academicJournals

Vol. 8(9), pp. 152-157, September 2016
DOI: 10.5897/JPHE2016.0842
Article Number: 072114960138
ISSN 2141-2316

http://www.academicjournals.org/JPHE

Journal of Public Health and Epidemiology

Full Length Research Paper

Knowledge and risk perception of the middle-east respiratory syndrome corona virus [MERS-CoV] among Ivoirian hajj pilgrims in 2013

Daouda Coulibaly[1]*, Youssouf Traore[1,3], Anderson K. N'gattia[1], Kouakou E.M. Ahoussou[1,3], Elisée A Kangah[1], Hervé A Kadjo[2], Djibril Cherif[1] and Simplice N Dagnan[1,3]

[1]National Institute of Public Hygiene, Abidjan, Côte d'Ivoire.
[2]Pasteur Institute of Cote d'Ivoire, Abidjan, Côte d'Ivoire.
[3]Faculty of Medical Sciences, Félix Houphouët-Boigny University, Cocody, Abidjan, Côte d'Ivoire.

Received 11 June, 2016; Accepted 19 July, 2016

The 2013 Hajj (Muslims' annual pilgrimage to Mecca) was marked by an outbreak of the middle-east respiratory syndrome coronavirus (MERS-CoV) in Saudi Arabia. In response to this threat, the Ivoirian health authorities carried out campaigns to inform and sensitize future pilgrims. Before departure to Saudi Arabia, a survey was conducted among the pilgrims to assess their level of knowledge about MERS-CoV as well as their perception concerning the risks of the illness. A cross-sectional study was carried out from September 19 to 29, 2013 at the Riviera Golf Mosque in Abidjan, a large gathering point for Hajj pilgrims. The sample size was estimated using a sampling rate of 10% on an estimated population of 4,500 pilgrim's. 460 respondents were selected using simple random sampling. A logistic regression analysis was carried out using SPSS software. Overall, 255 (55.4%) people had knowledge about MERS-CoV. Among those aware of MERS-CoV, 63.5% (162) expressed fear of contracting the illness during the Hajj. In a multivariable analysis, factors significantly associated with the fear of contracting MERS-CoV were sex (OR=0.4; CI 95% = 0.225-0.723) and participation in a MERS-CoV sensitization campaign in Saudi Arabia (OR=1.80; CI 95% = 0.980-3, 270). Ivoirian hajj pilgrims expressed great fear about contracting MERS-CoV.

Key words: Knowledge, middle-east corona virus, Hajj.

INTRODUCTION

The 2013 edition of the Hajj was organized during an outbreak of the middle-east respiratory syndrome coronavirus (MERS-CoV) which was first identified in Saudi Arabia in September 2012 in two patients who showed signs of severe pulmonary disease (Al-Ahdal et al., 2012; Sampathkumar, 2014; Zaki et al., 2012). The disease spread to several countries resulting in a total of 130 cases with 58 deaths by 20 September, 2013 (WHO,

*Corresponding author. E-mail: daocoul@yahoo.fr. Tel: +225 07 98 47 52. Fax: +225 21 24 69 81.

2013a). Many of the cases were reported in Saudi Arabia leading to dual fears of pilgrims contracting the disease and spreading it during the pilgrimage (Cauchemez et al., 2013; Khan et al., 2013; Mailles et al., 2013). In fact, during the hajj, one of the largest mass gatherings in the world, the transmission of respiratory diseases is significant due to overcrowding and population density (Abubakar et al., 2012; Ahmed et al., 2006; Al-Tawfiq et al., 2013). In response to this new threat, the World Health Organization urged states to implement reinforced surveillance and strategies geared towards informing pilgrims on measures to be taken to reduce the risks of infection and transmission of the disease (WHO, 2013b). With reference to this recommendation, the Ivoirian health authorities implemented several strategies to protect future pilgrims (WHO, 2013b). This includes primarily the sensitization and early detection of cases of infection. However, the limited knowledge on the disease, and particularly on its method of transmission, the origin of the virus, the type of exposure that could lead to infection, and the lack of any available vaccine (Pebody et al., 2013; Sampathkumar, 2014; WHO, 2016) made it difficult to effectively implement the recommended measures. The Government of Côte d'Ivoire set up a special organization to allow more than 4000 people to participate in this religious ritual. These Hajj pilgrims thus benefitted from training sessions on religious aspects of the Hajj and health risks related to MERS-CoV. Prior to the pilgrims' departures to Saudi Arabia, scheduled for September 20 to 29, 2013, a survey was conducted among those departing with the aim of assessing the level of knowledge about MERS-CoV as well as their perception of the risk posed by the disease.

METHODOLOGY

A cross-sectional study was carried out from September 19 to 29, 2013 at the Riviera Golf Mosque in Abidjan, a large gathering point for Hajj pilgrims. The sample size was estimated using a sampling rate of 10% and a non-response rate of 10%. Thus, for an estimated population of 4500 pilgrims, 500 people were to be surveyed. A random sampling was conducted using 10 daily lists of pilgrims scheduled for departure compiled by the organizers of the pilgrimage. Fifty people were chosen by random drawing each day for ten days and interviewed using a questionnaire. Each interview lasted about 15 min. Information collected covered participants' socio-demographic characteristics, the level of knowledge about MERS-CoV, and how the risk of contracting the disease is perceived. This information was used to measure the frequencies, estimate the proportions, and determine the odds ratio associated with the fear of contracting the disease and the level of knowledge.

The survey was authorized by the Ministry of Public Health and the Fight against AIDS of the Republic of Côte d'Ivoire, and all participants gave their verbal consent.

Statistical analysis

A logistic regression model was realized to study the factors related to the perception of risk of contracting the disease. The outcome variable was fear of contracting MERS-CoV. Univariate analysis was used to estimate crude odds ratios (OR) and 95% confidence intervals of potential predictors. The Pearson Chi-squared test was applied with a statistical significance of 5%.

In a multivariable analysis, potential predictors (age, gender, level of education, previous participation in the Hajj, sensitization about MERS-CoV, modes of transmission, existence of cases of MERS-CoV infections in Saudi Arabia, possibility of contracting the disease) were introduced as co-variable adjustments in logistics models. Model design was done through digressive selection of the predictors based on the logistic regression. Inclusion and exclusion criteria for independent variables were $p \leq 0.05$ and $p \geq 0.10$. The adequacy of the final model was verified using the Hosmer-Lemeshow test to detect potential outliers by examining residuals. Table 4 shows the adjusted odds ratios and their confidence intervals at 95% as well as the P-values corresponding to the Wald Chi-squared test for each predictor included in the model. Analyses were carried out with the SPSS software version 17.0.

RESULTS

Among the 460 subjects interviewed, 160 (34.8%) were aged 25-54 years, 233 (50.7%) were female, 265 (57.6%) had no education or primary education, 424 (92.2%) spoke Malinke, 260 (56.5%) spoke French and 410 (89.1%) had never participated in the Hajj (Table 1).

With regards to knowledge about MERS-CoV, 255 (55.4%) of respondents were aware of the disease. Information channels were the mosque (54.9%), radio (17.6%), television (14.9%) and print media (2%) respectively. Among those aware, 175 (68.6%) knew about the existence of cases in Saudi Arabia, 50 (19.6%) knew about the modes of transmission of the disease, 93 (36.5%) thought it was possible that they get the disease during the hajj. Measures to prevent the transmission of the disease were not known by 51 respondents (20%) while 79 (31%) knew at least one measure, 42 (16.5%) at least two measures, and 13 (5.1%) at least three measures. 162 respondents (63.5% of those aware of MERS-CoV) expressed fear of contracting the virus.

Results on attitudes and practices with respect to MERS-CoV showed 176 of those interviewed (38.3%) attended the sensitization campaign, 436 (94.8%) asserted that they will wear a nose mask, 444 (96.5%) said that they will wash their hands regularly with soap and water during the pilgrimage. In the event that respiratory signs did appear (cough and sneezing) during the Hajj, 172 pilgrims interviewed (37.4%) asserted that they will cover their mouths and nose with a handkerchief. 118 (25.7%) of respondents, said they will avoid close and prolonged contact with someone who has a cough or sneezes during the pilgrimage (Table 2).

With the univariate analysis, we observed that significant factors associated with the fear of contracting MERS-CoV during the hajj were related to sex and participation in a sensitization campaign on the disease and the possibility of contracting MERS-CoV in Saudi Arabia. In fact, the fear of contracting the disease during

Table 1. Characteristics of respondents (n= 460).

Variable	n	%
Age (years)		
25 - 54	160	34.8
55 - 63	150	32.6
64 and above	150	32.6
Gender		
Male	227	49.3
Female	233	50.7
Level of education		
None and primary education level	265	57.6
Secondary and University education	110	23.9
Coranic school	76	16.5
Language understood		
French	260	56.5
Malinke	424	92.2
Arabic	32	7.0
Number of pilgrims who participated in the Hajj		
No participants	410	89.1
One participant or more	39	8.5

the pilgrimage was less amongst men than in women (crude OR = 0.4; CI 95% = 0.235-0.715). This fear was stronger in pilgrims who had participated in a MERS-CoV sensitization campaign (crude OR = 2.89; CI 95% = 1.634-5.088) as well as among those who believed they could contract the disease in Saudi Arabia (crude OR = 1.77; CI 95% = 0.999-3.133). Other factors including age, the number of hajj pilgrims, the level of education, information about the existence of cases of MERS-CoV in Saudi Arabia, and knowledge about the modes of transmission were not significantly related to the fear of getting the disease (Table 3).

After adjustment, the results were the same as those of the univariate analysis. Therefore, the adjusted odds ratios were 0.4 for gender, 2.62 for participation in a sensitization campaign on MERS-CoV, and 1.80 for the possibility of contracting this disease during the hajj respectively (Table 4).

DISCUSSION

Our study concludes that 55.4% of pilgrims were aware of MERS-CoV before embarking on the Hajj. This lack of information has also been observed in a similar study amongst the French pilgrims of whom about two-third (64.7%) was not informed of the MERS-CoV outbreak in Saudi Arabia (Gautret et al., 2013). Considering the high risk of infection during the pilgrimage (Cauchemez et al., 2013; Khan et al., 2013), recommendations were made by international health organizations to inform and sensitize all pilgrims on preventive measures (Gautret, 2013; WHO, 2013b; Kingdom of Saudi Arabia - Ministry of Health Portal, 2016). The organizers of this large religious mass gathering had to continue to disseminate information and conduct sensitization campaigns during the pilgrimage. The mosques were the best means of disseminating information to the pilgrims, surpassing classic media (television, radio, etc.) in effectiveness. In fact, training sessions, conducted in mosques, on religious practices during the Hajj offered an opportunity to inform pilgrims on health risks and particularly on MERS-CoV. The collaboration between health and administrative authorities in organizing the pilgrimage is essential because it takes into account public health issues when managing large gatherings. The level of knowledge about MERS-CoV in our study is low. In fact, less than 20% of the pilgrims were aware of the disease and knew about the methods of transmission; 20% were not cognizant of the measures to curb transmission and only 31% knew at least one preventive measure. This low level of knowledge related to the health risks during the Hajj (overcrowding, hygiene, heat) shows the magnitude of the risk of contracting MERS-CoV faced by Ivoirian Hajj pilgrims. Prior studies revealed significant risks of respiratory diseases during the pilgrimage (Abubakar et al., 2012; Ahmed et al., 2006; Al-Tawfiq et al., 2013). This low level of knowledge about MERS-CoV can be attributed to the quality of pre-pilgrimage information and sensitization campaigns. To improve this level of knowledge, information campaigns on the disease were conducted by teams of epidemiologists working for the Ministry of Health at the pilgrims gathering point before departure. The feeling of fear expressed by the pilgrims

Table 2. Knowledge about MERS-CoV, attitudes, and practices among pilgrims (n= 460).

Knowledge about MERS-Cov*	Positive answers/Total answers	%
Information channel about MERS-CoV		
Television	38/255	14.9
Radio	45/255	17.6
Print media	5/255	2.0
Mosque	140/255	54.9
Aware of the existence of cases of MERS-CoV in Saudi Arabia	175/255	68.6
Transmission of MERS-CoV through close contact with an infected person	50/255	19.6
Transmission of MERS-CoV through cough	50/255	19.6
The possibility of contracting MERS-CoV during the Hajj	93/255	36.5
Knowledge about the measures to curb the transmission of MERS-CoV during the Hajj**		
Do not know any measures	51/255	20
One or two measures	79/255	31.0
Know at least two measures	42/255	16.5
Know at least three measures	13/255	5.1
Attitudes and practices on MERS-CoV		
Fear of contracting MERS-CoV during the Hajj	162/255	63.5
Participated in at least one sensitization campaign on MERS-CoV	176/460	38.3
Will wear a mask during the pilgrimage	436/460	94.8
Will regularly wash hands with water and soap during the pilgrimage	444/460	96.5
What to do in case cough or sneezing is noticed during the Hajj		
Will limit contact with other pilgrims	34/460	7.4
Will cover mouth and nose with a handkerchief when coughing or sneezing	172/460	37.4
Will wash hands with water and soap after coughing or sneezing	39/460	8.5
Will cover mouth and nose with a mask	24/460	5.2
Will cough or sneeze into the elbows	19/460	4.1
Inform the leader about the situation	117/460	25.4
Nothing	44/460	9.6
What to do when faced with a subject who coughs or sneezes during the Hajj		
Avoid close and prolonged contact with such a person	118/460	25.7
Always wear a mask when around such a person	66/460	14.3
Call the attention of the leader	113/460	24.6
Nothing	41/460	8.9

*Estimates made on subjects informed about MERS-CoV (n=255); **measures: (1) regularly wash hands with soap and water, (2) cover mouth and nose with a handkerchief when coughing or sneezing, (3) avoid contact with someone with acute respiratory infection.

faced with the possibility of infection was real. More than 60% of pilgrims were afraid of contracting the disease and consequently dreaded the 2013 Hajj. The pilgrims who participated in the study were fully aware of the risk; however, they did not give up the hajj since the study was conducted at the gathering point at the airport before departure. The desire to accomplish this pillar of Islam overcame the fear of the possibility of getting MERS-CoV. Their fear was justified because this disease had caused many deaths in Saudi Arabia and was a source of international concern (Al-Ahdal et al., 2012; Assiri et al., 2013a, 2013b; Memish et al., 2013). The study shows that the fear of the disease was real among women and people who participated in a sensitization session, and that those concerned did not exclude the possibility of contracting a MERS-CoV infection during the Hajj. This indicates that for people with this profile, it is necessary to implement actions which could assuage this fear to ensure a smooth Hajj in the event of similar threats during future years. These actions may include sensitization campaigns, providing nasal protection masks, and reinforcing hygiene measures throughout the pilgrimage.

This study had its limitations. In fact, the data were collected only among pilgrims that were part of the government's program (the largest group of Hajj pilgrims

Table 3. Factors associated to the fear of contracting MERS-CoV among the pilgrims: univariate analysis.

Variable	N (%)	OR*	CI** 95%	P-value
Age (years)				0.170
20 - 34	61(60.4)	ref		
35 - 40	56(73.7)	1.84	0.92-3.70	
41 and above	45(68.2)	1.41	0.70-2.85	
Gender				0.001
Male	73(57.5)	0.4	0.235-0.715	
Female	89(76.7)			
Number of pilgrims who participated in the Hajj				0.212
No participation	144(67.6)	1.67	0.742-3.759	
One participation and more	15(55.6)			
Level of education				0.372
None or primary education	77(63.6)	ref		
Secondary or University level	50(66.7)	1.14	0.60-2.19	
Koranic school	31(75.6)	1.77	0.75-4.29	
Participation in a sensitization campaign on MERS-CoV: yes versus no	124(74.3)	2.89	1.634-5.088	<0.001
Existence of MERS-CoV cases in Saudi Arabia: Yes versus no	116(67.8)	1.2	0.664-2.186	0.539
Transmission of MERS-CoV by close contact with an infected person: Yes versus no	34(68,0)	1,08	0555-2.098	0.822
Possibility of contracting MERS-CoV in Saudi Arabia: Yes versus no	69(74.2)	1.77	0.999-3.133	0.049

* = odds ratio unadjusted. **= confidence interval.

Table 4. Adjusted odds ratio derived from the logistic regression highlighting the associations with risk factors and the fear of contracting MERS-CoV among other pilgrims (n= 240; yes=160).

Variable	OR*adjusted	CI95%**	P-value[$]
Gender			
Male	0.40	0.226 - 0.723	0.002
Female	ref		
Participation in a sensitization campaign on MERS-CoV: Yes versus no	2.62	1.454 - 4.715	0.001
Possibility of contracting MERS-CoV in Saudi Arabia: Yes versus no	1.80	0.980 - 3.270	0.058

* = adjusted odds ratio; ** = confidence interval; $ = Wald's test.

in Côte d'Ivoire). Those from private sector organizations were not interviewed.

Conclusion

The fear of contracting MERS-CoV during the 2013 Hajj was significant amongst Ivorian pilgrims. Despite efforts made by Ivoirian authorities, the pilgrims lacked ample knowledge of the disease. Well conducted information and sensitization campaigns before and during the pilgrimage can contribute to improving the level of knowledge of the health risks and the proper implementation of preventive measures. As the hajj is a large annual gathering, health authorities should anticipate known and emerging health risks like MERS-CoV by adopting specific strategies to fight the disease, thereby eliminating concerns and helping pilgrims accomplish their religious duty with serenity.

Conflict of interests

The authors have not declared any conflict of interests.

ACKNOWLEDGEMENTS

This work was supported by the project "Surveillance and response to avian and pandemic influenza by national health authorities outside the United States – Cooperative Agreement Number 1U51/IP000154-03" based on the cooperative agreement between the U.S. Centers for Disease Control and Prevention (CDC) and the Ministry of Health of Côte d'Ivoire. The authors of this study would like to thank all participants. We would also like to extend our gratitude and special thanks to Dr

Serigne N'diaye who agreed to read and review the manuscript.

REFERENCES

Abubakar I, Gautret P, Brunette GW, Blumberg L, Johnson D, Poumerol G, Memish ZA, Barbeschi M, Khan AS (2012). Global perspectives for prevention of infectious diseases associated with mass gatherings. Lancet Infect. Dis. 12:66-74.

Ahmed QA, Arabi YM, Memish ZA (2006). Health risks at the Hajj. Lancet 367(9515):1008-1015.

Al-Ahdal MN, Al-Qahtani AA, Rubino S (2012). Coronavirus respiratory illness in Saudi Arabia. J. Infect. Dev. Ctries. 6(10):692-694.

Al-Tawfiq JA, Smallwood CAH, Arbuthnott KG, Malik MSK, Barbeschi M, Memish ZA (2013). Emerging respiratory and novel coronavirus 2012 infections and mass gatherings/infections respiratoires émergentes, nouveau coronavirus 2012 et rassemblements de masse. East. Mediterr. Health J. 19:S48.

Assiri A, Al-Tawfiq JA, Al-Rabeeah AA., Al-Rabiah FA, Al-Hajjar S, Al-Barrak A, Flemban H, Al-Nassir WN, Balkhy HH, Al-Hakeem RF, Makhdoom HQ, Zumla AI, Memish ZA (2013a). Epidemiological, demographic, and clinical characteristics of 47 cases of Middle East respiratory syndrome coronavirus disease from Saudi Arabia: a descriptive study. Lancet Infect. Dis. 13:752-761.

Assiri A, McGeer A, Perl TM, Price CS, Al Rabeeah AA, Cummings DAT, Alabdullatif ZN, Assad M, Almulhim A, Makhdoom H, Madani, H, Alhakeem R, Al-Tawfiq JA, Cotten M, Watson SJ, Kellam P, Zumla AI, Memish ZA (2013b). Hospital outbreak of Middle East respiratory syndrome coronavirus. N. Engl. J. Med. 369:407-416.

Cauchemez S, Van Kerkhove MD, Riley S, Donnelly CA, Fraser C, Ferguson NM (2013). Transmission scenarios for Middle East Respiratory Syndrome Coronavirus (MERS-CoV) and how to tell them apart. Euro surveillance: bulletin Europeen sur les maladies transmissibles. Eur. Commun. Dis. Bull. 18(24).

Gautret P (2013). Middle East Respiratory Syndrome (MERS) coronavirus. What travel health advice should be given to Hajj pilgrims? Travel Med. Infect. Dis. 11:263-265.

Gautret P, Benkouiten S, Salaheddine I, Belhouchat K, Drali T, Parola P, Brouqui P (2013). Hajj pilgrims knowledge about Middle East respiratory syndrome coronavirus, August to September 2013. Eur. Surveill. 18(41):20604.

Khan K, Sears J, Hu VW, Brownstein JS, Hay S, Kossowsky D, Eckhardt R, Chim T, Berry I, Bogoch I, Cetron M (2013). Potential for the international spread of middle East respiratory syndrome in association with mass gatherings in saudi arabia. PLoS Curr. P 5.

Kingdom of Saudi Arabia - Ministry of Health Portal (2016). Health Regulations for Travellers to Saudi Arabia for Umrah & Pilgrimage (Hajj)-1434 H. Available at: http://www.moh.gov.sa/en/

Mailles A, Blanckaert K, Chaud P, Van der Werf S, Lina B, Caro V, Campese C, Guéry B, Prouvost H, Lemaire X, Paty MC (2013). First cases of Middle East Respiratory Syndrome Coronavirus (MERS-CoV) infections in France, investigations and implications for the prevention of human-to-human transmission, France, May 2013. Middle East Respiratory Syndrome Coronavirus (MERS-CoV), 12(19).

Memish ZA, Zumla AI, Al-Hakeem RF, Al-Rabeeah AA, Stephens GM (2013). Family cluster of Middle East respiratory syndrome coronavirus infections. N. Engl. J. Med. 368:2487-2494.

Pebody R, Zambon M, Watson JM (2013). Novel coronavirus: how much of a threat? We know the questions to ask; we don't yet have many answers. BMJ 346:f1301.

Sampathkumar P (2014). Middle East respiratory syndrome: what clinicians need to know. In Mayo Clin. Proc. 89(8):1153-1158).

World Health Organization (WHO) (2013a). Middle East respiratory syndrome coronavirus (MERS-CoV) summary and literature update – as of 20 September 2013. WHO. Available at: http://www.who.int/csr/disease/coronavirus_infections/update_20130920/en/.

World Health Organization (WHO) (2016). Middle East respiratory syndrome coronavirus (MERS-CoV)WHO. Available at: http://www.who.int/mediacentre/factsheets/mers-cov/en/.

World Health Organization (WHO). (2013b). WHO Statement on the third meeting of the IHR Emergency committee concerning Middle East respiratory syndrome coronavirus (MERS-CoV). 88(40):429-436.

Zaki AM, van Boheemen S, Bestebroer TM, Osterhaus ADME, Fouchier RAM (2012). Isolation of a novel coronavirus from a man with pneumonia in Saudi Arabia. N. Engl. J. Med. 367:1814-1820.