Risk Factors, Subtypes and Outcome of Ischaemic Stroke in Kuwait – A Hospital-Based Study

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Key Words

Stroke · Stroke subtypes · Risk factors · Atherosclerosis · Kuwait

Abstract

Objective: To report on stroke subtypes, associated risk factors and outcome in Kuwait. **Methods:** The records of 62 patients (30 male, 32 female) admitted with diagnosis of stroke to Kuwait Oil Company Hospital, Kuwait, a tertiary care hospital, during a 5-year period (1995–1999), were retrospectively reviewed. **Results:** Small artery infarction was the most common subtype and occurred in 37 subjects (59.7%); less common were atherosclerotic large artery strokes (19 patients, 30.6%) and strokes of cardio-embolic origin (6 patients, 9.7%). Identifiable risk factors or associated morbidities were hypertension (72.5%), diabetes mellitus (69.4%), ischaemic heart disease (14.5%), history of migraine (8.1%), lone atrial fibrillation (5.0%), and valvular heart disease (1.6%). The most important determinants of a deleterious 30-day outcome, as indicated by severe disability or death, were female gender, lack of use of anti-platelet drugs, presence of a large artery infarction stroke subtype, and cardio-embolic stroke. **Conclusion:** Prevalence of hypertension and diabetes is high among patients with stroke in

Kuwait, with rates higher than those found in any previous reports from the Gulf region. Two unusual observations were that women had a rather high frequency of stroke, and infarction of the small artery was more common than that of the large artery. Outcome, as indicated by severe disability or death, was worse among women, elderly patients, and those with large artery atherosclerotic and cardio-embolic strokes. There is some evidence that such a deleterious outcome might be ameliorated with use of anti-platelet drugs.

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Introduction

Stroke is an important cause of hospital admissions and long-term disability in most countries. It ranks as the third leading cause of death in developed countries after ischaemic heart disease and cancer [1]. However, in recent times, the incidence of stroke and subsequent mortality appear to have decreased in industrialised countries, probably due to better control of the associated risk factors and improved acute care resources [2]. Most studies indicate that arterial hypertension is the major risk factor for stroke, irrespective of gender and race; other important recognised risk factors are diabetes mellitus,

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cardiac disorders and cigarette smoking [3–5]. It has indeed been suggested that the prevalence of these risk factors appears to be on the increase in most developing countries, which is likely to have implications on stroke prevalence.

The frequency of occurrence of stroke subtypes and their risk factors vary among different countries, including those in the Arabian Gulf region [6–13]. Only limited information is available about the types of stroke and their risk factors in the Gulf region in general, and in Kuwait in particular [11]. There are even fewer articles on its short- and long-term outcomes. A study of this type in Kuwait is important in the light of the extensive modernisation of Kuwaiti society, which began about 3 decades ago and has involved the adoption of Western dietary habits, especially the frequent consumption of ‘fast food’, and a documented increase in the prevalence of obesity [14].

This study therefore presents preliminary data on the subtypes, risk factors and outcome in 62 patients diagnosed with stroke and seen over a 5-year period (1995–1999) at the Kuwait Oil Company (KOC) Hospital in Kuwait.

Subjects and Methods

The case records of 62 patients diagnosed with ischaemic stroke between January 1995 and December 1999 were analyzed retrospectively. These patients had been admitted to the KOC Hospital, a tertiary facility located in the Governorate of Ahmadi, Kuwait, that provides medical services to employees working in the Kuwait oil industry and their family members (total patient base of approximately 70,000). Most of the patients at the hospital are middle class and generally reflect the demographic characteristics of Kuwait. The patients satisfied the World Health Organization criteria of stroke, namely ‘a focal or global disturbance of brain function leading to death or persisting for more than 24 hours with no apparent cause other than vascular’ [15].

The patients were aged 64.1 ± 13.2 years (range 15–85 years) and included 51 Kuwaitis aged 65.5 ± 13.6 years, who were older than the 11 expatriates aged 57.5 ± 9.2 years ($p < 0.009$). There were almost as many men as women (30/32), with no significant difference in their mean ages.

The following information was obtained from the patient case records: age, sex, nationality, past or current history of stroke, transient ischaemic attacks, hypertension, diabetes mellitus, cardiac disease, atrial fibrillation, migraine, cigarette smoking, dyslipidaemia, alcohol and drug intake, especially use of contraceptive pills. A family history of stroke was also elicited. Patients with only transient ischaemic attacks or traumatic brain haemorrhage were excluded.

Hypertension was considered present in patients with an established history of blood pressure (BP) greater than 160/190 mm Hg or supervised use of antihypertensive medication [16]. The patients who experienced a transient rise of BP on admission were not consid-

ered to be hypertensive. Diabetes mellitus was diagnosed by a past history of supervised diabetes control or persistently high fasting plasma glucose levels (> 7.0 mmol/l) [17]. Dyslipidaemia was considered to be present with supervised hypolipidaemic medication or persistent elevation of fasting plasma total cholesterol (> 5.2 mmol/l) and/or triglyceride levels (> 2.0 mmol/l) [18].

A detailed neurological examination was performed on each patient, as was a detailed physical examination for clinical evidence of cardiac disease, especially ischaemic heart disease, valvular heart disease, tachy- and bradyarrhythmia, congenital heart disease and cardiomyopathy. Patients clinically suspected of associated cardiac disease were further evaluated by echocardiography and Holter monitoring. Brain computed tomography (CT) was performed on admission and, if normal, repeated on the 3rd to 7th days to confirm the diagnosis, site and type of stroke in all of the subjects. Stroke subtypes were determined by the following internationally acceptable criteria [19–21]: (a) a cerebral infarct was defined as a hypodense lesion on brain CT, corresponding to the territory of the involved cerebral vessel [20]; (b) a small vessel infarct was defined as a constellation of clinical symptoms and signs showing high correlation with small, deep, rounded infarct due to a single penetrating small arterial occlusion as confirmed by CT [21].

The patients were managed according to standard criteria and procedures [22]. Sixteen of the patients were on anti-platelet therapy (14 on aspirin alone and 2 on aspirin and dipyridamole). Additionally, 3 of the patients received warfarin treatment. None had carotid endarterectomy.

Outcomes were evaluated for each subject 30 days after admission, and the number of deaths and degrees of residual disability (nil, slight, moderate and severe) were assessed for each subject by internationally verifiable criteria [22].

Statistical Analysis

Data management and statistical analysis were carried out using SPSS (PC version 11.0). Means were compared using Mann-Whitney U-test, other comparisons for outcomes and relationships with specific risk factors or co-morbidities were assessed by applying χ^2 or Fisher’s test. A probability level of $p < 0.05$ was considered significant.

Results

Apart from the age difference, clinical presentation, management and outcome of ischaemic stroke did not differ significantly between Kuwaitis and non-Kuwaitis, and in view of the relatively small subject numbers, both groups were merged for subsequent analyses and discussion.

The prevalence of risk factors for stroke is shown in table 1. In this stroke population, the prevalence of hypertension was 72.5%, diabetes 69.4%, hyperlipidaemia 30.6% and smoking 1.6%. The prevalence of the major risk factors of hypertension and diabetes did not differ between the sexes.

Table 1. Prevalence of co-morbidities and risk factors in patients diagnosed with stroke in Kuwait

Risk factor	M n = 30	F n = 32	Total n = 65	Percent	General population prevalence, %
Hypertension	20	25	45	72.5	10–17 [32]
Diabetes mellitus	19	24	43	69.4	12 [34]
Hyperlipidaemia	12	7	19	30.6	>50 [34]
Past history of TIA	3	3	6	9.7	NA
Cardiac disease	7	8	15	24.2	NA
Lone atrial fibrillation	1	3	4	6.5	NA
Migraine	–	5	5	8.1	NA
Smoking	2	0	2	1.6	M 50; F 9.4 [31]

M = Male; F = female; TIA = transient ischemic attack.

Table 2. Stroke subtype in relation to comorbidity and identifiable risk factors

Risk factor	Stroke subtype			Total n = 62
	LAS n = 19	SAS n = 37	CES n = 6	
Hypertension	15 (78.9)	26 (70.3)	4 (66.7)	45 (72.5)
Diabetes	14 (73.7)	27 (73.0)	2 (33.3)	43 (69.4)
Cardiac origin	6 (31.6)	4 (10.8)	5 (83.3)	15 (24.2)
Smoking	–	1 (2.7)	–	1 (1.6)
Hyperlipidaemia	7 (36.8)	12 (32.4)	1 (16.7)	19 (30.6)

Percentages in parentheses.

LAS = Large artery stroke, atherosclerotic aetiology; SAS = small artery stroke; CES = cardio-embolic stroke.

Table 3. Thirty-day stroke outcome (disability/death) in relation to stroke subtype

Disability	Stroke subtype			Total n = 62
	LAS n = 19	SAS n = 37	CES n = 6	
Not significant	4 (21.1)	10 (27.0)	–	14 (22.6)
Slight	4 (21.1)	11 (29.7)	1 (16.7)	18 (29.0)
Moderate	3 (15.8)	8 (21.6)	1 (16.7)	12 (19.4)
Moderately severe	1 (5.3)	1 (2.7)	–	3 (4.8)
Severe	2 (10.5)	6 (16.2)	2 (33.4)	10 (16.1)
Death	5 (26.3)	1 (2.7)	2 (33.3)	8 (12.9)

Percentages in parentheses.

LAS = Large artery; atherosclerotic aetiology; SAS = small artery stroke; CES = cardio-embolic stroke.

Stroke Subtypes

With respect to the location of the infarct, the anterior circulation was affected in 36 (58%) of the 62 patients and the posterior circulation in 9 (14.5%), while 4 patients (6.5%) showed evidence of infarcts in both territories. Infarction in a small artery was the most common lesion, seen in 37 (59.7%) subjects, large artery infarcts of atherosclerotic aetiology in 19 (30.6%) patients and cardio-embolic strokes in 6 (9.7%) patients.

Thirty days after admission, 8 (12.9%) patients had died (6 women and 2 men). The relative frequencies of the various degrees of residual disability and how these were related to the associated risk factors and co-morbidities of those still alive are shown in tables 2–4. Seven women (22%) and 3 men (10%) had severe disability. Conversely, 20 men (66.7%) and 10 women (31.3%) had slight or no significant disability, suggesting a generally worse outcome for women (OR = 4.4). Age had a significant effect, as 18 (90%) of patients who died or had severe disability were more than 60 years old ($p < 0.035$). A greater proportion of deaths and severe disability occurred in patients with cardio-embolism (table 3), as well as among the subjects who were not on aspirin or other anti-platelet therapy (34.2%) compared to 25% for those on anti-platelet therapy.

Discussion

Previous reports on stroke in Kuwait [11] and the Arabian Gulf Region [10, 12, 13, 23] have focused primarily on epidemiology and risk factors. This study, however, has provided additional information on the outcome of stroke, which is particularly important in planning long-

Table 4. Thirty-day stroke outcome in relation to co-morbidities and risk factors

Disability	Co-morbidity/risk factors						
	HP n = 45	DM n = 43	CO n = 15	SM n = 1	HL n = 19	Mig n = 5	AF n = 4
Not significant	8 (17.8)	10 (23.3)	4 (26.7)	1 (100)	7 (36.8)	2 (40.0)	–
Slight	12 (27.7)	11 (26.7)	2 (13.3)		6 (31.6)	1 (20.0)	1 (25.0)
Moderate	10 (22.2)	10 (23.3)	2 (13.3)	–	3 (15.8)	1 (20.0)	1 (25.0)
Moderately severe	2 (4.4)	2 (4.7)	–	–	1 (5.3)	–	–
Severe	7 (15.6)	5 (11.6)	2 (13.3)	–	1 (5.3)	1 (20.0)	1 (25.0)
Death	6 (13.3)	5 (11.6)	5 (33.3)	–	2 (10.0)	–	1 (25.0)

Percentages in parentheses.

HP = Hypertension; DM = diabetes mellitus; CO = cardiac origin; SM = cigarette smoking; HL = hyperlipidaemia; Mig = migraine; AF = atrial fibrillation.

term care for affected individuals. A drawback of this study is its relatively small sample size, as the study was limited to only one hospital in Kuwait. As such the study is preliminary, and a larger, longer-term study of stroke in the whole country is currently being planned. Nevertheless, inferences can still be drawn from the results of this study.

General Aspects

Almost as many women as men were affected, contrary to previous reports in which there was demonstrable male preponderance [11, 12]. This is surprising, as there was no age difference between male and female patients. Similarly, the prevalence of the major risk factors of hypertension and diabetes did not differ between the sexes.

Stroke Subtypes and Risk Factors

A previous study of stroke in Kuwait [11] reported infarction in the large carotid territory in 46.5% of cases, lacunar in 17%, and involvement of the posterior circulation in 8.3%. That study and others [23–26] have generally indicated that large-artery infarcts are more common than small-artery ones. In this study, however, lacunar infarcts were the most common (59.7%), and were much more frequently seen than the large-artery infarcts (30.6%). The difference in the pattern observed here from that in an earlier study [11] in the same population and other reports [23–26] might therefore reflect the effects of stress and increasing obesity [14]. The pattern of stroke subtypes reported in this study might also be explained by the unusually high frequency of hypertension and diabetes in our patients. Hypertension was present in 72% of

our patients (table 1), while most other studies reported about 54% prevalence of hypertension in stroke patients [25–29]. Diabetes had a 69% prevalence in our subjects, in contrast to the range of 14–42% reported in many other studies [11, 23, 27–28], including those from Kuwait [11] and Saudi Arabia [23]. The prevalence of hypertension and diabetes in this stroke population is up to three times that of the general population (10–17%, table 1).

With respect to the other risk factors, cardiac disease was present in 24% of patients, similar to that reported in other studies [10–23]. The 5 subjects with migraine had other associated risk factors (4 had hypertension and 1 had diabetes; 2 of those with hypertension also had atrial fibrillation), which made it difficult to isolate migraine as an independent risk factor for stroke in this study. However, hemiplegic migraine can cause focal neurological deficit [30]. Also of some interest is the observation that cigarette smoking, which is widely prevalent in the Gulf Region [31], was relatively uncommon among the stroke patients in this study (1.6% versus 9.4–50% among the general population, table 1), as was a prior history of a transient ischaemic attack. Furthermore, the prevalence of hyperlipidaemia in the study population was not much different from that reported in the general Kuwaiti population [32, 34] (table 1). Given the relatively low or normal prevalence rates of these risk factors and the high prevalence of hypertension and diabetes among this population, it is tempting to suggest that there is a relationship between atherosclerotic strokes and hypertension and diabetes.

Outcome

Of concern in this study is the observation that the outcome was worse among women than men, with a higher percentage dying within 30 days or having severe disability. An analogous situation exists with regard to the prevalence of ischaemic heart disease in the population [33], where women are affected earlier and more severely than men. As, in general, women tend to be more obese than men [14], it is of interest whether obesity plays a role in these observations. The post-menopausal oestrogen loss in these women, almost all of whom were older than 50 years of age, might also have an effect on stroke outcome. These issues deserve further detailed evaluation.

As earlier indicated, diabetes and hypertension were the most important risk factors associated with stroke in this study. Both were about equally associated with small-artery (lacunar) and large-artery (atherosclerotic) strokes, and both had a significant association with death or severe disability at 30 days (tables 2, 4). They should therefore be managed aggressively in the prevention and treatment of stroke, especially when present with an underlying cardiac disease, as was the case in most of the deaths in the study (table 4).

The stroke subtype associated with the highest death rate (62.5%) was the large-artery stroke (table 3), which is probably a reflection of the size of the infarct. Cardio-embolic strokes also resulted in death and/or severe dis-

ability in about two thirds of those affected, but anti-platelet therapy with aspirin and/or persantin appeared to have an ameliorative effect on risk of death and severe disability. Its early and effective use should therefore be encouraged in all appropriate cases.

Conclusion

Our findings indicate that stroke is common in Kuwait, and its more important risk factors are diabetes, hypertension and coincidental cardiac disease. Lacunar ischaemic stroke was the most common subtype. Outcome as indicated by severe disability or death was worst among women, elderly patients and patients with large artery atherosclerotic and cardio-embolic strokes. Some evidence exists that such deleterious outcome might have been averted with prior use of anti-platelet drugs. These observations have implications for the aetiopathogenesis, prevention and management of this widespread disorder and form the focus of our continuing studies.

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