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RESEARCH ARTICLE

The Incidence and Risk Factors Associated with Stroke among Patients Who Attended the Medical Ward of Mettu Karl Referral Hospital, South Western, Ethiopia: A Prospective Observational Study

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Abstract

Background: Stroke as a clinical syndrome typified by "rapidly developing clinical signs of focal or global disturbance of cerebral function, lasting more than 24 hours or leading to death, with no apparent cause apart that of vascular origin. Stroke is a major cause of death and disability in many countries. If left untreated, stroke is a debilitating disease that can lead to death.

Objective: To ascertain the incidence and risk factors associated with stroke among patients who attended the medical ward of Mettu Karl Referral Hospital.

Methods: A prospective observational study design was carried out from May 13/2021 to July 19/2021. Data was collected through employing well structured questioner, and then the collected data was cleared, coded and analyzed by statistical packages for social sciences 25.0 version statistical software. The relationship between risk factors and stroke subtypes were examined by logistic regression and chi-square test. Statistical significant was P value at < 0.05.

Findings: From the 84 patients, nearly above one-half 47 (56.0%) of participants were male patients. Nearly one half 39 (46.4%) of respondents age were between 45-65 years. From the study subjects, majority 48 (57.1%) of respondents were have ischemic type of stroke followed by 29 (34.5%) hemorrhagic stroke. In multivariable regression analysis, the age > 65 years (AOR = 3.58, 95% CI: 2.931-7.208; p = 0.001), male (AOR = 1.78; 95% CI: 1.935-2.916; p = 0.039), comorbidities (AOR = 2.15; 95% CI: 2.074-3.858; p = 0.005), coronary artery disease comorbidity (AOR: 3.47; 95% CI: 3.175-8.093; P < 0.001), and hypertension comorbidity (AOR: 1.78; 95% CI: 1.406-3.072; P = 0.049), medication non-adherence (AOR = 4.67; 95% CI: 4.524-9.105; p = 0.001), don't reduce salt in diet (AOR = 1.79; 95% CI: 1.971-2.431; p = 0.046), eating fatty diet (AOR = 2.05, 95% CI: 2.157-4.381; p = 0.005), and rural residents (AOR = 3.74; 95% CI: 2.904-7.516; p = 0.006) were significantly associated with stroke risk factors.

Conclusion and recommendation: Among the study participants, less than half of patients were smoke cigarette every, were smoking cigarette after diagnosed, were do regularly exercise regularly, were drink alcohol every, were drink alcohol currently, were don't reduce salt in diet, and were eat fatty diet. Health care workers should have to treat stroke risk factors to manage the stroke mortality rate.

Keywords

Stroke, Risk factors, Medical ward, Mettu Karl Referral Hospital, Ethiopia

Abbreviations

GBD: Global Burden of Disease; HTN: Hypertension; MKRH: Mettu Karl Referral Hospital; NCDs: Non-Communicable Disease; SAH: Subarachnoid, Hemorrhage; T2DM: Type 2 Diabetes Mellitus; TIA: Transient Ischemic Attacks; WHO: World Health Organization

Introduction

Stroke is defined as a rapidly developing global or focal neurological deficit maintaining more than 24 hr or causing death without clear causes other than vascular origin". Also, stroke can be defined as a rapid damage in brain function caused by brain arteries

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decrease or stop [1]. It is divided into three types; most commonly hemorrhagic, ischemic, and Transient Ischemic Attacks (TIA). Stroke is a major public health problem, affecting millions of people in both developed and developing countries. It mainly occurs because of poor blood flow to the brain which results in cell death. Inability to move, cognitive impairment, talking problems, and feeling as the world is spinning; severe headache and loss of vision are key signs and symptoms of stroke [2]. The incidence, prevalence, and mortality rate of stroke have been increased worldwide, with most of the burden being in low and middle-income countries. The incidence, prevalence, and mortality rate of stroke have been increased worldwide, with most of the burden being in low and middle-income countries [3]. Developing countries have a higher burden of non-communicable diseases than the rest of the world. More-than two-third (70%) of strokes occurs in low- and middle-income countries [4]. Globally, stroke has covered about 16 million incidences and 9.7% deaths. Over 23 and 7.8 million new stroke cases and deaths are expected by 2030; respectively if there will not be intervention [5]. According to Global Burden of Disease (GBD) study in 2010, more than 11 million ischemic strokes occurred while 63% of them were in lowland middle-income countries. Because of the difference in social and economic status of rural and urban societies, probability of stroke incidence, its course and distribution of stroke risk factors such as hypertension (HTN), diabetes mellitus (DM), ischemic heart disease (IHD), hyperlipidemia (HLP), smoking, obesity, and physical inactivity [6-9] in these societies are different. Knowledge of these differences is very important to get correct information for prevention planning and management of stroke. However, effective stroke prevention needs to be addressed by strategies targeting those at high risk for stroke, which may differ in these two societies [10-13]. Also, near 3 million deaths occurred due to ischemic stroke. About 13% of stroke is of a hemorrhagic type [14]. According to GBD study in 2010, there were about 5.3 million hemorrhagic stroke cases, out of which about 80% occurred in low and middle-income countries. Over 3 million deaths occurred from hemorrhagic stroke [15]. Stroke in sub-Saharan Africa is a major public health problem, with higher mortality than in developed countries and occurrence at a younger age [16]. The American heart association plans to reduce disease and deaths from stroke by 20 percent in 2020 by focusing on seven key health factors and behaviors that decrease the risk of stroke, those are not-smoking, physical activity, healthy diet, bodyweight, and control of cholesterol, blood pressure, and blood sugar [17]. Stroke has different risk factors, which can be grouped into modifiable and non-modifiable risk factors. Major risk factors for stroke include age, history of cerebrovascular event, smoking, alcohol consumption, physical inactivity, hypertension, dyslipidaemia, diabetes mellitus, cardiovascular diseases, obesity, metabolic syndrome, diet, nutrition, and genetic risk factors [18]. The most factors linked to intracerebral hemorrhage are HTN and oral anticoagulation therapy; while, smoking, alcohol consumption, and HTN have been reported as risk factors to subarachnoid hemorrhage [19].

According to the World Health Organization, the second cause of death over the past 2002-2012 has been stroke. Also, it has estimated that in 2004 about 5.7 million deaths happened because of stroke which accounted for 9.7% of deaths; more than 85% of these deaths occurred in middle-income and low income countries [20]. The reasons for this trend are not clear, but it can be attributed to getting more information about the risk factors of stroke. There were several studies which confirm this relationship. One of them conducted in Saudi Arabian in (1993) reported hypertension as one of the most serious stroke risk factors between the Saudi populations. Thus far, no nationwide has been conducted recently on the prevalence and incidence of strokes in Saudi Arabia. However, it was reported in a study that the rate of stroke in Saudi Arabia was 29.8/100,000. They also reported that ischemic strokes (69%) predominated and Subarachnoid Hemorrhage (SAH) accounting only for 1.4% [21]. Developing countries have shared the majority of global stroke mortality [22]. About 85.5% of world's stroke deaths have occurred in developing counties. There was an increment of stroke prevalence by 8% in Africa between 2002 and 2004. Smoking, alcohol intake, diabetes mellitus, poor physical activity and unhealthy diets were the stated factors to stroke. Old age also has a positive linkage with stroke [23]. In 2015/16-2019/20 the Ethiopian health sector development program projects to decrease by 12.5% premature mortality from non-communicable disease (NCDs). In Ethiopia currently, stroke is one of the greatest public health problems, accounts for 7% of total deaths. Study in Mekelle, Ethiopia showed that the stroke was the third most common cause of medical intensive care unit admission (15.2%) and the first cause of death, which accounts for 17% of all deaths in the medical intensive care unit [24]. Similarly, hypertension is responsible for 66.2% of all stroke admission and 38% of all strokes were on anti-hypertensive treatment [25]. This study was conducted to estimate the magnitude of risk factors of stroke and mortality rate in hospital and, the unavailability of a nationwide study that determines the magnitude of risk factors and mortality rate in-hospital of stroke is an important research gap.

Methodology

Study setting

The study was conducted in MKRH, Mettu town, South West Oromia, Ethiopia which is found at 600 km from Addis Ababa. Mettu, located in the Illu babor Zone

of the Oromia Region along the Sor River, this town has a latitude and longitude of 8°18'N 35°35'E and an altitude of 1605 m. The hospital can give service for around 1.4 million clients. There are different wards and clinics within MKRH; those include internal medicine ward, surgery ward, pediatric ward, gynecology and obstetrics ward, Ante natal clinic, dental clinics, tuberculosis clinic, anti-retroviral therapy clinic and ophthalmologic clinic.

Study design and period

A Hospital based prospective observational study design was conducted from May 13/2021 to July 19/2021.

Inclusion and exclusion criteria

Participants, aged 18 over (patients, patients' companions and visitors), attending urban primary health care centers held as part of the study to benefit from preventive or curative care, were included in the study. Health workers, pregnant mothers, patients who admitted to intensive care unit were excluded.

Sample size determination and recruitment of study participants

The sample size was determined by using the Single Population proportion Formula: The sample size was determined based on "P" value which was taken from Ethiopia, P = 0.15, or 15.1%.

$$n = \frac{(Za/2)2\ \ P(1-P)}{d2}$$

n = sample size, P = prevalence of stroke, d = margin of sampling error tolerated, z = the standard normal value at confidence interval of 95%.

$$n\ = \frac{(1.96)^2(1\ -\ 0.151)\ x\ (0.151)}{(0.05)^2} = 197$$

Since the total number of stroke patients was less than 10,000, reduction formula (correction formula) was applied as follow

$$n_f = \frac{n}{\left(1+\left(n/N\right)\right)}$$

$$n_f = \frac{197}{\left(1+\left(197/124\right)\right)} = 76$$

When 10% contingency is added to minimize non response rate, then final sample size was found to be 84. Purposive sampling technique was used to recruit samples for the study in each day of the data collection process until the desired sample size was obtained.

Data collection tools and procedures

A face-to-face questionnaire survey was used for data collection of respondents with the first part including sections reserved for: Socio-demographic characteristics (age, sex, marital status, level of education, spoken languages, place of residence, socioeconomic level (family income), behavioral factors (smoking status, exercise per day, and dietitians (which restricted their intakes of sugar, salt, and fat), clinical characteristics (family histories of strokes, the duration of disease, and self-reported comorbidities), medications history and associated comorbidities (high blood pressure, diabetes, hypercholesterolemia, cardiac disease, history of stroke in respondent or immediate family, and history of stroke in relatives, acquaintances, or neighbors). During data collection, data collector measures weight, height, blood pressure, as follows. Weight was measured in light closing and without shoes by calibrated UNICEF Seca digital weighing scale. Stadiometer in centimeter in erect position at a precision of 0.5 cm without shoes was used to measure height. Mercury sphygmomanometer was used to measure blood pressure average of two measurements 5 minutes apart was recorded for those who we take BP during the data collection.

Data quality assurance

In order to assure quality of data important measures were undertaken including: the patient card number was used, to check for if there is invalid and incomplete pertinent response and these cards were also coded so over or under count was not matter. The data collected was checked for completeness and consistency on daily basis.

Data management and statistical analysis

The gathered quantitative data was cleared, arranged, coded, and then analyzed through employing statistical packages for social sciences 25.0 version statistical software. Categorical variables were expressed by percentage and frequency, whereas continuous variables were present by mean and standard deviation. Bivariate and multivariate logistic regression analysis was computed to identify factors associated with the stroke. All independent variables with a p-value < 0.25 in the uni-variate analysis were taken into account in the multivariate logistic regression analysis. P values < 0.05 were considered to indicate statistical significance.

Ethical clearance

Ethical clearance was taken from SWAN diagnostic pharmaceutical importer and informed consent was obtained from each subject. No any personal identifier was taken from the patient registration log book. The information was recorded anonymously and behind the scenes and beneficence was assured throughout the study period.

Operational definitions

- **Stroke:** Is the abrupt onset of a neurologic deficit and attributable to a focal vascular cause.

Table 1: Socio-demographic characteristics of the stroke patients at MKRH, South western, Ethiopia 2021 (n = 84).

Variables	Category	Frequency	Percent
Age	< 45 years	24	28.6
	45-65 years	39	46.4
	> 65 years	21	25.0
Sex	Male	47	56.0
	Female	37	44.0
Monthly income	< 1000 ETB	55	65.5
	≥ 1000 ETB	29	34.5
Marital status	Married	51	60.7
	Unmarried	33	39.3
Educational status	Educated	41	48.8
	Uneducated	43	51.2
Residency	Urban	49	58.3
	Rural	35	41.7
Social habit	Yes	38	45.2
	No	46	54.8

Table 2: Behavioral factors of the stroke patients at MKRH, South western, Ethiopia 2021 (n = 84).

Variables	Category	Frequency	Percent
Have you ever smoke cigarette	Yes	30	35.7
	No	54	64.3
Smoking after you diagnosed	Yes	36	42.9
	No	48	57.1
Regular physical exercise	Yes	34	40.5
	No	50	59.5
Medication non-adherence	Yes	32	38.1
	No	52	61.9
Have you ever drink alcohol	Yes	29	34.5
	No	55	65.5
Current alcohol drink	Yes	25	29.8
	No	59	70.2
Do you reduce salt in diet	Yes	23	27.4
	No	61	72.6
Do you eat fatty diet	Yes	34	40.5
	No	50	59.5

- **Ischemic stroke:** Is blockage artery that supplies oxygen rich blood to the brain.
- **Hemorrhagic stroke:** Is leakage of artery in the brain.

Results

Socio-demographic characteristics of the study participants

From the 84 patients, nearly above one-half 47 (56.0%) were male patients. Nearly one half 39 (46.4%) of respondents age were between 45-65 years, and majority 55 (65.5%) of patients were earn monthly income < 1000 ETB. More than half 51 (60.7%) of participants were married, 43 (51.2%) were uneducated, and 49 (58.3%) were dwell in rural area. Less than half 38 (45.2%) of participants had at least one social habit (Table 1).

Behavioral factors of the respondents

Among the study participants, less than half 30 (35.7%) of patients were smoke cigarette every, 36 (42.9%) were smoking cigarette after diagnosed, 34 (40.5%) were do regularly exercise reguraly, 29 (34.5%) were drink alcohol every, 25 (29.8%) were drink alcohol current, 23 (27.4%) were reduce salt in diet, and 34 (40.5%) were eat fatty diet. The medication non-adherence was 32 (38.1%) (Table 2).

Clinical and drug related characteristics of the patients

In our survey, slightly less than half 41(48.8%) of the study participants were have laboratory values, and more than half 52 (61.9%) of the respondents had at least one comorbidities. A majority 27 (32.1%) of participants BMI were between 18.5-24.99 kg/m^2. Above half 45 (53.6%) of the participants were have past medical history and half 42 (50.0%) of study subjects were have past medication history. Less than half 37 (44.0%) of participants had past family medical history, and 35 (41.7%) participants had past family medication history. From the study subjects, majority 48 (57.1%) were have ischemic type of stroke followed by 29 (34.5%) haemorrhagic stroke. Majority 50 (59.5%) of study subjects had high level blood pressure and only 32 (38.1%) of patients had family history of stroke (Table 3).

Table 3: Clinical and drug related characteristics of the stroke patients at MKRH, South western, Ethiopia 2021 (n = 84).

Variables	Category	Frequency	Percent
Laboratory values	Yes	41	48.8
	No	43	51.2
Comorbidities	Yes	52	61.9
	No	32	38.1
BMI	< 18.5 kg/m^2	20	23.8
	18.5-24.99 kg/m^2	27	32.1
	25-29.9 kg/m^2	18	21.4
	≥ 30 kg/m^2	19	22.6
Past medical history	Yes	45	53.6
	No	39	46.4
Past medication history	Yes	42	50.0
	No	42	50.0
Past family medical history	Yes	37	44.0
	No	47	55.0
Past family medication history	Yes	35	41.7
	No	49	58.3
Type of stroke	Haemorrhagic	29	34.5
	Ischemic	48	57.1
	Transit	5	6.0
	Unclassified	2	2.4
Blood pressure	Normal	34	40.5
	High level	50	59.5
Family history of stroke	Yes	32	38.1
	No	452	61.9

Table 4: Comorbidities of the stroke patients at MKRH, South western, Ethiopia 2021 (n = 84).

Variables	Category	Frequency	Percent
Comorbidities	Hypertension	14	16.7
	Ischemic heart disease	7	8.3
	Diabetes mellitus	9	10.7
	Chronic kidney disease	10	11.9
	Acute kidney injury	12	14.3
	Seizure	5	6.0
	Anemia	6	7.1
	Asthma	4	4.8
	Dyslipidaemia	8	9.5
	Stroke	7	8.3
	Others	2	2.4

Comorbidities of the stroke among stroke patients

From the total of 84 study subjects 14 (16.7%) of patients were have hypertension followed by acute kidney injury 12 (14.35%) and chronic kidney disease 10 (11.9%). Anemia 6 (7.1%) were least identified comorbidities followed by 5 (6.0%) seizure and 4 (4.8%) asthma (Table 4).

Logistic regression analysis for factors associated with stroke risk factors

In multivariable regression analysis, the > 65 years, male, high BMI, comorbidities, medication non-adherence, don't reduce salt in diet, and eating fatty diet were significantly associated with stroke risk factors. Participants were age above > 65 years were 3.57 times more likely stroke risk factors (AOR: 3.579; 95% CI: 2.931-7.208; P = 0.001), and male were 1.78 times more likely stroke risk factors (AOR: 1.78; 95% CI: 1.935-2.916; P = 0.039). Comorbidities were 2.15 times more likely stroke risk factors (AOR: 2.15; 95% CI: 2.074-3.858; P = 0.005) and patients who have medication non-adherence were 2.15 times more likely stroke risk factors (AOR: 4.67; 95% CI: 4.524-9.105; P = 0.001). Those who had coronary artery disease comorbidity were 1.79 times more likely stroke risk factors (AOR: 3.47; 95% CI: 3.175-8.093; P < 0.001), and those who had hypertension comorbidity were 1.79 times more likely stroke risk factors (AOR: 1.78; 95% CI: 1.406-3.072; P = 0.049). Don't reduce salt in diet were 1.79 times more likely stroke risk factors (AOR: 1.79; 95% CI: 1.971-2.431; P = 0.046) and eating fatty diet were 2.05 times more likely stroke risk factors (AOR:1.79; 95% CI: 2.157-4.381; P = 0.005) (Table 5).

Discussion

According to WHO data published in 2017, stroke deaths in Ethiopia reached 6.23% of total deaths. In addition, the age-adjusted death rate of stroke in the country is 89.82 per 100,000 of the population.

Table 5: Factors associated with stroke patients at MKRH, Southwestern, Ethiopia 2021 (n = 84).

Variables	Category	N (%)	AOR (95% C.I)	P-value
Age	< 45 years	24 (28.6)	ref	
	45-65 years	39 (46.4)	1.32 (1.045-1.453)	0.734
	> 65 years	21 (25.0)	3.579 (2.931-7.208)	0.001**
Sex	Female	37 (44.0)	ref	
	Male	47 (56.0)	1.78 (1.935-2.916)	0.039*
Blood pressure	Normal	34 (40.5)	ref	
	High level	50 (59.5)	0.97 (0.057-1.032)	0.317
Comorbidities	Yes	52 (61.9)	ref	
	No	32 (38.1)	2.15 (2.074-3.858)	0.005**
Coronary artery disease	No	27 (32.1)	ref	
	Yes	57 (67.9)	3.47 (3.175-8.093)	< 0.001**
Hypertension	No	38 (44.3)	ref	
	Yes	46 (54.7)	1.78 (1.406-3.072)	0.049*
Aortic valve disease	No	11 (13.1)	ref	
	Yes	73 (86.9)	1.02 (1.016-1.759)	0.094
Medication non-adherence	Yes	32 (38.1)	ref	
	No	52 (61.9)	4.67 (4.524-9.105)	0.001**
Have you ever smoke cigarette	Yes	30 (35.7)	ref	
	No	54 (64.3)	1.16 (1.128-1.976)	0.027*
Have you ever drink alcohol	Yes	29 (34.5)	ref	
	No	55 (65.5)	0.92 (0.023-1.032)	0.870
Do you reduce salt in diet	Yes	23 (27.4)	ref	
	No	61 (72.6)	1.79 (1.971-2.431)	0.046*
Do you eat fatty diet	No	50 (59.5)	ref	
	Yes	34 (40.5)	2.05 (2.157-4.381)	0.005**
Residency	Urban	49 (58.3)	ref	
	Rural	35 (41.7)	3.74 (2.904-7.516	0.006**

AOR: Adjusted Odd Ratio; CL: Confidence Interval; COR: Crude Odd Ratio, ref: Reference

*P-value < 0.05; **P-value < 0.01

Previous reports that showed the future trend of stroke in SSA revealed that stroke burden will increase over the coming years owing to poor healthcare seeking behavior, and poor neurologic interventions [26]. The present study revealed rural residents were 3.74 times more likely higher stroke risk factors (AOR: 3.74; 95% CI: 2.904-7.516; P = 0.006) than urban area residents were higher than the study conducted in Iran [27] those patients who were resident in urban districts were more than 1.5 times at higher risk of developing stroke compared with residents of rural areas, which can be probably attributed to the unhealthy lifestyle practices with regard to lack of physical activity and unhealthy diet. Because rural residents report less leisure time physical activity and lower seatbelt use than urban residents and rural residents also have higher rate of poverty, less access to health care and are less likely to have health insurance. Our survey showed that 14 (16.7%) of stroke patients were have hypertension followed by acute kidney injury 12 (14.35%) and chronic kidney disease 10 (11.9%) comorbidities were in line with the meta-analysis study done in Ethiopia [28] showed diabetes is a well-established risk factor of stroke, and our analysis showed that diabetes mellitus is the second most common comorbidity of stroke. Nearly one-tenth (8%) of stroke patients had diabetes mellitus. Due to hypertension were the risk factors for stroke due to in hypertension blood pressure was high which factors of coronary heart disease and stroke. The current study showed that nearly above one-half 47 (56.0%) were male patients were consistent with the study surveyed in Felege Hiwot Referral hospital [29] which showed male patients were more affected by stroke; 20 (62.5%) in this study. Due to male had no cardio-protective hormone which protect hypertensive heart diseases and men diagnosed with diabetes more than women, which increases the risk of stroke because it can cause disease of blood vessels in brain.

The present survey showed that majority 48 (57.1%) of respondents were have ischemic type of stroke followed by 29 (34.5%) hemorrhagic stroke were in line with the study conducted in Felege Hiwot Hospital [29] showed that ischemic stroke was more prevalent (56.7%) than haemorrhagic. Because they happen when blood clot blocks the flow of blood and oxygen to the brain and the occlusions contribute to around 85% of causalities of stroke patients. Our study revealed that participants were age above > 65 years were 3.57 times more likely stroke risk factors (AOR: 3.579; 95% CI: 2.931-7.208; P = 0.001) were in line with the study conducted in Felege Hiwot Hospital [29] showed that older age (> 50-years-old) was factor associated with stroke; AOR = 0.41. Due to stroke was a disease of aging and the risk increase with age, the incidence doubling with each decade after the age of 45 years and over 70% of all strokes occur above the age of 65. The current study revealed that patients who have medication non-adherence were 2.15 times more likely stroke risk factors (AOR: 4.67; 95% CI: 4.524-9.105; P = 0.001) were in line with the study conducted in Ayder Comprehensive Specialized Hospital [30] showed that medication none-adhered were 4 times (AOR = 3.967, 95% CI: 2.256-6.973) more likely to be at high risk for stroke than the medication adherent hypertensive patients. Here non adherences to cardiovascular medication perhaps increase of stroke occurrence. Our study revealed that the patients don't reduce salt in diet were 1.79 times more likely stroke risk factors (AOR: 1.79; 95% CI: 1.971-2.431; P = 0.046) and patients eat fatty diet were 2.05 times more likely stroke risk factors (AOR: 1.79; 95% CI: 2.157-4.381; P = 0.005) were in line with the study conducted in Ayder Comprehensive Specialized Hospital [30] showed that hypertensive patients who did not reduce salt in diet were around 3.2 times more likely to be at high risk for stroke (AOR = 3.249, 95% CI: 1.544-6.837). Because consuming too much salt can increase the risk of having high blood pressure, which is a risk factors for coronary heart disease and stroke and eating unhealthy (fat) diet can increase your chances of having a stroke because it may lead to an increase in the blood pressure and cholesterol levels. Our study revealed that male stroke patients were 1.78 times more likely stroke risk factors (AOR: 1.78; 95% CI: 1.935-2.916; P = 0.039) than females and patients who have comorbidities were 2.15 times more likely stroke risk factors (AOR: 2.15; 95% CI: 2.074-3.858; P = 0.005) than without comorbidities.

Conclusion and Recommendation

Among the study participants, less than half of patients were smoke cigarette every, were smoking cigarette after diagnosed, were do regularly exercise regularly, were drink alcohol every, were drink alcohol current, were reduce salt in diet, and were eat fatty diet. The medication non-adherence of stroke patients was high. Patients age > 65 years, male, comorbidities, medication non-adherence, don't reduce salt in diet, and eating fatty diet were significantly associated with stroke risk factors. Health care workers should have to treat stroke risk factors to manage the stroke mortality rate.

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Data Availability

The data used in this study can be obtained on written request to the corresponding author.

Conflict of Interest

No competing interest exists.

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None.

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