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ORIGINAL ARTICLE

Evaluation of Stroke Risk Factors among a Sample of Patients at Rizgary Teaching Hospital in Erbil/Iraq

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ABSTRACT

Background: *Stroke was the second leading cause of death following heart disease in 2013 and was the major cause of permanent disability. The burden of stroke in terms of morbidity, mortality and disability is escalating. Despite the fact that stroke has a high burden globally, there's insufficient data regarding risk factors and difference in risk factors between stroke subtypes in middle- and low-income countries like Iraq.*

Objective: *the aim of this study is to assess risk factors, clinical presentations and predictors of stroke subtypes among adult patients admitted to Rizgary teaching hospital, in Erbil province of KRG, Iraq.*

Patients and Methods: *A cross-sectional study was carried out at Rizgary Teaching Hospital for 3 consecutive months from June, 2022 to August, 2022. A questionnaire was used to collect data from patients' interviews. Data was entered into SPSS Version 25. Stepwise binary logistic regression was used to identify the predictors of stroke subtypes.*

Result: *A total of 100 eligible stroke patients were recruited. The mean age was 59.2 ± ~14.0 years. Males comprised 58% of the studied group and females comprised 42% of the studied group. 89% of the total stroke cases were diagnosed as ischemic stroke and 11% were diagnosed as hemorrhagic stroke. The most common clinical presentation was left side weakness complained by 33% of the patients followed by right side weakness 21% and slurred speech 16%. Positive family history and past medical history of stroke are identified as independent predictors of hemorrhagic stroke.*

Conclusion: *The outcome of this study was similar to the available studies done in middle-and-low-income countries. Large-scale community health campaigns should be developed with an emphasis on educating the public on stroke risk factors and the identification of symptoms associated with stroke, due to their high priority worldwide.*

Keywords: *Ischemic stroke, hemorrhagic stroke, risk factors*

1. INTRODUCTION

Stroke is the second-most-common cause of mortality and a significant contributor to disability worldwide (1-3). The burden of stroke in terms of morbidity, mortality and disability is escalating (4, 5). The World Health Organization (WHO) noted that stroke incidents have doubled in the past 40 years (6, 7). In addition, statistics from 2010 study "the global burden of diseases, injuries and risk factors" showed that stroke is the main cause of morbidity, mortality and disability among low- and middle-income populations in developing countries (8). According to an article published in 2013 by the American Heart Association, the term "stroke" is a broad term that refers to a variety of conditions. Ischemic stroke, stroke caused by intracerebral hemorrhage, subarachnoid hemorrhage, cerebral venous thrombosis, and stroke that is not otherwise specified are among these conditions (9). The risk factors for stroke can be categorized into modifiable and non-modifiable factors. Effective prevention strategies include targeting the modifiable factors. The modifiable risk factors include hypertension, hyperlipidemia, diabetes mellitus, sedentary lifestyle, smoking, Atrial fibrillation, cardiovascular diseases, unhealthy diet and obesity (10-13). Three subtypes of stroke exist in terms of pathology: 1) Ischemic brain injury 2) intracerebral Hemorrhage 3) subarachnoid hemorrhage (14). Ischemic stroke accounts for 80% of all stroke cases (15-17). It is brought on by a halt in blood flow to a portion of the brain, retina or spinal cord, resulting in an abrupt loss of function (5). Some studies have shown that the prevalence of risk factors varies among the various subtypes of stroke. This illustrates how important pathophysiology knowledge is for management and patient care (18). The Kurdistan Regional government and Iraq as a whole lack reliable information on stroke and its epidemiology. Public awareness should be executed regarding stroke; and its risk factors should be identified to help the population understand the damaging effects of stroke. Consequently, this paper's goal is to gather and combine information on stroke and its potential risk factors among stroke patients who have been admitted to Rizgary Teaching Hospital located in Erbil province, KRG, Iraq

2. METHODOLOGY

Ethical approval:

The Study was Approved by the ethics committee of Kurdistan Higher Council of Medical Specialties

Patient involvement in research:

The patient involvement in the study was based on convenient sampling method. All information related to each patient was deidentified and each patient was assigned a numerical code.

Study design:

A prospective cross-sectional study was carried out to determine the prevalence of risk factors of stroke.

Setting:

The sample population of the study included stroke patients admitted to Rizgary Teaching Hospital from June 2022 to August 2022.

Participants:

All patients with the diagnosis of stroke, admitted in Rizgary teaching hospital located in Erbil.

province during the time period June 2022 to August 2022 were included in the study population. A total of one hundred stroke cases were identified and were found eligible to be included in the study. The inclusion criteria for the study are the following: middle and old age patients from both genders, who had the risk factors of stroke and were diagnosed with any of the subtypes of stroke were included. Patients with insufficient medical record for diagnosis and those diagnosed with transient ischemic attack were excluded from this study. Recruitment. The data were collected by interviewing patients and completed by obtaining information from the case records of each patient. Those data included age, gender, socioeconomic status, signs and symptoms on admission, past medical history of hypertension, diabetes, hyperlipidemia, cardiovascular diseases, family history of stroke, smoking history, and alcohol consumption.

Statistical analysis:

A statistical program (SPSS, IBM, Chicago) version 23.0 was used to analyze the recruited data. Continuous data were presented in the form of mean and standard deviation; whereas, categorical variables were displayed in frequencies and percentages. Data analysis was carried out by backward binary logistic regression analysis and odds ratio (OR), and the 95% confidence interval (CI) was calculated by using standard statistical techniques. Any value of $P < 0.05$ was considered as significant.

3. RESULTS

One hundred patients with diagnosis of stroke were recruited at Rizgary teaching hospital for this study. History was obtained from the patients. CT scan was done for all the patients to diagnose or exclude Hemorrhagic stroke. When hemorrhagic stroke was excluded, the patients were evaluated clinically to diagnose ischemic stroke.

Patient characteristics:

The mean age of patients was 59.2 ± ~14.0 years (Range: 31-87). Males comprised 58% of the studied group and females comprised 42% of the studied group. The male: female ratio was determined to be 1.38. The mean age for females was 56.3 ± 14.3 (Range: 31-85) while the mean age for males was 61.3 ± 13.4 (Range: 35-87). The majority of our patients in both genders were in the age range of 45-65. The majority of participants (57%) had primary school education and 55% were in middle income families (**Table 2**).

Risk factors for stroke and stroke subtypes:

Risk factors were identified in 96% of patients and 4% did not have any known risk factors; 89% of the total stroke cases were diagnosed as ischemic stroke and 11% were diagnosed as hemorrhagic stroke. The most common encountered risk factor was hypertension which accounted for 73% of cases followed by diabetes mellitus which accounted for 49%, past medical history of stroke current smoker 24%, dyslipidemia 22%, ischemic heart disease 21%. and ex-smoker 16%. The most common risk factor for stroke in general was hypertension, accounting for 73% of patients. The second most common risk factor was diabetes mellitus found in 49% of patients, followed by past medical history of stroke (25%), dyslipidemia (22%), ischemic heart disease (21%), obesity (19%). Hypertension was more

prevalent in males. Diabetes Mellitus was more prevalent among females but for both hypertension and diabetes there were not statistically significant differences between stroke subtypes. From 25 patients who gave a history of stroke, 20 of them were ischemic stroke. From 9 patients with family history of stroke, 5 patients were diagnosed to have ischemic stroke and 4 patients were hemorrhagic stroke and there was a statistically significant difference between stroke subtypes. Among the nonmodifiable risk factors; gender was not a statistically significant risk factor for ischemic or hemorrhagic stroke. From 21 patients with history of ischemic heart disease 20 patients were ischemic stroke and only 1 patient was hemorrhagic stroke. The risk factors of stroke in general and each subtype is mentioned in (**Table 3**).

Clinical presentation of stroke patients:

The most common clinical presentation was left side weakness complained by 33 (33%) of the patients followed by right side weakness 21 (21%) and slurred speech 16 (16%). Most ischemic stroke patients presented with left side weakness 30 (33.7), right side weakness 19 (21.3%), and slurred speech 15 (16.9%). Likewise, the most common clinical presentation of hemorrhagic stroke was left side weakness (27.3%), followed by both right-side weakness 2 (18.2%) and decreased level of consciousness 2 (18.2%) (**Table 4 & Figure 1**).

Predictors of stroke subtypes:

Using $P < 0.05$ for candidate variable selection for predictors of stroke subtypes on stepwise binary logistic regression; gender, situation of smoking habit, hypertension, diabetes mellitus, dyslipidemia, ischemic heart disease, past medical history of stroke, obesity, and family history of stroke were selected to be included. Up on stepwise binary logistic regression only past medical history of stroke and family history of stroke were independent predictors of hemorrhagic stroke. Patients having past medical history of stroke were 5 times more likely to experience hemorrhagic stroke than ischemic stroke ($P < 0.05$). Patients having family history of stroke were 10 times more likely to experience hemorrhagic stroke than ischemic stroke ($P < 0.05$) (**Table 5, 6**).

Table 1. Age and gender distribution of the studied group

Age (year)	Male		Female		Total	
	No.	%	No.	%	No.	%
<45	8	13.8	11	26.2	19	19.0
45-65	27	46.6	17	40.5	44	44.0
>65	23	39.6	14	33.3	37	37.0
Total	58	100.0	42	100.0	100	100.0

Chi square = 2.44, P. value = 0.295

Table 2. Baseline characteristics of stroke patients admitted to Rizgary teaching hospital

Variable		Ischemic stroke (n=89)		Hemorrhagic stroke (n=11)		Total (n=100)	
		No.	%	No.	%	No.	%
Age	<45	19	21.3	0	0.0	19	19.0
	45-65	42	47.2	2	18.2	44	44.0
	>65	28	31.5	9	81.8	37	37.0
Gender	Male	53	59.6	5	45.5	58	58.0
	Female	36	40.4	6	54.5	42	42.0
Marital status	Single	7	7.9	0	0.0	7	7.0
	Married	78	87.6	8	72.7	86	86.0
	Divorced	0	0.0	0	0.0	0	0.0
	Widower	4	4.5	3	27.3	7	7.0
Education status	No Education	2	2.2	5	45.5	7	7.0
	Primary school	52	58.4	5	45.5	57	57.0
	Secondary school	18	20.2	1	9.1	19	19.0
	High school	12	13.5	0	0.0	12	12.0
	Bachelor's degree	5	5.6	0	0.0	5	5.0
Socio-economic status	Low income	41	46.1	2	18.2	43	43.0
	Middle income	46	51.7	9	81.8	55	55.0
	High income	2	2.2	0	0.0	2	2.0

Table 3. Risk factor of stroke subtypes among adult patients admitted to Rizgary teaching hospital

Stroke Risk factors		Ischemic stroke (n= 89)		Hemorrhagic stroke (n=11)		Total patients (n= 100)		P. value
		No.	%	No.	%	No.	%	
Gender	Male	53	59.6	5	45.5	58	58.0	0.519
	Female	36	40.4	6	54.5	42	42.0	
Current smoker		23	25.8	1	9.1	24	24.0	0.289
Ex-smoker		14	15.7	2	18.2	16	16.0	1
Hypertension		65	73.0	8	72.7	73	73.0	1
Diabetes Mellitus		46	51.7	3	27.3	49	49.0	0.127
Dyslipidemia		19	21.3	3	27.3	22	22.0	0.703
Ischemic Heart disease		20	22.5	1	9.1	21	21.0	0.45
Atrial Fibrillation		5	5.6	0	0.0	5	5.0	1
History of stroke		20	22.5	5	45.5	25	25.0	0.136
Alcohol Consumption		1	1.1	0	0.0	1	1.0	1
Sedentary lifestyle		10	11.2	0	0.0	10	10.0	0.596
Obesity		17	19.1	2	18.2	19	19.0	1
Family history of stroke		5	5.6	4	36.4	9	9.0	0.008*

*Statistically significant

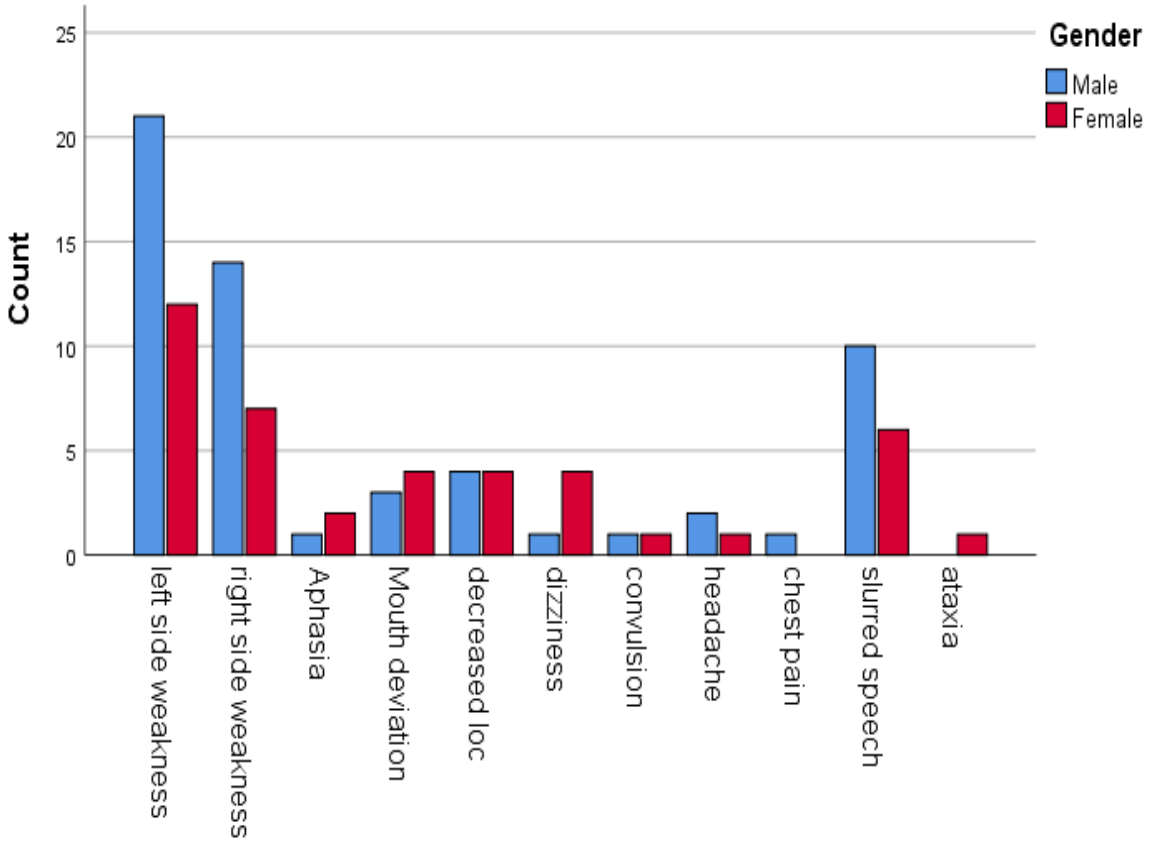

Figure 1. Comparison of clinical presentation of stroke in male and female

Table 4. Frequency of chief complaints among the studied population

Clinical presentation	Ischemic stroke		Hemorrhagic stroke		Total	
	No.	%	No.	%	No.	%
Headache	3	3.4	0	0.0	3	3.0
Aphasia	2	2.2	1	9.1	3	3.0
Slurred speech	15	16.9	1	9.1	16	16.0
Decreased level of consciousness	6	6.7	2	18.2	8	8.0
Mouth deviation	6	6.7	1	9.1	7	7.0
Left side weakness	30	33.7	3	27.3	33	33.0
Right side weakness	19	21.3	2	18.2	21	21.0
Dizziness	5	5.6	0	0.0	5	5.0
Convulsion	1	1.1	1	9.1	2	2.0
Chest pain	1	1.1	0	0.0	1	1.0
Ataxia	1	1.1	0	0.0	1	1.0

Table 5. Stepwise logistic regression (initial model)

Risk factors	OR	95% CI		P. value
		Lower	Upper	
Gender	0.212	0.033	1.360	0.102
Current smoker	0.229	0.010	5.168	0.354
Ex-smoker	3.177	0.310	32.542	0.330
Hypertension	0.451	0.70	2.891	0.401
Diabetes Mellitus	0.138	0.18	1.086	0.60
Dyslipidemia	1.569	0.233	10.580	0.644
Ischemic heart disease	0.624	0.059	6.630	0.696
Past medical history of stroke	3.789	0.626	22.9944	0.147
Obesity	0.363	0.21	6.267	0.468
Family history of stroke	29.338	2.497	344.626	0.007

Table 6. Stepwise logistic regression (Final model)

Risk factor	OR	95% CI		P. value
		Lower	Upper	
Diabetes Mellitus	0.248	0.050	1.224	0.87
Past medical history of stroke	5.440	1.157	25.583	0.032
Family history of stroke	10.756	2.020	57.274	0.005

4. DISCUSSION

The sociodemographic aspects of this study are comparable to earlier findings.(19)The mean age of the patients was 59.2 ±14.0 years, which was lower than studies by Tirschwell et al. and Sagui et al.(20, 21) but in accordance with other studies done in developing countries (20, 22-24). In this study, Stroke incidence was highest among people in their middle age (45-65 years) (44%), and about one fifth (19%) of the study population had an attack of stroke before the age of 45. Both of these findings are consistent with Fekadu et al.'s findings.21 Whereas other areas of Ethiopia and some areas of Nigeria have found lower rates of stroke among young age patients (<45 years) (22, 25-27).

The higher rate of stroke in male patients compared to female patients is consistent with other earlier researches.(28-30) The cause of that may be related to higher risk factors including tobacco use and the absence of endogenous estrogens in males that would normally provide vascular protection. The results of this study were unlike some studies that showed a higher percentage of female patients than male patients (26, 31). Hypertension, which accounted for 73% of the cases, was shown to be the most prevalent modifiable risk factor. This finding is consistent with earlier research, as uncontrolled hypertension is the primary risk factor for stroke in both developing and developed countries (27-30, 32, 33). This factor may be as a result of lack of healthcare access, poor health practices, and a lack of community knowledge. This suggests to us that hypertension is underdiagnosed and inadequately treated in our community, particularly given the absence of a robust screening program, the failure to regularly check blood pressure, the inadequate medical history, and the subpar patient follow-up. Additionally, because simple hypertension is typically symptomatic and denial of the disease is prevalent, it might be difficult for the patient to adhere to long-term medication. Compared to two previous studies conducted in Egypt, dyslipidemia was found in only 22% of the participants in the current study. Soliman et al. study and the El Tallawy et al. study found that patients had dyslipidemia in 58.1% and 54.2%, respectively (34, 35). HMG-CoA reductase inhibitors (statins) can lower the incidence of stroke in a variety of study populations with coronary heart disease, diabetes, hypertension, and the elderly, despite the fact that the precise involvement of lipids is unclear (36). One of the main causes of atherosclerosis and a risk factor for stroke is diabetes mellitus. In our study population, 49 (or 49%) of the patients had diabetes mellitus. Our study's prevalence of diabetes mellitus is comparable to a study by De Carvalho et al (46.8%) (37). The prevalence was lower in previous studies by Sarkar et al. (25.9%), Desalu et al. (23.8%), and Soliman et al. (34.7%) (23, 32, 34). Cigarette smoking is a well-known risk factor for stroke because of its significant correlation with the atherothrombotic process. In this study, 40% of the patients had a smoking history, with 16% of them being former smokers and 24% being current smokers. In the Framingham research, it was discovered that the relative risk of stroke in smokers was 2.3 in men and 3.1 in women after controlling for age and hypertension. Additionally, a notable dose-response association was discovered. The risk

for heavy smokers was twice that of light smokers. After quitting smoking for five years, the risk of stroke reverted to non-smoker levels (38). In this study, 41.5% of patients who had ischemic strokes were either current or former smokers. This is congruent with the findings of the study by Soliman et al., in which smoking behaviors were reported in 41.3% of the patients (34). Twenty five percent of the patients had a history of stroke in the past. Only 9% of patients who had hemorrhagic strokes were found to have a history of previous strokes, compared to 22.5% of patients who had ischemic strokes. This conclusion is lower than those of Soliman et al. and Altafi et al., whose studies found that previous stroke history was related to 26% of hemorrhagic stroke cases and 27.5% of ischemic stroke patients, respectively (33, 34). A number of mechanisms, including the inheritance of susceptibility to the effects of such risk factors, the sharing of cultural, environmental, and lifestyle factors within families, and the interaction of genetic and environmental factors, can explain the potential contribution of a positive family history to increasing the risk of stroke and its subtypes (38). A total of 9% of patients had a positive family history. 5.6% of our patients with ischemic stroke had a positive family history, compared to 36.4% of hemorrhagic stroke patients, who had a positive family history. The statistical significance of this discovery was >0.05. It is determined that a positive family history was linked to increased risk of stroke. Numerous processes, such as the genetic inheritance of risk factors and genetic vulnerability to their effects, cultural/environmental and lifestyle factors, and the interaction of genetic and environmental factors, can be used to explain the significance of family history (39). Previous studies have shown that family history of stroke increases the risk of stroke by 30% (38). Positive family history of stroke and prior medical history of stroke were independent predictors of hemorrhagic stroke according to backward binary logistic regression in this study. The likelihood of hemorrhagic stroke over ischemic stroke was significantly higher in patients with a positive family history of stroke and a prior medical history of stroke. This finding was not in accordance with Fekadu et al.'s study in which positive family history of stroke and past medical history of stroke were more likely in ischemic stroke than hemorrhagic stroke (20). This difference can be attributed to the fact that these risk factors were more common in our study population.

Similar to a recent study by Tirschwell et al. ischemic stroke was frequently linked to cardiac conditions like atrial fibrillation, ischemic heart disease, and heart failure (21). In our study, 21% of patients had ischemic heart disease. In contrast to 9.1% of patients with hemorrhagic stroke, 22.5% of ischemic stroke cases had a history of ischemic heart disease. Only 5% of our patients had atrial fibrillation. This is considerably less than studies by Fekadu et al. and De Carvalho et al., in which atrial fibrillation was found in 16.4% of cases and 14.95% of patients, respectively (19, 37). All of the atrial fibrillation cases were ultimately determined to have had ischemic strokes. This difference can be explained by a higher incidence of ischemic heart disease and atrial fibrillation in those studies as in our study the percentage of ischemic heart disease was 21% and that of atrial fibrillation was only 5%. This is in comparison to approximately 15% of patients in De Carvalho et al.'s study and 16% of patients in Fekadu et al.'s study (20, 37). Left side weakness (33% of patients) was the most prevalent clinical symptom at the time of stroke start. This result is in line with findings from earlier research in which hemiplegia and hemiparesis were the most prevalent clinical manifestations (24, 26-28, 31, 37). Both ischemic stroke (33.7%) and hemorrhagic stroke (27.3%) most frequently manifested as left side weakness, with right side weakness (21.3%) and impaired speech (16.9%) following closely behind. The second most frequent signs of a hemorrhagic stroke were right side weakness and a decreased degree of consciousness. In the study by Fekadu et al., headache was the most frequent clinical manifestation (75%), followed by aphasia (60.3%) and hemiparesis (53.4%) (20).

Limitations

This research is intended to determine various stroke risk factors. For the purposes of our study, we acquired more or less trustworthy information and consistently ascertainable risk factor identification to provide a uniform data collection. The study had some restrictions and disadvantages. In contrast to a longitudinal community study, this study was hospital-based. The true prevalence of stroke in the population might not be accurately represented by the convenience sample technique that we used. Even though the study was hospital-based, the fact that there was only one referral center may have been an accurate reflection of the true scope of stroke in our nation.

Based on clinical manifestations, risk profiles, illness history, and other supportive investigations, approximately half of the patients were diagnosed with stroke just only on clinical evidence. The precision and dependability of the data may be distorted by clinical diagnosis methods that rely more on physician judgment than biological information. This could result in unintentional associations between the study's many variables that are falsely positive and falsely negative. Therefore, care should be exercised when extrapolating the findings to a sizable group. The risk factor status in our study procedure was not appropriately clarified, particularly for ischemic stroke patients with cardiac problems. Even straightforward and affordable diagnostic procedures like electrocardiograms (ECG) were not frequently carried out. Poor risk factor diagnosis and identification may under- or overestimate some risk factors. Finally, because of the short recruiting period, the sample size was small, which made it difficult to analyze some predictors. Additionally, we relied on patient accounts of some of their risk variables and other patient-related histories, both of which could have introduced recall bias

5. CONCLUSIONS

The majority of patients were middle-aged men who had a moderate level of education and socioeconomic status. Hypertension was identified as the most common risk factor. left side weakness was the most prevalent clinical presentation. Those with ischemic stroke were more likely to appear with slurred speech and dizziness, while patients with hemorrhagic stroke were more likely to have a decreased level of consciousness. Large-scale community health campaigns should be developed with an emphasis on educating the public on stroke risk factors and the identification of symptoms associated with stroke, due to their high priority worldwide. Early detection and treatment could enhance results. Authorities should therefore implement measures for managing and screening for common risk factors like hypertension.

Ethical Approval:

All ethical issues were approved by the author. Data collection and patients enrollment were in accordance with Declaration of Helsinki of World Medical Association , 2013 for the ethical principles of researches involving human. Signed informed consent was obtained from each participant and data were kept confidentially.

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