

**PERCEPTION, ATTITUDE AND PRACTICE
TOWARDS MELIOIDOSIS AMONG OLDER
ADULTS IN KOTA BHARU: DEVELOPMENT,
VALIDATION AND CROSS-SECTIONAL STUDY**

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“It's the job that's never started as takes longest to finish.” J.R.R Tolkien

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ABSTRACT

Title: Perception, attitude and practice towards melioidosis among older adults in Kota Bharu: Development, validation and cross-sectional study.

Introduction: Melioidosis is an emerging infectious disease that is endemic toward the northeast of Kelantan in Malaysia. The muddy clay rich soils in Kota Bharu and heavy rainfall during the monsoon season of November to March every year serve as breeding ground for a dangerous disease that is relatively unknown. It is especially vicious toward older people who are more susceptible to its infection and possible complication. This is compounded by the lack of proper perception, attitude and practice towards managing the disease among older adults.

Objective: This study aims to develop and validate a questionnaire which can measure perception, attitude and practice regarding Melioidosis among older adults in Kota Bharu, following which to determine perception, attitude and practice regarding Melioidosis among them in Kota Bharu and to determine the factors associated to perception, attitude and practice regarding Melioidosis in Kota Bharu.

Method: This was a dual design study conducted in 2019 in Kota Bharu among older adults. The questionnaires were developed by an expert panel of three professionals from varying public health fields based upon pre-existing KAP questionnaires and validated through a validation study consisting of 108 older adults' individuals using EFA using IRT for the section on perception, PCA and Oblimin rotation methods for attitude and practice and CFA using the Maximum Likelihood estimation method. The validated questionnaires were distributed among 260 older adults' respondents in Kota Bharu. Their score in perception, attitude and practice towards melioidosis were scored using this newly developed and validated questionnaire. All the scores were compared to sociodemographic factors such as age, gender, marital status,

educational level, income status, employment status and presence of co- morbid to determine associated factors for good knowledge, attitude and practice.

Results: The questionnaire was found to be valid with a good IRT scores for perception and two factor solution with a good KMOMSA for attitude and practice. It was also reliable with a Cronbach's Alpha of 0.81, a high degree of fit with all confirmatory indices with a cumulative RMSEA of 0.18, CFI of 0.967 and TLI of 0.953. A cut off 80 percent was determined using prior literature as good scores. The surveyed respondents scored poorly on perception with 75.8% getting a poor score. The attitude scores were better, with 79.6% of the respondents getting a good score while the practice scores were mediocre with only 41.5% of the respondents getting a good score. Tertiary education was found to be associated with good scores in perception (OR 2.110; 95% CI: 1.792, 4.603 $p=0.005$). For good attitude scores, secondary education (OR 3.92; 95% CI: 1.60, 9.57 $p=0.003$) and tertiary education (OR 3.329; 95% CI: 1.14, 9.72 $p=0.028$) were found to be significant. While for good practice, employment status (OR 1.63; 95% CI: 1.43, 2.94 $p=0.040$) had a significant association.

Conclusion: The developed questionnaire was found to be valid and reliable. Older adults in Kota Bharu have a poor perception towards melioidosis together with mediocre practice. Although they have good attitude toward melioidosis due to the exposure to other similar infectious disease, all these scores seem to be significantly tied towards the educational level or employment status of the respondent. Health programs to improve the perception of the older adults in Kota Bharu, especially towards those who are not well-educated will be essential in combating the emerging infectious disease.

Keywords: KAP, Development and Validation, older adults, Melioidosis, Associated factors

ABSTRAK

Tajuk: Persepsi, sikap dan amalan terhadap melioidosis dalam kalangan orang dewasa yang lebih berusia di Kota Bharu: Kajian pembangunan, pengesahan dan keratan rentas.

Pengenalan: Melioidosis adalah penyakit berjangkit yang semakin menular di bahagian timur laut Kelantan di Malaysia. Tanah liat berlumpur di Kota Bharu dan hujan lebat semasa musim tengkujuh November hingga Mac setiap tahun menjadi tempat pembiakan penyakit berbahaya yang tidak diketahui ramai. Ia amat berbahaya terhadap orang dewasa yang lebih berusia, mereka lebih senang terdedah kepada jangkitan dan komplikasi yang mungkin berlaku. Malah ini menjadi lebih ketara dengan kekurangan persepsi, sikap dan amalan yang betul untuk menguruskan penyakit dalam kalangan orang tua.

Objektif: Kajian ini bertujuan untuk membangunkan dan mengesahkan soal selidik yang dapat mengukur persepsi, sikap dan amalan mengenai melioidosis dalam kalangan orang dewasa yang lebih berusia di Kota Bharu, serta menentukan persepsi, sikap dan amalan mengenai melioidosis di kalangan mereka di Kota Bharu dan menentukan faktor-faktor yang boleh dikaitkan dengan persepsi, sikap dan amalan mengenai Melioidosis di Kota Bharu.

Kaedah: Ini merupakan kajian reka bentuk dwifasa yang dijalankan pada tahun 2019 di Kota Bharu dalam kalangan orang dewasa yang berusia. Soal selidik dibangunkan oleh panel tiga ahli profesional daripada pelbagai bidang kesihatan awam berdasarkan kepada soal selidik KAP yang sedia ada dan disahkan melalui kajian pengesahan yang terdiri daripada 108 warga tua dengan menggunakan IRT untuk bahagian persepsi, PCA dan EFA dan kaedah rotasi Oblimin untuk sikap dan praktik dan CFA menggunakan kaedah Maximum Likelihood. Soal selidik yang baru dibangunkan dan disahkan diedarkan dalam kalangan 260 responden orang dewasa yang lebih berusia di Kota Bharu. Skor mereka dalam persepsi, sikap dan amalan terhadap melioidosis telah dikira menggunakan soal selidik ini. Semua skor dibandingkan

dengan faktor sosiodemografi seperti umur, jantina, status perkahwinan, tahap pendidikan, status pendapatan, status pekerjaan dan kehadiran penyakit kronik lain untuk menentukan faktor-faktor yang berkaitan untuk persepsi, sikap atau amalan yang baik.

Keputusan: Soal selidik ini didapati sah dengan skor IRT yang baik untuk persepsi dan penyelesaian dua faktor dengan KMOMSA yang baik untuk sikap dan amalan. Soal selidik didapati mencapai Alpha Cronbach 0.81 darjah yang tinggi, dan sesuai dengan semua indeks pengesahan dengan RMSEA kumulatif 0.18, CFI 0.967 dan TLI 0.953. Responden yang ditinjau didapati markah yang rendah mengenai persepsi dengan hanya 24.2% mendapat markah yang baik. Bagi markah sikap, 79.6% daripada responden mendapat skor yang baik manakala markah amalan adalah sederhana dengan hanya 41.5% responden mendapat markah yang baik. Pendidikan tinggi dikaitkan dengan markah yang baik untuk persepsi (OR 2.110; 95% CI: 1.792, 4.603 $p=0.005$). Bagi markah sikap yang baik, pendidikan menengah (OR 3.92, 95% CI: 1.60, 9.57 $p = 0.003$) dan pendidikan tinggi (OR 3.329; 95% CI: 1.14, 9.72 $p = 0.028$) didapati mempunyai kaitan yang ketara.. Untuk amalan yang baik, status pekerjaan (OR 1.63; 95% CI: 1.43, 2.94 $p=0.040$) mempunyai kaitan yang ketra.

Kesimpulan: Orang dewasa yang lebih berusia di Kota Bharu mempunyai persepsi yang rendah terhadap melioidosis bersama dengan amalan yang sederhana. Walaupun mereka mempunyai sikap yang baik terhadap melioidosis akibat pendedahan kepada penyakit berjangkit yang serupa, semua markah ini kelihatannya sangat terikat pada tahap pendidikan atau status pekerjaan responden. Program kesihatan untuk meningkatkan persepsi warga tua di Kota Bharu, terutamanya terhadap mereka yang tidak berpendidikan tinggi penting dalam memerangi penyakit berjangkit yang muncul ini.

Kata kunci: KAP, Pembangunan dan Pengesahan, Warga Tua, Melioidosis, Faktor berkaitan

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List of common abbreviations

EFA: Exploratory Factor Analysis

CFA: Confirmatory Factor Analysis

KAP: Knowledge, attitude and practice

PAP: Perception, attitude and practice

CVI: Content validity index

CVR: Content validity ration

IIS: Item impact scale

IRT: Item response theory

PCA: Principal component analysis

KMOMSA: Kaiser-Meyer-Olkin test for sampling adequacy

SRMR: Standardized root mean square

RMSEA: Root mean square error of approximation

CFI: Comparative fit index

TLI: Tucker-Lewis Index

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CHAPTER ONE

INTRODUCTION

1.1 Introduction

Melioidosis is caused by the Gram-negative bacillus, *Burkholderia pseudomallei*. It is an infectious disease that can infect humans or animals. This bacterium is usually found in muddy water as well as humid soil and is prevalent in many tropical countries. The pathologist Alfred Whitmore and his assistant C.S. Krishnaswami first discovered melioidosis among morphia addicts in Rangoon, Burma, in 1911 (Samy et al., 2017). They recognized this new organism that fulfilled Koch's postulates for causation of disease. This bacterium, which could be isolated from autopsy specimens, could be distinguished by its relatively rapid growth and motility. This new disease, called melioidosis, was named from the Greek “melis” (distemper of asses) and “eidos” (resemblance) by Stanton and Fletcher in 1932.

Melioidosis has always had a close relation with Malaysia, in fact in 1913, when Fletcher first recognized the disease, it was in laboratory animals at the Institute for Medical Research in Kuala Lumpur, Malaysia. Furthermore, in 1917 Stanton first described the infection in a human patient from Kuala Lumpur and consequently these authors wrote a short monograph on the disease and its sporadic occurrence in Malaya up to 1932 (Puthuchery, 2009). In time, cases from both Peninsular and East Malaysia have continued to be described, for example, Puthuchery et al. reviewed 50 septicemic cases of melioidosis in 1992 at a single referral center in Kuala Lumpur and noted a total of 85 cases from June 1976 to June 1991 (Puthuchery et al., 1992). A serosurvey conducted in Malaysia in 1964 to 1966 revealed a 7.3% seropositivity (indirect hemagglutination assay [IHA] titers of >1:40), with the highest rates in recruits from Kedah (Peninsular Malaysia) and Sabah (East Malaysia) (Strauss et al., 1969). These studies have continued to the modern day with many centres examining the

seroprevalence and mortality of causes related to melioidosis in Malaysia, however none of these studies have deigned to have explored the perception of the public towards this disease.

Burkholderia pseudomallei is an environmental saprophyte which is endemic in southeast-Asia and tropical Australia as show by the distribution of the disease in Figure 1, but its global distribution continues to expand well beyond these traditionally recognized endemic regions. Although, the organism was first isolated in Malaysia in 1913 (Puthuchear, 2009), its widespread nature was only identified when it was isolated from soil and water from all states in West Malaysia by Strauss and co-workers in 1969 (Strauss *et al.*, 1969). Samples were taken from primary and secondary forests, wet rice fields and recently cleared areas. The isolation rates were lower from the forested areas compared to the cleared areas of wet rice fields and newly planted oil palm plantations. Soil moisture was an important criterion in the isolation of the organism and the incidence of melioidosis peaks during the months of heavy rainfall in Thailand and Australia: this is because the water table rises to the surface carrying with it the bacteria that normally resides below the surface.

In Malaysia, although the percentage of water and soil specimens positive for *Pseudomallei* was higher during increased rainfall, there appeared to be only a slight increase in the number of cases during the wet monsoon period. Findings of correlation of rainfall and the occurrence of 125 patients with culture proven melioidosis, over a 30 year period, support the hypothesized general association between melioidosis and rainfall (Cheng and Currie, 2005). But the correlation appeared less strong than those reported in other areas, which may be due to other factors, including the different local patterns of rainfall intensity, as well as increased exposure to the organism during ploughing and planting of the rice paddies in endemic areas. Soil and surface waters are noted to be highly complex ecosystems in which a vast range of physical, chemical and biological factors interact. But the organism is found to persist in some tropical regions better than others, such as hyper endemic foci or “hot spots” such as north-eastern

Thailand and East Malaysia where more cases are reported than from the rest of the country but the exact reasons for this are far from clear. The tenacity of *Burkholderia Pseudomallei* to survive in a hostile environment should not be underestimated. There is a homeostatic balance in nature between man, organism and the environment and any disturbance of this by logging, clearing of large tracts of vegetation will upset this equilibrium with drastic consequences for man, animals and the environment (Puthucheary, 2009).

This pathogen, *Burkholderia Psudomeallei* thrives in Kelantan due to its weather and geographical characteristics. Traditionally, the north eastern states of Peninsular Malaysia suffer heavy monsoon from November to March every year and more than 60,000 hectares of the land are muddy clay rich soils with stagnant pond water in paddy fields. This makes these areas an ideal breeding ground for *Burkholderia*. It is estimated that hundred thousand of people in this region are at risk of contracting *B. pseudomallei*, which is a great public health concern. The state of Kedah, which is situated at the Malaysia–Thailand border and is also noted to be the largest rice producer in Malaysia, reported an incidence of 16.35 per 100,000 population a year (Deris et al., 2010). Based on incidence and mortality of melioidosis in Malaysia, it is estimated that more than 2000 patients die of melioidosis per year, which is much higher than death resulting from dengue or tuberculosis infection. Despite advances in treatment, the case fatality ranged from one-third to about half of patients (33–54%) (Nathan *et al.*, 2018).

Specifically, Kota Bharu features a tropical monsoon climate bordering on a tropical rainforest climate. Unlike most monsoon tropical areas, Kota Bharu does not have a true dry season although the city experiences noticeably heavier rainfall from August through January. Also, Kota Bharu experiences slightly cooler temperatures between December and February than during the rest of the year, making it one of the most "seasonal" cities in Malaysia. The city sees on average about 2,600 millimetres (100 inches) of precipitation annually.

Furthermore, Kota Bharu is an agrarian city with large swathes of paddy plantations. There are also various plots used for agriculture within the city. All these characteristics serve to propel Kota Bharu as an excellent breeding ground for melioidosis.

Literature shows that the most common way humans can acquire the infection is through ingestion of contaminated water, and contact with contaminated soil, especially through skin abrasions (Titball et al., 2017). Another common mode of transmission is noted to be through inhalation of contaminated dust or water droplets, effectively proposing an airborne route of transmission. The inhalation route for melioidosis was first suspected for soldiers exposed to dusts by helicopter rotor blades during Vietnam War. They subsequently developed melioidosis pneumonia. Involvement of lymph nodes in the mediastinum can occur in pneumonia caused by melioidosis (Chen *et al.*, 2015). There have also been rare cases where transmission has occurred from human- to human; in one of these cases, an infant, whose father was a Vietnam veteran presented with fever and multiple lesions. The pathogen was isolated from multiple anatomic sites on this child, but no source of transmission to the neonate was discovered despite a careful search (McCormick *et al.*, 1975). In addition, there is also literature from Australia which has shown transmission through human breast milk (Ralph *et al.*, 2004).

As discussed earlier, diagnosis of melioidosis remain an issue of great difficulty. It is underdiagnosed because of its variable non-specific clinical manifestations, limited awareness of the disease and misidentification of *B. pseudomallei*, particularly in inexperienced laboratories. Acute infections are often misdiagnosed as community-acquired pneumonia, localized skin infection or septicemic shock. Conversely, chronic lung infection often resembles pulmonary tuberculosis (Chakravorty and Heath, 2019). Culture of *B. pseudomallei* from clinical specimens remains the mainstay of diagnosis, with slow growth on standard blood/MacConkey agar media. Identification of *B. pseudomallei* using traditional commercial biochemical identification systems is inconsistent, resulting in it often being misidentified as

Pseudomonas or other *Burkholderia* species, particularly outside endemic areas. Isolation is enhanced by inoculating non-sterile specimens onto selective media (e.g. Ashdown's agar), which facilitates detection of colonies. . Although Ashdown's agar is widely used in other melioidosis-endemic countries , it is not widely used in diagnostic laboratories in Malaysia. Instead, Francis media agar , MacConkey agar, blood agar, and chocolate agar are the common media used in public healthcare, where use of different combinations of agar media varies from one hospital to another (Nathan *et al.*, 2018). Where available, matrix-assisted laser desorption/ionization time-of-flight mass spectrometry systems with advanced database libraries can provide rapid, accurate identification of *B. pseudomallei* (Chakravorty and Heath, 2019).

In general, the older adults as an epidemiological group are more susceptible to infectious diseases (Bender, 2003). The cause for this is usually multifactorial in origin. One of the reasons is nutrition. Malnutrition in young person's mimics many of the effects of aging on the immune response: With increasing age there is a decrease in delayed immunity, similar deficits can be produced by certain vitamin deficiencies and by zinc deficiency. Similarly, older adults' persons may be predisposed to bacterial infections because altered mucosal defence barriers may make them more susceptible to colonization, the first step of a bacterial infectious process (Schneider 1983). Cell mediated immunity also shows a decline with age, with T- cells showing deficits in function, reduced generation of high affinity antibodies and depressed lymphocyte numbers. This humoral immune defect is closely related to age related T-cell dysfunction (Birnie *et al.*, 2019).

There have also been many studies which specifically show a correlation between melioidosis and older people. Out of these studies on the incidence of melioidosis, many have been found to be strongly related to age, with almost all these studies showing a minimum age of those above 40 and more showing a stronger correlation of with those above 50 years of age. (Currie

et al., 2010; Deris et al., 2010; Hassan et al., 2010). Some studies go even further, by proposing that melioidosis is a disease of the older adults, citing the increased incidence of the disease among the older adults (Birnie *et al.*, 2019). In fact, studies around our region has consistently shown the older adults as the epidemiological group that has the highest incidence of this disease. Case in point being Singapore (Tan *et al.*, 1990), Thailand (Chaowagul *et al.*, 1989) and Malaysia (Hii *et al.*, 2016).

Melioidosis as a disease has a higher prevalence in people who are suffering from co-morbid diseases such as diabetes, hypertension and other cardiovascular diseases. Some studies showed that there was high titre of seroprevalence in the older adults with co morbid (Chen *et al.*, 2005). Regional studies further strengthen this causation by showing that melioidosis occurs more commonly in individuals with pre-existing illnesses; up to 80 % of melioidosis patients have one or more risk factors (How et al., 2005). There is also evidence that people with diabetes have a twelve-fold increased risk of melioidosis, and over half of all cases of melioidosis have diabetes (Dunachie, 2018). Collectively, data shows that chronic diseases comprise most of the global disease burden of the older adults and are the most common causes of mortality in the older adults (Kennedy 2014). Thus, older people are also more at-risk due to their concurrent chronic illnesses.

In addition to the older adults having a higher risk to be infected by melioidosis, they suffer more from the burden of this disease. Studies show that infections in the older adults are not only more frequent and more severe but causes a significant burden to healthcare (Gavazzi and Krause 2017). This is usually reflected to prolonged hospital stays to manage the disease and multiple relapses requiring constant returns to the hospital, negatively impacting the productivity and health status of the older adults affected. This impact of age on melioidosis is not confined merely to its incidence or its morbidity, in fact there is strong evidence showing that patients with advanced age had an increased estimated risk for developing fatal outcomes

(Zeuter et al., 2016). This data does not fully reflect the true burden of the disease though as, the true burden of melioidosis is undiscovered due to underdiagnosis and mis recording cause of death due to old age (Limmathurotsakul *et al.*, 2010).

Perception to a disease is almost always underplayed and under researched, it is not usually considered to be an important part in controlling an infectious disease, especially in the case of melioidosis (Chansrichavala *et al.*, 2015). All these factors come into play when the medical community does not invest enough material or energy into investigating a rising infectious disease problem such as melioidosis and subsequently educating the public on its importance and necessary precautionary methods. In the end we have a situation where the general public lack awareness of a rising infectious disease issue, unable to comprehend the cause of their ailment let alone the way to control its spread and rise (Funk *et al.*, 2010). This all plays into The Health Belief Model, which was constructed to explain which beliefs should be targeted in communication campaigns to cause positive health behaviours. The model specifies that if individuals perceives a negative health outcome to be severe, perceives themselves to be susceptible to it, perceives the benefits to behaviours which reduce the likelihood of that outcome to be high, and perceives the barriers to adopting those behaviours to be low, then the behaviour is likely (Carpenter, 2010). Therefore, improved perception and knowledge of an epidemiological group on a disease is usually associated with an improvement in health outcomes (von Thiele Schwarz, 2016).

This situation is especially apparent due to a lack of perception of health problems among the older adults, in the 1980s, approximately 80% of the American population aged 65 and above suffered from illness because they lacked the necessary health perception and basic health behaviour (He *et al.*, 2016). People in older age groups were found to be more likely to have low perception of infectious diseases (Liu *et al.*, 2013). In a study in China, the perception of the name of chronic diseases in the oldest-old group (aged ≥ 80 years) were significantly lower

than those in the younger older adults' group (aged 60–79 years). The perception of the prevention and treatment of dementia, CVD, and hypertension among the oldest-old group were also remarkably lower than those among the younger older adults group (Tan *et al.*, 2015).

Ultimately, we have a disease, melioidosis, that has a big impact on a certain epidemiological group, the older adults, and the problem is further exacerbated by a lack of any form of knowledge dissemination to the targeted group. Therefore, the first logical step in containing this problem is to directly assess this target group, the older adults, of the perception towards melioidosis. Knowledge, attitude and practice (KAP) studies have been used to great benefit in various fields to explore a public's general perception of a disease. This is especially effective when used upon a target demography on a relatively unknown disease. It has been previously used in other infectious diseases involving various walks of life (Khajehkazemi *et al.*, 2014; Ogoina *et al.*, 2015). The effectiveness of KAP studies in emerging infectious diseases is especially apparent in the case of leptospirosis. Leptospirosis shares many similarities with melioidosis, it has similar environmental characteristics and is endemic in almost all the same regions. Furthermore, it was relatively unknown until a spate of KAP studies locally (AZFAR *et al.*, 2018; Sakinah *et al.*, 2015) and internationally (de Araújo *et al.*, 2013) propelled it into the mainstream Malaysian health care zeitgeist. Today, leptospirosis is relatively well known in both the health community and general public, resulting in more effective interventions and health outcomes.

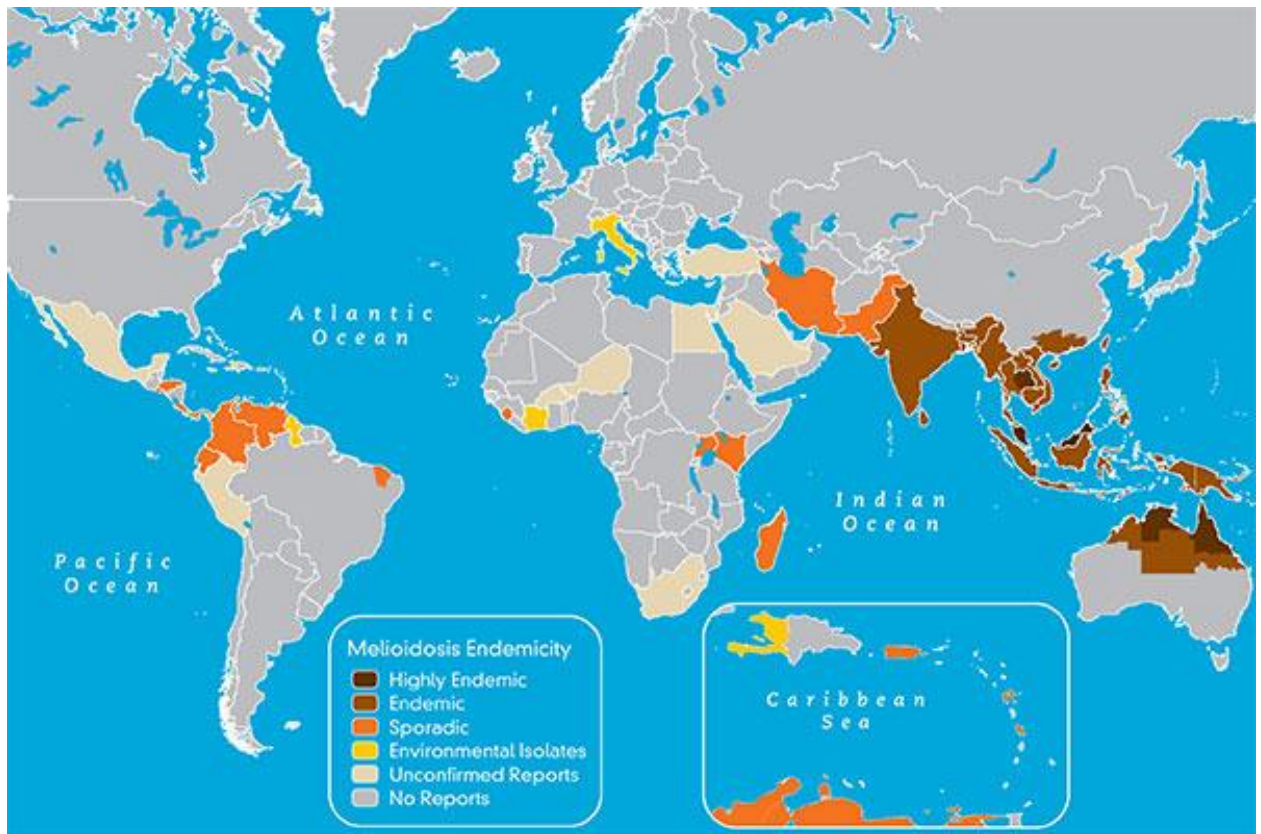


Figure 1: Endemicity of melioidosis infection (CDC 2012)

1.2 Problem Statement

Melioidosis is an emerging disease that is endemic to the northern states in Malaysia, especially in Kota Bharu with a very high annual incidence and high mortality rate. Evidence from a study based in Kelantan shows that almost 75% of cases arise near Kota Bharu (Zueter *et al.*, 2016). It is easily mistaken for other diseases with its atypical presentation. Furthermore, advanced age is seen to be a predisposing factor for melioidosis infections. The older adults are also more predisposed to this infection due to their advanced age and co-morbidities.

This conundrum is exacerbated further by the general lack of perception among the older adults of this disease in endemic areas, with no health campaigns geared towards melioidosis. Finally, although there have been many case studies, studies on environmental factors, and studies on seroprevalence done in Malaysia since the 1900's, there has been no study done on perception, attitude and practice regarding melioidosis in Malaysia.

The development of a valid questionnaire will create a tool that will help to assess the perception, attitude and practice regarding an emerging disease among a vulnerable population such as the older adults, knowing this will allow us to understand how older adults understand this disease of melioidosis. In addition, this data can also be used in the future to create a meaningful Malaysian public health approach to tackle the lack of melioidosis awareness among the older adults in areas where the disease is endemic.

1.3 Research Questions

1. Is the developed questionnaire valid and reliable to assess the perception, attitude and practice of the older adults towards melioidosis?
2. What is the perception, attitude and practice of the older adults towards melioidosis in Kota Bharu?

3. What are the factors associated with perception, attitude and practice of melioidosis among the older adults in Kota Bharu?

1.4 General Objective

To develop and validate a questionnaire and then measure the perception, attitude and practice of melioidosis among the older adults in Kota Bharu.

1.5 Specific Objectives

- 1.To develop and validate a questionnaire which can measure perception, attitude and practice regarding melioidosis among the older adults in Kota Bharu
- 2.To determine perception, attitude and practice regarding melioidosis among the older adults in Kota Bharu.
- 3.To determine the factors associated to perception, attitude and practice regarding melioidosis in Kota Bharu.