

## ORIGINAL ARTICLE

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### **Influenza vaccination among Australian Hajj pilgrims: uptake, attitudes and barriers**

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**Running title:** Influenza vaccination among Australian Hajjis

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## ABSTRACT

*Background:* Hajj is the largest annual mass gathering; the risk of respiratory infection is high. Although the Saudi Arabian authority recommends influenza vaccination for Hajj pilgrims, the uptake is variable. Influenza vaccine uptake among Australian Hajj pilgrims is not readily available. Therefore we aimed to estimate the influenza vaccination uptake rate and identify both attitudes and barriers to vaccine uptake from two consecutive surveys at Hajj in 2011 and 2012.

*Methods:* Using an anonymous self-administered questionnaire, surveys were conducted in Mecca, Saudi Arabia among Hajj pilgrims from Australia in 2011 and 2012. Pilgrims staying in 'Australian' tents were recruited serially.

*Results:* In 2011, 431 Australian pilgrims completed the survey - median age was 42 (range 7-86) years, 55% were male; 65% reported receiving influenza vaccine. In 2012, 535 pilgrims median age 43 (range 12-83) years completed the survey, 62% were males; 89% reported receiving the vaccine. Both in 2011 and 2012, common reasons for not receiving the vaccine were the pilgrims' reliance on their 'natural immunity' (33% and 26% respectively,  $p = 0.4$ ) and believing that they would rarely catch influenza or come in contact with influenza patients (18% and 29% respectively,  $p = 0.1$ ). In 2012 when asked why they had received the vaccine, 65% pilgrims responded that it was because of the tour group leaders' recommendation.

*Conclusion:* Influenza vaccine uptake among Australian Hajj pilgrims seems satisfactory and increasing but could be better because many pilgrims have misconceptions about vaccines. Tour operators may play a greater role in promoting vaccination.

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## Introduction

Hajj is one of the five basic tenets of Islam. Every practising, financially and physically capable Muslim is required to perform Hajj at least once in their lifetime. Each year up to 3 million people from more than 180 countries assemble in Mecca, Saudi Arabia to perform Hajj pilgrimage. Severe crowding, shared accommodation, reduced personal hygiene and environmental pollution at Hajj may collectively lead to increased transmission of respiratory viruses, notably influenza.<sup>1-3</sup>

Several months before each Hajj, the Saudi Arabian Ministry of Health (MoH) publishes health recommendations including vaccination requirements for pilgrims.<sup>4</sup> Influenza vaccine has been recommended since 2005, particularly for people 'at-risk' of severe complications, defined as those aged  $\geq 65$  years old and/or people with pre-existing medical conditions such as chronic lung, heart, liver, kidney, neuromuscular, metabolic or immune-compromising conditions.<sup>4,5</sup> Despite this yearly recommendation, influenza vaccine uptake rate among Hajj pilgrims has varied by country and by year (see Table 1).<sup>6-13</sup>

There are no comprehensive official data on influenza vaccination rate among Australian Hajj pilgrims or other travellers. A prospective study that assessed the incidence and risk factors for acute respiratory illnesses and influenza infections among Australian travellers between August 2007 and January 2010, reported only 49% influenza vaccine uptake prior to their trip to Asia, and actually just 56% travellers admitted receiving the vaccine in the 3 years before travel.<sup>14</sup> In a subsequent survey conducted among the students of the University of New South Wales, Sydney, Australia in 2010, intending to travel abroad, only 25% students reported 'ever' receiving an influenza vaccine.<sup>15</sup>

To this end, we have assessed the uptake of influenza vaccine, and examined the attitudes and barriers to, and perception of vaccination among Australian pilgrims who attended Hajj pilgrimage in 2 consecutive years, 2011 and 2012.

## **Method**

### *Study participants*

The study surveyed a convenience sample of Australian pilgrims who assembled for Hajj pilgrimage in Mina (an important Hajj location at the outskirts of Mecca), Saudi Arabia, in November 2011 and October 2012. All pilgrims residing in Australian camps were approached serially according to tents and were invited to participate in this study. Only those who verbally consented were included.

### *Study survey*

Between 4<sup>th</sup> and 9<sup>th</sup> November 2011, and between 24<sup>th</sup> and 29<sup>th</sup> October 2012, a survey was conducted using an anonymous self-administered structured questionnaire in Mina, Mecca to obtain participant's demographics such as age, gender, postcode/suburb, tour group details, vaccination status and examine the participant's perceptions of influenza vaccination.

For the 2011 survey, we included history of influenza vaccination in 2009 (monovalent pandemic) and 2010 (trivalent seasonal) and where the vaccine had been administered. In the 2012 questionnaire, reasons for receiving the vaccine were added but the place of vaccine administration was deleted. The questionnaire in both years (2011 and 2012) was piloted among staff of the National Centre for Immunisation Research and Surveillance (NCIRS) prior to the study.

Twenty six trained volunteer researchers conducted the Hajj studies, answering questions and providing explanations as required. Questionnaires were collected within 30 minutes. The tour group guides arranged broadcasts about the study in English and Arabic. For those pilgrims who could not complete the questionnaires or preferred not to, volunteer researchers recorded dictated answers.

### ***Ethics Approval***

The study was approved by the Human Research Ethics Committee (HREC) at Sydney Children's Hospital Network, Australia (Ref: 11/SCHN/162).

### ***Data analysis***

Analysis was performed using statistical Package for the Social Sciences (IBM SPSS® 19, Chicago, IL, USA). Categorical variables were compared by using Chi-square test and continuous data by Student's t test, and where appropriate multivariate analysis was done by using multinomial logistic regression to assess demographic and socio-economic influences on vaccine uptake. A  $p$  value  $\leq 0.05$  was considered statistically significant.

## **Results**

### ***The 2011 Survey***

#### ***Demographics***

In 2011, about 4,200 Australian pilgrims assembled for Hajj; 442 (11%) were serially approached and 431 (98%) completed the questionnaire (Fig. 1), 235 (55%) were male, 187 (44%) female and in 9 (2%) gender was not stated. Age or date of birth was obtained from 417

(97%) pilgrims aged between 7 and 86 (median 42) years. Females were slightly older than males (mean age 43 {standard deviation [SD 15] versus 41 [SD 14]} years,  $p = 0.05$ ) while the proportion of ‘at-risk’ pilgrims was similar in both gender groups (20% versus 22%,  $p = 0.7$ ).

Half of the participants ( $n=217$ ) were from New South Wales (NSW), a third ( $n=143$ ) were from Victoria and the rest 17% ( $n=71$ ) were from other Australian states and territories, reflecting a representative sample of Muslims based on their place of residence in Australia.<sup>16</sup>

Saudi Arabian Hajj regulations require that every Hajj pilgrim must travel to Mecca through a registered tour group. Our study participants travelled to Hajj through 16 different tour groups. The largest proportion of the respondents belonged to tour group ‘A’ ( $n=104$ , 24%) and the rest belonged to one of 15 ‘other tour groups’ ranging in size from 1 to 81.

Ninety one pilgrims (21%) were ‘at-risk’ ( $n=61$ , 67% with chronic medical conditions,  $n=12$ , 13% aged  $\geq 65$  years and  $n=18$ , 20% with both). Fifty one (56%) of them were male and 38 (42%) female; gender was unknown for 2 (2%).

### *Vaccine uptake*

Of 431 pilgrims, 278 (65%) reported receiving influenza vaccine in 2011. The vaccination rate in pilgrims from NSW was significantly lower than those from the other states and they were younger (mean age: 40 [SD 15] versus 44 [SD 14] years,  $p < 0.01$ ). However, they had a similar proportion of pilgrims with risk conditions (19% versus 23%,  $p = 0.37$ ). Uptake rates by those aged  $\geq 65$  years from NSW and from other states were similar (73%).

The vaccination rates by age groups, ‘at-risk’ conditions and tour groups are shown in Table 2.

‘Not at-risk’ females had higher vaccination rate compared to ‘not at-risk’ males (73% versus 56%,  $p < 0.01$ ), but for the ‘at-risk’ groups (76% versus 69%,  $p = 0.43$ ) the difference was not significant.

Of the 278 vaccinated pilgrims in 2011, 244 (88%) reported receiving the vaccine from their GPs, 13 (5%) from hospitals, 11 (4%) at their work place, 7 (3%) at other places including travel clinics and the remaining 3 (1%) did not specify the place of vaccination.

Of 153 non-vaccinated pilgrims, 142 (93%) provided reasons for not being vaccinated; the reasons are listed in Table 3.

One hundred and forty two (33%) reported receiving the monovalent pandemic vaccine in 2009, whereas 268 (62%) did not, and the remaining 21 (5%) Hajjis did not answer the question. One hundred and twenty five (29%) reported receiving seasonal vaccine in 2010, 293 (68%) did not, and the rest 13 (3%) did not answer. Receiving the pandemic vaccine in 2009 and the seasonal vaccine in 2010 doubled the likelihood of receiving influenza vaccine in 2011 (OR 2.2; 95% CI 1.2 – 4.0;  $p < 0.01$  and 2.1 95% CI: 1.1 – 3.9;  $p = 0.02$  respectively).

## **The 2012 Survey**

### *Demographics*

In 2012, about 4,000 Australian pilgrims congregated at Hajj; 553 (14%) of these were approached and 535 (97%) completed the questionnaires (Fig. 1), 334 (62%) were male, 182 (34%) female and in 19 (4%) gender was not stated. Age or date of birth was obtained from 506 (95%) pilgrims aged between 12 and 83 (median 43) years.



The distribution of residency in this survey was comparable to the 2011 survey with 40% (n=216) participants from NSW, 36% (n=192) from Victoria and the rest 25% (n=133) from other Australian states and territories. Participants travelled to the 2012 Hajj through 13 different tour groups. As in 2011, the largest proportion of the participants were from tour group 'A' (n=111, 21%) and the rest belonged to one of 12 'other tour groups'.

One hundred pilgrims (19%) were considered 'at-risk' due to the presence of one or more indications for vaccination including chronic medical conditions (n=83, 83%), age  $\geq 65$  years (n=17, 17%) or both (n=16, 16%); 62 (62%) were male and 37 (37%) female and the gender of one pilgrims 'at-risk' (1%) was unknown.

#### *Vaccine uptake*

Of 535 participants, 476 (89%) reported receiving influenza vaccine in 2012, 42 (8%) did not receive the vaccine and in 17 (3%) vaccination history was not stated. The uptake rate was similar in both genders, across the states and tour groups (Table 2).

Of 42 non-vaccinated pilgrims, 32 (76%) provided reasons for not being vaccinated; the reasons are listed in Table 3. Recommendation of the Hajj tour group leader was the commonest reason (65%) for pilgrims' vaccine uptake; other reasons are listed in Table 4.

#### **Discussion**

We have shown evidence for a much greater uptake of influenza vaccine among Australian Hajj pilgrims in 2012 compared to 2011. Also, prior history of receiving influenza vaccine in 2009

and/or 2010 was associated with an increased likelihood of receiving the vaccine in 2011. Some Hajj pilgrims still have misconceptions about influenza vaccine, however.

As in this study, other surveys conducted among older Australian residents also show an increased influenza vaccine uptake.<sup>17, 18</sup> The coverage rate of 89% in 2012 among Australian Hajj pilgrims compares well with the vaccination rate among the Iranian pilgrims (86%-98%) for the last few years, and French (97%) and domestic Saudi pilgrims (94%) for the 2009 Hajj.<sup>7, 11, 13, 19, 20</sup> It was higher than among US (63%) and Malaysian (73%) pilgrims.<sup>6, 21</sup> A cross-sectional survey conducted several years ago among Asia-Pacific travellers, including Australians, showed that only 3% of 'Western' (i.e., those from Australia, New Zealand, Europe and North America) travellers received influenza vaccine for their trip and 11% received the vaccine in previous years. However, specific data for Australian travellers were not shown.<sup>15</sup> Specific data on influenza vaccination uptake among Australian travellers to Asia and student travellers to international destinations show that the uptake rate is generally between 25% and 49%.<sup>14</sup> However, vaccine uptake among Australian travellers and Hajj pilgrims (found in this survey) is better than for some other developed countries such as the UK where a recent survey found that only 20.8% travellers reported having influenza vaccine over the preceding 5 years.<sup>22</sup>

In our 2011 survey, pilgrims who had received influenza vaccine previously had a higher vaccine uptake. Systematic reviews have consistently confirmed that receiving a prior seasonal influenza vaccination is an important determinant of both pandemic and seasonal influenza vaccination.<sup>23-</sup>  
<sup>25</sup> This fact was examined by Shahrabani and Benzion through the use of an analytical model based on four dependent variables: beliefs about susceptibility to contracting influenza, severity of illness, perceived benefits of the vaccine in preventing influenza, and perceived barriers to

getting vaccinated. The investigators found out that individuals who had 'flu shots' in the past perceived higher levels of benefits from the vaccine and lower barriers to getting the vaccine than those who had not been vaccinated, while those who had had influenza infection over the previous 2 years exhibited higher levels of perceived susceptibility and lower levels of perceived benefits from the vaccine. Health beliefs regarding the influenza vaccine and past illness seem to influence vaccine acceptance, but not always predictably.<sup>26</sup> This helps explain why pilgrims receiving influenza vaccine previously had a significantly higher uptake than those who missed it.

Misconceptions were common among Hajj pilgrims who did not receive the influenza vaccine. Reliance on 'natural immunity' was the main reason given for not receiving the vaccine in 2011 and 2012. While our survey did not distinguish between reliance on the body's general immune competence and immunity resulting from past infection with influenza, it did expose a lack of understanding of the need for annual influenza vaccination. A recent Australian national survey has demonstrated that the three most cited reasons by those aged  $\geq 65$  years for refusing vaccination were: 'I don't get the flu', 'I'm not at-risk', and 'It brings on the flu'<sup>27</sup>, paralleled by some Hajj pilgrims. Memish and colleagues reported that lack of awareness and knowledge about the access to vaccine were the two most important reasons for not receiving seasonal influenza vaccine among international pilgrims during the Hajj 2009.<sup>7</sup> Misperceptions about pandemic influenza vaccine have also been reported among health care workers (HCWs) deployed at Hajj in 2009 when over half refused the vaccine mainly because of a belief that pandemic influenza was not fatal and there were toxic preservatives in the vaccine.<sup>28</sup> In a previous survey conducted among Asia-Pacific travellers including Australians, 27% believed

that they were not at risk of influenza and another 14% thought that influenza vaccine was not important.<sup>29</sup> A USA survey also confirms that many travellers avoid influenza vaccination due to misperceptions such as thinking that they do not need the vaccine and fearing of being ill from the vaccine or of needles etc.<sup>30</sup> It is reassuring that in our study no Hajj pilgrim refused the vaccine on 'religious grounds'. However, this study indicated that recommendations of religious leaders like Imams and tour group leaders were important in enhancing the uptake of influenza vaccine among pilgrims. A study in the UK showed that religious leaders—such as Imams and Quran teachers are “important drivers of health promotion measures”.<sup>31</sup>

In 2011 females had significantly higher vaccine uptake than males which corresponds with Australian national influenza vaccination data.<sup>27</sup> A Dutch study involving Hajj pilgrims in 2001 to 2009 showed similar gender difference for diphtheria, tetanus and pertussis (DTP) vaccine uptake.<sup>32</sup> However, a gender difference was not observed in the 2012 survey, neither were there differences across tour groups or Australian states when many more people accepted vaccination. Moreover, there were differences in vaccination rates across tour groups and Australian states which were not found in the 2012 survey, implying that such a difference was peculiar to the year 2011 only, and the differences disappeared when the overall vaccination rate improved in 2012.

A strength of this study is that it is the first to investigate influenza vaccine uptake among Australian Hajj pilgrims and one of the few studies to assess vaccine uptake among Australian travellers, and the study is representative of Muslims throughout Australia. Surveys were completed and collected within 30 minutes after Hajjis had opportunity to clarify questions; we achieved a very high (97%) response rate. However, the study has some limitations: being an anonymous survey, GP vaccination records could not be used for verification of vaccination or

co-morbid conditions. Additionally, some data were missing as some questionnaires were only partially completed (for instance about 3.5% pilgrims did not disclose their age and gender). Level of education and occupation could influence pilgrims' perception about influenza vaccine, but these data were not collected. Finally, our findings may not be generalisable to ordinary travellers due to the distinctive characteristics of Hajj pilgrims and the religious nature of the event.

In summary, this survey shows that many more Australian pilgrims (89%) received influenza vaccine in 2012 perhaps due to a combination of tour group leaders' recommendation, awareness about the availability of influenza vaccine and an increased perception of risk, even though misperceptions about influenza vaccine were frequent. Targeted education of pilgrims, and maximizing the preventive role of tour group leaders underpinned by good continuing surveillance could improve the vaccination acceptance and rates.

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## **Declaration of Interests**

LH and RB has received financial support from pharmaceutical companies CSL, Sanofi, GSK, Novartis, Roche, and Wyeth to conduct influenza control research and attend and present at scientific meetings. Any funding received is directed to an NCIRS research account at The Children's Hospital at Westmead and is not personally accepted by LH or RB.

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JNVT has received funding to attend influenza related meetings, lecture and consultancy fees and research funding from several influenza antiviral drug and vaccine manufacturers. All forms of personal remuneration ceased in September 2010, but research funding from

GlaxoSmithKline, Astra-Zeneca and F Hoffmann-La Roche is on-going. He is a former employee of SmithKline Beecham plc. (now GlaxoSmithKline), Roche Products Ltd (UK) and Aventis-Pasteur MSD (now Sanofi-Pasteur MSD), all prior to 2005, with no remaining pecuniary interests by way of share holdings, share options and pension rights.

Other authors have no conflict of interest to declare.



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**Figure legend**

**Figure 1** Flow diagram showing recruitment of participants

**Table 1** Summary of studies showed influenza vaccine uptake among pilgrims from different countries in different Hajj years.

<b>Authors</b>	<b>Study settings</b>	<b>Study type</b>	<b>Study year</b>	<b>Influenza vaccine uptake %</b>
Meysamie et al <sup>11</sup>	Pre-travel clinical and para-clinical assesment followed up by a survey during Hajj in Mecca	Cohort	2004 and 2005	88
Rashid et al <sup>9</sup>	British Hajj Delegation (BHD) clinics in Mecca and Mina	Cohort	2005	28
Alborzi et al <sup>13</sup>	Post-travel surveillance among pilgrims arrived from Hajj at Shiraz airport	Cross-section	2006	86
Rashid et al <sup>12</sup>	BHD clinics in Mecca and Mina	Cohort	2006	37
Rashid et al <sup>12</sup>	National Guard Health Affairs clinics in Mina	Cohort	2006	4
Gautret et al <sup>10</sup>	Pre-travel and post-travel surveys for the same participants in travel clinics followed up by telephone interview	Cohort	2007	27
Balaban et al <sup>6</sup>	Pre-travel and post-travel surveys for the same participants in travel clinics, mosques, community clinics and at airport	Cohort	2009	63
Gautret et al <sup>7</sup>	Pre-travel and post-travel surveys for the same participants in travel clinics followed up by telephone interview	Cohort	2009	97
Memish et al <sup>8</sup>	2 separate surveys during arrival and departure of pilgrims at Jeddah airport	Cross-section	2009	53

**Table 2** Influenza vaccine uptake rates according to gender, residential address, risk status and previous years' vaccination

<b>Characteristics</b>	<b>Vaccine uptake in 2011 n (%)</b>	<b>Vaccine uptake in 2012 n (%)</b>	<b>p Value*</b>
<b><i>Gender</i></b> <sup>†</sup>			
Male	138 (59)	297 (88)	<0.01
Female	136 (73)	162 (89)	<0.01
<b><i>State of residence</i></b> <sup>‡</sup>			
New South Wales	123 (57)	196 (91)	<0.01
Other states including Victoria	155 (72)	241 (89)	<0.01
<b><i>Age and risk status</i></b>			
'At-risk'	66 (73)	93 (93)	<0.01
'Not at-risk'	212 (62)	383 (88)	<0.01
Age ≥65	22 (73)	31 (94)	<0.01
Age <65 with chronic medical conditions	43 (73)	58 (92)	<0.01
Age <65 without chronic medical conditions	207 (63)	366 (89)	<0.01
<b><i>Tour groups</i></b>			
Pilgrims in tour group 'A' <sup>§</sup>	41 (39)	104 (94)	<0.01
Pilgrims in 'other tour groups'	237 (73)	359 (89)	<0.01

\*p value is for the difference in vaccine uptake between 2011 and 2012, calculated by Chi-square test.

<sup>†</sup>Gender was not known for 9 subjects in 2011 and 17 in 2012.

<sup>‡</sup>State of residence was not reported for 39 pilgrims.

<sup>§</sup>Hajj tour group 'A' is a group with the largest proportion of the respondents.

**Table 3** Reported reasons for not receiving influenza vaccine in 2011 and 2012

<b>Reasons for not receiving the vaccine</b>	<b>Respondents n* (%) in 2011</b>	<b>Respondents* n (%) in 2012</b>	<b>p Value†</b>
Reliance on natural immunity	50 (33)	11 (26)	0.4
Believing that they rarely get influenza	28 (18)	12 (29)	0.1
Too busy to get the vaccine	20 (13)	7 (17)	0.5
Not aware of the availability of flu vaccine	19 (12)	0	0.02
Don't like injections	13 (8)	0	0.05
Fear of side effects	10 (7)	1 (2)	0.3
Believing that the vaccine doesn't work	10 (7)	2 (5)	0.7
Thought that vaccine gives flu	9 (6)	2 (5)	0.8
They had to pay	9 (6)	1 (2)	0.4
They took it in previous years year	8 (5)	2 (5)	0.9
Got flu from the vaccine in the past	6 (4)	0	0.2
Other reasons	14 (9)	1 (2)	0.1

\*Participants reported more than one reason.

†Calculated by Chi-square test.



**Table 4** Reasons for receiving influenza vaccine in 2012

<b>Reasons for being vaccinated</b>	<b>Respondents* n (%)</b>
Recommended by Hajj tour group	311 (65)
Because flu is a serious disease	162 (34)
Recommended by doctor	144 (30)
Recommended by a friend	55 (12)
To protect family	47 (10)
Vaccine is offered at workplace	43 (9)
Working with vulnerable people	31 (7)
Considering themselves “at-risk”	17 (4)
Because of travel to Hajj	15 (3)
Other reasons	12 (3)

\*Most participants reported more than one reason.