# Effectiveness of an education health programme about Middle East respiratory syndrome coronavirus tested during travel consultations

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# Effectiveness of an education health program about Middle East respiratory syndrome coronavirus (MERS-CoV) tested during travel consultation

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Running title: Education health program about MERS-CoV tested during travel consultation

**Key words**: education health program, MERS-CoV, Middle East Respiratory Syndrome coronavirus, international travel, pilgrims.

Word count: 1598

CONFLICT OF INTEREST: NONE
SOURCES OF FUNDING: NONE

Caroline MIGAULT, Lukshe KANAGARATNAM and F. BANI-SADR designed the study, interpreted the data, and wrote the article.

Magali THIBAULT, Astrid LEGALL, Yohan NGUYEN, Aurélien GILTAT, Maxime HENTZIEN and Caroline MIGAULT collected the data.

All authors contributed to writing of the manuscript. All authors read and approved the final version for submission.

**Abstract**

Objective

We aimed to evaluate the level of knowledge of Middle East respiratory syndrome coronavirus (MERS-CoV) among Hajj pilgrims before and after an education health program during international vaccine consultations in France.

Study Design

A cross-sectional study was performed in the consultation for travel medicine and international vaccination in Reims University Hospital between July 2014 and October 2015.

Methods

Consecutive adults (>18 years) who attended for pre-Hajj meningococcal vaccination were eligible to complete an anonymous questionnaire with closed answers to evaluate their level of knowledge about MERS-CoV. In order to evaluate the effectiveness of the information given during the consultation, the same questionnaire was completed by **Hajj pilgrim** before and after the consultation where the information about MERS-CoV was provided.

Results

Among 82 Hajj pilgrims adults enrolled in the study, less than 25% were aware of the routes of transmission, symptoms and preventive behaviours to adopt abroad, or in case of fever. Pilgrims had a higher rate of correct responses on each question at the time they completed the second questionnaire, as compared to the first, with 11 out of 13 questions answered significantly better after delivery of educational information about MERS-CoV. However, although the rate of correct answers to the questions about routes of transmission, symptoms, preventive behaviours to adopt in case of fever, and time delay between return and potential MERS-CoV occurrence increased significantly after receiving the information, the rates remained below 50%.

## Conclusion

Information given during travel consultations significantly increases the general level of knowledge; but not enough to achieve epidemic control.

## Introduction

Since the emergence of Middle East respiratory syndrome coronavirus (MERS-CoV) from the Kingdom of Saudi Arabia in 2012, nearly 2,200 cases of MERS have been identified in the Arabian Peninsula and among visitors to the region, with a case fatality rate of around 39% [1,2]. Significant epidemics among families and healthcare providers have been reported [1,2], and the intra-family transmission rate has been estimated at 4% [3]. **There is some evidence that education programs could improve knowledge of infectious diseases transmission and increase subsequent engagement in preventive behaviors [4,5]. As Hajj pilgrims represent a population who are at risk of returning to their country of residence with MERS-CoV, it is important to target this groups for educational initiatives, with a view to minimizing the risk of contracting and spreading MERSCoV.** ~~While secondary cases can be prevented by an education program, Hajj pilgrims represent a population who are at risk of returning to their country of residence with MERS-CoV~~ [3,6,7]. In 2014, the WHO published travel advice on MERS-CoV for pilgrimages and recommended that each country inform pilgrims. In France, the lay press and media have relayed information about MERS-CoV. We aimed to evaluate the level of knowledge of MERS-CoV among Hajj pilgrims before, and after an educational health program delivered during international vaccine consultations.

## Methods

A cross-sectional study was performed in the consultation for travel medicine and international vaccination in Reims University Hospital between July 2014 and October 2015. Consecutive adults (>18 years) who attended for pre-Hajj meningococcal vaccination were eligible to complete an anonymous questionnaire with closed answers to evaluate their level of knowledge about MERS-CoV. The study was approved by the institutional ethics committee of Reims University Hospital under the number 2018-01. Participation was voluntary and without compensation. The

standardized questionnaire recorded information on the participant's gender, age, place of birth, educational level (**high school certificate** yes/no). **The second part of questionnaire concerned knowledge about MERS-CoV. All questions are listed in Table 1.** ~~The second part of questionnaire concerned knowledge about : the geographical area at risk for MERS-CoV contamination, the transmission routes of the disease (direct contact with camels and person-to-person contact), symptoms, severity of the disease, availability of treatment or vaccines, preventive measures to reduce the possibility of contracting and/or spreading illness during travel and after return – for example, in case of fever and respiratory symptoms (e.g. cough or shortness of breath), within 14 days after travelling, cover your mouth with a tissue when you cough or sneeze, call ahead to a healthcare provider and mention the recent travel, and avoid contact with other people until medical care has been received, to reduce the possibility of spreading the illness to others.~~

In order to evaluate the effectiveness of the information given during the consultation, the same questionnaire was completed by each **Hajj pilgrim** before and after the consultation where the information about MERS-CoV was provided. The information given to the **Hajj pilgrims** was provided by a nurse, using an information leaflet. **The last one defined MERS-CoV and detailed the geographical area at risk for MERS-CoV contamination, the different transmission routes of the disease, symptoms, severity of the disease, availability of treatment or vaccines, preventive measures to reduce the possibility of contracting and/or spreading illness during travel and after return (annexe 1). All the answers to the questionnaire were given in the information leaflet.** Two nurses participated in the study and both received the same instructions. The questionnaire and the information leaflet were first tested on non-healthcare providers to assess their intelligibility. Additional explanations were also given on top of the **routine information usually delivered** ~~usual other explanations given~~ during the travel medicine consultation. If the **Hajj pilgrim** was not able to read or understand French, they were assisted by a healthcare provider and an unofficial translator.

The responses to the two questionnaires (before and after) were then compared. A question was

considered to be answered correctly if the correct answer (for questions with a single answer) or all the correct answers (for answers with multiple correct options) were given. Quantitative variables are presented as mean values with standard deviation (SD). Qualitative variables are presented as number and percentage. Responses before and after explanations were compared with the Mc Nemar test. A p-value of 0.05 was considered statistically significant. All analyses were performed using SAS version 9.4 (SAS Institute Inc., Cary, NC, USA).

## Results

~~All 82 adult Hajj pilgrims who attended a travel medicine and international vaccination consultation to receive meningococcal vaccination during the study period were enrolled. No eligible pilgrim refused to participate.~~ **Among 82 adult Hajj pilgrims who attended a travel medicine and international vaccination consultation to receive meningococcal vaccination during the study period, no eligible pilgrim refused to participate**. The mean age was 54.8 ± 14.5 years; 53% were women. A large majority of the pilgrims (89%) were able to understand French. Sixty eight percent did not have a high level of education.

The responses to the questionnaire before and after receiving information about MERS-CoV are reported in Table 1. At the time they completed the first questionnaire, only 32% of pilgrims namely know MERS-CoV disease, and 52% of them know the geographical area at risk. More than 50% of them were aware of the contagiousness and severity of the illness. In contrast, pilgrims had poorly knowledge of the routes of transmission (4%), the symptoms (7%) and the preventive behaviours to adopt either abroad (22%), in case of fever (17%) and after return (11%).

Pilgrims had a higher rate of correct responses on each question at the time they completed the second questionnaire, as compared to the first, with 11 out of 13 questions answered significantly better after delivery of educational information about MERS-CoV. However, although the rate of correct answers to the questions about routes of transmission, symptoms, preventive behaviours to adopt in case of fever, and time delay between return and potential MERS-CoV occurrence increased significantly after receiving the information, the rates remained below 50%. The absence of available vaccine or specific treatment was also poorly known, with only 23% and 24% of correct answers respectively, increasing to 76% and 67% respectively after the delivery of information.

**Finally, the rates of correct answers differs according level of education (having high level of education yes versus no). For the first questionnaire, pilgrims with high level of education (n=23) had significantly higher correct answers for 3 questions (is it contagious? (70 vs 42%;**

**p=0.03, is it a serious disease? (78 vs 52%; p=0.03 and is this disease respiratory, cardiac or genetic? (70 vs 44%; p=0.04). For the second questionnaire, the pilgrims with high level of education pilgrims had higher correct answer for only one question (On your return :No special measures required; I must take precautions for the period during which I could develop disease symptoms; I can develop the disease 2 weeks after my return? 2 months after my return?) (57 versus 20%; p=0.002).**

## Discussion

This study shows that educational disease-specific information delivered during travel vaccine consultations can help improve the level of knowledge about MERS-CoV among **Hajj** pilgrims consulting for vaccination prior to travel.

At the time of the study, the topic of MERS-CoV and its risk of transmission were extensively covered by the media because of the epidemic in Saudi Arabia. Thus, it was expected that a large portion of the pilgrims would have been informed via the traditional media. Although only 32% of the pilgrims stated that they know the exact name of MERS-CoV, most of them knew about the geographical area at risk (52%), the contagiousness (51%), the severity (61%) and the respiratory features (55%) of the illness. This discordance could probably be explained by the fact that pilgrims may have heard of the epidemic in Saudi Arabia even though they did not know the name of the virus. Our results are in line with those of a study performed in 2013 among pilgrims departing from the South of France showing that 65% of them were aware of an ongoing MERS-CoV epidemic in Saudi Arabia [6]. However, the information delivered by the media was insufficient to give pilgrims a high level of knowledge about the routes of transmission (4%), the symptoms (7%) and the preventive behaviours (22%). Furthermore, we noted from our health information delivery that while the preventive behaviours during travel were understood in 60% of cases, the recommended course of action in case of fever (35%) and after return (30%) were less well understood. Similarly,

in a study performed among nursing students in Korea, the authors found a high knowledge level on MERS-CoV (84.4%) but low rates of correct answers regarding preventive behaviours (44.5%)[8]. The unavailability of vaccines was less well known among the pilgrims in our study (24%) than among Saudi Arabian pilgrims (39%) [7].

**This study has some limitations. First, this was a single-centre study and therefore, the study sample may not be representative of Hajj pilgrims in France. Secondly, the rate of knowledge improvement observed in our study could be related in part to the level of education. Indeed, educational achievement is a well known social determinant of health as it is associated with fundamental knowledge and reasoning ability. In our study, a low proportion of pilgrims had a high level of education (32%). Although Hajj pilgrims with a high level of education had significantly higher proportions of correct answers for 3 questions on the first questionnaire, likely linked to better baseline knowledge, they only had more correct answers on one question in the second questionnaire. Furthermore, the rate of correct answers for the recommended course of action in case of fever (48%) and after return (57%) remained low in these pilgrims, despite their level of education. Finally, this remaining low understanding of the recommended course of action in case of fever and after return could be explained by the number of behaviours the pilgrims had to integrate in a short time, regarding both self-medical care and preventive behaviours to avoid spreading MERS-CoV.**

Information targeting the public is the preferred means to implement infection control, and has proven its efficacy in HIV infection, multidrug bacterial resistance, and other infectious disease epidemics [9,12,13]. In our study, poor knowledge about MERS-CoV was observed among adult Hajj pilgrims attending a travel medicine and international vaccination consultation. Information given during this consultation significantly increased the level of knowledge of the pilgrims, but specific knowledge about preventive behaviours to adopt in case of fever, and time delay between return and potential MERS-CoV occurrence remained insufficient (below 50%) suggesting potential difficulties in achieving epidemic control in case of MERS-CoV contamination. Therefore,

improved delivery of specific information remains necessary to increase the level of knowledge about targeted aspects of the disease.

Table 1 – ~~Questions and answers~~ **Knowledge** about MERS-CoV before and after delivery of health information about MERS CoV during international travel and vaccination consultations in Reims University Hospital (N=82)

| Question | Correct Answer(s) | Before<br>N (%) | After<br>N (%) | P |
|---|---|---|---|---|
| **Do you namely** know MERS- CoV?<br>Yes / No | Yes | 26 (32) | 72 (88) | <.0001 |
| Is it contagious?<br>Yes /No | Yes | 42 (51) | 74 (90) | <.0001 |
| Where can one contract this disease?<br>Australia / Japan / Arabian peninsula / India /Latin America | Arabian peninsula | 43 (52) | 75 (91) | <.0001 |
| How can one contract MERS-CoV?<br>From person to person through the air? By touch? From dog or cat to person? From rodent to person? From camel to person? | By air, touch and camel | 3 (4) | 31 (38) | <.0001 |
| Is this disease :<br>Respiratory? Cardiac? Genetic? | Respiratory | 45 (55) | 74 (90) | <.0001 |
| What are the symptoms of MERS-CoV?<br>Chest pain? Cough and shortness of breath? Fever? Diarrhoea? | Chest pain, Cough and shortness of breath, Fever, Diarrhoea | 6 (7) | 8 (10) | 0.48 |
| Do you think it can be a serious disease?<br>Yes / No | Yes | 50 (61) | 73 (89) | 0.0001 |
| Is it more severe in immuno-compromised individuals? Yes / No | Yes | 6 (7) | 9 (11) | 0.26 |
| **What precautions should be taken during and after the pilgrimage?**<br>Hand hygiene? Stay in well-aired places? | Hand hygiene, stay in well-aired places | 18 (22) | 49 (60) | <0.0001 |
| **What should you do if you have fever?**<br>Call a doctor and inform them about your stay? Wear a mask? Inform your relatives? Avoid contact with others? | Call a doctor and inform them about your stay, Wear a mask, Inform your relatives, Avoid contact with others. | 14 (17) | 29 (35) | 0.0018 |
| **On your return** :<br>No special measures required; I must take precautions for the period during which I could develop disease symptoms; I can develop the disease 2 weeks after my return? 2 months after my return? | I must take precautions for the period during which I could develop disease symptoms; I can develop the disease 2 weeks after my return | 9 (11) | 25 (30) | 0.0002 |

| | | | | |
|---|---|---|---|---|
| In your opinion, is there a treatment against MERS- Co? Yes/ No | No | 19 (23) | 62 (76) | <.0001 |
| In your opinion, is there a vaccine to protect against MERs- Cov? Yes/ No | No | 20 (24) | 55 (67) | <.0001 |

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