

### Mass gathering health: *Considering triggering factors associated with acute cardiovascular events using linked registry data*

To the Editor

We have read with great interest the original research article entitled “Incidence and impact of stroke during Hajj: Results of 2015 Hajj stroke registry” by Almekhlaf MA et al published recently in *Neurosciences* journal.<sup>1</sup> We would like to commend the authors for this noteworthy and unique research article, which we believe contributes towards the literature regarding the mass gathering health issues. Mass gatherings have been associated with high rates of morbidity and mortality from communicable as well as non-communicable diseases.<sup>2,3</sup> Also, occurrences of injury related to natural, non-intentional, and intentional causes add extra layer of complexity in mass gathering health and thus poses multifaceted public health challenges.<sup>2</sup> Hajj is one of the largest annually recurring mass gathering in the world. The attendance was more than 2 million in 2017.<sup>4</sup> Despite the mass gathering during the Hajj, not many studies have been conducted around the issue of non-communicable diseases related to Hajj. In the current study, the authors built a registry of all acute stroke patients admitted to 6 hospitals in the city of Makkah during the 2015 Hajj season. Any patients with acute ischemic or non-traumatic haemorrhagic stroke were included with a prospective case-identification approach during that period. Stroke diagnosis was confirmed by imaging and relevant clinical and demographic information were collected. The quality of the data collected was ensured by neurologist supervision, instantaneous data entry, and systematic checks. A total of 186 stroke cases occurred during the study period among 2,084,238 pilgrims. Among the stroke cases, 17.2% were Saudis, 10.2% were Indians, 5.9% were Indonesians, and 4.3% were Egyptians and Pakistanis each. The elderly people are more likely to suffer from stroke (mean age at the time of stroke was 60.8 ± SD 12.9 years) and most commonly reported risk factors were hypertension (57%) and diabetes mellitus (40.9%). The authors reported that only 5 patients received intravenous tissue plasminogen activator (IV tPA) and the most common cause for not receiving tPA was delay in arrival to the hospital (72.2%). Twenty-one patients (11.3%) died during hospitalization. One important observation that was described in **Table 4** (reasons for not giving tPA, n=138) will require further exploration

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to improve the service towards the stroke patients with the objective of improved outcomes. To identify the factors related to the delay in hospitalization for acute cardiovascular events<sup>5,6</sup> (e.g. stroke) will be of immense contribution to the health service research.

In addition to all the conventional risk factors that Almekhlaf MA et al have explored in this study, identifying triggering factors of stroke (which may have triggered the acute event),<sup>7</sup> would be an important aspect that might shed light in potential stroke-preventive activities during Hajj. Linking the Hajj Stroke Registry to external databases (e.g. weather parameters) will open up the possibility to study the stroke triggering factors in detail. The continuation of data collection for updating the “Hajj Stroke Registry” will be a very important approach for getting more comprehensive data for studying non-communicable disease (like stroke) in a mass gathering health setting (like Hajj). We hope that the authors will continue their efforts.

*Tanvir C. Turin*

*Department of Family Medicine,  
O'Brien Institute of Public Health,  
Cumming School of Medicine, University of Calgary,  
Calgary, Canada*

*Mohammad Al Mamun*

*Department of Public Health,  
General Directorate of Health Affairs in Tabuk Region,  
Ministry of Health, Tabuk, Kingdom of Saudi Arabia*

### Reply from the Author

We would like to thank Dr. Turin and Al Mamun for their interest in our article and their insightful discussion. The Hajj stroke registry is ongoing and data linking is planned with various datasets to explore patterns of incidence related to weather and activity.

*Mohammed Almekhlafi,*

*Department of Neurology, Faculty of Medicine,  
King Abdulaziz University,  
Jeddah, Kingdom of Saudi Arabia*

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