Stroke and the weather

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Cerebrovascular diseases are the most important cause of death and disability after heart diseases and cancer. Approximately 15% of the deaths are caused by stroke, which affects males and females between the ages of 50-80.[1] A total of 60,000 persons die from stroke in United Kingdom annually, compared with 170,000 persons in the United States of America, thus causing important health and economical problems. Risk factors are numerous, such as hypertension, diabetes, hyperlipidemia, myocardial infarction and smoking for example, and one of them is high weather temperature.[2,3] The objective of this study is to demonstrate the influence of weather conditions on patients, weather temperatures and their fluctuation between day and night, humidity variations between winter and summer, all of which have important implications in causing stroke.[3-5]

This study was carried out in Syria between 1997 and 1999, which lies on the eastern coast of the Mediterranean. The population is 17,000,000, spread over an area of 185,000 square km where the Mediterranean climate prevails. A dry hot summer, and a rainy winter in December and January which are the coldest months of the year while June and July are the hottest with differences between maximum and minimum temperatures ranging from 23-45°C. Sometimes temperatures could frequently drop below -10°C in winter, and easily exceed 45°C in summer.

Between 1997 and 1999, 300 patients who reported to Douma Specialized Hospital were suffering from stroke as follows: 1. Cerebral infarction – 230 patients. (Cerebral thrombosis and embolism) 2. Intracerebral hemorrhage - 65 patients 3. Subarachnoid hemorrhage and aneurysm - 5 patients. The definition of stroke given by the World Health Organization (WHO) is the following: "Rapidly developing clinical signs of local or global disturbance of cerebral function with symptoms lasting 24 hours or longer". These patients were made to undergo the following tests: 1. Computerized Tomography (CT Scan) 2. Magnetic Resonance Imaging (MRI) 3. Electrocardiograph (ECG) 4. Echocardiography (Echo) 5. Blood Sedimentation Rate Electrolytes.

This study covers 300 cerebrovascular diseased patients (195 females and 105 males) out of which 20 males and 10 females died. The average age of the patient was 63.2 years. There were 230 cases (76.7%) of cerebral infarction, 65 cases (21.6%) of intracerebral hemorrhage and 5 cases (1.7%) of subarachnoid hemorrhage and aneurysm. The daily occurrence of cerebral infarction and intracerebral hemorrhage was analyzed and correlated with 3 major meteorological factors (air temperature, fluctuating temperature between day and night and relative humidity). The clinical neurological examination of the patients with cerebral infarction, stroke in evolution, intracerebral hemorrhage or subarachnoid hemorrhage showed that the clinical neurological presentation and evaluation at the time of admission was: confusion, disturbance of swallowing, aphasia, dizziness and paralyses or hemiplegia of one of the sides of the body.

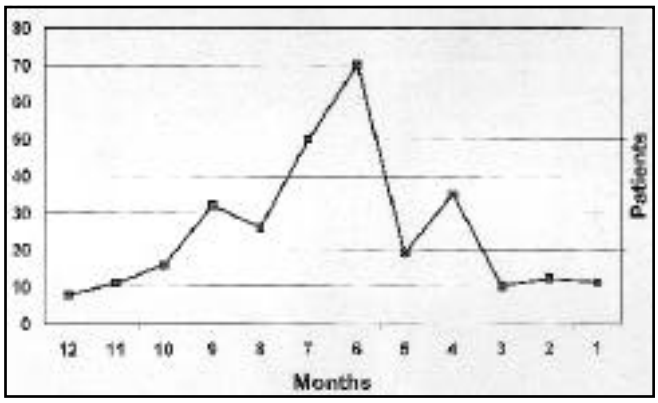

Figure 1 - Monthly rate of patients presenting with stroke.

Out of all the patients with stroke, 75 (38.4%) of the female patients are between 60-70 years old, and 45 (43%) of the male patients also belong to this age group. Amongst the age group 70-80 years, 45 (23%) are female and 19 patients (18%) are males. Stroke is rare among young patients.

In the hottest days of summer, 50 patients presented with stroke in June, and 70 patients presented in July. In the cold winter, 8 patients presented in December, and 11 patients presented in January. The highest summer temperatures sometimes exceeded 45°C and the fluctuation between day and night with unstable humidity could lead to dehydration, activate the biochemical coagulation, raise the viscosity of the blood and could cause cerebral lesions and that is the mechanism of stroke. This is also supported in the literature.[2-5] The incidence of the disease peaks in July and there are secondary peaks in April and September (**Figure 1**) with the maximum falling on the first day after weather changes.

In conclusion of this study, ischemic cerebral lesions are more common in summer while hemorrhage cerebral lesions are particularly encountered during winter. Other points of view reported from different countries also support this fact.[3] Males and females between 50-80 years of age are susceptible to cerebrovascular disease. Occurrence of stroke is mostly during June and July with the maximum falling after weather changes. However, this should be confirmed by further study and appropriate statistical methodology.

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