

## Letter to the Editors

# No evidence of MERS-CoV in Ghanaian Hajj pilgrims: cautious interpretation is needed

The study by Annan *et al.* recently published in the *Tropical Medicine and International Health* is, to our knowledge, the first attempt to describe the epidemiology of respiratory infections including Middle East respiratory syndrome coronavirus (MERS-CoV) among African Hajj pilgrims [1]. The study sample was representative of the Ghanaian Muslim population. However, there are limitations to the interpretation of their findings.

Intense crowding, close contact and shared accommodation amplify the risk of transmission of respiratory infections among Hajj pilgrims [2]. Emergence of MERS-CoV during 2012 in Saudi Arabia and neighbouring countries has raised concern about the risk of global spread of MERS-CoV from Hajj [3]. In 2013, the virus spread to a number of countries, including by Umrah performers/returnees [4, 5]. There were several surveillance studies performed at Hajj 2013, referenced by Annan *et al.*, but others not been cited even though they add to our understanding [6, 7] (Table 1).

Studies conducted at Hajj 2013 varied in their methods, study population and sample size, perhaps influencing outcomes. Memish *et al.* [8] and Annan *et al.* [1] recruited, respectively, 5235 and 839 people but provided only airport-based surveillance data. In contrast, studies by Barasheed *et al.* [7] and Benkouiten *et al.* [6] were conducted at the main Hajj locations (Makkah and Mina) during the peak period of Hajj with daily follow-up. Benkouiten *et al.* followed one Hajj travel group ( $n = 129$ ) from Marseille, France, and studied an array of microorganisms including bacteria and uncommon viruses, whereas Barasheed *et al.* selected participants from several travel groups who developed respiratory symptoms; they were closely followed up in a large trial ( $n = 1038$ ) involving Saudi Arabian, Australian and Qatari pilgrims.

All these 2013 studies involved testing nasopharyngeal or nasal samples for MERS-CoV (Benkouiten *et al.* additionally obtained throat swabs), which are less sensitive in detecting MERS-CoV (Table 1); lower respiratory tract samples such as bronchoalveolar lavage and tracheal aspirates result in higher yields [9]; therefore, Annan *et al.*'s notion that there is 'no evidence of MERS-CoV in Hajj pilgrims returning to Ghana, 2013' sounds overenthusiastic [1].

Most studies reported participants' respiratory symptoms; the most commonly reported symptoms were cough, sore throat and fever. Barasheed *et al.* [7] and Benkouiten *et al.* [6] reported the prevalence of influenza-like illness (ILI) among their participants to be 11% and 47%, respectively, but Annan *et al.* [1] did not provide the prevalence of ILI. One caveat is that the definition of ILI differed between the studies (Table 1). The attack rate of laboratory-proven influenza in Annan *et al.*'s study was lower than in other studies (Benkouiten *et al.* and Barasheed *et al.*) (Table 1). This could be influenced by differences in influenza vaccine uptake. For instance, none of the French recruits received the 2013 influenza vaccine, while 69% of the participants in Barasheed *et al.*'s study did. The rate of influenza A was 7% and 4%, respectively [6, 7]. Annan *et al.* [1] reported an attack rate for influenza of 1.1%, but did not provide influenza vaccination data. Of interest, influenza was circulating in tropical Africa during the Hajj 2013 [10].

Thirdly, Annan *et al.* reported that the prevalence of RSV among returned Ghanaian pilgrims was 5.1% (attack rate 1.1) and contrasted that with Benkouiten's prevalence of 0.8% among French pilgrims. However, the higher rate of RSV reported by Annan *et al.* is not unexpected; a higher attack rate of 9% was reported among returned symptomatic UK pilgrims after the Hajj 2005 [11]. Rashid *et al.* also showed that during the same year the attack rate of RSV among UK pilgrims in Makkah was 4% [12]. By contrast, during the subsequent Hajj season, the attack rate of RSV was very low (0.7%) among UK pilgrims and zero among Saudi pilgrims [13] indicating that the circulation of RSV is dependent on various factors such as seasonality, geographical origin of the pilgrims and their close association with children.

Absence of MERS-CoV in nasal or nasopharyngeal samples of pilgrims does not rule out risk of the disease at Hajj. A recent estimate suggests that MERS-CoV has a basic reproduction number ( $R_0$ ) similar to that of SARS, that is 2–6.7 [14], but mathematical modelling studies indicate that the risk of an outbreak is low [15]. Considering the increasing number of Umrah pilgrims in the forthcoming months when the likelihood of a MERS-CoV upsurge is high due to the seasonal pattern of the

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**Table 1** Comparison between respiratory infection studies conducted among Hajj pilgrims in 2013

2013 Hajj studies	Annan <i>et al.</i> [1]	Barasheed <i>et al.</i> [7]	Benkouiten <i>et al.</i> [6]	Memish <i>et al.</i> [8]
Study design	Cross-sectional study (post-Hajj) (prevalence and attack rate)	Randomised controlled trial (attack rate)	Prospective cohort before and at the end of Hajj (prevalence)	Two cross-sectional studies (pre- and post-Hajj) (prevalence of MERS-CoV)
Sample size	839	1038	129	5235
Place of recruitment	Kotoka International Airport, Ghana	Mina, Greater Makkah	Marseille, France, Makkah City and Mina	Jeddah Airport
Participants' country of origin	Ghana	Australia, Saudi Arabia and Qatar	France	International (from 22 countries)
Age range (mean) in years	21–85 (52)	18–75 (35)	34–85 (62)	18–93 (52)
Influenza vaccine uptake	Not reported	69%	None received the 2013 influenza vaccine, but 44% received it in the previous season	22%
ILI	ILI not reported (77.6% [651/839] had respiratory symptoms)	11% (112/1038) ILI was defined as subjective (or proven) fever and at least one respiratory symptom such as cough, sore throat and rhinorrhoea	47.3% (61/129) ILI was defined as the presence of cough, sore throat, and subjective fever	Not reported
Swabs type	Nasopharyngeal	Nasopharyngeal	Paired nasal and pharyngeal	Nasopharyngeal
Laboratory findings	No MERS-CoV	No MERS-CoV	No MERS-CoV	No MERS-CoV
Human rhinovirus (HRV)	Prevalence 16.8% (141/839) Attack rate 17.5% (114/651)	Attack rate 25% (28/112)	Prevalence 14.7% (19/129)	Not recorded
Influenza A	Prevalence 1.3% (11/839) Attack rate 1.1% (7/651)	Attack rate 4% (5/112)	Prevalence 7% (9/129)	Not recorded
Influenza B	Not studied	Attack rate 0%	Prevalence 0.8% (1/129)	Not recorded
RSV	Prevalence 5.1% (43/839) Attack rate 1.1% (7/651)	Attack rate 0%	Prevalence 0.8% (1/129)	Not recorded
Non-MERS corona	Not studied	Attack rate 2% (2/112) (OC43 and 229E)	Prevalence 20.9% (27/129) (16 229E, 5 OC43, 5 HKU1 and 1 NL63)	Not recorded
Parainfluenza	Not studied	Attack rate 2.7% (3/112)	Prevalence 0.8% (1/129)	Not recorded
Dual viral infection	Prevalence 1.9% (16/839) (14 RSV/HRV and 2 Flu A/HRV)	Attack rate 2% (2/112) (HRV/adenovirus and HRV/coronavirus)	Nil	Not relevant

MERS-CoV, Middle East respiratory syndrome coronavirus.

disease [16], surveillance must continue. Accordingly, we continued our study in 2014 and recruited over 2000 pilgrims from Gulf countries and Australia. Preliminary

findings suggest that of 298 Australian pilgrims, only two (0.7%) had symptoms of severe respiratory infection, but none had pneumonia. Virological testing will provide

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further data on the epidemiology of respiratory viruses among Hajj pilgrims. Ongoing active surveillance is mandatory to better understand transmission dynamics of MERS-CoV.

## Acknowledgement

The study conducted by our team [7] was made possible by a National Priorities Research Program grant from the Qatar National Research Fund (a member of Qatar Foundation).

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