaitan dengan manusia dikalangan dewasa di kawasan wabak denggi hotspot dan bukan-hotspot di Kuching dan Samarahan, Sarawak.

2. Nama Institusi dan Nama Penyelidik

Dr Ahmad Salimi Bin Abu Bakar

Sarjana Kesihatan Awam

Universiti Malaysia Sarawak

3. Pengenalan

Denggi merupakan beban kepada kesihatan, ekonomi dan sosial. Oleh itu, anda dijemput untuk mengambil bahagian dalam penyelidikan ini. Kajian ini telah mendapat kelulusan Jawatankuasa Etika Universiti Malaysia Sarawak, UNIMAS dan kebenaran menjalankan kajian ini telah diluluskan oleh pihak universiti. Penyertaan anda dalam kajian ini adalah secara sukarela. Anda adalah bebas untuk memilih untuk tidak menjawab kajian ini jika anda tidak mahu menyertai. Anda juga berhak menarik diri dari kajian ini pada bila-bila masa tanpa apa-apa yang menjejaskan keadaan semasa anda. Risalah ini akan menjelaskan hal-hal berkenaan kajian tersebut dengan lebih mendalam dan terperinci. Adalah amat penting bahawa anda memahami mengapa kajian ini dilakukan dan apa yang akan dilakukan dalam kajian ini. Sila ambil masa yang secukupnya untuk membaca dan mempertimbangkan dengan teliti penerangan yang diberi sebelum anda bersetuju untuk menyertai kajian ini. Jika ada sebarang kemusykilan ataupun maklumat lanjut yang anda ingin tahu, anda boleh bertanya dengan saya. Setelah anda berpuashati bahawa anda memahami kajian ini, dan anda berminat untuk turut serta, anda dikehendaki untuk

menandatangani Borang Kebenaran untuk Menyertai Kajian Peserta, pada muka surat terakhir risalah ini.

4. Apakah tujuan kajian ini dilakukan?

Tujuan kajian ini adalah untuk membandingkan status sosioekonomi dan faktor-faktor yang berkaitan dengan manusia dikalangan dewasa di kawasan wabak denggi hotspot dan bukan-hotspot di Kuching dan Samarahan, Sarawak. Kajian ini akan memberi manfaat kepada kawalan denggi khususnya untuk mencari pendekatan yang lebih baik dalam mengurangkan kes demam denggi di kawasan Kuching dan Samarahan. Sebanyak 175 orang dewasa akan mengambil bahagian dalam kajian ini.

5. Apakah tanggungjawab saya sewaktu menyertai kajian ini?

Sekiranya anda bersetuju untuk menyertai kajian ini, saya akan menemubual anda dengan menggunakan satu borang soal selidik. Adalah amat penting bahawa anda menjawab kesemua soalan dalam borang soal selidik dengan jujur dan lengkap.

6. Apakah manfaatnya saya menyertai kajian ini?

Kajian ini mungkin akan mendatangkan manfaat ataupun langsung tiada memberi apa-apa manfaat kepada anda. Walau bagaimanapun, maklumat yang diperolehi daripada kajian ini akan membantu dalam mewujudkan intervensi yang lebih berkesan dalam menangani masalah denggi di kawasan Kuching dan Samarahan. Segala maklumat anda yang diperolehi dalam kajian ini akan disimpan dan dikendalikan secara sulit, bersesuaian dengan peraturan-peraturan dan undang-undang yang berkenaan. Sekiranya hasil kajian ini diterbitkan atau dibentangkan kepada orang ramai, identiti anda tidak akan didedahkan tanpa kebenaran anda terlebih dahulu.

7. Siapakah yang perlu saya hubungi sekiranya saya mempunyai sebarang pertanyaan?

Anda boleh menghubungi saya, Ahmad Salimi Bin Abu Bakar di talian telefon bimbit 019-4636609 atau melalui emel di alamat emel: asalimi79@gmail.com sekiranya anda mempunyai sebarang pertanyaan mengenai kajian ini.

BORANG KEBENARAN BERTULIS UNTUK MENYERTAI KAJIAN

Tajuk Kajian: Perbandingan status sosioekonomi dan faktor-faktor yang berkaitan dengan manusia dikalangan dewasa di kawasan wabak denggi hotspot dan bukan-hotspot di Kuching dan Samarahan, Sarawak.

Dengan menandatangani di bawah, saya mengesahkan bahawa:

- Saya telah diberi maklumat tentang kajian di atas secara lisan dan bertulis and saya telah membaca dan memahami segala maklumat yang diberikan dalam risalah ini.
- Saya telah diberikan masa yang secukupnya untuk mempertimbangkan penyertaan saya dalam kajian ini dan telah diberi peluang untuk bertanyakan soalan dan semua persoalan saya telah dijawab dengan sempurna dan memuaskan.
- Saya juga faham bahawa penyertaan saya adalah secara sukarela dan pada bila-bila masa saya bebas menarik diri daripada kajian ini tanpa harus memberi sebarang alasan.
- Segala maklumat dan data peribadi saya akan dianggap sebagai SULIT.
- Saya akan menerima satu salinan 'Risalah Maklumat Peserta dan Borang Kebenaran Peserta' yang telah lengkap dengan tarikh dan tandatangan untuk dibawa pulang ke rumah.

Subjek:

Tandatangan:

Nombor K/P:

Nama:

Tarikh:

Saksi:

Tandatangan:

Nombor K/P:

Nama:

Tarikh:

Penyelidik yang mengendalikan proses menandatangani borang kebenaran:

Tandatangan:

Nombor K/P:

Nama:

Tarikh:

APPENDIX E: GANTT CHART

Gantt Chart of the Research Project

Activities	Oct 2019	Nov 2019	Dec 2019	Jan 2020	Feb 2020	Mar 2020	Apr 2020	May 2020	Jun 2020	July 2020	Aug 2020	Sept 2020
Proposal preparation												
Proposal presentation and approval												
Pretest												
Data collection												
Data entry and data analysis												
Report writing												
Report presentation and submission												

**APPENDIX F: UNIVERSITY MALAYSIA SARAWAK (UNIMAS) ETHIC
COMMITTEE APPROVAL LETTER**

UNIMAS/NC-21.02/03-02 Jld.4 (47)

22 Januari 2020

Dr Ahmad Salimi Bin Abu Bakar
Fakulti Perubatan Dan Sains Kesihatan
Universiti Malaysia Sarawak
94300 Kota Samarahan,
Sarawak.

Dr,

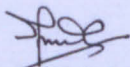
Kelulusan Mesyuarat Etika Perubatan Untuk Kajian:
- Comparison Of Socioeconomic Status And Human Related Factors Among Adults Between Hotspot And Non-Hotspot Areas Of Dengue In Northern Kuching, Sarawak.

Dengan segala hormatnya perkara di atas dirujuk.

Sukacita dimaklumkan bahawa kertas kerja penyelidikan seperti di atas yang dijalankan oleh Dr Ahmad Salimi Bin Abu Bakar dan diselia oleh Prof Datu Dr Andrew Kiyu telah diluluskan dalam Mesyuarat Jawatankuasa Etika Perubatan Fakulti bil 01/2020 pada 7 Januari 2020.

Sehubungan itu, penyelidikan tersebut boleh dimulakan dan diharap ia dapat dijalankan seperti yang dirancang.

Yang benar,



Professor Dr Lela Hj Su'ut
Pengerusi
Jawatankuasa Etika Perubatan
Fakulti Perubatan dan Sains Kesihatan

