Determinants of case-fatalities for meningitis during outbreaks in Makkah, 1988-1997

Meningococcal disease (MCD) is a major health problem in both developing and industrialized countries, especially sub-Saharan Africa and the Pacific islands [1]. The reported case-fatality rate (CFR) of MCD ranges from 2% to 15% [1]. In three to 11% of the survivors, serious sequelae were encountered [1]. Saudi Arabia, especially Makkah, has frequently been affected by meningococcal epidemics. The annual Islamic pilgrimage to Makkah, which attracts pilgrims from almost every country, plays a central role in the amplification and dissemination of MCD all over the world [2].

We studied the CFRs among MCD patients in Makkah hospitals for different strains of *Neisseria meningitidis* and the associated clinical, host and sociodemographic factors. We reviewed the surveillance system for MCD at the Health Directorate in Makkah and the medical records at six governmental hospitals in Makkah to ascertain the outcome of all confirmed cases (CC) of MCD that occurred during the period between 1988 and 1997 (1408-1417H).

There were 431 (89.2%) MCD cases due to *N. meningitidis* group A, 31 (6.4%) group W135, 16 (3.3%) group C, and 5 (1.0%) group B. Of all the 483 CC of MCD diagnosed in the last decade, 81 patients died (crude CFR=16.8%). The crude CFRs were 14.8%, 33.3%, 31.3%, and 20% due to *N. meningitidis* groups A, W135, C, and B respectively. About 70% of our patients died within 70 hours. After the first year of life, the age-specific CFR of MCD due to *N. meningitidis* group A increased steadily with increase in age ($p<0.05$, chi-square for linear trend). The nationality-specific CFRs were above 18% among patients from Mali (25%), Pakistan (23%), Indonesia (22%), Turkey (18%), Bangladesh (18%) and Afghanistan (18%).

Predictors of death among CC of MCD were seeking first medical help at a foreign Hajj medical mission (RR 36%, 95% CI 19-56), presenting with coma to a hospital (RR 12; 95% CI 6.9-20), appearance of skin rash (RR 8.5; 95% CI 4.9-15), and vomiting (RR 2.6; 95% CI 1.2-5.5), having shock or hypotension during the course of the disease (RR 11; 95% CI 7.7-15), renal failure (RR 5.7; 95% CI 3.7-8.7), gastrointestinal (GI) bleeding (RR 7.3; 95% CI 5.8-9.3), disseminated intravascular coagulopathy (RR 6.8; 95% CI 5.4-8.6), being diabetic (RR 2.4; 95% CI 1.5-2.6), and being treated in a non-specialized hospital (RR 1.5; 95% CI 1.0-2.4). CFRs declined for patients from Southeast Asia and Sub-Saharan Africa, increased among patients from the Indian Subcontinent, Middle Eastern countries and North African countries, and remained unchanged (around 10% and 0%) for Saudis and Europeans respectively (Figure 1).

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Editorial note: The nationality-specific CFRs corroborate the results of some previous studies [2][3]. The relatively high CFR is due to the predominance of older patients in Makkah. Management of all MCD cases in a specialized hospital was beneficial. It has been reported that roughly two-thirds of patients who die succumb within 16 to 24 hours after hospital admission [4][5]. In fulminant conditions, with death occurring 12-48 hours after presentation, the CFR ranges between 15% and 30%. [6]. These alarming data emphasize the need for a prompt diagnosis [5].

The results were based on data from hospitals in Makkah and may not reflect the CFR of MCD diagnosed in other cities in Saudi Arabia. Use of MCV will remain the most important action to prevent MCD outbreaks and related deaths. Collaborative efforts between Health Affairs in Makkah and foreign medical missions in providing emergency medical care during Hajj is recommended.

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Monthly number of cases of meningococcal meningitis Makkah, Saudi Arabia, 1988-1997 (1408-1417H)