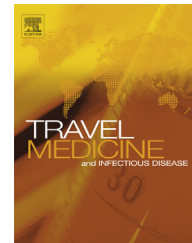




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COMMENTARY

# French Hajj pilgrims' experience with pneumococcal infection and vaccination: A knowledge, attitudes and practice (KAP) evaluation



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Received 8 December 2014; received in revised form 7 February 2015; accepted 9 February 2015

Available online 18 February 2015

## KEYWORDS

Hajj;  
KAP;  
Vaccination;  
*Streptococcus pneumoniae*

**Summary** *Background:* Transmission of respiratory infections poses a major public health challenge during the Hajj and Umrah in the Kingdom of Saudi Arabia. Acquisition of *Streptococcus pneumoniae* during Hajj has been studied in the past and recommendations for vaccination against *S. pneumoniae* have been made for high risk groups.

*Methods:* The purpose of this study was to assess the knowledge and attitudes of French Hajj pilgrims towards pneumococcal vaccination. Adult pilgrims departing from Marseille, France to Mecca for the 2014 Hajj season were administered a face-to-face questionnaire to ascertain their knowledge and attitudes towards pneumococcal vaccination before departing for Hajj.

*Results:* A total of 300 participants took part. Their overall knowledge about the severity of pneumonia and the existence of the vaccine was very low. Out of 101 participants who had an indication for pneumococcal vaccination, irrespective of their travel status, only 7% were advised to have the vaccine by their general practitioner.

*Conclusions:* These results reinforce the need for better dissemination of information either before or during the pre-travel counselling. The visit to the travel clinic for receiving the

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mandatory meningococcal vaccination for Hajj is a good opportunity to update routine immunizations, including pneumococcal vaccination.

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## 1. Introduction

Each year, more than 10 million pilgrims from over 180 countries arrive in Mecca, Kingdom of Saudi Arabia (KSA), for the Hajj or Umrah, presenting a major public health challenge in terms of transmission of infectious diseases, notably respiratory infections [1]. Pneumonia is the leading cause of hospitalization and intensive care unit admissions during the Hajj [2]. *Streptococcus pneumoniae* was isolated in 37% of patients with severe community-acquired pneumonia during the Hajj in Saudi hospitals [3]. Attack rates of respiratory symptoms among French Hajj pilgrims have been shown to be as high as 90% [4]. Nasal carriage of *S. pneumoniae* among French Hajj pilgrims, as reported in 2012, was 20% before leaving the KSA as opposed to 7% before departing from France [5]. In 2013, 62% of the French Hajj pilgrims tested positive for *S. pneumoniae* in throat samples following participation to the Hajj and 36.3% of them had acquired the infection during their stay in KSA [4]. Evidence for the importance of pneumococcal disease at the Hajj is summarized in Table 1.

Currently, the French Ministry of Health recommends pneumococcal vaccination to high risk patients such as individuals with immunocompromised conditions, chronic respiratory diseases, chronic cardiac diseases, chronic renal diseases, diabetes, chronic liver diseases and cochlear implants [6]. In addition, it recommends that Hajj pilgrims aged 60 and over be vaccinated independently of

their medical status [7] in line with the recommendations of some experts [8].

This study aimed to evaluate the knowledge and attitudes and practices (KAP) of French Hajj pilgrims with regard to pneumococcal vaccination.

## 2. Material and methods

### 2.1. Study participants

Travellers who were participating in the Hajj 2014 season were recruited from two different settings. Most of them were recruited over a period of 5 weeks, from 11th August 2014 to 12th September 2014, during their visit to a travel clinic at Hospital Nord, Marseille for their pre-travel counsel and vaccination. In addition, some participants were recruited during a pre-travel preparation session arranged by a specialized travel agency in Marseille, which organizes travel to Mecca. This meeting was spread over 2 Sundays, on 7th September and 14th September 2014 respectively.

### 2.2. Questionnaire administration

The questionnaire was administered during a face-to-face interview by a French-speaking or Arabic-speaking medical intern, as required. The first part of the questionnaire contained all demographic details including age, sex,

**Table 1** Summary of previous data on importance of pneumococcal pathogen among Hajj pilgrims.

Hajj season	Setting	Number of individuals	Result	Reference
2002	4 hospitals in Mina and Arafat	160 inpatients	39.4% pneumonia	[14]
2003	7 hospitals in Mina and Arafat	575 inpatients	19.7% pneumonia	[15]
2004	7 hospitals in Mina and Arafat	140 inpatients (intensive care units only)	22.0% pneumonia	[16]
2005	1 hospital in Mecca	699 inpatients	25.6% pneumonia	[17]
2009–2010	15 hospitals in Mecca, Mina, Arafat and Medina	452 inpatients (intensive care units only)	27.2% pneumonia	[18]
2013	15 hospitals in Mecca, Mina, Arafat and Medina	38 inpatients with bilateral pneumonia (intensive care units only)	31.6% confirmed <i>Streptococcus pneumoniae</i> infection	[3]
2012	Cohort survey (French pilgrims)	137	19.5% nasal carriage of <i>Streptococcus pneumoniae</i> following the Hajj (67.6% acquisition rate)	[5]
2013	Cohort survey (French pilgrims)	129	60.0% <i>S. pneumoniae</i> throat carriage of following the Hajj (36.3% acquisition rate)	[4]

residence, country of birth and year of immigration (when appropriate). No personal identifications were recorded and the answers were kept anonymous. The second part had medical history including chronic health conditions, medications and past vaccinations. The third part had 6 questions that were designed to evaluate the knowledge and attitudes of the pilgrims towards pneumococcal vaccination. Considering past experience and the level of education of the consulting pilgrims, the responses were limited to yes, no or don't know.

### 2.3. Statistical analysis

Statistical analyses were performed using STATA 12 software (Stata Corporation, College Station, TX, USA). We performed separate analyses for the high risk and the not-at-risk groups. Age >60 years and presence of one or more chronic diseases (diabetes, chronic cardiac diseases, chronic respiratory diseases, chronic renal diseases or immunocompromised situations) were considered as indications for vaccination. Shapiro–Wilk test was used to determine normality of the data. Comparisons between different groups were done using Pearson's Chi-square test and Fisher's exact test, as appropriate. P values of 0.05 or less were considered significant. Multinomial logistic regression was performed using sex and age as confounding factors.

### 3. Results

Two hundred and twenty nine people, participating in Hajj, attended the travel clinic at Hospital Nord and agreed to participate in the study. In addition, 98 people were approached during the pre-travel preparation session. Among them, 71 were included in the study and 27 either refused to participate or were already recruited in the study at the hospital. In total, 300 individuals were thus included in the study, with a male-to-female sex ratio of 1:1 and a mean age of 58.5 years (SD: 14.09; range, 22–85 years) (Table 2). About 13% were born in France and the others were immigrants, mainly from North Africa. The average duration of stay for immigrants in France was 37 years (Range: 1–65 years). One hundred and thirty-three (44%) of the participants had at least one chronic comorbidity; with hypertension and diabetes being the most frequent. In addition, 79% of the participants were either obese or over-weight.

Out of 300 study participants, 194 (64.7%) had at least one risk factor warranting pneumococcal vaccination in the context of the Hajj; of whom 13 (6.7%) reported receiving a pneumococcal vaccination in the past 5 years. Sex was evenly distributed between those having risk factors and those not having risk factors for pneumococcal diseases ( $p > 0.05$ ). Age was unevenly distributed between the two groups ( $p < 10^{-3}$ ) with the risk group having a higher mean age of 65.7 years (95% CI 64.5–67.1) than the not-at-risk group of 45.2 (95% CI 43.0–47.4).

The overall knowledge of participants about the severity of pneumonia and the existence of a vaccine was low. Even though one-third of them (33.7%) had an indication for pneumococcal vaccination according to the French guidelines, independent of their participation in the Hajj, only

**Table 2** Demographics, chronic medical conditions and indication for pneumococcal vaccination for pilgrims in preparation for the Hajj.

Characteristic	n (%)
Sex (N = 300)	
Male	146 (48.7)
Female	154 (51.3)
Mean age (N = 300)	58.5 years (SD: 14.09; min 22; max 85)
Age >60 years	169 (56.5)
Country of birth (N = 300)	
Algeria	140 (48.8)
Morocco	66 (23.0)
Tunisia	42 (14.6)
France	38 (13.2)
Other <sup>a</sup>	14 (0.4)
Mean time of residence in France for migrants (N = 264)	37 years (min 1; max 65)
First participation to the Hajj (N = 300)	205 (68.6)
Chronic medical conditions (N = 300)	
Diabetes	62 (20.7)
Hypertension	77 (25.7)
Chronic cardiac conditions	26 (8.7)
Chronic respiratory conditions	24 (8.0)
Deficient immunity/drugs lowering immunity	9 (3.0)
Chronic renal conditions	2 (0.7)
Others <sup>b</sup>	1 (0.3)
Having indication for pneumococcal vaccine (not specifically in the context of Hajj (N = 300)	98 (32.7)
Indication for pneumococcal in the context of the Hajj (N = 300)	194 (64.7)

<sup>a</sup> Comoros 4; Mauritius 2; Nigeria 2; Senegal 2; Egypt 1; Germany 1; Guinea Conakry 1; Madagascar 1.

<sup>b</sup> Asplenia, organ transplantation.

7% were offered the vaccination by their general practitioner (Table 3). Three of the questions had significantly different responses between the risk and the not-at-risk group. However, when multinomial logistic regression was performed with age group below and above 65 years as one of the covariates, the differences became insignificant for two of those questions. After adjusting for covariates, response to the question "Did your general practitioner ever recommend vaccination for pneumococcus?" was significantly different in both groups ( $p = 0.039$ ). Those in the risk group had the vaccination recommended to them more often than those in the not-at-risk group.

### 4. Discussion

The overall lack of knowledge about pneumococcal infection at Hajj in French pilgrims corroborates results obtained from a survey of Australian pilgrims in 2013 [9]. We

**Table 3** Comparison of response to the KAP questions between the groups with and without risk factors for pneumonia.

	Having risk factors, no. (%)				Not having risk factors, no. (%)				P value
	Yes	No	Don't know	Total	Yes	No	Don't know	Total	
Are you aware about the existence of pneumococcal vaccination? (N = 288)	45 (15.6)	31 (10.8)	109 (37.8)	185 (64.2)	28 (9.7)	26 (9.0)	49 (17.0)	103 (35.8)	0.12
If yes, do you think the vaccine is efficacious? (N = 70)	28 (40.0)	9 (12.9)	7 (10.0)	44 (62.9)	12 (17.1)	5 (7.1)	9 (12.9)	26 (37.1)	0.18
Do you think pneumococcal pneumonia is a grave disease? (N = 287)	99 (34.5)	16 (5.6)	69 (24.0)	184 (64.1)	74 (25.8)	7 (2.4)	22 (7.7)	103 (35.9)	0.010
Do you think you are at risk of contracting the disease? (N = 286)	62 (21.7)	41 (14.3)	80 (28.0)	183 (64.0)	42 (14.7)	23 (8.0)	38 (13.3)	103 (36.0)	0.44
Do you think the vaccine for pneumococcus is same as the vaccine for influenza? (N = 287)	25 (8.7)	56 (19.5)	103 (35.9)	184 (64.1)	10 (3.5)	50 (17.4)	43 (15.0)	103 (35.9)	0.010
Did your general practitioner ever propose vaccination for pneumococcus? (N = 287)	14 (4.9)	130 (45.3)	40 (13.9)	184 (64.1)	5 (1.7)	88 (30.7)	10 (3.5)	103 (35.9)	0.017

observed in 2013, a similar lack of knowledge about Middle East respiratory syndrome among French pilgrims [10] that was also comparable to the Australian data [9]. These results reinforce the need for better dissemination of information either during the pre-travel counselling or at the entry point of KSA [11]. Tour leaders may also play a significant role in promoting vaccination [12].

In our survey, the low rate of vaccination against pneumococcus among pilgrims prior to consultation at our specialized clinic is similar to that observed here in 2010 [13], 2011 and 2013 (unpublished data).

Pneumococcal pathogens play a significant role in the infections reported among Hajj patients hospitalized in KSA and *S. pneumoniae* carriage is frequently acquired by pilgrims following participation to the Hajj (Table 1). An estimated one third of Hajj pilgrims are at risk of pneumococcal disease either by virtue of age or pre-existing medical conditions and consideration should be given to vaccinating high risk pilgrims against pneumococcal disease [2]. The new generation of conjugate vaccine has proven effective in the prevention of severe pneumococcal disease. It is well tolerated. Local reactions tend to be mild and short lived [2]. Data on the preventive effect of pneumococcal vaccination in the context of Hajj is lacking, and further epidemiological research is needed to assess the likely benefit of vaccinating Hajj pilgrims against pneumococcal disease and to allow Saudi Arabian Ministry of Health to issue appropriate recommendations regarding health interventions for Hajj pilgrims [8].

## 5. Conclusions

The consultation in the travel clinic for mandatory meningococcal vaccination for Hajj provides a good opportunity

to update routine vaccination including pneumococcal vaccination in this specific population comprising a high proportion of individuals at-risk of pneumococcal disease.

## Conflict of interest

All authors declare no conflict of interest.

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