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ISCHEMIC STROKE AND ITS ASSOCIATED FACTORS AMONG ADULT PATIENTS AT PUBLIC REFERRAL HOSPITALS, IN ADDIS ABABA, ETHIOPIA

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ABSTRACT

Background: Stroke is a chronic non-communicable disease resulting from infraction or spontaneous hemorrhage in the brain. The burden of stroke is increasing at an alarming rate globally. In 2013 there were 6.5 million stroke deaths, 113 million disability-adjusted life years due to stroke from this, 75.2% of all stroke mortality and 81.0% of stroke-related disability-adjusted life years are from the developing countries. Ischemic stroke is the most common form of stroke approximately about 80%–85% of all strokes in nature. Stroke Deaths in Ethiopia reached 7% of total deaths. It is decreasing in the developed countries while it is increasing in low level, and middle-income countries. This study aims to assess ischemic stroke and associated factors among four selected hospitals in Addis Ababa Ethiopia

Methods: Hospitals-based cross-sectional study design was conducted among 159 stroke patients' who were attending at four selected hospitals in Addis Ababa, Ethiopia May 1/2019 to April 30/2020. Information on relevant variables was collected from adult stroke patients' paper-based medical records and registries. The study period was from December 2020 to June 2020. Using a systematic random sampling technique 159 were included in this study. Record review was used to collect data and it was entered and analyzed by using SPSS version 24. Variables with a p-value less than 0.25 in bivariable logistic regression were selected for multivariable logistic regression. The adjusted odds ratio and 95% confidence interval was used to determine the association. P-value <0.05 was used to declare statistical significance in multivariable analysis.

Result: 159 adult stroke patients were included in the study with that 156 (98.11%) response rates. Out of the total 156 patients, 31 (19.9 %%) died and the remaining 125 (80.1%) were improved. The mean (SD) age of the study patient was 54.84+17.12 years. The prevalence of ischemic stroke was 81 (51.92%), [95% CI, 41-55.8] with the

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determinant risk factors of ischemic stroke were hypertension (AOR= 4.49, 95% CI: 1.89-10.67) followed by Atrial fibrillation (AOR=8.08, 95% CI: 2.50-26.12) and valular heart disease (AOR=3.07, 95% CI: 1.34-7.01) were the significant association of ischemic stroke.

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INTRODUCTION

Stroke is a major public health and clinical issue that represents the third leading cause of disease worldwide among the non-communicable diseases of adults, it is estimated that around 16 million people worldwide have suffered a stroke for the first time and 62 million people have survived a stroke(1). An ischemic stroke occurs when blood flow through the arteries that supply oxygen-rich blood to the brain is blocked. Blood clots usually cause obstruction, which can lead to ischemic stroke(2).

According to a release by the World Health Organization (WHO) stroke accounts for 10.8% of mortality and 3.1% of disease burden worldwide(3). There is an epidemiologic and demographic transition of diseases in most developing countries with increased risk for cardiovascular disease. It has been projected that by the year 2030, about 80% of all stroke cases will occur in low a middle-income countries of the world(4). The burden has been predicted to rise for developing countries; still, data's are limited, especially in sub-Saharan Africa. Stroke is the 2nd Ethiopian top 50 causes of death by age-standardized death rate and the 6th Ethiopian total deaths by cause percent among top 50 causes(4, 5)

Ischemic stroke in young adults remains a significant health problem for individuals, their families and society due to ongoing demographic changes, including an aging population and health transitions seen in developing countries. In young adults, it accounts for about 10-30% of all stroke patients in India and 3-8.5% in Western countries(6).

"According to the latest study published by the WHO in May 2014, the death toll from a stroke in Ethiopia reached 28,320, accounting for 4.71% of all deaths." The age-adjusted Death Rate is 71.94 per 100,000 of population ranks Ethiopia #107 in the world. Currently, stroke can be considered the greatest public health problem in Ethiopia and in many countries of Latin America. In the United States, in 2008 the cost of care for disability caused by stroke was estimated in 18.8 billion dollars, while productivity loss and premature deaths had cost of 15.5 billion dollars(6, 7).

Data from national statistics from United Kingdome reveals that alcohol use12.8%, active Smoking 20%, past smokers 66%, alcohol, and illegal drug use 62%, diabetes mellitus 5%, high cholesterol use 21%, Illegal drug use 19.8% were factors associated with presence of stroke(8). According to the study conducted in Sweden the prevalence of stroke was 7% with a significant association of age, 65-80years (4.7%), >80 years (11.6%) and Sex; male 8.4% and female 5.7%(3). A study conducted in China by First Hospital of Jilin University scholars 91.7% (95% CI 87.4% to 94.6%), were ischaemic stroke and the proportion of ischaemic stroke was higher than, those reported in developed countries, where ischaemic stroke accounted for approximately 67.3–80.5% of all stroke cases(9).

A study done from tertiary health care centers in Central India showed that hypertension was a major risk factor in 45% of young and 80% of old AIS patients. Compared with 12% of elderly AIS patients, the hospitalization outcome of young AIS patients is poor and the dependency rate is higher at 24%. Long-term outcomes for young AIS patients with a low dependency rate were more favorable at 12 months and 18 months after discharge, at 16% and 11%, respectively, while

elderly AIS patients were 41 % and 24%, respectively(10).

A study done in Nigeria showed that Ischemic stroke was 64.4% and hypertension (85.2%), diabetes mellitus (23.8%), and tobacco smoking (22.8%) were the common identifiable risk factors for it(4, 10). A study done in Iran university of medical science stated that the most common risk factors among the study patients were a history of hypertension (30.3%), smoking (28.7%), a history of heart disease (26.2%), taking high-risk drugs (23.8%), and a history of medical diseases. (22.9%), hyperlipidemia (20.5%) and diabetes (18.8%)(11). Another study conducted from University of Trakya turkey reported, hypertension was the main risk factor which accounts (45%), followed by smoking (37%), hyperlipidemia (35.4%), diabetes (17%) and family history of stroke (18%)(12).

A study conducted from Felege Hiwot hospital, Ethiopia, 48(11.2%), 120(28%), 73(17.1%) and 77(18%) patients had diabetes mellitus, hypertension, cardiac and unknown diagnosis, respectively and Older age, being (hypertensive, diabetes and cardiac), alcohol intake and cigarette smoking were significant factors to stroke(13). Study done at Jimma University Medical Center with Prospective Observational Study and Bahir Dar Ethiopia: A Retrospective Hospital-Based Study prevalence of ischemic was 38.3%, 59.4% respectively (14, 15).

OBJECTIVES

General objective

- To assess ischemic stroke and its associated factors among patients at public referral hospitals in Addis Ababa, Ethiopia

Specific objectives

- To determine ischemic stroke at the selected public referral hospitals in Addis Ababa, Ethiopia
- To identify factors that associated with ischemic stroke at the selected public referral hospitals in Addis Ababa, Ethiopia

SUBJECTS AND METHODS

Study design and Area

A hospitals based retrospective cross-sectional study was conducted at Four selected public referral hospitals in Addis Ababa, Ethiopia which are Black lion specialized hospital, Zewuditu memorial hospital, and Abet hospital those are located in the capital city of Ethiopia. These Four hospitals are selected by lottery method among eleven referral hospitals. Addis Ababa is the capital city of Ethiopia, which has an area of 530 km^2.

Study Population and Study Period

The target populations for this study all patients' aged ≥ 18 years old with stroke at the referral hospitals stroke clinic. Adult stroke patient who were admitted in the hospitals' and they started the treatment from May 1/2019-April 30/2020 and the data collected from February 2020 to May 2020.

Sample size and data collection procedure

In this retrospective cross-sectional study during study period, 159 with stroke were admitted at the selected hospitals. Thus the study included 156 adult stroke patients in the analysis, where the others were excluded from the study, which had key missed information like treatment history, investigation results, age < 18 years, missed diagnosis and their charts.

Data was collected using standardized structured questionnaire and relevant data have taken from ischemic stroke follow-up charts. Professional nurses collected the data and more experienced nurses are included for supervision.

The study reviews patients stroke charts, intake forms and follow up charts of stroke patients. Each patient has one medical file containing all stroke notes, which includes the patient intake forms and stroke care and follow-up card, prepared by the Federal ministry of health (FMOH) uniformly used by clinicians to early identify and document clinical and epidemiological variables. Thus, in this study secondary data, which was collected from HMIS LOG books of each hospital of the

patient, follow up records. Based on this record of the patients, the variables, which were important for the study, were selected by using the patients' unique identification number or the investigations code. This has done by communicating with four trained nurses data collectors and one supervisor were recruited to run the data collection procedure and to get the medical record and other important information for the study.

One year (from May 1/2019-April 30/2020) total patients admitted to the four selected hospitals were 627 patients with the diagnosis of stroke were taken since the total 159 study subjects were taken with systematic random sampling method used. There are eleven public hospitals in Addis Ababa. Four hospitals were selected by lottery method **(figure 1).**

Hospitals selection procedure

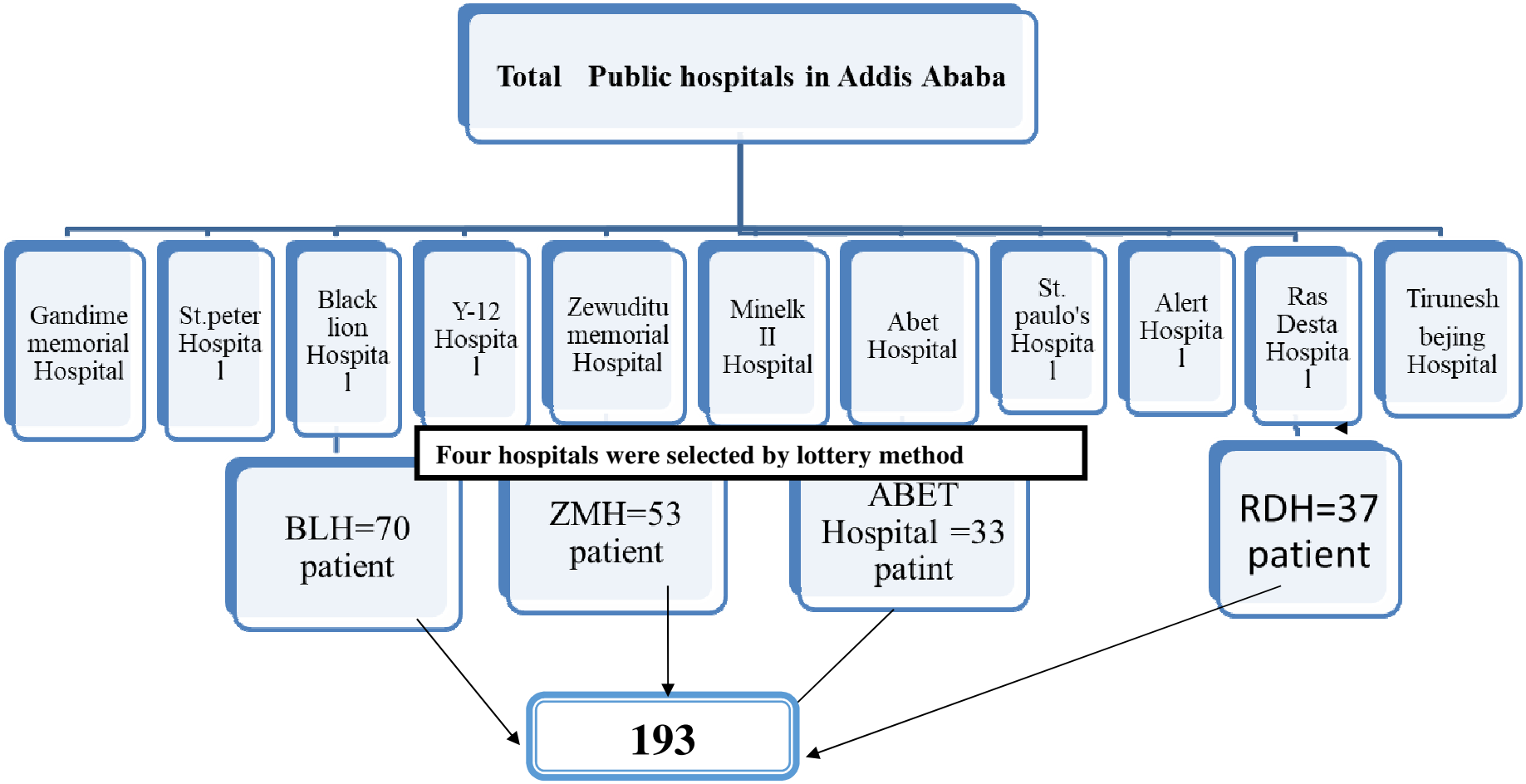

Figure: 1 Schematic Presentation of sampling procedure that selected hospitals with lottery method

Eligibility criteria

This study included all stroke patients whose age 18 and above, as well as stroke patient charts with CT scan/ECG/ECHO/MRI confirmations. Patients with an unknown discharge status between May 1/2019-April 30/2020 as well as incomplete and missing stroke patient chart records during the data collection period were excluded.

Study variables

The Dependent variable was ischemic Stroke patient and the independent variables were classified as socio-demographic (sex, age, residence and ethnicity, religion and outcome), and co-morbidity (Diabetes mellitus, atrial fibrillation, obesity, cigarette smoking, hypertension, neurological signs, heart failure and vascular heart disease)

Operational Definition

Patient identification number: It is the hospital medical record number code written on patient chart.

Stroke surveillance site code: It is selected hospital at which data is going to be collected

Interviewer Code; it is identification number given to each data collectors.

Obesity: A person who has unhealthy body weight with body mass index >30kg/m2

Data collection tool and procedure

Pre-test done by checklist from HMIS LOG books of each hospital those excluded from our study area, which was yekatit-12 hospital two weeks before data collection. Checklist adopted from different literatures. Data extracting structured English version questionnaire, adopted and modified from different literatures was used to collect data from medical ward of each selected hospital. Four trained data collectors and one supervisor recruited to run the data collection procedure. Continuous follow up and the supervisor and principal investigator did supervision. First 193 charts MRN taken from HMIS books .then it was given to chart room staffs to get patient charts .Finally the complete medical records was collected by the data collectors.

Data Processing and Analysis

Data was checked its completeness and accuracy daily, data were coded and entered to SPSS version 24.0. Descriptive statistics are used to present in means standard deviation for numerical variables and frequency percentages for categorical variables. Finally, ischemic stroke and its associated factors were extracted from SPSS so that it was presented by using charts, tables, and graphs to show results as appropriate. Binary logistic regression and odds ratio were done for associated factors. Categorical variables were analyzed by Chi-squares test. The significance level used $p<0.05$.

Data quality assurance

In order to keep the data quality, the questionnaire first prepared in English then the pre-test was carried on 5% of the sample size so that the consistency/completeness of the questionnaire in line to the medical records checked. Thus, correction was done according to the available data on medical records.

Ethical considerations

Letter of ethical clearance was obtained from Addis Ababa University review board. Then official letter was sent to the selected hospitals. Confidentiality of the information gathered was assured via avoiding the name and address of the patients in the questionnaire.

RESULT

Socio-demographic Characteristics

A total of 193 stroke patient were admitted to medical wards of Black line, Zewuditu memorial, Abnet and Ras desta referral hospitals from May 1/2019 to April 30/ 2020 with their charts were retrieved from HMIS log book of each public hospital. Of these 51.92%, patients were admitted with the diagnosis of ischemic stroke. 79 (50.64%) patients were aged above 55 years with the mean (SD) age of 54.84 ± 17.12 SD years with the age range from 20-90 years. Majority 102

(65.38%) of the study participants were male and the ratio of male and female was (M: F =1.89:1). Above half of the patients 86 (55.13%) have been living in Addis Ababa and Out of the total 156 patients, 31 (19.9 %%) died and the remaining 125 (80.1%) were improved (Table 1).

Table 1. Socio-Demographic Characteristics of admitted patients at referral hospitals in Addis Ababa Ethiopia, 2020 (n=156)

Variables	Category	Frequency	Percent
Age	<34	22	14.10
	35-54	55	35.26
	≥55	79	50.64
	Total	156	100
Sex	Male	102	65.38
	Female	54	34.62
	Total	156	100
Residence	Addis Ababa	86	55.13
	Out of Addis Ababa	70	44.87
Out come	Improved	125	80.1
	Died	31	19.9
Total		156	100

CLINICAL VARIALES

This study identified different clinical variables. Among the study patients 73(46.8%) had neurological signs with disturbed consciousness followed by right or left sided hemiparesis 69 (44.2%). Additionally, 24.36% of the study participants were cigarette smoker and about 28.85 % of patients had diabetes mellitus **(Table-2).**

Table-2- Clinical characteristic observed from admitted patients at referral Hospitals in Addis Ababa Ethiopia, 2020(n=156).

Variables	Category	Frequency	Percent
DM	Yes	45	28.85
	No	111	71.15
AF	Yes	31	19.87
	No	125	80.13
HF &VHD	Yes	53	33.97
	No	103	66.03
Smoking	Yes	38	24.36
	No	118	75.64
HTN	Yes	116	74.36
	No	40	25.64
Obesity	Yes	7	4.49
	No	149	95.51
Neurological signs observed at presentation	Change in mental status	73	46.8
	Weakness/paresis	69	44.2
	Speech disturbance	11	7.1

Table 3 Supportive diagnosis methods performed for patients admitted at referral hospitals in Addis Ababa Ethiopia, 2020 (n=156).

Type of diagnostic method performed	Frequency	Percent
Angiography	18	8.04
carotid ultrasound	37	16.52
ECHO	68	30.36
ECG	101	45.08
Total	224	100

N.B for one patient more than one diagnosis method may have been done .that is why 224. However, our sample size was 156.

Factors associated with ischemic stroke patient

In multivariable logistic regression analysis Hypertension [AOR= 4.49, 95% CI (1.89-10.67)], Atrial fibrillation [AOR= 8.08, 95% CI (2.50-26.12)] and heart failure and vascular heart disease [AOR=3.07, 95 CI (1.34-7.01)] were significantly associated with ischemic stroke (table: 4).

Table-4- Crud and adjusted analysis of factors associated with ischemic stroke patients at referral hospitals in Addis Ababa, Ethiopia, 2020 (n=156)

NB: COR=Crude odds Ratio, AOR=Adjusted odds ratio, CI= Confidence interval

Variables	**Category**	**Ischemic stroke**		**OR (95% CI)**	
		Yes (%)	**No (%)**	**COR**	**AOR**
Age	<34	11(50)	11(50)	1.00	1.00
	35-54	17(37.8)	28(62.2)	0.61(0.22-1.70)	00.41(0.12-1.39)
	>=55	53(59.6)	36(40.4)	1.47(0.58-3.76)	1.39(0.46-4.13)
Sex	Male	51(50)	51(50)	0.8(0.41-1.55)	0.77(0.36-1.68)
	Female	30(55.6)	24(44.4)	1.00	1.00
Residence	Addis Ababa	52(60.5)	34(39.5)	**2.16(1.14-4.11)**	1.94(0.92-4.12)
	Out of Addis Ababa	29(41.4)	41(58.6)	1.00	1.00
Hypertension	Yes	64(55.2)	52(44.8)	**3.25(1.48-7.11)**	**4.49(1.89-10.67)**
	No	11(27.5)	29(72.5)	1.00	1.00
Diabetes mellitus	Yes	29(64.4)	16(35.6)	**2.06(1.01-4.21)**	2.12(0.92-4.86)
	No	52(46.8)	59(53.2)	1.00	1.00
Atrial Fibrillation	Yes	27(87.1)	4(12.9)	**8.88(2.93-26.88)**	**8.08(2.50-26.12)**
	No	54(43.2)	71(56.8)	1.00	1.00
HF&VHD	Yes	36(67.9)	17(32.1)	**2.73(1.36-5.47)**	**3.07(1.34-7.01)**
	No	45(43.7)	58(56.3)	1.00	1.00
Smoking	Yes	26(68.4)	12(31.6)	**2.48(1.15-5.38)**	1.18(0.47-2.97)
	No	55(46.6)	63(53.4)	1.00	1.00

DISCUSSION

This study revealed that the ischemic stroke patients with their risk factors who were admitted in public referral hospitals for one year the review of their medical records. Prevalence of ischemic stroke was 51.92 %, [95% CI, 41-55.8]. The result of this study was lower than the study done in china 91.7% (95% CI 87.4% to 94.6%), and other developed countries that accounts 67.3–80.5% of all stroke cases(9), this discrepancy might be due to data collection time variation, sampling method and socio-economic as well as there may be life style and cultural difference. Similarly, the current finding was lower than study conducted in Nigeria 64.4%(4), Saudi Arabia 61%(16). This difference might be patient characteristics, clinical set up, healthcare systems such as the difference in availability of structured patient health educational programs, quality of care, technologies and patient burden, which put considerable difference in prevalence of ischemic stroke. In addition, the present study finding was in line with study done in Jima 38.3%(14) and Bahir Dar 59.4%(15).

Regarding factors associated with ischemic stroke: patients having hypertension 4.49 times more likely develop ischemic stroke than patients who had no hypertension [AOR=4.49, 95% CI: 1.89, 10.67]. This is supported by a study conducted in USA, China, United Kingdom, Sweden, Finland, Saudi Arabia, India, Korea, Nigeria, Turkey, Iran, Egypt and Ethiopia (2, 4, 8-12, 14-22). High blood pressure is one of the most usual and critical elements for the development of ischemic stroke. While stroke occurs, the blood stress (BP) regularly rises due to various factors, which includes mental strain, pain, increased intracranial stress, urinary retention, and hypoxemia.

Patients who had experienced atrial fibrillation are 8.08 times more likely to have ischemic stroke compared with patients without atrial fibrillation [AOR=8.08, 95% CI: 2.50, 26.12]. This is in line a study done in USA, Finland, Egypt, and Ethiopia (15, 17, 18, 20, 23). Atrial fibrillation is a type of arrhythmia and makes the heart beat much faster than normal. In addition, the upper and lower chambers of the heart are not working properly. When this happens, the lower cavity cannot be completely filled or pump enough blood into the lungs and body. This can make feel tired or dizzy or may notice palpitations or chest pain. Blood also pools in the heart, increasing the risk of blood clots and can cause a stroke.

Heart failure/ vascular heart disease are significantly associated with ischemic stroke, patients who had Heart failure and vascular heart disease 3.07 times more likely attack with ischemic stroke compared with patients are free from heart failure and vascular heart disease [AOR=3.07, 95% CI: 1.34, 7.01]. This is supported by a study conducted in USA, China, Netherlands, Saudi Arabia, Ethiopia (9, 13, 15, 16, 22, 24). Vascular heart disease and heart failure are both types of heart disease, but they are different conditions. A heart attack occurs when the blood supply to the heart is insufficient, and heart failure is when the heart cannot effectively pump blood throughout the body.

Limitation

This is a hospital and not a population-based study, so may be affected by referral bias and information on some important factors such as drinking alcohol was not available. This cannot be generalized whole population as a national wide.

CONCLUSION

The prevalence of ischemic stroke was greater than from that of all stroke patients with significantly association with hypertension, atrial fibrillation, and heart failure and vascular heart disease. The pre dominant risk factor of ischemic stroke was atrial fibrillation. Therefore, early identification, careful treatment of stroke and creating community awareness about risk

factors of stroke and providing health education is essential.

Ethics approval and consent to participant

The study was approved by the Addis Ababa University College of Medicine and Health Sciences, School of Nursing Ethical and Research Review Committee on behalf of the Addis Ababa University Ethical Review board and was approved on December 2017. Permission and a supportive letter were obtained from each hospital. Oral consent obtained from each study area hospital medical record coordinators.

Consent for publication

Not applicable

Availability of data and material

The authors declare that all relevant data are within the manuscript and fully available without restriction

Competing interests

There is no conflict of interest between authors

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