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PATTERNS AND OUTCOMES OF STROKE HOSPITAL ADMISSIONS IN THE MIDDLE PROVINCE OF SAUDI ARABIA

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ABSTRACT
Stroke is one of the largest health burdens in developed countries, as well as in developing countries. The epidemiology of stroke may be changing over time as a result of a number of factors, including an aging population and advances in the prevention and treatment of stroke. The Objective of this study was to design and identify the risk factors, patterns and outcomes of stroke hospital admissions in the Middle Province of Saudi Arabia. A retrospective study of consecutive acute stroke patients admitted to the medical wards in the study period. All patients were assessed individually by one of the two available neurologists. Data was collected on pre-designed protocol, and analysis was performed using tables and figures, and SPSS v.20 (SPSS, Chicago, Illinois, USA). Around 300 Saudi patients studied fulfilled the criteria for stroke. The male: female ratio of the patients was 1.95:1, and their ages 61.93±12.14 years (range 33-89 years). Out of all patients, 89% were more than 45 years. There was an increase incidence in males as compared to females, 198 males 102 females and the overall. The relative frequencies of stroke subtypes were Large ischemic infarcts (52.6%),while (25.2%) were lacunar infarcts, massive cerebral hemorrhage (19.6%), and subarachnoid hemorrhage (2.6%).The most common risk factor was concomitant hypertension with diabetes mellitus(40%) followed by hypertension alone(20.8%), hyperlipidemia(9.9%) and diabetes(6.75).The outcome of stroke was death in 10% while vegetative in 16.3 %. However 60.3% improved without neurological deficit and 13.6% improved with neurological deficit. Hereby it was concluded that the necessity to establish the national project for stroke prevention and treatment similar to those in developed countries with favorable epidemiological data.

INTRODUCTION

Cerebrovascular disease CVD (stroke) is the third leading cause of death after ischemic heart disease and cancer in many developed countries. It is one of the most important causes of long hospital admission and long term disability in most industrialized populations. It causes major financial burden on medical health care but also causes extensive human and family suffering, prolong functional disability and associated mortality [1]. Stroke is one of the principal causes of morbidity and mortality in adults in the developed world and the leading cause of disability in all industrialized countries and based on the World Health Organization (WHO) report in 2006, it is responsible for 9.9% of all deaths in the world which over 85% of these deaths occurred in developing countries [2]. The World Health Organization (WHO) definition of stroke is: "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 of vascular origin" [3].

Stroke incidence is approximately one million per year in the European Union and survivors can suffer several neurological deficits or impairments, such as hemiparesis, communication disorders, cognitive deficits or disorders in visuo-spatial perception [4,5]. These impairments have an important impact in patient's life and

considerable costs for health and social services. Moreover, after completing standard rehabilitation, approximately 50%-60% of stroke patients still experience some degree of motor impairment, and approximately 50% are at least partly dependent in activities-of-daily-living (ADL) [6,7].

Studies have demonstrated that different ethnic groups may have different predisposing risk factors, epidemiologic patterns, and outcomes of stroke. This has been shown in African Americans, Caucasians, Hispanics, Arabs, and Asians. These differences could be due to differences in demographic or socioeconomic factors or in lifestyle [8-10].

The incidence of stroke is reported to be declining, this 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 [11-13].

Several studies has been performed about changes in incidence of stroke and its related mortality rate in different parts of the world, and generally showed gradual but remarkable decrease in the stroke mortality rate during recent decades [14,15]. However, according to WHO, changes in stroke mortality in most populations were mainly due to changes in case fatality rather than changes in event rates [16], which can reflect changes in the management of stroke or changes in disease severity.

Many risk factors for stroke have been described. They may refer to inherent biological traits such as age and sex, physiological characteristics that predict future occurrence such as high blood pressure, serum cholesterol, fibrinogen; behaviors such as smoking, diet, alcohol consumption, physical inactivity; social characteristics such as education, social class and ethnicity; and environmental factors that may be physical (temperature, altitude), geographical, or psychosocial. In addition, medical factors including previous TIA or stroke, ischemic heart disease, atrial fibrillation, and glucose intolerance, all increase the risk of stroke [17].

Data on stroke epidemiology are important for diagnostic, therapeutic and preventive purposes. Furthermore, knowledge of the prevalence of stroke-related risk factors can help health decision makers to direct efforts toward reducing stroke-related morbidity and mortality, therefore this study was conducted to identify the risk factors, patterns and outcomes of stroke hospital admissions in the Middle Province of Saudi Arabia.

METHODS AND PATIENTS

A retrospective study of consecutive acute stroke patients admitted between January 2011 and December 2012 are carried out at King Khalid Hospital-Al Majmaah, General Hospital in Zulfi. All the patients were assessed by one of the neurologists who made a clinical diagnosis of stroke. The personal history, clinical findings and the type of stroke were entered on a pre-designed protocol. The diagnosis of CVD was based on the clinical features related with neuroimaging data (brain CT scan or MRI) which was confirmed by agreement of a staff neurologist. A database that collected patients' information was used to identify eligible patients. Further data that did not exist in the database were gathered by researchers via evaluation of patient records.

The definition of stroke given by the World Health Organization, (WHO1989)2 were applied to include cases in this study. Patients with cerebral infarction, stroke in evolution, massive cerebral hemorrhage or subarachnoid hemorrhage who were documented either by CT scan or MRI were included in this study. Histories of presence of aphasia, loss of consciousness, recurrent stroke, presence of bilateral stroke, use of mechanical ventilation were also recorded. Patients with a transient ischemic attack (TIA) or patients referred from other cities were excluded. Every hospital admission was considered as a separate event and thus, patients may have been registered for more than one record.

The data were collected by retrospective review of medical charts included demographics such as age, gender, nationality, length of hospital stay, stroke subtypes (ischemic or hemorrhagic stroke). The clinical neurological presentation and evaluation at the time of admission was classified as coma, confusion, right sided hemiplegia, left sided hemiplegia, aphasia, convulsion, dizziness. The data also included frequency of treatment with thrombolysis, use of medications (antihypertensives, antiplatelets, anticoagulation, and statin), frequency of in-hospital rehabilitation (physical therapy and speech therapy), stroke risk factors, complications and outcomes.

Risk factors analyzed in the study included hypertension (sustained systolic blood pressure > 160 mm/Hg and a diastolic blood pressure > 95 mm/Hg) or both, diabetes mellitus was considered present if the patients were already diagnosed and receiving medication or the fasting blood glucose values were 7.8 mmol/l, hyperlipidemia when the fasting cholesterol value was 6.7 mmol/l or triglyceride value 1.8 mmol/l, ischemic heart disease, post myocardial infarction, and atrial fibrillation, cigarette smoking, previous stroke, and obesity and carotid stenosis. Risk factors were considered if described on the patient's chart or if medications for known risk factors were used before hospital admission or at discharge [18-21]. The post-stroke complications considered were the presence of one or more of the following: pneumonia, deep venous thrombosis, constipation, seizure, depression, infection, limb pain, and gastrointestinal upset. The outcome of stroke patients were classified into death, vegetative state, and improved with or without neurological deficit.

Ethical consideration

Data collection was approved by the health authorities at the hospital. Research Ethical Committee approval was obtained from Basic & Health Science

Research Center, Scientific Research Deanship, Majmaah University

Statistical Analysis

Results are given as "means ± standard deviation" for continuous variables and number (percent) for categorical variables. The chi-square test or Fisher's exact test was used for categorical variables and the Students t-test or the Wilcoxon Rank Sum test for continuous variables. Statistical analyses were performed using SPSS v.16 (SPSS, Chicago, Illinois, USA) and a p value less than 0.05 was considered significant.

RESULTS

A total of 300 patients were admitted with stroke during the period between January 2011 to 31 December 2012 at King Khalid Hospital in Al- Majmaa"h and General Hospital in Zulfi. The mean age was 61.93±12.14 years (range 33-89 years). Out of all patients, 89% were more than 45 years. There was an increase incidence in males as compared to females, 198 males 102 females and the overall male to female ratio was 1.95: 1. Radiological assessment was carried out on all patients by CT (81%) and MRI (17%) except seven cases due to early death before assessments were done. According to the radiological assessment confirm clinical diagnosis according to the subtypes in both sexes. large cerebral infarcts is more in male significantly more males 115 cases (58.1%) than in female 43cases (42.2%) and lacunar infarcts is significantly more in male 51 cases (25.8) than female 24 cases(23.5). However, massive cerebral hemorrhage were significantly more females32 (31.4) than males. There were only 8 cases of subarachnoid hemorrhage (2.6%). As regard to the clinical neurological presentation, 61.3% of patients had Lt hemiplegia, 18% had Rt hemiplegia, 11.3% had aphasia and 9.4% had coma. Most of the patients had more than one neurological symptom at the time of admission. Many risk factors for stroke had been recorded. The most common risk factor for both ischemic, as well as hemorrhage stroke was hypertension concomitant with diabetes which constituted (40%) followed by hypertension (20.8%), diabetes (6.7%) and hyperlipidemia (9.9%). Stroke patients are at highest risk of death in the first weeks after the event, and between 20% to 50% die within the first month depending on type, severity, age, comorbidity and effectiveness of treatment of complications. Patients who survive may be left with no disability or with mild, moderate or severe disability [22]. In our study, the outcome of stroke was death in 10.2% while vegetative in 16.3 %. However 60.4% improved with neurological deficit and 13.6% improved without neurological deficit.

Table 1. Types of Stroke

Stroke Type	Male (%)	Female (%)	Total
Large infarction	115 (58.1)	43 (42.2)	158(52.6)
Lacunar infarction	51(25.8)	24 (23.5)	75(25.2)
Massive hemorrhage	27(13.6)	32 (31.4)	59 (19.6)
Subarachnoid hemorrhage	5 (2.5)	3 (2.9)	8(2.6)
Total	198 (100)	102 (100)	300 (100)

Table 2. Risk factors and stroke subtypes

Risk Factors	Total	Infarction	Hemorrhage
Hypertension &Diabetes	121(40)	103 (44.2)	18(26.8)
Hypertension	63(20.8)	45(19.3)	18(26.8)
Diabetes	20(6.7)	20(8.6)	---
Ischemic heart disease	19(6.4)	19(8.1)	---
Hyperlipidemia	30(9.9)	30(12.8)	---
Atrial Fibrillation	13(4.4)	4(1.7)	9(13.4)
Renal Failure	13(4.4)	---	13(19.4)
Smoking	8(2.7)	---	8(11.9)
No risk Factor	13(4.4)	12(5.1)	1(1.4)
Total	300	233(100)	67(100)

Table 3. Stroke outcomes

	Total	Infarction	Hemorrhage
Death	31(10.2)	22	9
Vegative	49(16.3)	32	17
Improved with neurological deficit	181(60.4)	152	29
Improved without neurological deficit	39(13.6)	27	12
Total	300(100)	233	67

Figure 1. Types of Stroke

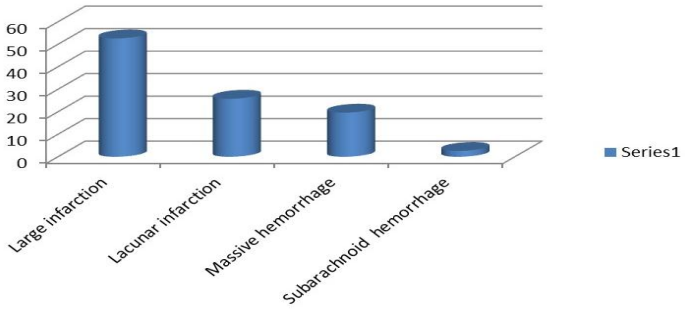


Figure 2. Risk factors and stroke subtypes

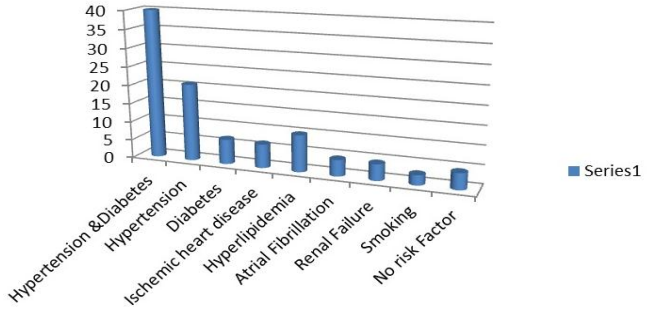
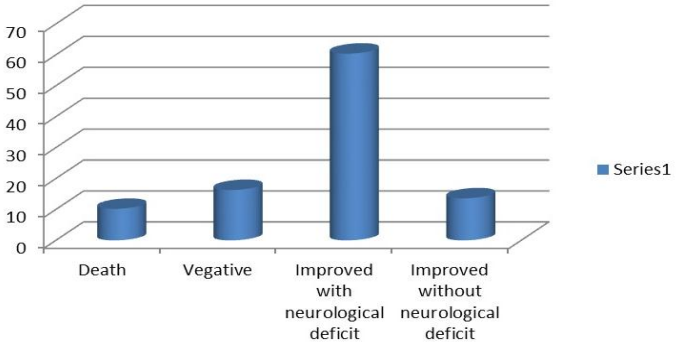


Figure 3. Stroke outcomes



DISCUSSION

In this hospital-based retrospective study of stroke, 300 Saudi patients were admitted in two years. This study showed the case fatality of 10% is lower than the 12% reported by Al Rajeh et al [23] the 17% reported from Kuwait [24] and the overall mortality of 37% reported by Adeuja and Osuntokun [25]. The most common pathological stroke subtypes were ischemic infarctions result from large cerebral infarcts, and lacunar infarcts. The frequency of lacunar infarcts in this study is similar to that observed by others [26,27]. Hemorrhagic strokes accounted for about 19% of cases in this study. The normal CT scans in our stroke patients were not unusual. Although CT remains the single most important first choice examination, it is positive in up to 70% of acute infarcts within 24 hours. However, inconclusive CT scan may require clarification by MRI [28]. The major risk factor for stroke in this study was the combined effect of hypertension with diabetes mellitus. This is an important observation which accords with the recent report by Al Rajeh et al. Adeuja and Osuntokun in Nigeria had observed that diabetes and hypertension together were present in 10% of non-embolic ischemic brain infarctions, and in 8% of those with massive cerebral hemorrhage. Zargar et al [29] found concomitant hypertension in 66.6% of diabetic patients with stroke, compared to our finding of 40%. About 62% of our hypertensive stroke patients had concomitant diabetes mellitus. These differences may be due to environmental and sociocultural factors.

Various epidemiological studies have shown that high blood pressure or hypertension is the single most important risk factor for stroke. The risk is a direct function of either systolic or diastolic BP [30-32]. All patients in our study were known hypertensives under treatment for a few years before the onset of stroke. Patient compliance with treatment was doubtful in some cases. Diabetes mellitus is another major risk factor. Although it was reported in some study that there may be no clear symptoms of diabetes, all our patients were known diabetics and were on medications. Among diabetics, the incidence of stroke has no relationship to treatment or non-treatment or any specific mode of treatment: diet, insulin or oral agents [33]. Recently, several large population studies have shown an increase in the prevalence of stroke in the known diabetic population, the undiagnosed diabetic population and those with glucose intolerance [34,35].

Atrial fibrillation (AF) without valvular heart disease constituted an important risk factor in this study, accounting for about 4.4% of our cases.

The frequency of non-valvular atrial fibrillation increases with advancing age and the incidence of stroke in AF patients is equally age related [36,37]. Smoking is associated with all forms of stroke in about the same prevalence rate as it is with coronary heart disease [38]. In this study, The frequency of smoking was 2.7% of all strokes, which were predominantly ischemic infarctions. Other studies [39,40] have associated increased risk of subarachnoid hemorrhage with smoking.

Our finding matched with the observation of Al Rajehet al. The risk of smoking appears to be dose-related. Our findings showed that hypertension, in association with diabetes mellitus, constituted a potent risk factor and should be thus classified. Our case fatality was low and both the incidence and mortality showed some seasonal variation. In spite of the high prevalence of sickle cell gene in the region, we did not encounter stroke in adults with the disease.

CONCLUSION

We believe there is a need to establish a stroke unit at Suduar Region so that the actual incidence and prevalence rates of the disease can be more accurately measured. We concluded the necessity to establish the national project for stroke prevention and treatment similar to those in developed countries with favorable epidemiological data.

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