

PREVENTIVE MEASURES AND ASSOCIATED
FACTORS OF RESPIRATORY ILLNESS AMONG
MALAYSIAN PILGRIMS 2013

by:

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LIST OF ABBREVIATIONS

CDC	Center for Disease Control and Prevention
CI	Confidence Interval
COAD	Chronic Obstructive Airway Disease
DM	Diabetes Mellitus
ILI	Influenza-like illness
KSA	Kingdom of Saudi Arabia
LRI	Lower Respiratory Infection
LRTI	Lower Respiratory Tract Infection
N	Number
OR	Odds Ratio
PHAC	Public Health Agency of Canada
ROC	Receiver Operating Characteristic
RSV	Respiratory Syncytial Virus
SD	Standard Deviation
TB	Tuberculosis
URI	Upper Respiratory Infection
WHO	World Health Organization

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ABSTRAK

TAJUK : LANGKAH-LANGKAH PENCEGAHAN DAN FAKTOR-FAKTOR YANG BERHUBUNGKAIT DENGAN JANGKITAN SALURAN PERNAFASAN DI KALANGAN JEMAAH HAJI MALAYSIA 2013

Pengenalan : Jangkitan saluran pernafasan terus memberi beban kepada jemaah haji di Mekah. Tujuan utama kajian ini adalah untuk mengetahui prevalens masalah saluran pernafasan dan faktor-faktor penyumbang dan juga langkah-langkah pencegahan yang dipraktis oleh jemaah haji Malaysia 2013.

Metodologi : Kajian lintang ini melibatkan dua buah negara iaitu di Mekah dan Malaysia, melibatkan 468 jemaah haji. Setiap jemaah haji yang bersetuju menyertai kajian ini akan diberi borang yang memerlukan maklumat seperti sosio-demografi, pengalaman mengerjakan haji atau umrah, status merokok, lain-lain komorbiditi seperti penyakit kronik dan obesiti, dan juga langkah pencegahan yang diambil untuk mengurangkan transmisi jangkitan saluran pernafasan dan juga 'Influenza-like illness' (ILI).

Keputusan : Kadar penyakit saluran pernafasan adalah sebanyak 93.4% di mana 78.2% menepati definisi atau syarat bagi ILI. Masalah pernafasan ini kebanyakannya kurang daripada dua minggu (77.8%). Manakala 61.8% daripada jemaah yang sakit ini telah menerima rawatan antibiotik dan hanya sebilangan kecil sahaja dimasukkan ke hospital (2.1%). Kebanyakan daripada jemaah haji mendapat penyakit saluran pernafasan selepas wukuf di Arafah (81.2%). Peratusan jemaah yang mendapatkan imunisasi influenza dan pneumokokal juga agak tinggi iaitu masing-masing adalah 65.2% dan

59.4%. Jemaah haji yang mengamalkan cara yang betul dalam penjagaan kebersihan tangan pula masih rendah (31.8%). Tiga ratus dua puluh orang jemaah telah memakai penutup muka yang standard (83.0%) namun, daripada jumlah tersebut hanya 45.3% menggunakannya dengan cara yang betul. Pengalaman mengerjakan haji (OR 0.24; 95% CI 0.10-0.56) dan umrah (OR 0.19; 95% CI 0.07-0.52) merupakan faktor utama

yang boleh mengurangkan kadar jangkitan saluran pernafasan. Namun bagi ILI, mereka yang mempunyai pengalaman mengerjakan haji (OR 0.26; 95% CI 0.15-0.46) sahaja terbukti secara statistik dapat mengurangkan masalah tersebut manakala bagi penghidap asthma (OR 7.27; 95% CI 0.96-54.94) berisiko tinggi mendapat ILI. Seramai 228 daripada jemaah haji Malaysia mempunyai sejarah berhubung dengan mereka yang mempunyai simptom saluran pernafasan dan secara statistik juga ia menyumbang kepada risiko untuk mendapat jangkitan saluran pernafasan (OR 3.01; 95% CI 1.35-6.68).

Kesimpulan : Prevalens penyakit saluran pernafasan di kalangan jemaah haji Malaysia masih tinggi walaupun sebahagian besar daripada mereka telah mengamalkan langkah-langkah pencegahan tertentu seperti mendapatkan vaksinasi, penjagaan kebersihan tangan dan memakai penutup muka dengan betul. Kesemua langkah pencegahan ini perlu dilakukan secara serentak bagi memastikan kadar jangkitan saluran pernafasan dapat dikurangkan di kalangan jemaah haji.

Kata kunci : Jangkitan saluran pernafasan, Jemaah haji, Malaysia, Influenza-like illness (ILI), Penutup muka, Penjagaan kebersihan tangan,

ABSTRACT

TITLE: PREVENTIVE MEASURES AND ASSOCIATED FACTORS OF RESPIRATORY ILLNESS AMONG MALAYSIAN PILGRIMS 2013

Background: Respiratory illness continues to exert a burden on hajj pilgrims in Makkah. The purpose of this study is to determine the prevalence of respiratory illness and its associated factors among Malaysian hajj pilgrims in 2013 and to describe its preventive measures.

Methods: A cross-sectional study was conducted in Makkah and Malaysia during the 2013 hajj season. A self-administered form on social demographics, previous experience of hajj or umrah, smoking habits, co-morbid illness and practices of preventive measures against respiratory illness and ILI were obtained. Altogether 468 forms were analysed.

Results: The prevalence of the respiratory illness was 93.4% with a subset of 78.2% fulfilled the criteria for influenza-like illness (ILI). Most of them (77.8%) had a respiratory illness of less than 2 weeks duration. About 61.8% were administered antibiotics, but only 2.1% of them had been hospitalized. Most of them acquired the infection after a brief stay at Arafat (81.2%). Vaccination coverages for influenza virus and pneumococcal disease were quite high, 65.2% and 59.4% respectively. For other preventive measures practices, only 31.8% of them practiced good hand hygiene. Three hundred and twenty two of our pilgrims had worn standard face masks (83.0%) and out

of these numbers, 45.3% of them used in proper way. Malaysian hajj pilgrims with previous experience of hajj (OR 0.24; 95% CI 0.10-0.56) or umrah (OR 0.19; 95% CI 0.07-0.52) were significantly associated with lower risk of respiratory illness. Otherwise, pilgrims having contact with those with respiratory illness (OR 3.01; 95% CI 1.35-6.68) were associated with higher risk. Malaysian hajj pilgrims with previous

experienced of hajj (OR 0.26; 95% CI 0.15-0.46) were protected from ILI while those who suffered from bronchial asthma (OR 7.27; 95% CI 0.96-54.94) were found to be significantly associated with higher risk of getting ILI.

Conclusions: The prevalence of respiratory illness remains high among Malaysian hajj pilgrims despite having some practices of preventive measures. All preventive measures which include hand hygiene, wearing face masks and influenza vaccination must be practiced together as bundle of care to reduce respiratory infections effectively.

Keywords: Respiratory illness, Hajj pilgrims, Malaysia, Influenza-like illness, Face mask, Hand hygiene

CHAPTER 1

CHAPTER 1

INTRODUCTION & LITERATURE REVIEW

1.1 What is hajj?

The hajj is an Islamic pilgrimage to Makkah. It draws about 3 million Muslims from all over the world which account the largest gathering of Muslim people in the world every year. It is one of the five pillars of Islam and every Muslim is obligated to perform hajj once in their lifetime.

The hajj begins from 8th to 12th Dhu al-Hijjah, the last month of the Islamic year. They perform specific rituals and follow a detailed route. Most pilgrims arrive at Mina on foot or by bus. They will spend one night there for prayers and additional rituals. In Mina, there are more than 30,000 share tent-type houses in almost 2.9 square kilometers in size and contains over (Mandourah *et al.*, 2012). Mina is also known as tent city. The Saudi government has build up thousands of large white tent in Mina (figure 1.1). The pilgrims need to share about 50-100 people in a single tent (Gatrad *et al.*, 2006).

At dawn on the 9th day of Dhu al-Hijja, pilgrims start to walk to the plain of Arafat (figure 1.2). When the sun sets, they leave Arafat and move to Muzdalifah (located between Arafat and Mina) where they sleep in the open air. Here, the pilgrims will pick-up the pebbles and ready for the ritual of the stoning of the Devil (Shaitan) at Jamarat on the next morning. After Jamarat, pilgrims then makes an animal sacrifice as a symbolize the ram that Abraham sacrificed instead of his son.



Figure 1.1: Tent housing facilities located in Mina. Adapted from <http://skepticism.org/timeline/april-history/5436-fire-erupts-in-overcrowded-tent-city-of-pilgrims-on-hajj-outside-mecca.html>



Figure 1.2: Pilgrims gather on Mount Arafat to take part in one of the Hajj rituals before heading to Muzdalifah for the stoning of the devil ritual. Adapted from <http://www.astroawani.com/photos/album/wukuf-di-arafat-1654/pilgrims-gather-on-mount-arafat-18294>

After returning to Makkah, the pilgrims will perform circumambulations (tawaf) by walking seven times anti-clockwise around the Kaaba at the Grand Mosque. Then, they are required to walk for a total distance of about 2.1km between the hills of Safa and Marwah seven times before they return to Mina (figure 1.3).

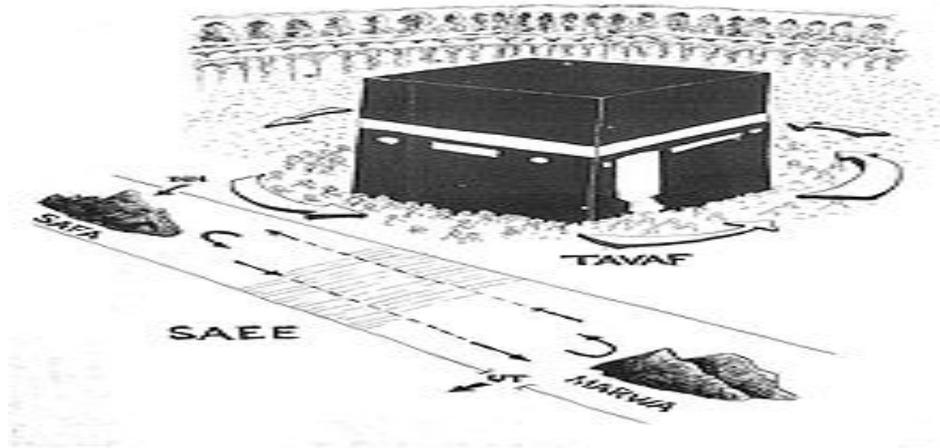


Figure 1.3: Tawaf around the Kaaba and Sae' between Safa and Marwa. Adapted from <http://en.m.wikipedia.org/wiki/Sa%27yee>

Pilgrims will leave Mina and travel again to the Great Mosque for the last tawaf, after which they leave Makkah, ending Hajj. The umrah pilgrimage, which is called the lesser pilgrimage; it is different as it can be performed throughout the year, the pilgrims are not required to perform the brief stay at Arafat.

1.2 Communicable and non-communicable disease during hajj

Various communicable diseases outbreaks have been reported repeatedly, during and following the hajj (Memish, 2010). Extended stays at hajj sites, extreme heat and crowded accommodation will easily cause disease transmission especially of airborne agents. Besides that, traffic jams and inadequately prepared or stored food are also contributes to health risk among pilgrims (Ahmed *et al.*, 2006). Skin infections also consider as communicable hazards during hajj and quite common among pilgrims. The examples are impetigo, carbuncles, furuncles and folliculitis (Memish, 2007).

If the hajj falls during summertime, heat exhaustion and heat stroke could become a major cause of mortality and morbidity. Performing rituals at night, using umbrellas, seeking shade, adequate fluid intake and wearing high-Sun Protection Factor (SPF) sunblock creams are advisable and permissible during hajj in order to prevent heat exhaustion and heat stroke.

Table 1.1 : Communicable and non-communicable health hazards during hajj (adapted from Memish, 2010)

Communicable Hazards	Non-communicable Hazards
Meningococcal meningitis	Trauma eg. stampede and motor vehicle accident
Respiratory tract infections (upper and lower) including tuberculosis, viral infections and community-acquired pneumonia	Slaughter related injuries
Polio virus	Heat stroke and heat exhaustion
Blood-borne diseases	Sunburn
Food poisoning	Dehydration
Zoonotic diseases	Fire related injuries

1.3 Respiratory infections during hajj

For about 1400 years, the mass gathering during hajj has been associated with the risk of communicable diseases, particularly respiratory infections (Haworth *et al.*, 2013). Crowd densities during hajj have been estimated about up to seven people per square meter (Ahmed *et al.*, 2009). Respiratory infection during hajj continues to exert a burden on pilgrims. The respiratory problems account for 74% of all medical illness reported during hajj seasons (Ahmed *et al.*, 2006). It was the most common cause (57%) of admission to hospital, with pneumonia being the leading reason for admission in 39% of all patients (Al-Ghamdi *et al.*, 2003).

The term 'acute respiratory infection' is suggested to be used only when the pilgrims were admitted or the causative organism is identified (Rashid *et al.*, 2008). Respiratory infection refers to any of a number of infectious diseases involving the respiratory tract. An infection of this type is normally further classified as an upper respiratory tract infection (URI or URTI) or a lower respiratory tract infection (LRI or LRTI). Lower respiratory infections, such as pneumonia, tend to be far more serious conditions than upper respiratory infections, such as the common cold. Patient may presented with fever, runny nose, sore throat and cough, limb or joint pain, headache, lethargy, chest pain and breathing difficulty. In a more recent study involving Malaysian pilgrims, it was found that as many as 90% of them presented with at least one respiratory symptom (Deris *et al.*, 2010b).

Influenza virus is the leading cause of upper respiratory tract infection during hajj (Mansouri *et al.*, 2014). However bacterial superinfection often follows it (Memish, 2010). Among bacteria pathogens, the following have been more frequently reported to cause respiratory infections; *Haemophilus influenza* (12.3%), *Klebsiella pneumoniae* (15.1%), *Streptococcus pneumoniae* (12.3%), *Staphylococcus aureus* (3.8%) and *Streptococcus pyogenes* (2.4%) (El-Sheikh *et al.*, 1998). More than 200 viruses can cause URTI but during hajj, the main pathogens are respiratory syncytial virus (RSV), parainfluenza, influenza and adenovirus (Balkhy *et al.*, 2004).

1.4 Definition of respiratory illness

Respiratory Illness is a disease affecting respiratory system. It can be due to infection or non-infection. It is difficult to define the syndromes of respiratory illness because of great variation in the severity, duration and types of symptom (Eccles, 2005). An expanded definition of respiratory illness was used for this study. Respiratory illness was defined as when the person is having at least one of the respiratory symptoms (non ILI) or influenza-like illness (ILI). With references to other studies and some limitations (mainly logistic problems), ILI is defined as the triad of cough, subjective fever and sore throat, those who did not fulfil the criteria of ILI were classified into a non-ILI group (Mustafa *et al.*, 2003; Rashid *et al.*, 2008; Deris *et al.*, 2010a; Gautret *et al.*, 2014).

1.5 Definition of influenza-like illness (ILI)

Influenza-like illness (ILI) is a subset of acute respiratory infections, a leading cause of morbidity and mortality worldwide. There are several case definitions for ILI as follows:

a) Centers for Disease Control and Prevention (CDC) :

- Fever (at least 37.8° c), at least cough or sore throat without a known cause other than influenza

b) World Health Organization (WHO) :

- An acute respiratory infection with measured fever of $\geq 38^{\circ}\text{C}$ and cough with the onset within the last 10 days

c) Public Health Agency of Canada (PHAC) :

-Fever and cough and one of symptoms (sore throat, arthralgia, myalgia or prostration)

1.6 Routes of transmission for respiratory infections

Basically, the pathogens that caused respiratory infection can be spread through one of four main routes; droplet transmission, airborne route, direct and indirect contact transmission. The droplet is greater than five microns while airborne is less than five micron in size. These droplets, because of the bigger size will remain in the air for a short period and able to travel about one meter. So, closeness is required for transmission. Droplet is produce during coughing, sneezing or talking. For airborne, it can stay longer in the air and able to travel more than a meter from the source. It is still be infectious, either by mucous membrane contact or inhalation. Direct contact transmission is occur when the pathogen are passed directly from an infected person, usually from affected hands, having direct contact to a recipient who is than transfer the organism into their mouth, nose or eyes. For indirect contact usually involved contaminated object such as bedding, furniture, tissue, handkerchief and many more. Again, the recipient transfers the pathogens from the object to their mouth, nose or eyes. (WHO 2007b, CDC 2010)

1.7 Risk factors for respiratory infections

Identification of the risk factors of the respiratory infection is important and beneficial to interrupt transmission. Crowding, nutritional factors, and smoking are among the risk factor of respiratory infection. There are risk factors noted to be in relation with specific respiratory diseases, like asthma, chronic obstructive pulmonary disease (COPD) and tuberculosis. Other factors such as active smoking, low socio-economic status, occupational exposure and exposure to air pollution (van Gageldonk-Lafeber *et al.*, 2005).

Respiratory infections could be complicated by exacerbations of asthma, chronic obstructive pulmonary disease, sinusitis and pneumonia (Balkhy *et al.*, 2004). The incidence of ARI was not significantly associated with sex, educational status or smoking but the risk of illness was significantly higher among old age, diabetics patient, those who stayed longer in the hajj area and who pray at Namera mosque, Arafat (optional activity) (Choudhry *et al.*, 2006). Patient with underlying asthma was significantly associated with patient being admitted to hospital for the treatment of acute respiratory symptoms (Deris *et al.*, 2010a). The higher rate of ARI in UK pilgrims was partly attributed to the longer time spent by them in Mecca and the Grand Mosque as compared to the local pilgrims (Mansouri *et al.*, 2014).

1.7 The preventive measures for respiratory infections

The transmission of all respiratory infections, including influenza can be prevented by implementing infection control measures at the first point of contact with a potentially infected person.

CDC had introduced Respiratory Hygiene/Cough Etiquette guidelines in order to reduce the transmission of respiratory infections (CDC, 2009b):

- Cover your mouth and nose with a tissue when coughing or sneezing.
- Use in the nearest waste receptacle to dispose of the tissue after use appropriately.
- Perform hand hygiene (e.g., hand washing with non-antimicrobial soap and water, alcohol-based hand rub, or anti-septic hand wash) after having contact with respiratory secretions or contaminated objects/materials.

- Masking and Separation of Persons with Respiratory Symptoms. Advice person with respiratory symptoms to wear face mask and to sit at least 3 feet away from others when coughing
- Droplet Precautions. In addition to standard precautions, the healthcare personnel are advisable to wear face mask when examine patient with symptoms of respiratory infections until it is determined the cause is not infectious.

Face mask

Public Health England also had published a simple guideline ‘Advice for Hajj and Umrah pilgrims 2013’. These documents highlight the main health issues for hajj and umrah pilgrims. Those who have respiratory symptoms are advisable to avoid contact with the eyes, nose and mouth. Pilgrims also need to wear mask especially in crowded places and maintain personal hygiene (Public Health England 2013). A study found that using facemasks offered no significant protection against acute respiratory infections (Al-Asmary *et al.*, 2007). However, usual paper and surgical facemasks were not known to provide complete protection from influenza infection and should be used only once (CDC, 2009a). Although the US CDC suggests that surgical face masks do not provide adequate filtering of small respiratory particles, it may be desirable to use at least among males, particularly in semi-closed areas. Encouraging respiratory hygiene measures such as frequent hand washing and disinfectants are essential measures in preventing cross-infection (WHO, 2003; Al-Asmary *et al.*, 2007).

Hand hygiene

Hand hygiene is a general term referring to any action of hand cleansing (WHO,2007a). It has been acknowledged as an important measure to prevent and control infectious diseases including respiratory illness in both community and also in health-care settings (WHO,2007a). In 2002, the CDC/HICPAC recommended alcohol-based handrubbing as the standard of care for hand hygiene practices in health-care settings. However, using handrub is not recommended by WHO when hands are dirty or visibly contaminated with proteinaceous materials.

Pilgrims are exposed with overcrowding and unsanitary conditions during hajj. Both conditions can easily transmit the respiratory illness via various routes that have been mention before. Thus, practising good hand hygiene is important as defective hand cleansing resulting in hands remaining contaminated. In one study they found that using only 1 ml of liquid soap or alcohol-based handrub yielded lower log reductions (greater number of bacteria remaining on hands) than using 3 ml of product to clean hands (Larson et al.,1987).

Among US pilgrims in 2009, those who practiced hand hygiene during hajj was associated with less incidence of respiratory illness (Balaban et al., 2012). The finding was strongly supported with the 5-year reviewed study (2004-2009) among Iranian pilgrims. Repetitive hand washing, avoiding from shaking hands with the patients and not touching eyes and respiratory mucous membrane with contamination hand are among the effective preventive measures (Razavi S.M. et al., 2014). Several studies also mentioned that the appropriate use of alcohol-based hand disinfectants during hajj should be strongly encouraged (Al-Samary *et al.*, 2006; Choudhry *et al.*, 2006). The incidence of ILI was showed to be reduced with the combination used of hand hygiene and face mask rather than face mask alone (Aiello et al., 2010).

Vaccinations

For vaccination, there are some vaccines that are necessary to obtain an entry visa to Kingdom of Saudi Arabia such as meningitis ACW135Y (Public Health England 2013). Influenza vaccine is also recommended for all pilgrims especially the elderly and those with chronic medical conditions (Public Health England 2013). In some study, they found that influenza vaccination was effective in preventing clinic visits for ILI among Malaysian hajj pilgrim (Mustafa et al., 2003). The role of the influenza vaccine has been established in reducing mortality and morbidity of influenza. Both inactivated and live attenuated vaccine prevented about 70% of cases of laboratory-confirmed symptomatic influenza in healthy adults. Recent data regarding UK pilgrims showed that the rate of influenza was lower in a vaccinated group as compared to an unvaccinated group (7% and 14%, respectively) (Ohmit et al., 2006; Rashid et al., 2008). The influenza vaccine coverage among Malaysian hajj pilgrims were more than 70%, however it was not helpful to reduce ILI and respiratory tract symptoms (Deris et al., 2010b).

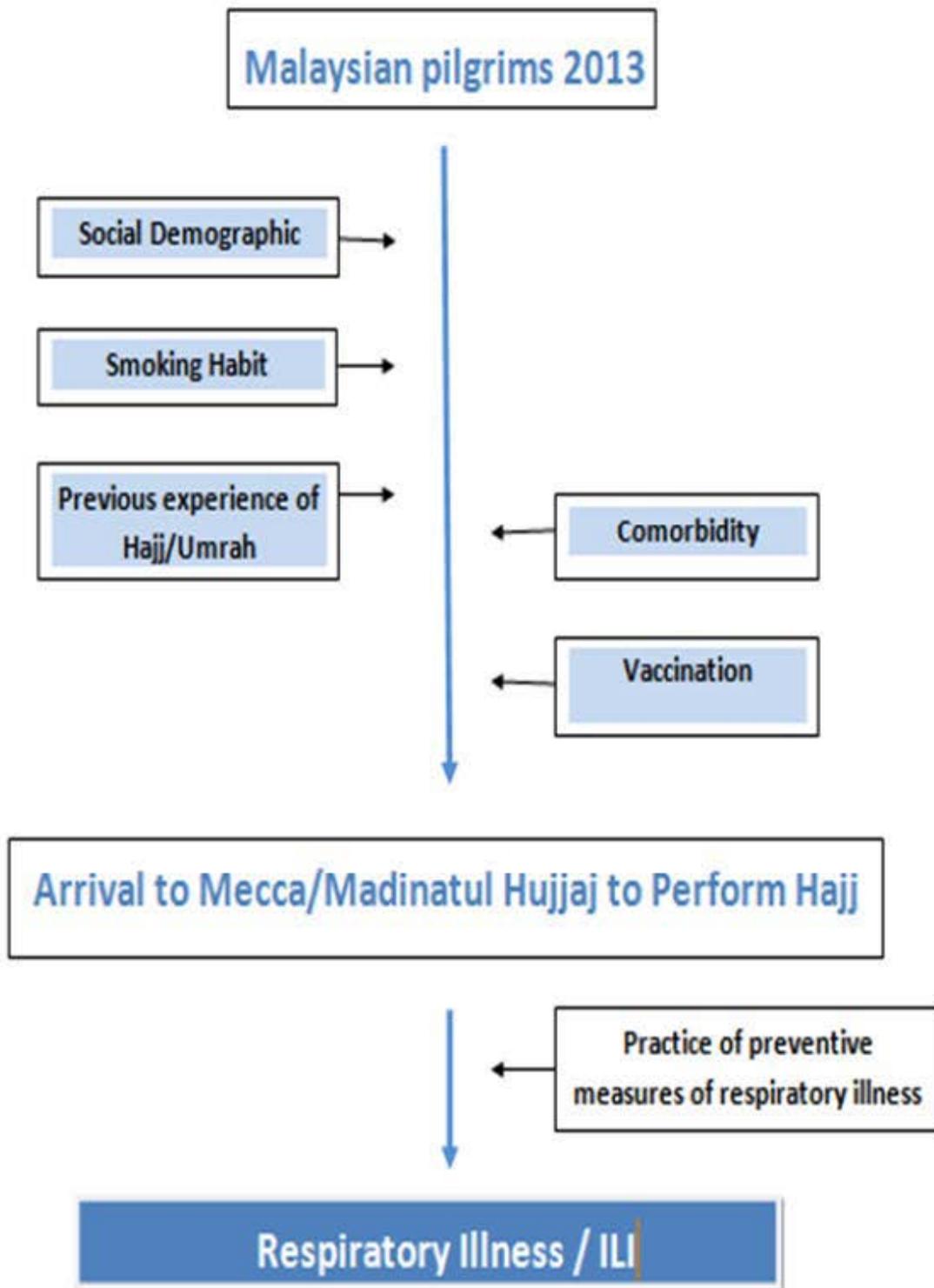
Supplements

Honey is known as antibacterial agent and it has been recognized since 1892. There were many research conducted on the role of honey in chronic wound management and other indications. Recently there was a studied about honey 'Madu Lebah Tualang-Agromas' and it was shown to reduce the respiratory symptoms score of Malaysian hajj pilgrims (Sulaiman *et al.*, 2011). In other study they found that honey actually can stimulates the immune system of the body (Tonks *et al.*, 2003; Brinkmann, 2007) and is effective in inhibiting recalcitrant bacteria (Alandejani *et al.*, 2009).

Anti-viral chemoprophylaxis has been used in annual influenza epidemics as an adjunct to influenza vaccine. Only two drugs, both neuraminidase inhibitors, are currently recommended for preventing or treating influenza: zanamivir (Relenza) and oseltamivir (Tamiflu). Patients should be started on anti-viral medications within 48 hours of contracting ARI (Cooper *et al.*, 2003).

There have been many published reports on preventive measures against respiratory illness among pilgrims which include influenza vaccination in other countries but not in Malaysia. Thus, the unsettling problem and the limited data on this infectious disease, I would like to explore it further in my study. Even though respiratory infections seemed to be very common and inevitable in pilgrims, preventive measures and practices need to be explored and subsequently recommended to the hajj pilgrims. The purpose of this study is to determine the prevalence of the respiratory illness among Malaysian hajj pilgrims in 2013, to describe its preventative measures including hand hygiene and face mask practices, vaccination coverage and supplement intake, and also to determine the association between socio-demographic, previous experience of hajj/umrah, co-morbidity, smoking habits, vaccination and the practice of preventative measures including religious practices with respiratory illness or ILI. In this study, apart from the listed preventive measures, we also explored the association between good hand hygiene practice and good standard face mask practice with the occurrence of respiratory illness/ILI (refer conceptual framework).

Conceptual framework



CHAPTER 2

CHAPTER 2

OBJECTIVES & HYPOTHESES

2.1 General objective

To determine the preventive measures and associated factors for respiratory illness among Malaysian hajj pilgrims in 2013 hajj season

2.2 Specific objectives

1. To describe the prevalence of the respiratory illness among Malaysian hajj pilgrims

2. To describe the practice of preventive measures for respiratory illness among Malaysian hajj pilgrims

3. To determine the association between respiratory illness with practice of preventive measures and other factors among Malaysian hajj pilgrims

4. To determine the association between influenza-like illness (ILI) with preventive measures and other factors among Malaysian hajj pilgrims

2.3 Research questions

Is there association between social demographic, co-morbid, smoking habit, vaccination and practice of preventive measures with respiratory illness?

2.4 Research hypothesis

There is association between social demographic, co-morbid, smoking habit, vaccination and practice of preventive measures with respiratory illness.

CHAPTER 3

CHAPTER 3

METHODOLOGY

3.1 Study design

- This is a cross-sectional study involving all consented Malaysian hajj pilgrims in November, 2013

3.2 Study location

- The study was conducted in Makkah and Malaysia during the 2013 hajj season.

3.3 Reference participants

- All consented Malaysian pilgrims in 2013 hajj season.

3.4 Sample size

Sample size was calculated for each objective based on double proportion formula. It was based on the data shown in Table 1 (Deris *et al.*, 2009; Deris *et al.*, 2010a; Sulaiman *et al.*, 2011)

Table 3.1: Risk factors and protective measures against respiratory infections

VARIABLES	P0	P1	N
DM	12.1% (Deris <i>et al.</i> , 2009)	24%	160
Asthma	8.6% (Deris <i>et al.</i> ,2009)	13%	780
COAD	9.1% (Deris <i>et al.</i> ,2009)	16%	361
HPT	9.9% (Deris <i>et al.</i> ,2009)	20%	195
IHD	1.3% (Deris <i>et al.</i> ,2009)	5%	349
Mask	69.4% (Deris <i>et al.</i> ,2010)	30%	24
Vaccine	72.6% (Deris <i>et al.</i> ,2010)	30%	20
Honey	79.2% (Sulaiman <i>et al.</i> ,2010)	30%	15
Others (specify) smoking	9.9% (Deris <i>et al.</i> ,2009)	20%	195

Based on the sample size determination according to potential associated factors, the largest sample size was given 780. After adding possible non respondent rate of 10%, then the sample size needed for this study is 858.

3.5 Sampling method

- Non-probability voluntary sampling was done as this was not an interventional study.

3.6 Sampling frame

- Malaysian pilgrims in 2013 who attended the hajj course at USM Kelantan on 23rd of August and the 24th of August 2013.
- Malaysian pilgrims in 2013 who transitted at Hajj Building Complex, Malaysia from the 15th of September until the 19th of September 2013.
- Malaysian hujjaj 2013 at the Kingdom of Saudi Arabia (KSA) (other than two groups above).

Inclusion criteria:

- Malaysian adult hajj pilgrim > 18 years old
- Able to comprehend Malay language
- Willing to participate in this study

Exclusion criteria:

- Ill person.
- Tabung Haji staff
- Non-Malaysian
- Malaysian pilgrims come from other countries eg. Egypt

3.7 Data collection

The forms were distributed during hajj course at USM Kelantan on 23rd of August and the 24th of August 2013, at Hajj Building Complex, Malaysia from the 15th of September until the 19th of September 2013 and also at Makkah before departing for a brief stay at Arafat (figure 3.1)

Method of data collection

- The eligible pilgrims were given brief instruction.
- Those consented were enrolled into the study and given the forms.
- All the completed forms were collected after completion of hajj at Makkah and at the local airport upon arrival in Malaysia or via postage. The pilgrims were required to complete the forms at least 2 weeks after their stay at Arafat. All respiratory symptoms that occurred about 2 weeks after arrival in KSA were considered significant.
- All study participants with available phone number was contacted to know the submission status of the forms. Complete envelopes with address and stamp were sent to respective participants who want to give back the forms. Missing form will be replaced with the new one.

3.8 Variables and research tools

VARIABLE DEFINITION

Outcome

1. Respiratory illness

- Triad of fever, cough, sore throat (ILI)
- At least having one of the respiratory symptoms and did not fulfill the criteria of ILI (non-ILI)

2. Duration & place of the onset of the respiratory illness

3. Management of the respiratory illness

- antibiotic
- hospital admission
- none of the above

Respiratory illness and ILI

An expanded definition of respiratory illness was used for this study. ILI is defined as the triad of cough, subjective fever and sore throat. Those who did not fulfil the criteria of ILI were classified into a non-ILI group. Respiratory illness was defined as when the person is having at least one of the respiratory symptoms (non ILI) or influenza-like illness (ILI).

Independent variables

- Age
- Gender
- Marital status
- Level of education
- Previous experience of hajj or umrah
- Background of medical illness
- Height & weight for the calculation of the body mass index (BMI)
- Smoking habit
- Vaccination coverage

Study Instrument (Appendix)

Section A

A checklist of the form containing:

- Social demographic
- Co-morbid illness
- Smoking habit
- Description of the respiratory illness

Section B

In the checklist, the domain was preventive measures practices towards respiratory illness. It further subdivided into several subdomain including supplements (2 items), hand hygiene (2 items), face masks (5 items), contact precautions/avoidances (3 items) and religious practices (1 item).

Good hand hygiene:

Good hand hygiene or optimal handwashing practices is defined as handwashing for 20 seconds at least 5 times per day either by using water together with soap or a hand sanitizer (WHO, 2007; Aiello *et al.*, 2010). In this study, we define good hand hygiene practice as those who frequently wash their hands using hand sanitizer as indicated by CDC (CDC, 2013) . Those who were using water only, handkerchiefs or disposable tissues were considered as poor hand hygiene practices.

Good face mask practice:

There was no proper definition for good practice of wearing face mask. The CDC has recommended surgical face mask and N95 face mask or even tissue to cover the nose and mouth especially for those having respiratory symptoms (CDC, 2009b). They are advised to change the mask once it getting wet or contaminated with respiratory secretion and also used it especially in the crowded places or area (CDC, 2009b; Emamian *et al.*, 2013). Those who change the mask every two hours able to protect them from having respiratory illness (Hobday RA, 2009). In this study, face mask is divided into standard and non-standard face mask. Standard face mask include

surgical face mask and N95 face mask while non-standard face mask include wet and dry towel and veil. Those who wear the face mask throughout the day or as needed (eg. in crowded area or in contact with respiratory illness patient) were reflected as good practices while those who used it only half day or sometimes were considered as poor practices. The face mask need to be wear correctly and consistently in order to reduce the transmission of the respiratory illness (Shahrul anuwar *et al.*,2014.). Here, those who changed the face mask at least once a day or as needed (eg. when wet/contaminated) is considered under good or proper practice of wearing face mask.

Contact precautions:

History of contact with respiratory illness sufferers is defined as pilgrims who have direct contact or close contact (being within approximately 6 feet (2 meters) or within the room or care area for a prolonged period of time while not wearing recommended personal protective equipment (CDC, 2015).