

Stroke: Incidence and Pattern in Benghazi, Libya

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Over a period of three years (January 1991 to December 1993), a total of 921 cases of stroke occurred in Benghazi, Libya. This provides a crude annual incidence rate for stroke of 48 per 100,000 population and a rate of 52 and 42 per 100,000 population for males and females respectively. The age-adjusted incidence rates were 162 and 133 per 100,000 population for males and females respectively for ≥ 45 years of age. Cerebral infarction was the most common type of stroke, accounting for 77%. Hypertension, smoking, diabetes mellitus and cardiac lesions were common risk factors among the male patients while hypertension, diabetes and cardiac lesions were common risk factors in females. Furthermore, females were found to have a high incidence of hypertension and diabetes when compared to males. However, 25% of males and 15% of females had no significant underlying risk factors. Fifty-four cases of stroke occurred during the study period in the age group of 15 to 45 years and constituted "stroke in the young", giving an annual incidence rate of 14 per 100,000 and rates of 15 and 13 per 100,000 population for males and females respectively in this age group. Hypertension, diabetes and heart disease were important risk factors for stroke in the young. However, nearly 45% of males and 20% of females had no significant risk factors. *Ann Saudi Med* 1995;15(4):

Cerebrovascular disease or stroke is the third leading cause of death and an important cause of hospital admission and long-term disability in most industrialized populations.¹ The incidence of stroke is reported to be declining.² In a small white rural population in Rochester, Minnesota, USA, the incidence of first-ever stroke declined by 54% between 1945-49 and 1975-79.³ The recent change may be explained by the introduction of computed tomography (CT) scanning, which improves the detection of less severe strokes; greater clinical awareness may also lead to the inclusion of very mild strokes formerly not detected, irrespective of CT scanning. The reliable population-based incidence data of stroke is rare in developing countries.⁴

Benghazi has a comprehensive medical care system and well-characterized population which has been enumerated in a recent census. In this present study, our aim is to find the incidence of stroke in relation to risk factors and also to know the incidence of stroke and risk factors in the young population as seen in Benghazi.

Subjects and Methods

Benghazi is a well-defined geographic area and has a stable population. Benghazi covers an area of 17,000 km² in the northeastern part of Libya on the southern Mediterranean coast at a latitude of 32°N and a longitude of

20° E. The people of Libya are of mixed Arab, African, Turkish and Southern European descent.⁵

The medical organization in Benghazi is such that patients can be referred from the walk-in polyclinics to the four university hospitals and to a rehabilitation center for the handicapped. Medical care is free. Besides this, state-financed medical treatment abroad, the desire to obtain disability certificates for tax benefits, and to quit compulsory army service encourage people to attend the clinics even for minor problems. Neurology outpatient clinics are conducted in polyclinics six days per week. The neurology unit in the 7th April Hospital in Benghazi provides extensive neurology services to the northeastern region of Libya.

All incident cases of stroke occurring among the Libyan residents of Benghazi were ascertained for a three year period between January of 1991 and December of 1993 through polyclinics, university hospitals and rehabilitation centers. Patients with transient ischemic attacks, previous history of stroke, vascular malformation or those living outside the Benghazi area were excluded from the study. Cranial CT scan was performed on all cases within the first week of onset of stroke. All cases were classified into two groups; Group 1, above 45 years of age and Group 2, patients from 15 to 45 years (i.e., stroke in the young). The July 1984 Libyan nationwide official census provided the population data.

Risk factors analyzed in the study include hypertension (sustained systolic blood pressure ≥ 160 mm/Hg and/or a diastolic blood pressure ≥ 95 mm/Hg for at least one week after stroke), diabetes mellitus (previous diagnosis, a casual

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blood glucose level >160 mg/dL or a blood glucose level > 200 mg/dL one hour after a 50 gm oral glucose load), hypercholesterolemia (serum cholesterol >260 mg/dL) and ischemic heart disease confirmed by a standard 12-lead electrocardiogram (ECG) examination and mitral valve prolapse or other valvular heart disease confirmed by 2D echocardiography. The majority of Libyan males smoke heavily from adolescence while cigarette smoking is nonexistent in the female population.

Results

A total of 921 strokes occurred in the three year study period in Benghazi. Of these, 867 patients were in Group 1 and 54 patients were in Group 2. Age and sex distribution of patients is shown in Figure 1. In Group 1, there were 493 males and 374 females. In Group 2, there were 29 males and 25 females. The age- and sex-specific incidence is shown in Table 1. Of the total stroke cases, 700 (76.9%) were occlusive and 221 (23.1%) were hemorrhagic.

Risk factors such as hypertension, diabetes mellitus, smoking and cardiac lesions were analyzed in both groups. In Group 1, 444 (51%) patients (221 males and 223 females) were found to be hypertensive, 214 (24.6%) patients (151 males and 63 females) were diabetic and 177 (20.4%) patients (102 males and 75 females) were found to have cardiac lesions. Smoking was the risk factor

identified in 164 (33%) exclusively male patients. No significant underlying risk factors were detected in 181 (20.8%) patients (121 males and 58 females).

In Group 2, i.e. stroke in the young, 12 (22.2%) patients (five males and seven females) had hypertension followed by diabetes mellitus in eight (14.8%) patients (three males and five females) and rheumatic valvular disease was diagnosed in 16 (30%) patients (eight males and eight females). No risk factors were detected in 18 (33.3%) patients (13 males and five females).

Discussion

An analysis of the incidence-associated risk factors for stroke in Benghazi, Libya has been presented. It is presumed that comprehensive case-finding sources utilized identified nearly all eligible cases. There is good reason to believe that the prerequisites for an accurate epidemiologic study such as precise diagnosis, completeness of the case ascertainment and knowledge of the population at risk have been accomplished in the Benghazi study.

The crude annual incidence rate for stroke in Benghazi of 48 per 100,000 population appears lower than the corresponding rates from most of the developed countries of the world.⁶⁻⁸ Incidence rates for stroke from Europe and North America ranged from 130 and 830 per 100,000 population.⁶⁻⁸ There are scanty population-based epidemiological data from developing countries. The incidence of 26/100,000 population in the Nigerian African⁴ is far below the present study.

The population of Benghazi is relatively young compared with those of the developed countries of North America and Europe. Cerebral infarction is common at the age of 65 or over in both sexes.⁹ The incidence of 162 and 133 per 100,000 for males and females respectively above the age of 45 years in Benghazi is higher than the corresponding rate of 54.7 for males in Auckland.⁸ The total estimated incidence of 200/100,000 for Goteborg is higher than that of the present study.¹⁰

Ashok et al.¹¹ reported a crude annual incidence rate for stroke of 63 per 100,000 population per year while the incidence rate was 131.1 per 100,000 population above 15 years of age in Benghazi.

The difference in the incidence rate of stroke in the young between the developed and developing countries may reflect dissimilarities in the age structure of the population. The incidence rate of 14 per 100,000 population and 15 per 100,000 population for males and females respectively from 15 to 45 years in Benghazi is lower than corresponding figures reported from the developed countries.^{8,12} Stroke in patients in the age group of 15 to 45 years comprised 6% of stroke at all ages in the present series, which is lower when compared with 12.3% reported in the Nigerian epidemiologic study.⁴ A report

FIGURE 1. Age and sex distribution of the patients.

TABLE 1. Age and sex incidence of stroke.

Age (yrs)	No. of males (%)	No. of females (%)
15-45	29 (3.1)	25 (2.2)
46-55	81 (8.8)	63 (6.8)
56-65	185 (20.1)	128 (13.9)
66-75	136 (14.8)	113 (12.3)
> 75	91 (9.9)	70 (7.6)

from Saudi Arabia¹³ showed 23% of young stroke. Cerebral infarction was present in 77% and cerebral hemorrhage in 23% of the cases, concordant with most other reports. Ischemic stroke (55%) was more frequent than hemorrhagic stroke (25%) from Saudi Arabia.¹³

Hypertension, ischemic heart disease, diabetes mellitus, smoking and hypercholesterolemia are well-known risk factors for stroke. Oxfordshire community stroke project study showed that risk factors for cerebral infarction were present in 80% of cases,¹⁴ hypertension in 52%, ischemic heart disease in 38%, peripheral vascular disease in 25%; cardiac lesions were a major potential source of emboli to the brain in 20% and diabetes mellitus in 10%. Mortel et al.¹⁵ reported that diabetes is second to hypertension as a risk factor for stroke, followed by heart disease and smoking. Risk factors for stroke in middle age men in Goteborg, Sweden¹⁶ have been shown to be 20% hemorrhage, 42% cerebral infarction and 30% unspecified stroke. Manson et al.¹⁷ reported that maturity onset clinical diabetes mellitus is a strong determinant of coronary heart disease and ischemic stroke among middle age women. In our patients, hypertension as a risk factor presents as similar to the Oxfordshire community stroke project study¹⁴ but dissimilar with regard to ischemic heart disease and diabetes mellitus.

Zuber et al.¹⁸ reported that stroke mortality had declined in many industrialized countries in recent decades. In France, it has declined by more than 30% between 1968 and 1982 in all age groups in both sexes. In the community-based study of Rochester, Minnesota, stroke incidence decreased by 54% between 1945-49 and 1975-79. Recent analysis suggests that stroke incidence could drop rapidly after hypertension control and that lower blood pressure should confer a lower risk of vascular disease. The rate of stroke declines rapidly after the cessation of smoking. Diabetes mellitus and high fibrinogen levels are other independent risk factors for stroke.

The high incidence of risk factors among the stroke victims of Benghazi indicates that control of these factors is of paramount importance in the prevention of stroke in patients exposed to these risks.

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