

The association between pre-morbid conditions and respiratory tract manifestations amongst Malaysian Hajj pilgrims

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Abstract. In a very closed and overcrowding environment, influenza transmission during Hajj season is almost inevitable. The aim of this study was to determine the association between pre-morbid conditions and influenza-like illness (ILI) amongst Hajj pilgrims. A cross-sectional study was conducted amongst Malaysian Hajj pilgrims in year 2007. Survey forms were distributed at Madinatul-Hujjaj, Jeddah and Tabung Haji Clinic, Medina, Saudi Arabia where pilgrims stay on transit before returning to Malaysia. Allergic rhinitis was significantly associated with sore throat ($p=0.047$), longer duration of cough ($p=0.017$) and runny nose ($p=0.016$). Pilgrims who suffered from chronic obstructive pulmonary diseases (COPD) had significant association with longer duration of cough ($p=0.041$) and those with diabetes mellitus had significant association with longer duration of sore throat ($p=0.048$). Underlying asthma was significantly associated with severe influenza like illness requiring admission to hospital for further treatment of respiratory symptoms ($p=0.016$). Based on these findings, we suggest those with underlying asthma should be discouraged from participating in the hajj and they should seek early treatment if they develop respiratory symptoms.

INTRODUCTION

Every year, Saudi Arabia hosts the largest annual gatherings in the world; the Hajj. This event gathers approximately three million people together from various countries into one confined geographical area. According to the 5th tenet of Islam, all adult Muslims who are physically and financially competent are required to perform the Hajj once in their lifetime. During the ritual, the pilgrims move from one holy site to another in Makkah to

complete the Hajj activities (Gatrad & Sheikh, 2005).

The rituals of Hajj are physically very demanding. Extreme physical stressors such as extreme heat, sun exposure, prolonged stays at Hajj sites, dryness of environment, overcrowding, traffic congestions, minimum toilet facilities, air pollution and rough and uneven ground increase the risk of communicable and non-communicable diseases (Ahmed *et al.*, 2006; Shafi *et al.*, 2008). Ideally; only those who are physically fit have a religious

obligation to perform Hajj. But unfortunately some with preexisting health conditions and in very extreme age are still ambitious to perform Hajj. Old age and co-morbid condition of the Hajj pilgrims are known important risk factors for hospital admission during Hajj season (Al-Ghamdi *et al.*, 2003).

It is not unusual for 50-100 people to share a tent overnight in Mina during Hajj (Gatrad *et al.*, 2006). Respiratory infections continue to increase the disease burden of Hajj pilgrims but there is a lack of studies to overcome this problem (Alzeer, 2009). In this very closed and overcrowding area, the transmission of pathogens especially influenza virus is almost inevitable. This study was aimed to find out the associated factor of influenza-like illness among Hajj pilgrims. Because of the language barrier and logistic problem, the scope of the subjects was Malaysian Hajj pilgrims that performed Hajj during 2007 season.

MATERIALS AND METHODS

Study design and subjects

A cross-sectional study was conducted amongst Malaysian Hajj pilgrims in year 2007. Over the years, around 25000 Malaysian Hajj pilgrims travel to Makkah. They are managed by Malaysian Hajj Fund (Tabung Haji), i.e. a government linked company to take care of Malaysian Hajj pilgrims. They stay in the holy land for about forty days. Around two third of the Hajj pilgrims go to Medina first for eight days. Then they reside at Makkah for the rest of the Hajj journey. After completing the Hajj ritual, they go to Jeddah and stay at Medinatul-Hujjaj of Jeddah for two nights to wait their flight to come back to their home. Another one third of the Hajj pilgrims goes directly to Makkah and come back via Medina.

Survey forms were distributed at Madinatul-Hujjaj, Jeddah and Tabung Haji Clinic, Medina, Saudi Arabia where pilgrims stay on transit before returning to Malaysia. The response to the survey was

on a voluntary basis. The calculated sample size was 276 respondents. After including 20% expected drop-out, total required minimal sample size was 331. Ethical approval was obtained from Universiti Sains Malaysia Research and Ethics Committee.

Definition

It is difficult to define the syndromes of respiratory tract infections because of great variation in the severity, duration, and types of symptom (Eccles, 2005). Case definitions of ILI for influenza surveillance vary widely worldwide (Thursky *et al.*, 2003). The CDC definition of ILI i.e. 'temperature of $\geq 37.8^{\circ}\text{C}$ and either cough and/or sore throat in the absence of a known cause other than influenza' has been shown to have low sensitivity in clinical practice (Babcock *et al.*, 2006; Rashid & Rafiq, 2006). During Hajj, as suggested by Rashid *et al.* (2008a), ILI was defined as the triad of cough, subjective fever and sore throat. This study also focused more on specific symptoms of acute respiratory tract manifestation such as cough, sore throat, runny nose and fever.

Statistical analysis

Data was entered and analyzed using SPSS software (SPSS, Chicago) version 12.0. Results were expressed in term of the number and percentage or the mean and standard deviation. For categorical variables, the differences in patient's characteristics and risk factors were tested using Chi-square or Fisher's exact test. For continuous variables, they were categorised in groups and analysed similar to categorical variable. P value of < 0.05 was considered to be statistically significant.

RESULTS

Out of 394 pilgrims who returned the questionnaires, seven were excluded from analysis as grossly incomplete. The underlying diseases among Malaysian Hajj

pilgrims were diabetes mellitus 12.1%; hypertension 9.6%; asthma 9.0%; chronic obstructive pulmonary diseases (COPD) 8.8%; allergic rhinitis 7.2%; arthritis and muscle ache 1.3%; heart diseases 0.5%; malignancy 0.26% and gastritis 0.1%. An 8.8% of Malaysian Hajj pilgrims were smokers. There were also no significant difference between ILI and non-ILI in term of underlying diseases and smoking habit (Table 1).

This study found that underlying allergic rhinitis was significantly associated with sore throat during Hajj season ($p=0.047$; OR 2.4 95% CI 0.99, 5.75). Allergic rhinitis also was significantly associated with cough and runny nose more than two weeks with $p=0.017$ (OR 2.5 95% CI 1.2, 5.6) and $p=0.016$ (OR 2.6 95% CI 1.2, 5.6) respectively. Diabetes mellitus was significantly associated with sore throat for more than two weeks ($p=0.048$ OR 2.2 95% CI 0.99, 4.71). COPD significantly associated with cough more than two weeks with $p=0.044$ (OR 2.1 95% CI 1.0, 4.4) respectively (Table 2).

Table 3 shows the association between underlying conditions of Hajj pilgrims and the hospital admission due to acute respiratory symptoms. Underlying asthma was significantly associated with patient admission to hospital for the treatment of respiratory symptoms ($p=0.012$).

DISCUSSION

Previous studies had shown that influenza A virus was only detected in 0.6% (Balkhy *et al.*, 2004), 8.1% (Rashid *et al.*, 2007), 8.6% (Rashid *et al.*, 2008c), 10.2% (Rashid *et al.*, 2008b) and 9.8% (Abdolvahab *et al.*, 2009) respectively among Hajj pilgrimages. Taking the lowest percentage of influenza A infection to the total two million pilgrims, it was estimated that at least 400,000 pilgrims would develop URTI symptoms and 24,000 would develop influenza (Balkhy *et al.*, 2004). This did not include those becoming ill from contact with Hajj pilgrims returning home. Hajj could potentially initiate waves of outbreaks

Table 1. Associated factors of influenza-like illness among hajj pilgrims in 2007

Variable	Influenza Like Illness *		p value [#]	OR (95%CI)
	Yes Mean (sd)/ n (%)	No Mean (sd)/ n (%)		
Gender				
Male	85 (54.8)	131 (56.5)	0.752 ^a	1.07 (0.71-1.61)
Female	70 (45.2)	101 (43.5)		
Age (y)	49.8 (10.6)	50.7 (11.2)	0.422 ^b	
Underlying diseases				
• Diabetic	19 (12.3)	28 (12.1)	0.955 ^a	1.01 (0.55, 1.90)
• Hypertension	14 (9.0)	23 (9.9)	0.773 ^a	0.90 (0.45, 1.81)
• COPD **	13 (8.4)	21 (9.1)	0.821 ^a	0.92 (0.45, 1.90)
• Asthma	15 (9.7)	20 (8.6)	0.722 ^a	1.14 (0.56, 2.29)
• Rhinitis	15 (9.7)	13 (5.6)	0.130 ^a	1.81 (0.83, 3.91)
• Heart diseases	2 (1.3)	0 (0.0)	0.160 ^c	–
Smoking while in Malaysia	11 (7.1)	23 (9.9)	0.337 ^a	0.69 (0.33, 1.47)

^a Pearson Chi square

^b Independent-t test

^c Fisher's Exact test

[#] Significance level was set at 0.05

* Influenza-like illness was defined as triad of cough, subjective fever and sore throat

** COPD – Chronic Obstructive Pulmonary Diseases

Table 2. Association between specific respiratory symptoms and common underlying conditions among hajj pilgrims in 2007

Symptom	Diabetes Mellitus			Asthma			Allergic Rhinitis			COPD**			Smoking habit		
	Yes (%)	No (%)	<i>p</i> Value	Yes (%)	No (%)	<i>p</i> Value	Yes (%)	No (%)	<i>p</i> Value	Yes (%)	No (%)	<i>p</i> Value	Yes (%)	No (%)	<i>p</i> Value
Cough	46 (97.9)	308 (90.6)	0.157 ^a	31 (88.6)	323 (91.2)	0.522 ^a	26 (92.9)	328 (91.4)	1.000 ^a	34 (100)	320 (90.7)	0.098 ^a	30 (88.2)	324 (91.8)	0.515 ^a
Duration of cough more than two weeks*	18 (39.1)	130 (39.6)	0.948 ^b	10 (30.3)	138 (40.5)	0.254 ^b	17 (60.7)	131 (37.9)	0.017 ^b	18 (56.3)	130 (38.0)	0.044 ^b	10 (31.3)	138 (40.4)	0.314 ^b
Runny nose	34 (80.3)	273 (72.3)	0.207 ^b	25 (71.4)	282 (80.1)	0.226 ^b	23 (82.1)	284 (79.1)	0.703 ^b	25 (73.5)	282 (79.9)	0.382 ^b	28 (82.4)	279 (79.0)	0.648 ^b
Duration of runny nose more than two weeks*	11 (23.4)	80 (24.2)	0.900 ^b	7 (21.9)	84 (24.3)	0.754 ^b	12 (42.9)	79 (22.6)	0.016 ^b	11 (33.3)	80 (23.2)	0.196 ^b	5 (15.2)	86 (25.0)	0.207 ^b
Sore throat	24 (51.1)	197 (57.9)	0.372 ^b	19 (54.3)	202 (57.4)	0.724 ^b	21 (75.0)	200 (55.7)	0.047 ^b	20 (58.8)	201 (56.9)	0.832 ^b	22 (64.7)	199 (56.4)	0.348 ^b
Duration of sore throat more than two weeks*	10 (21.3)	37 (11.1)	0.048 ^b	4 (12.1)	43 (12.4)	1.000 ^a	5 (17.9)	42 (11.9)	0.639 ^a	5 (15.2)	42 (12.1)	0.582 ^a	4 (11.8)	43 (12.4)	1.000 ^a
Fever	28 (59.6)	201 (59.1)	0.952 ^b	21 (60.0)	208 (59.1)	0.917 ^b	18 (64.3)	211 (58.8)	0.568 ^b	21 (61.8)	208 (58.9)	0.748 ^b	17 (50.0)	212 (60.1)	0.255 ^b
Duration of fever more than two weeks*	0 (0.0)	10 (3.0)	0.619 ^a	1 (3.1)	9 (2.6)	0.590 ^a	1 (3.6)	9 (2.6)	0.539 ^a	3 (8.8)	7 (2.0)	0.051 ^a	0 (0.0)	10 (2.9)	1.000 ^a

^a Fisher's Exact test

^b Pearson chi square test

Significance level was set at 0.05

*The hajj pilgrims with no history of symptom were analysed as 0 day of symptom

** COPD – Chronic Obstructive Pulmonary Diseases

Table 3. Association between underlying conditions and hospital admission for acute respiratory symptoms among hajj pilgrims 2007

Underlying Conditions	Admitted to hospital		<i>p</i> value
	Yes <i>n</i> (%)	No <i>n</i> (%)	
Diabetes Mellitus	3 (27.3)	44 (12.2)	0.150 ^a
Hypertension	0 (0.0)	34 (9.4)	0.609 ^a
Asthma	4 (36.4)	30 (8.3)	0.012 ^a
Allergic Rhinitis	1 (9.1)	26 (7.2)	0.568 ^a
Smoking	1 (9.1)	32 (8.8)	1.000 ^a
COPD**	1 (9.1)	33 (9.1)	1.000 ^a
Other underlying diseases	0 (0.0)	13 (3.6)	1.000 ^a

^a Fisher's Exact test

Significance level was set at 0.05

* Only hajj pilgrims with respiratory symptoms were included in the analysis

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worldwide and burden health-care systems (Ebrahim *et al.*, 2009).

In the era of H1N1 pandemic influenza, the ILI cases increase five times more than baseline rate (CDC, 2009). We have reported the prevalence of ILI among Malaysian Hajj pilgrims was 40.1% (Deris *et al.*, 2009). The secondary attack rate of pandemic H1N1 among household was estimated to be 27.3% (Yang *et al.*, 2009). The attack rate among Hajj pilgrims was expected to be much higher due to the overcrowding, winter season, overexertion and limited resources condition.

The pandemic influenza has created fear among Muslim communities and governments. Egypt, Oman, Iran and Tunisia were among these countries (Ebrahim *et al.*, 2009). The Saudi Health authority has implemented infection control measures that effectively controlled the previous H1N1 pandemic during hajj. Their measures were grouped as screening and isolation; surveillance, epidemiology, and informatics; laboratory testing; infection control; and treatment of the 2009 pandemic influenza A H1N1 infection (Memish *et al.*, 2009). These preparedness plans have been shown effective in minimising the disease transmission during the mass gathering and on their return home.

Among the most challenging recommendation is that the population groups considered to be at high risk for complications from influenza voluntarily refrain from the 2009 Hajj (Ebrahim *et al.*, 2009). In this pre-pandemic study, we documented that allergic rhinitis, diabetes mellitus and COPD associated with some respiratory symptoms and/or prolongation of the respiratory symptoms but these did not fulfil the ILI criteria. It was reasonably safe for Muslims with controlled underlying diseases to perform Hajj presuming that they have had appropriate pre-Hajj counseling on their illness. As practiced in many countries, Hajj pilgrims need to have health screening before going for Hajj and take sufficient supplies of their usual medications. They were advised to bring letter documenting medical problems and treatments to allow for rapid assessment of the illness and also help them go through customs (Gatrad & Sheikh, 2005; Shafi *et al.*, 2008). The Hajj pilgrims with these underlying diseases need to have medical consultation should they develop respiratory symptoms.

On the other hand underlying asthma was significantly associated with patients being admitted to hospital for the treatment of acute respiratory symptoms. The previous study has shown that COPD and asthma were the most common causes of severe sepsis during Hajj in which 54.7% of severe sepsis cases admitted to critical care units having the diseases (Baharoon *et al.*, 2008). Bronchial asthma accounted for 9.2% of hospital admission (Madani *et al.*, 2006) and directly caused 8.6% of intensive care admission during Hajj (Madani *et al.*, 2007). Asthma is known to cause acute respiratory distress when the patients are exposed to allergens and upper respiratory tract pathogens. This study supports the recommendation to refrain high risk group from participating in the 2009 Hajj.

In conclusion, this study showed that pilgrims who had underlying chronic diseases such as diabetes mellitus, allergic rhinitis, COPD and asthma needed to have their diseases controlled before embarking

on the pilgrimage to Makkah. Those with underlying asthma should voluntarily refrain from hajj during pandemic influenza season and if they are going for hajj, they should seek early medical attention whenever they develop respiratory symptoms.

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