

# Risk Factors of Bacterial Meningitis in Makkah during Hajj 1421 H: A Pilot Study.

Annually, more than two million pilgrims gather in Saudi Arabia to perform Hajj. The aim of this study was to investigate the risk factors of meningitis in Makkah during the Hajj season of 1421 H. The study was conducted using a case control approach, in Makkah hospitals during the period from 1–15 Dull Hijjah, 1421 H. Four controls were selected for each case, from the same hospital, matched for age (within five years), sex and hajj status (either hajji or not). Data were collected using a pre-structured questionnaire by interview with cases and controls. All clinically diagnosed and laboratory confirmed cases of meningitis reported to the Health Department in Makkah were included.

During the study period, 23 cases of meningitis (all types) were diagnosed in Makkah hospitals; 92 controls were selected. Among cases there were 8 males (34.8%) and 15 females (65.2%), and among controls there were 32 males and 60 females. Age of cases ranged from one to 70 years with a mean of 34.27 ( $\pm 25.3$ ) years.

Overcrowding, expressed as room density, was significantly associated with meningitis (Table 1). A significant effect of nationality was also noted, such that those from the Indian Subcontinent had the highest risk of acquiring meningitis. No Hajjees from Sub-Saharan Africa developed meningitis during the study period. Other factors, including smoking, vaccination, chemoprophylaxis, place of residence in Makkah, type of accommodation, joining Hamla and socio-economic factors were not statistically significant.

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**Editorial note:** Meningococcal disease is a major health problem in both developing and developed countries.<sup>1</sup> *Neisseria meningitidis* is one of the most common causes of bacterial meningitis worldwide.<sup>2,3</sup> During Hajj,

it causes considerable morbidity and mortality.<sup>4,5</sup>

Overcrowding is an important risk factor<sup>2,3</sup>, which was confirmed in this study. Meningococcal meningitis occurs more commonly among newly aggregated adults under crowded living conditions such as in barracks, institutions, and at mass gatherings<sup>3</sup>, such as during "Hajj" and "Umrah".

The present study did not show a significant association between smoking and meningitis, however, active and passive smoking are known risk factors.<sup>6</sup> While the study revealed that overcrowding and nationality are significant risk factors of meningitis, it was unable to detect the effect of some of the known risk factors. This may be attributed to the small number of cases. However, this study could be considered as a pilot study and further studies are recommended.

## References

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Table 1: Risk Factors of meningitis in Makkah, 1421 H

	Cases No (%)	Controls No (%)	OR	95% CI
<b>Marital status</b>				
Single	11 (47.8)	38 (41.3)	1.3	0.6–2.56
Married	12 (52.2)	54 (58.7)		
<b>Nationality*</b>				
Arab	5 (21.7)	50 (54.3)	1	
South East Asia	3 (13.0)	10 (10.9)	3	0.39-18.21
Indian Subcontinent	13 (56.5)	17 (18.4)	7.65	2.11-30.76
Other	2 (8.7)	15 (16.3)	1.33	0.12-9.19
<b>Hamla joining</b>				
Yes	12 (52.2)	50 (54.3)	0.92	0.33 – 2.51
No	11 (47.8)	42 (45.7)		
<b>Smoking</b>				
Yes	2 (8.7)	4 (4.3)	2.1	0.18 – 15.6
No	21 (91.3)	88 (95.7)		
<b>Vaccination status</b>				
Yes	13 (56.5)	59 (64.0)	0.73	0.26 – 2.03
No	10 (43.5)	33 (36.0)		
<b>Chemoprophylaxis</b>				
Yes	1 (4.4)	6 (6.5)	0.65	0.01 – 5.84
No	22 (95.6)	86 (93.5)		
<b>Room density</b>				
Mean (SD)	0.48 (0.21)	0.33 (0.21)		P = 0.003
<b>Total</b>	23 (100)	92 (100)		
* $\chi^2$ Linear trend = 4.223, P = 0.04				