The outcome of stroke: A six month follow-up study

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Abstract

Background and objective: Stroke is an increasing problem in developing countries and is the principal cause of disability and dependency in the western world. This study aimed to find out the one- and six-month case fatality, dependency and recurrence rates of stroke in Erbil teaching hospitals.

Methods: This hospital-based prospective study included 293 stroke patients hospitalized in Erbil teaching hospitals from January 1st, 2015 through December 31st, 2015. Stroke was diagnosed by a consultant internist or neurologist and confirmed by brain CT-scan and/or MRI. Patients were followed-up for six months, then one- and six-month outcomes were measured including case-fatality, dependency and recurrences rates.

Results: The one and six month case fatality rates were 28.3% and 37.5%, respectively. The rates in females (33.3%, 42.6%, respectively) were higher than that in males (23.7%, 32.9%, respectively), but there was no significant association between case-fatality rate and gender. A total of 74.3% and 45.4% of patients at one- and six-month were functionally dependent. The majority (88.9%) of diabetic patients were functionally dependent. Also, the one and six month recurrence rates of stroke patients were 15.7% and 23.2%, respectively. For both one and six month post stroke more recurrence occurred from ischemic (16.2%, 14.3%, respectively) than from hemorrhagic (24.5%, 19.5%, respectively) strokes, but there was no significant association between the recurrence and stroke subtype ($P = 0.691$, $P = 0.367$, respectively).

Conclusion: The reported outcomes are relatively comparable to that reported in other developing countries, although it is still more than the rates of developed countries. Outcome measures can help to give information and develop guidelines for clinical practice and research.

Keywords: Stroke; Case fatality; Recurrence; Functional outcome.

Introduction

Stroke is one of the leading causes of death worldwide, and it is an increasing problem in developing countries, and 87% of stroke deaths occurring in developing countries.[1-3] Stroke is the principal cause of disability, dependency and loss of social competence in the western world. The majority of strokes are of ischemic origin, and most ischemic strokes are due to athero-thrombosis. Clearly, a thorough knowledge of prognosis and effective secondary prevention strategies are of paramount importance for clinicians who care for stroke patients.[4] The overall case fatality gives information about the severity of the stroke and may also reflect the efficacy of early management of acute stroke, is roughly 20% within the first month, and increases around 5% per year. There is, however, a large variation in case fatality of stroke among populations; in the WHO Monitoring of Trends and Determinants in Cardiovascular Disease (MONICA) Stroke Study, the case-fatality of stroke varied between 12% in northern Sweden to 53% in Moscow in Russia. Generally, the case fatality was high in eastern European countries. In women, the difference in case fatality was greater than

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in men, ranging from 16% in Kuopio to 57% in Moscow.[5] Changes in incidence and better survival on the downhill trend in stroke mortality are difficult to measure, due to the complexity of determining precisely the incidence of stroke. Stroke has a multifactorial origin and a plethora of putative and confirmed risk factors have been listed and tested in various types of studies. The assessment of the global epidemiology is severely hindered by the lack of any kind of data on stroke occurrence and risk factors in most populations in the world. Although more than 65% of deaths due to stroke occur in developing countries, studies of stroke epidemiology in these populations hardly exist.[6] Outcomes measures can have different goals and according to the WHO classification, they may be measured at various levels. The purpose is to provide the results that measure not only therapeutic or technical success of rehabilitation but also the satisfaction of patient, as well as the patient's ability to function physically, emotionally, and socially. Outcome measures could be a study of cohorts of stroke patients in order to understand the clinical evolution of patients treated by specific drugs or techniques. This study was carried out to determine the one- and six-month case fatality, recurrence, and functional outcome of stroke patients in Erbil teaching hospitals.

Methods

This hospital-based prospective study was carried out between January 1st, 2015 and December 31st, 2015. A convenience sample of 293 newly diagnosed stroke patients by consultant internist and/or neurologist (based on clinical findings and confirmed by brain CT-scan and/or MRI) attending Erbil Teaching Hospitals in Iraq were included. A case was considered as a "stroke" according to the WHO definition.[7] Cases discovered to be secondary to a brain tumor, or brain metastasis, or caused by trauma was excluded from the study. Brain imaging (CT-Scan and/or MRI) was done for all patients to confirm the diagnosis and stroke subtype. The study protocol was approved by the scientific and ethical committees of College of Medicine at Hawler Medical University. Verbal informed consent obtained from all patients or their close relatives. Data collection was done by direct interview of the patient or their close relatives, including age, gender, marital status, history of hypertension and diabetes mellitus. Follow-up variables include patients' outcome (whether died or not), functional outcome and recurrent attack of stroke during six months period. Patients were followed-up and visited two times; first at one month and second at six month post stroke. If the patient was died, the case-fatality rate was calculated for the first and six months after stroke onset. If the patients were alive, they were examined for the grade of disability by modified Rankin scale (mRS) and also asked about any recurrent attack of stroke. The mRS was used to identify the functional outcome (the extent of disability after stroke). The mRS is a clinician-reported measure of disability that has usually been applied to evaluate recovery from stroke. The mRS consists of six-point scale ranging from zero to five.[8] The mRS is used, worldwide, to assess functional outcome in patients with stroke. An independent state was defined as Rankin score of zero to two and score of three to five for dependent state.[9] The statistical package for the social sciences (version 18.0) was used for data entry and analysis. Chi-square (χ^2) test was used to compare the proportions, and Student t-test was used to compare means of numerical variables. A *P* value of ≤0.05 was considered statistically significant.

Results

The sample included 293 patients; the mean age was 58.99 ± 9.15 years and age ranged from (35 to 74 years). The male proportion (152; 51.88%)

was slightly higher than female proportion (141; 48.12%) with a male: female ratio of 1.08:1. The female patients were slightly older than male patients. The mean age's ± SD was 59.09 ± 8.80 years for female and 58.89 ± 9.48 years for male patients. Table 1 shows that there was a significant difference between the means of age and years of education of patients for one-month (*P* <0.001 and 0.049, respectively) and six-month case fatalities (*P* <0.001 and 0.009, respectively). There was no significant difference between the mean ages of recurrent stroke patients for both one- month (*P* = 0.347) and six months (*P* = 0.598) post stroke. Results revealed that one and six months case fatality rates were 28.3% (83/293) and 37.5% (110/293), respectively. Although the rates in females (33.3%, 42.6%, respectively) were higher than that in males (23.7%, 32.9%, respectively), but there was no significant association between case-fatality rate and gender (*P* = 0.067, *P* = 0.88). There was a significant association between one month case-fatality rate and marital status, hypertension, and ischemic stroke (*P* = 0.001, 0.012, and 0.034, respectively). The case-fatality rate for both one and six months was higher in diabetic (29.9%, 37.7%, respectively) than non diabetic patients (27.8%, 37.5%, respectively). There was no statistically significant

Table 1: Mean and standard deviation of age and years of formal education by stroke outcome

Stroke outcome	One month Mean ± SD		*P* value	Six month Mean ± SD		*P* value
Outcome	Died	Alive		Died	Alive	
Age (years)	62.24 ± 7.24	57.70 ± 9.52	< 0.001	62.60 ± 7.05	56.81 ± 9.58	< 0.001
Years of education	1.98 ± 3.93	3.05 ± 4.72	0.049	1.90 ± 3.85	3.25 ± 4.83	0.009
Functional dependence	Dependent	Independent		Dependent	Independent	
Age (years)	58.78 ± 9.42	54.57 ± 9.16	0.005	59.06 ± 9.54	54.95 ± 9.26	0.004
Years of education	2.49 ± 4.44	4.67 ± 5.15	0.007	2.52 ± 4.47	3.86 ± 5.05	0.058
Recurrence	Yes	No		Yes	No	
Age (years)	60.15 ± 8.99	58.77 ± 9.18	0.347	59.50 ± 10.05	58.83 ± 8.87	0.598
Years of education	1.28 ± 3.30	3.02 ± 4.68	0.003	1.41 ± 3.44	3.15 ± 4.74	0.001

association between diabetes and case-fatality rates (P = 0.726, P = 0.980, respectively) as shown in Table 2. The results revealed that after one and six months from the onset of stroke, 74.3% (156/210) and 45.4% (83/183) of patients were functionally dependent with a higher proportion of functional dependency in females (79.8%) than in male stroke patients (69.8%) at one month post stroke. However, there was no significant

association between gender and the functional dependency rate for both one and six month post stroke. The majority (85.25%) of single and widowed and (88.9%) of diabetic stroke patients were functionally dependent one month post stroke. There was a significant association between functional dependence at one month with marital status and diabetes (P = 0.02, P = 0.004, respectively). These findings are shown in Table 3.

Table 2: One and six month case-fatality rates.

Characteristic	Case fatality rate			
	One month No. (%)	*P* value	Six month No. (%)	*P* value
Gender				
Male (N=152)	36 (23.7)	0.067	50 (32.9)	0.088
Female (N=141)	47 (33.3)		60 (42.6)	
Marital status				
Single and widow (N=101)	40 (39.6)	0.001	54 (53.5)	< 0.001
Married (N=192)	43 (22.4)		56 (29.2)	
Hypertension				
Hypertensive (N=182)	61 (33.5)	0.012	79 (43.4)	0.008
Not hypertensive (N=111)	22 (19.8)		31 (27.9)	
Diabetes mellitus				
Diabetic (N=77)	23 (29.9)	0.726	29 (37.7)	0.980
Not diabetic (N=216)	60 (27.8)		81 (37.5)	
Type of stroke				
Ischemic (N=216)	54 (25.0)	0.034	75 (34.7)	0.095
Hemorrhagic (N=77)	29 (37.7)		35 (45.5)	

Table 3: One and six month functional dependency rates.

Characteristic	Dependency rate			
	One month No. (%)	*P* value	Six month No. (%)	*P* value
Gender				
Male	81/116 (69.8)	0.101	47/102 (46.1)	0.825
Female	75/94 (79.8)		36/81 (44.4)	
Marital status				
Single and widow	52/61 (85.25)	0.020	23/47 (48.94)	0.567
Married	104/149 (69.8)		60/136 (44.1)	
Hypertension				
Hypertensive	95/121 (78.5)	0.102	49/103 (47.6)	0.494
Not hypertensive	61/89 (68.5)		34/80 (42.5)	
Diabetes mellitus				
Diabetic	48/54 (88.9)	0.004	27/48 (56.3)	0.078
Not diabetic	108/156 (69.2)		56/135 (41.5)	
Type of stroke				
Ischemic	116/162 (71.6)	0.102	60/141 (42.6)	0.163
Hemorrhagic	40/48 (83.3)		23/42 (54.8)	

The study findings revealed one and six months recurrence rates of stroke patients were 15.7% (46/293) and 23.2% (68/293), respectively. There is no statistically significant association between the recurrence rate for both one and six month post stroke with gender, marital status, hypertension, diabetes. For both one and six month post stroke more recurrence occurred from ischemic (16.2%, 14.3%, respectively) than from hemorrhagic (24.5%, 19.5%, respectively) strokes. However, there was no significant association between one and six-month recurrences of stroke and stroke subtype (*P* = 0.69 and *P* = 0.367, respectively), as shown in Table 4.

Discussion

In many developing countries, the incidence of stroke is rising because of the adoption of less healthy lifestyles. About 20% of acute stroke patients will die within a month of the event, and at least half of those who survive will be left with a physical disability.[10] In a study conducted in Australia, it has been reported that within one year of a stroke, around 37% will die and 10% will experience a recurrent stroke.[11] The one month case fatality rate in the current study was 28.3%, while it was 23.7% in a previous study in Erbil,[12] 27.2% in India,[13] 23.3% in Ukraine,[14] 20.3% in Malaysia,[15] and 31.5% in Iran,[16] 38% in Senegal.[17] Stroke mortality is projected to increase more rapidly in developing countries than in developed countries due to demographic and epidemiological shifts which resulted in stroke becoming a major health problem.[2] The six-month case-fatality rate revealed by this study (37.5%) is higher than that reported in other countries. In Australia, this figure has been reported to vary between 23.9% and 35.5% in different months.[18] The higher proportion of deaths for both one-month and six-month in females revealed by this study which is consistent with other studies done in Sweden[19] and Italy[20] may be due to the reported high proportion of risk factors (especially hypertension) in females. Risk of stroke is higher for older and low-income women and the death rate of stroke more

Table 4: One and six month recurrence rates.

Characteristic	Recurrence rate			
	One month No. (%)	*P* value	Six month No. (%)	*P* value
Gender				
Male (N=152)	19 (12.5)	0.118	31 (20.4)	0.236
Female (N=141)	27 (19.1)		37 (26.2)	
Marital status				
Single and widow (N=101)	19 (18.8)	0.288	27 (26.7)	0.300
Married (N=192)	27 (14.1)		41 (21.4)	
Hypertension				
Hypertensive (N=182)	28 (15.4)	0.849	41 (22.5)	0.724
Not hypertensive (N=111)	18 (16.2)		27 (24.3)	
Diabetes mellitus				
Diabetic (N=77)	14 (18.2)	0.486	19 (24.7)	0.722
Not diabetic (N=216)	32 (14.8)		49 (22.7)	
Type of stroke				
Ischemic (N=216)	35 (16.2)	0.691	53 (24.5)	0.367
Hemorrhagic (N=77)	11 (14.3)		15 (19.5)	

than triples with each added decade of life after 45 years age.[21] This study revealed that there is a higher proportion of deaths from hemorrhagic than ischemic stroke, a finding which is consistent with the studies done in Martinique (37.3% vs. 15.8%),[22] and in Croatia (54.3% vs. 25.8%).[23] The higher mortality in hemorrhagic strokes might be due to the extension of bleeding to the large area of brain tissue and development of increased intracranial pressure and consequent brain edema. The higher proportion of functional dependency in females than in male stroke patients was not statistically significant, which agrees with the findings of the study done in Kerala, India that revealed no significant difference in the functional outcome between males and females, and nearly 60% of patients were significantly disabled 1 month post-stroke.[13] Older age was related to a poorer functional outcome in the ADL/physical function domain. Moreover, increased age was related to a more severe stroke and worse recovery that may explain the low ADL and physical function scores.[24] Elsewhere, findings related to age have been somewhat inconsistent. In other studies, younger patients have had better post-stroke ADL.[25] It is expected that around 60% of stroke survivors are likely to recover independence, and 75% to walk independently. Another study showed that of those who survive, about 51% are disabled in various activities of daily living.[26] People dealing with stroke treatment are more worried about adaptation to disability and ability to perform activities of daily living, because the major goal of stroke rehabilitation is to return to independence in ADL.[27] Previous studies have established that advanced age and diabetes are predictors of recurrence,[28] and also revealed that lowering blood pressure in stroke survivors can reduce the risk for both first and recurrent stroke by 40%.[29] Unavailability of special stroke unit in Erbil teaching hospitals might be another factor for

poor outcomes. For people who were admitted to a stroke unit at the time of their index stroke, the risk of recurrent stroke was reduced by 16%, while patients transferred to another hospital at first admission had a 25% increased risk of recurrence. It has been shown that treatment in stroke units can improve outcomes, independence and capacity to live at home.[28]

Conclusion

The reported outcomes are relatively comparable to that reported in other developing countries, although it is still more than the rates of developed countries. Establishment of a stroke unit in Erbil teaching hospitals to improve the outcome of stroke patients is recommended. Finally, outcome measures can help to give information and develop guidelines for clinical practice and research.

Competing interests

The author declares that he has no competing interests.

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