

Profile of stroke in Bahrain

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ABSTRACT

Objectives: As no report on the pattern of stroke in Bahrain is available, we sought to determine the stroke types, the annual incidence rate, and the risk factors associated with different types of stroke in Bahrain nationals and expatriates in Bahrain.

Methods: Case records of patients admitted with stroke from January 1995 to December 1995 in a tertiary level hospital, the only one with a well established neurology service in Bahrain were reviewed. Diagnosis of stroke and its type were confirmed by clinical and computerized tomography of brain. Risk factor analysis was made based on clinical, laboratory and other relevant investigational data.

Results: The majority of strokes occurred in middle and late age Bahrainis. Males predominated in all types of strokes, except in the hemorrhagic type, among the Bahrainis. The crude annual incidence rate was 57 per

100,000 Bahrainis. The frequency of stroke types in Bahrainis was cerebral infarction in 53%, cerebral hemorrhage in 30% and unspecified in 16.5%; as against 76%, 10% and 15% in non Bahrainis. Subarachnoid hemorrhage was rare (2%). Hypertension, dyslipidemia, diabetes mellitus and ischemic heart disease and smoking were common risk factors for ischemic and hemorrhagic strokes.

Conclusions: Stroke incidence in Bahraini nationals is similar to that in developing countries and from other parts of the Arabian Peninsula. The differences observed in age and gender distribution and in the stroke types between Bahraini nationals and non Bahraini expatriates is most likely a reflection of the demographic structure existing in Bahrain.

Keywords: Stroke, stroke types, risk factors.

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Stroke remains the 3rd leading cause of death, after ischemic heart disease and cancer in many developed countries. However, significant differences in the incidence rate, types and nature of risk factors have been reported in different regions of the world.¹ The average annual incidence rates vary markedly between developed and developing countries in Asia.²⁻⁴ The frequency of ischemic, hemorrhagic and unspecified types of stroke and their respective etiologies also vary in different regions of the world.^{2,5-7} Some reports from India³ and the Arabian Peninsula⁸⁻¹⁰ indicate a high incidence of stroke in the younger population, as compared with western patients. These geographical differences in the different aspects of stroke highlight the importance of epidemiological studies as they

may provide a key to the understanding of the etiology, prevention and management of a disease apart from helping in the planning of health care services and necessary preventive actions in a community. As no such information is available previously from the State of Bahrain, the present study was undertaken to establish the epidemiology of stroke in Bahrain. Bahrain is situated in the eastern part of the Arabian Peninsula with an estimated population of nearly 569,000 in 1995, of which about 356,000 were Bahrainis and 213,000 were non-Bahraini expatriates residing in Bahrain. The Salmaniya Medical Complex is the only tertiary level government hospital with a well established neurological service that provides essentially all of the neurological care for all residents of Bahrain.

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Virtually all patients with suspected stroke in this country are admitted, evaluated and managed in this hospital. This renders this hospital-based data well suited for an epidemiological study on stroke in Bahrain.

Methods. In this retrospective study, the case records of all stroke patients admitted to Salmaniya Medical Complex, Bahrain, between January 1995 and December 1995 were reviewed. The definition of stroke given by the World Health Organization (WHO) as 'rapidly developing clinical signs of focal (or global) disturbance of cerebral function, with symptoms lasting 24 hours or longer or leading to death, with no apparent cause other than vascular origin' (WHO 1989) were applied¹¹ to include the cases in the present study. By this definition, patients with cerebral infarction, intracerebral hemorrhage or subarachnoid hemorrhage were included. Patients with cerebral infarction were further subdivided into 2 groups, namely lacunar and non-lacunar infarctions. Lacunar infarct is defined as any infarct measuring up to 1.5 cm on computerized tomography (CT) scan of the brain while any infarct larger than 1.5 cm in size was considered as non-lacunar infarct. Cases of transient ischemic attacks (TIAs), subdural and extradural hematomas were excluded. The relevant data was retrieved from the case records of the patients and was entered on a standardized computer record form, comprising items like age, gender, nationality, history of hypertension, diabetes mellitus, smoking, migraine, oral contraceptive use, cardiac or peripheral vascular disease, dyslipidemia, TIAs or stroke in the past. In addition to the findings on neurological evaluation at the time of admission, results of clinical and investigative findings of cardiovascular systems were also analyzed. Results of investigations like full blood count, packed cell volume, hemoglobin level, erythrocyte sedimentation rate, blood glucose, cholesterol, triglyceride, Venereal Disease Research Laboratory, x-ray of chest and electrocardiogram were also analyzed. The results of any other tests carried out after the initial screening blood investigations were also reviewed. Findings on CT scans of brain, performed within 1 week of the onset of stroke were used for classification of the type of stroke. Cerebral infarction was diagnosed based on typical CT scan findings of infarct or a normal CT scan when it was performed within 2 days of the onset of stroke or the presence of a potential source of cerebral emboli such as the heart or carotid artery relevant to the side of stroke. Intracerebral hemorrhage or subarachnoid hemorrhage was diagnosed based on clinical and CT scan findings. Where none of these criteria were fulfilled, the cases were classified as 'unspecified' type of stroke. Hypertension was considered to be present if the patient was already receiving anti-hypertensive therapy or if the systolic blood pressure

(BP) was >160mmHg and/or diastolic BP was >95mmHg at the time of admission and persisted even after that during the hospital stay. When serum cholesterol value was 6.7mmol/L or more and triglyceride value 1.8mmol/L or above, hypercholesterolemia and triglyceridemia were also diagnosed. Diabetes mellitus was considered to be present if the patient was already diagnosed and receiving medication for the same, or if at least 2 fasting blood glucose values were 7.8mmol/L or above during the patient's hospital stay. The term 'smoker' was applied if the patient was regularly and currently smoking either cigarettes or hubble-bubble, at the time of stroke. For the analysis of annual incidence rate and the population at risk, the national census report of Bahrain for the year 1995 by age, gender, and nationality was considered.

Results. Analysis of our data revealed that there was a total of 144 patients admitted with stroke during the year 1995, out of which 103 were Bahrainis and 41 non-Bahrainis. The male:female ratio for Bahrainis was 54:49 and for non-Bahrainis 35:6. The type of stroke related to nationality is shown in Table 1.

Types of stroke. Cerebral infarction constituted the majority of the cases (60%), 49% being due to non lacunar infarctions and 10% due to lacunar infarctions. Intracranial hemorrhage was found in 35 cases (24%), 33 of these with intracerebral hemorrhage and only 2 cases with subarachnoid hemorrhage. Unspecified stroke was diagnosed in 23 cases (16%). When the patients were divided into Bahraini and non-Bahraini groups based on their nationality, the incidence of ischemic strokes was disproportionately higher than hemorrhagic strokes among non-Bahrainis (31 and 4 out of 41 patients, Table 1) as compared to Bahraini patients. They also occurred at a much earlier age in non-Bahrainis. The frequency of unspecified type of stroke was nearly the same in Bahraini and non-Bahraini patients. There were only 2 cases of subarachnoid hemorrhage, both were Bahraini males in their middle age. Nine out of 55 cerebral infarctions (16%) among Bahrainis and 6 out of 31 cerebral infarctions (19%) among non-Bahrainis were lacunar infarctions.

Age and gender. Table 2 shows the age and gender distribution of stroke patients. The majority of stroke patients were in the age group of 45-65 years and few below the age of 45 years. However, the incidence of ischemic strokes increased progressively with age in Bahrainis, but it showed a sharp decline in non-Bahrainis. Hemorrhagic strokes occurred more frequently in the age group of 45-65 years, and after the age of 65 years their incidence declined in Bahrainis as well as non-Bahraini patients. There was an increased incidence of stroke in males as compared to females in all age groups and the overall male:female ratio was 1.6:1. The

Table 1 - Type of stroke related to nationality and gender.

STROKE TYPE	BAHRAINI				NON-BAHRAINI				TOTAL	
	M	F	TOTAL	%	M	F	TOTAL	%	No.	%
NLI	27	19	46	65	22	3	25	35	71	49
LI	4	5	9	60	6	-	6	40	15	10
ICH	12	17	29	88	3	1	4	12	33	23
SAH	2	-	2	100	-	-	-	-	2	1
Unspecified	9	8	17	74	4	2	6	26	23	16
TOTAL	54	49	103	71.5	35	6	41	28.5	144	100

M = male F = female
 NLI = Non lacunar infarction LI = Lacunar infarction ICH = Intra cerebral hemorrhage SAH = Subarachnoid hemorrhage

Table 2 - Distribution of stroke type in Bahraini and non-Bahraini subjects by age and gender.

STROKE TYPE		< 45 YEARS			46 - 65 YEARS			ABOVE 65 YEARS			TOTAL
		M	F	TOTAL	M	F	TOTAL	M	F	TOTAL	
NLI	Bahraini	1	-	1	10	9	19	16	10	26	46
	Non-Bahraini	7	-	7	14	1	15	1	2	3	25
LI	Bahraini	-	-	-	2	3	5	2	2	4	9
	Non-Bahraini	3	-	3	3	-	3	-	-	-	6
ICH	Bahraini	2	-	2	6	13	19	4	4	8	29
	Non-Bahraini	1	-	1	1	1	2	1	-	1	4
SAH	Bahraini	-	-	-	2	-	2	-	-	-	2
	Non-Bahraini	-	-	-	-	-	-	-	-	-	-
Unspecified	Bahraini	-	1	1	4	3	7	5	4	9	17
	Non-Bahraini	2	-	2	2	-	2	-	2	2	6
TOTAL		16	1	17	44	30	74	29	24	53	144

M = male F = female
 NLI = Non lacunar infarction LI = Lacunar infarction ICH = Intra cerebral hemorrhage SAH = Subarachnoid hemorrhage

Table 3 - Annual incidence of stroke in Bahraini population by gender and age.

Age group (years)	Population (1995)			No. of stroke cases			Annual incidence rate		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
20 - 44	68,123	64,900	133,027	3	1	4	4.4	1.5	3
45 - 65	16,396	17,971	34,367	24	28	52	146	155	151
Above 65	6,517	5,494	12,011	27	20	47	414	491	391
All ages	91,036	88,365	179,405	54	49	103	59	55	57

Table 4 - Annual incidence of stroke in non-Bahraini population by gender and age.

Age group (years)	Population (1995)			No. of stroke cases			Annual incidence rate		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
20 - 44	113,691	42,332	156,023	13	-	13	11	-	8
45 - 65	14,590	3,450	18,040	20	2	22	137	57	121
Above 65	523	311	834	2	4	6	382	1286	719
All ages	128,804	46,093	174,897	35	6	41	27	13	23

Table 5 - Risk factors related to stroke type and nationality.

Risk factors	Non Lacunar Infarction		Lacunar Infarction		Intracerebral hemorrhage		Unspecified		Total (N = 142)	
	Bahraini (n=46)	Non-Bahraini (n=25)	Bahraini (n=9)	Non-Bahraini (n=6)	Bahraini (n=29)	Non-Bahraini (n=4)	Bahraini (n=17)	Non-Bahraini (n=6)	No.	%
Hypertension	23 50	10 40	7 78	3 50	21 72	3 75	5 29	2 33	74	52
Dyslipidemia	21 46	13 52	6 67	3 50	16 55	1 25	10 59	2 33	41	29
Diabetes mellitus	19 41	7 28	7 78	2 33	7 24	1 25	4 23.5	1 17	40	20
Ischemic heart disease	19 41	7 28	3 33	1 17	5 17	1 25	3 18	1 17	71	50
Smoking	17 37	8 32	1 11	1 17	7 24	2 50	3 18	2 33	41	29

male:female ratio among Bahrainis was 1.1:1 whereas it was 5.8:1 for non-Bahrainis. Hemorrhagic strokes were more frequently seen in the middle aged Bahraini women. Past history of TIA was reported by 11% of patients in the cerebral infarction group while recurrent stroke occurred in 10% of all stroke cases.

Age and gender specific stroke incidence per 100,000 population at risk is shown in Tables 3 and 4. As will be observed from these tables, under the age of 65 years and especially under the age of 45 years, the non-Bahraini male population outnumbered the Bahraini male population, while the reverse trend was seen for the Bahraini and non-Bahraini female population. Above the age of 65 years, the number of Bahraini males and females was much higher than that of non-Bahraini counterparts. In contrast to this population structure in the community, the estimated annual incidence rate of stroke for males under the age of 65 years is similar for both Bahraini and non-Bahrainis (150 and 148 per 100,000 population). The annual incidence rate for women under the age of 65 years was more than double for Bahrainis compared to non-Bahrainis (156.5 and 57 per 100,000 population) while the reverse trend was observed for women above age of 65 years (Tables 3 & 4). A total of 29 out of 144 (20%) of stroke patients (3 under the age of 45 years and 26 above the age of 45 years) died in the first 30 days after the onset of stroke. They included 10 cases each with intracerebral hemorrhage and unspecified type of stroke, 7 with

non-lacunar infarction and 2 with subarachnoid hemorrhage. No patient with lacunar stroke died.

Risk factors. Table 5 shows the various risk factors associated with each type of stroke. Hypertension was the commonest risk factor, for both ischemic as well as hemorrhage strokes. Dyslipidemia, diabetes mellitus, smoking and ischemic heart disease were the other common risk factors in that order of frequency. The majority of patients had 2 or more risk factors. In about 10.5% of cases, no commonly recognized risk factor was present. Cerebral carotid bruit was detected in only 3 of the 86 patients with ischemic stroke.

Discussion. Recognizing the limitations of hospital-based and retrospective studies, we report our findings in a consecutive series of 144 patients. All but 6 of these had brain CT scan, which was an obvious advantage for stroke diagnosis and classification, compared to those centres where such a diagnostic facility was either not available or was not applied so frequently as in our study of stroke cases. Analysis of our data showed that the age and gender adjusted annual incidence rate of stroke among Bahrainis was 57 per 100,000 population, which was clearly lower than that reported from developed countries,^{1,2,5-7} but similar to that found in the neighboring country of Saudi Arabia.⁸

Cerebral infarction accounted for 60% of stroke cases which was consistent with most reports^{5,6,12,13}

including reports including Saudi Arabia.⁸ As reported from Saudi Arabia,^{8,10} in the present study, a sharp decline in the incidence of cerebral infarction among non-Bahrainis above the age of 65 years was also noticed. This observation may be artificial rather than a true decline, considering the general population structure of expatriates in these countries. The incidence of lacunar infarction was 19% and 16% of all cerebral infarction in Bahrainis and non-Bahrainis, which is comparable to the incidence reported in the Harvard Stroke Registry,¹³ but much lower than 30% reported in Saudi Arabia patients.^{8,10} A higher incidence of intracerebral hemorrhage was observed among Bahrainis compared to non-Bahrainis. A similar observation was made in Saudis and non-Saudis in reports from Saudi Arabia.⁸ However, it is worth noting that during the present study period, there were only 2 cases of subarachnoid hemorrhage among Bahrainis and none among non-Bahrainis.

As previously reported,^{15,16} in the present study also, hypertension, dyslipidemia, diabetes mellitus, ischemic heart disease and smoking were present either alone or in combination in the majority of our patients. Only in 10.5% of our cases, could no risk factors be detected.

In conclusion, stroke is a common neurological disorder in Bahrain and the pattern of stroke subtypes among the Bahrainis is similar to those reported from Saudi Arabia and other developing countries. Hemorrhagic strokes are more common than ischemic strokes in the middle aged Bahrainis. Among non-Bahrainis, ischemic strokes occurred more frequently and at an earlier age than hemorrhagic strokes. In the present study the incidence of subarachnoid hemorrhage was extremely low in both Bahrainis and non-Bahrainis. The profile of risk factors is similar to that reported from other parts of the world.

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