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Short Communication

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



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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 programme 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 old) 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. To evaluate the effectiveness of the information given during the consultation, the same questionnaire was completed by the Hajj pilgrim before and after the consultation, where the information about MERS-CoV was provided.

Results: Among 82 Hajj pilgrim 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 with the first, with 11 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.

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Introduction

Since the emergence of Middle East respiratory syndrome coronavirus (MERS-CoV) from the Kingdom of Saudi Arabia in 2012, nearly 2200 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 intrafamily transmission rate has been estimated to be 4%.³ There is some evidence that education programmes could improve knowledge of infectious disease transmission and increase subsequent engagement in preventive behaviours.^{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 group for educational initiatives, with a view to minimise the risk of contracting and spreading MERS-CoV.^{3,6,7} In 2014, the World Health Organisation 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 programme 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 old) 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 standardised questionnaire recorded information on the participant's gender, age, place of birth and educational level (high school certificate yes/no). The second part of the questionnaire concerned knowledge about MERS-CoV. All questions are listed in [Table 1](#).

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 of MERS-CoV contamination, the different transmission routes of the disease, symptoms, severity of the disease, availability of treatment or vaccines and preventive measures to reduce the possibility of contracting and/or spreading illness during travel and after return (see [supplementary material](#)). 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 during the travel

medicine consultation. If the Hajj pilgrims were 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 questions with multiple correct options) were given. Quantitative variables are presented as mean values with standard deviation. Qualitative variables are presented as numbers and percentages. Responses before and after explanations were compared using McNemar's 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

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 poor 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 with the first, with 11 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 differ according to the level of education (having high level of education, yes versus no). For the first questionnaire, pilgrims with a high level of education ($n = 23$) had significantly more 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 a high level of education had more correct answers 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%; $P = 0.002$).

Table 1 – 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 [N (%)]	After [N (%)]	P
Do you namely know MERS-CoV? Yes/No	Yes	26 (32)	72 (88)	<0.0001
Is it contagious? Yes/No	Yes	42 (51)	74 (90)	<0.0001
Where can one contract this disease? Australia/Japan/Arabian peninsula/India/ Latin America	Arabian peninsula	43 (52)	75 (91)	<0.0001
How can one contract MERS-CoV? 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)	<0.0001
Is this disease: Respiratory? Cardiac? Genetic?	Respiratory	45 (55)	74 (90)	<0.0001
What are the symptoms of MERS-CoV? 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? Yes/No	Yes	50 (61)	73 (89)	0.0001
Is it more severe in immunocompromised individuals? Yes/No	Yes	6 (7)	9 (11)	0.26
What precautions should be taken during and after the pilgrimage? 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? 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: 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-CoV? Yes/No	No	19 (23)	62 (76)	<0.0001
In your opinion, is there a vaccine to protect against MERS-CoV? Yes/No	No	20 (24)	55 (67)	<0.0001

MERS-CoV, Middle East respiratory syndrome coronavirus; N, number.

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 before 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, although 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 although 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. Second, 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.^{9,10,11} 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 low understanding of recommended course of actions in case of fever and after return could be explained by the numbers of behaviors the pilgrims had to integrate in a short and same time for both their self-medical care and their preventive behaviours in order to avoid spreading MERS-CoV.

Information targeting the public is the preferred means to implement infection control, and this approach 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.

Author statements

Ethical approval

The study was approved by the Institutional Ethics Committee of Reims University Hospital under the number 2018-01.

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Competing interests

None declared.

Author contributions

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.

REFERENCES

1. Alsahafi AJ, Cheng AC. The epidemiology of Middle East respiratory syndrome coronavirus in the Kingdom of Saudi Arabia, 2012–2015. *Int J Infect Dis* 2016;**45**:1–4.
2. Kim KH, Tandil TE, Choi JW, Moon JM, Kim MS. Middle East respiratory syndrome coronavirus (MERS-CoV) outbreak in South Korea, 2015: epidemiology, characteristics and public health implications. *J Hosp Infect* 2017;**95**:207–13.
3. Hui DS, Azhar EI, Kim Y-J, Memish ZA, Oh M, Zumla A. Middle East respiratory syndrome coronavirus: risk factors and determinants of primary, household, and nosocomial transmission. *Lancet Infect Dis* April 2018;**18**. [https://doi.org/10.1016/S1473-3099\(18\)30127-0](https://doi.org/10.1016/S1473-3099(18)30127-0). Published Online First.
4. Wagman JA, Gray RH, Campbell JC, Thoma M, Ndyababo A, Ssekasanvu J, et al. Effectiveness of an integrated intimate partner violence and HIV prevention intervention in Rakai, Uganda: analysis of an intervention in an existing cluster randomised cohort. *Lancet Glob Health* 2015;**3**:e23–33.
5. Jewkes R, Nduna M, Levin J, Jama N, Dunkle K, Puren A, et al. Impact of Stepping Stones on incidence of HIV and HSV-2 and sexual behaviour in rural South Africa: cluster randomised controlled trial. *BMJ* 2008;**337**: a506–a506.
6. Gautret P, Benkouiten S, Salaheddine I, Belhouchat K, Drali T, Parola P, et al. Hajj pilgrims knowledge about Middle East respiratory syndrome coronavirus, August to September 2013. *Euro Surveill Bull Eur Sur Mal Transm Eur Commun Dis Bull* 2013;**18**:20604.
7. Althobaity HM, Alharthi RAS, Altowairqi MH, Alsufyani ZA, Aloufi NS, Altowairqi AE, et al. Knowledge and awareness of Middle East respiratory syndrome coronavirus among Saudi and Non-Saudi Arabian pilgrims. *Int J Health Sci* 2017;**11**:20–5.
8. Kim JS, Choi JS. Middle East respiratory syndrome-related knowledge, preventive behaviours and risk perception among nursing students during outbreak. *J Clin Nurs* 2016;**25**:2542–9.
9. Robert A, Nguyen Y, Bajolet O, Vuillemin B, Defoin B, Vernet-Garnier V, et al. Knowledge of antibiotics and antibiotic resistance in patients followed by family physicians. *Med Maladies Infect* 2017;**47**:142–51.
10. Winnock M, Bani-Sadr F, Pambrun E, Loko M-A, Lascoux-Combe C, Garipuy D, et al. Prevalence of immunity to hepatitis viruses A and B in a large cohort of HIV/HCV-coinfected patients, and factors associated with HAV and HBV vaccination. *Vaccine* 2011;**29**:8656–60.
11. Bani-Sadr F, Loko M-A, Pambrun E, Winnock M, Carrieri P, Gilbert C, et al. Correlates of HIV sustained viral suppression in HIV/hepatitis C virus coinfected patients: possible role of the hepatitis C virus sustained viral response. *AIDS* 2014;**28**:1155–60.
12. Ruiz-Perez I, Murphy M, Pastor-Moreno G, Rojas-García A, Rodríguez-Barranco M. The effectiveness of HIV prevention interventions in socioeconomically disadvantaged ethnic minority women: a systematic review and meta-analysis. *Am J Public Health* 2017;**107**:e13–21.
13. DiClemente RJ, Salazar LF, Crosby RA, Rosenthal SL. Prevention and control of sexually transmitted infections among adolescents: the importance of a socio-ecological perspective—a commentary. *Publ Health* 2005;**119**:825–36.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.puhe.2019.05.017>.