

BMJ Open Knowledge of stroke risk factors and prevention among hypertensive patients on follow-up at Addis Ababa University Tertiary Hospital, Addis Ababa, Ethiopia: a cross-sectional study

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ABSTRACT

Objective This study was conducted to assess knowledge of stroke risk factors and prevention among hypertensive patients on follow-up at Addis Ababa University Tertiary Hospital, Addis Ababa, Ethiopia.

Design Cross-sectional study design.

Setting This study was conducted at Addis Ababa University Tertiary Hospital in Addis Ababa, Ethiopia.

Participants The sample size was determined using the single population proportion calculation. A list of all patients with hypertension on follow-up was framed from the appointment book of the cardiovascular clinic. Then, 316 participants were recruited by simple random sampling procedure from 18 April 2022 to 19 May 2022. The study included all patients with hypertension >18 years of age who were on follow-up during the data-collecting period. In contrast, patients with memory loss or cognitive impairment and who are unable to communicate were excluded from the study.

Result With a response rate of 96.8%, 306 respondents in total were questioned. The average age of the participants was 53.6 years (SD±13.4). More than half of participants (52.9%) were female. The average score for understanding stroke risk factors and prevention is 44.1% and 49.7%, respectively. Knowledge of stroke risk factors was substantially correlated with residency and educational level, while knowledge of stroke prevention was significantly associated with sex, income and educational level.

Conclusion This study indicates that patients with hypertension who participated in the study had poor knowledge of stroke risk factors and prevention. The mean score of knowledge on risk factors and prevention strategies of stroke is 44.1% and 49.7%, respectively, and needs improvement.

INTRODUCTION

The neurological condition known as stroke is the leading cause of physical and mental disability and death in the world. It is characterised by an acute focal injury to the central nervous system brought on by a vascular cause, such as cerebral infarction,

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This study incorporates a large sample size which increases representativeness and provides a more accurate mean value.
- ⇒ With little improvement, the study used a nationally and internationally valid and standardised data collection instrument.
- ⇒ The generalisability of the findings to the general population is limited because the study was institution based and limited to one hospital.
- ⇒ This study is cross-sectional; so, the relation between cause-and-effect cannot be identified.

intracerebral haemorrhage or subarachnoid haemorrhage.¹

With a 6.6 million annual mortality rate, it ranks behind ischaemic heart disease as the second greatest cause of death worldwide. Stroke incidence, prevalence and mortality rates have all risen globally; low-income and middle-income nations have borne the brunt of this burden. A 2016 study estimated that 13.7 million new strokes occur annually, meaning one in every four people over the age of 25 will experience a stroke at some point in their lifetime.²⁻⁴

Non-communicable diseases such as stroke were formerly believed to be rare in Africa, especially in the sub-Saharan region, but research has shown that these conditions are 2–3 times more common in Africa than in western Europe and the USA. According to data from the previous 10 years, Africa had an incidence rate of up to 316 per 100 000 people per year, a prevalence rate of up to 1460 per 100 000 people per year, and a 3 year fatality rate of more than 80%.⁵

Stroke rates have been steadily increasing as a result of a lack of knowledge about the illness among the general public.^{6,7} Although age-standardised rates were much lower



between 1990 and 2019, the annual number of strokes and fatalities from stroke increased significantly. The death rate from stroke is higher in low-income countries.⁸ Lack of knowledge and ineffective management of stroke risk factors are to blame for the rise in stroke incidence. The success of primary prevention initiatives and quick medical intervention after a stroke is influenced by the public's awareness and perception of stroke and its risk factors.^{9–11}

The majority of patients who had a stroke passed away shortly after being admitted as a result of the stroke's acute medical and neurological complications. Due to late presentation and a lack of knowledge about stroke risk factors and warning signs, in-hospital mortality is high, and the majority of patients leave the hospital with serious physical impairments.^{6 8 9 12} The biggest burden of stroke in the healthcare system, aside from mortality, is the cost of care for a long-term physical and learning disabilities. It impacts not just the stroke victim but also their family and other caregivers.^{13 14}

In 2016, the Burden of Disease study reported that there were 52548 new incidences of stroke and 38353 deaths in Ethiopia. According to WHO data, stroke deaths accounted for 6.23% of all deaths in Ethiopia in 2017.^{15–17}

Despite the fact that stroke is one of Ethiopia's largest health problems, it is unknown what the risk factors and prevention strategies are for people with hypertension in our study location. Consequently, the purpose of this study was to evaluate the patients' knowledge of stroke risk factors, prevention strategies and associated factors at Addis Ababa University tertiary hospital called Tikur Anbessa Specialised Hospital (TASH).

MATERIALS AND METHODS

Study setting and participants

The study was conducted at TASH, a tertiary hospital affiliated with Addis Ababa University and situated in Ethiopia's capital city Addis Ababa. With more than 700 beds, the hospital is the largest specialised hospital in Ethiopia and acts as a training ground for both undergraduate and graduate medical students¹⁸ and it was purposely selected for this study. All of the patients with hypertension on follow-up were listed in the appointment book of cardiovascular clinic. Then, a total of 316 participants were recruited by simple random sampling procedure from 18 April 2022 to 19 May 2022.

Sample size determination and technique

Using a 95% confidence level and a 5% margin of error, the necessary sample size was determined using the single population proportion calculation. A prior related study with a p value of 0.249 reveals that 24.9% of individuals with hypertension have a good awareness of stroke prevention.¹⁹ $Z_{\alpha/2}$ - critical value at 95% CI=1.96; P - the proportion of patients with hypertension who have good knowledge of the prevention of stroke=24.9%; d - margin of error=5%, the initial sample size= $(Z_{\alpha/2})^2 p (1-p)/$

$d^2=(1.96)^2 0.249 (1-0.249)/(0.05)^2=287$; then by adding a 10% non-response rate, the final sample size was 316.

Inclusion and exclusion criteria

The study included all hypertensive patients >18 years of age who were on follow-up during the data collection period, whereas patients with memory loss or cognitive impairment and who were unable to communicate were excluded from the study.

Data collection tools

The data were collected by face-to-face interviews with a pretested and structured closed-ended questionnaire after a full explanation of the purposes, benefit and confidentiality of the study. The questionnaire was adopted from literature published in different international journals.^{10 19 20} It was created in English, expertly translated into the national Amharic language, and then translated back into English to assure uniformity. Five sections make up the questionnaire. Part I included sociodemographic details such as age, sex, marital status, religion, education level, place of residence, employment status and monthly income. Part II included four clinical variables: duration of hypertension (labelled as <5 years or ≥ 5 years), prior stroke history, family history of stroke and prior diabetes mellitus (DM) history. All three variables were yes or no questions, and for statistical purposes, yes was assigned number 1 while no was assigned 0. Part III: Eight questions with a yes/no response were included in the information about the cause of the stroke. Number 1 was assigned for the yes answer, whereas no was given the number 0 for analysis. Part IV: There were eight questions in this, and the participant's knowledge of the risk factors for stroke development was determined by their responses to the yes or no questions. Part V: The final section asked eight yes-or-no questions about the participant's awareness of stroke prevention strategies. Yes-answer received the number 1 and no received the number 0 in order to do the analysis. For the reliability, Cronbach's alpha was calculated and scored 0.757 for knowledge questions on stroke risk factors and 0.722 for knowledge of stroke prevention techniques. The validity of the tool was verified by many experts in the field. Then good knowledge of stroke risk factors and prevention included those participants who had responded to the mean value and above to stroke risk factors and prevention questions^{21 22} whereas poor knowledge of stroke risk factors and prevention included those participants who had responded below the mean value to stroke risk factors and prevention questions^{21 22} (online supplemental table 1).

Data quality management

As data collectors, there were three BSc nurses. At a half-day training session, data collectors were taught how to conduct patient interviews and use the data collection tool. In addition to providing support as necessary, the primary investigator keeps a close eye. At the conclusion of each data collection date, the primary initiator verified

that the questionnaire was valid and recorded the pertinent data.

Data analysis

The questionnaire was reviewed for precision and thoroughness. Completed surveys were imported into a computer using epi-data V.4.6, cleaned and then analysed using SPSS V.26.0. The study participants' sociodemographic information and clinical variables were summarised using descriptive statistics like mean and SD for continuous variables and frequency and percentage for categorical variables. For multiple logistic regressions, variables were chosen using binary logistic regression at a p value of less than 0.25. Then, in multivariate logistic regressions, variables were deemed statistically significant if their p value was less than 0.05.

Patient and public involvement

No patients were recruited for this study.

RESULT

Sociodemographic characteristics of the participants

A total of 306 (96.8%) out of the 316 participants in the study answered our questionnaire. With a mean age of 53.6 (SD±13.4) years, the participants' ages vary from 19 to 86. Women made up more than half of the participants (52.9%). The majority of the participants (94.1%) came from urban areas (table 1).

Clinical variables of the participants

According to the clinical characteristics of the participants, 61.8% had hypertension for more than or equal to 5 years, and one-third of them (33.5%) had DM. Just 13.7% of the participants had a family history, whereas 9.2% of them had experienced a stroke before (table 2).

Among a variety of responses, stroke sufferers (24%) were the most prevalent source of knowledge of stroke risk factors and prevention, followed by television (21.9%), whereas friends and family accounted for (21.4%) (figure 1).

Knowledge of participants in stroke risk factors

The overall knowledge of participants on stroke risk factors was only 44.1%, whereas about 55.9% had poor knowledge. High blood pressure was the most often cited risk factor by respondents (83.0%), followed by an unhealthy diet or excessive fat in the diet (63.1%), physical or mental stress (59.5%) and obesity (56.9%). Less than 50% of respondents reported DM, heart disease, high cholesterol levels and smoking (table 3).

Factors associated with knowledge of stroke risk factors

Age, sex, educational level, place of residence, income and prior history of stroke all significantly correlate with knowledge of the risk factors for stroke in binary logistic regression. Educational level and residency had a significant relationship with knowledge of stroke risk factors in multivariate logistic regression at (p<0.05). As

Table 1 Sociodemographic characteristics of the participants 2022 (N=306)

Variable	Category	Frequency	Percentage
Age	<45	85	27.8
	≥45	221	72.2
Sex	Male	144	47.1
	Female	162	52.9
Marriage	Single	32	10.5
	Married	229	74.8
	Divorced	13	4.2
	Widowed	32	10.5
Religion	Orthodox	205	67.0
	Muslim	52	17.0
	Protestant	38	12.4
	Adventist	2	0.7
	Catholic	5	1.6
	Other*	4	1.3
Education level	Secondary education and above	203	66.3
	Primary education and below	103	33.7
Residency occupation	Urban	288	94.1
	Rural	18	5.9
	Government worker	87	28.4
Residency	Merchant	48	15.7
	House wife	58	19.0
Occupation income	Student	4	1.3
	Labour worker	6	2.0
	Farmer	8	2.6
	Pensioner	78	25.5
	Other†	17	5.6
	<5000	220	71.9
≥5000	86	28.1	

*Wakefata, no religion.

†Job less, parking.

a comparison to patients with elementary education or less, patients with hypertension with secondary education or higher are around three times more likely to have a strong understanding of stroke risk factors (AOR 2.6; 95% CI 1.5 to 4.5, p=0.001). Urban residents are four times more likely to be well-informed about stroke risk factors (AOR 4.0; 95% CI 1.1 to 15, p=0.036) (table 4).

Knowledge of participants on the stroke prevention

The overall knowledge of participants on stroke prevention was 49.7%, whereas 50.3% had poor knowledge. Getting proper hypertension medication (71.6%) and reducing fatty food consumption (67.3%) were the top

Table 2 Clinical characteristics of the participants 2022 (N=306)

Clinical variables	Category	Frequency	Percentage
Duration of hypertension	<5 years	117	38.2
	≥5 years	189	61.8
Previous history of stroke	Yes	28	9.2
	No	278	90.8
Family history of stroke	Yes	42	13.7
	No	264	86.3
Diabetes mellitus	Yes	108	33.5
	No	198	64.7

Source of information on stroke risk factors and prevention.

two stroke prevention strategies mentioned by respondents, followed by regular exercise (64.4%). Less than 50% of the respondents stated eating fruit and vegetables, decreasing weight if overweight, regulating blood sugar levels and making sure heart disease is properly treated (table 5).

Factors associated with knowledge of stroke prevention

Sex, marital status, educational attainment, income, place of residence and having DM all significantly correlate with awareness of stroke preventive strategies in bivariate logistic regressions. In multiple logistic regression, knowledge of stroke preventive strategies was positively correlated with sex and level of education ($p < 0.05$). Men are 1.6 times more likely to have good knowledge of stroke prevention methods (AOR 1.6; 95% CI 1.0 to 2.7; $p = 0.045$). Higher educated individuals (those with a secondary education or higher) are 1.7 times more likely to be knowledgeable about stroke prevention strategies (AOR 1.7; 95% CI 1.0 to 2.9, $p = 0.037$) (table 6).

DISCUSSION

In comparison to studies conducted in Nigeria (86.6%) and India (66.7%), in this study, only 44.1% of study participants had a good knowledge of stroke risk factors in our study.^{23 24} The reason for this might be due to different socioeconomic status. However, it is higher than the result of the Felege Hiwot Hospital study (18.3%).²⁵ One explanation for the discrepancy is that in the study conducted at the Felege Hiwot Hospital, more than half of the participants were illiterate and from rural areas.

In this study, 83% of the participants named hypertension as a stroke risk factor, followed by a poor diet or too much fat in the diet (63.1%) and physical or mental stress (59.5%). This study's findings are generally in line with a study done in Nigeria, which found that high dietary fat (92.0%) and obesity (84.9%) were the two most common risk factors for stroke.²⁴ The similarity might be due to the use of an identical study design. This study's results are also comparable to those from India, where the prevalence of hypertension (58.57%) is found to be the highest risk factor.²³ The results of other studies conducted in

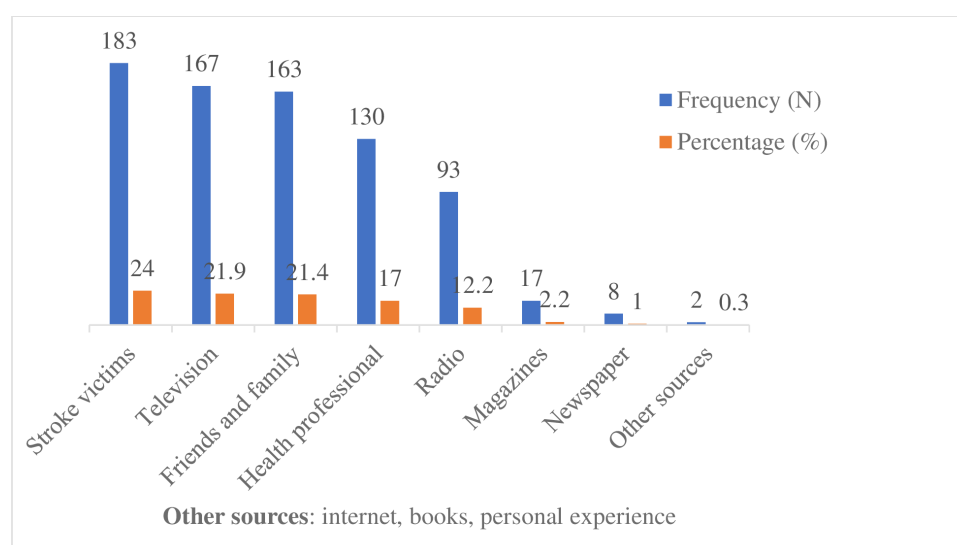
**Figure 1** Source of information on stroke risk factors and prevention strategies for the respondents 2022 (N=306).

Table 3 Stroke risk factors identified by respondents 2022 (N=306)

Risk factors	Category	Frequency	Percentage
High blood pressure	Yes	254	83.0
	No	52	17.0
Diabetes mellitus	Yes	94	30.7
	No	212	69.3
Heart disease	Yes	130	42.5
	No	176	57.5
Abnormal blood Cholesterol	Yes	111	36.3
	No	195	63.7
Unhealthy diet/excess Fat in diet	Yes	193	63.1
	No	113	36.9
Smoking	Yes	114	37.3
	No	192	62.7
Obesity	Yes	174	56.9
	No	132	43.1
Physical/emotional Stress	Yes	182	59.5
	No	124	40.5

Table 5 Stroke prevention strategies identified by the respondents 2022 (N=306)

Prevention	Category	Frequency	Percentage
Engage in a regular physical exercise	Yes	197	64.4
	No	109	35.6
Lose weight (if overweight)	Yes	119	38.9
	No	187	61.1
Ensure appropriate treatment of hypertension	Yes	219	71.6
	No	87	28.4
Control blood sugar level	Yes	72	23.5
	No	234	76.5
Avoid or quite smoking	Yes	68	22.2
	No	238	77.8
Reduce the consumption of fatty food	Yes	206	67.3
	No	100	32.7
Eat fruit and vegetables regularly	Yes	147	48
	No	159	52
Ensure appropriate treatment of heart disease	Yes	46	15
	No	260	85

Thailand are generally consistent with those of this study, in which hypertension (35%), dyslipidaemia (28.6%) and diabetes (22.9%) were the most frequently recognised

risk factors. In this study, 53.6% of those who had underlying hypertension acknowledged that it was a risk factor for stroke.²⁶ According to another study conducted in

Table 4 Multivariable analysis of factors associated with knowledge of stroke risk factors 2022 (N=306)

Variable	Category	Risk factor knowledge		COR		AOR	
		Good	Poor	95% CI	P value	95% CI	P value
Age	<45	95	126	1.1 (0.7 to 1.9)	0.521		
	≥45	40	45	1			
Sex	Male	72	72	1.5 (0.9 to 2.4)	0.051*	1.3 (0.8 to 2.1)	0.231
	Female	63	99	1		1	
Educational level	Secondary education and above	107	96	2.9 (1.7 to 4.9)	0.000*	2.6 (1.5 to 4.5)	0.001†
	Primary education and below	28	75	1		1	
Residency	Urban	132	156	4.2 (1.2 to 15)	0.025*	4.0 (1.1 to 15)	0.036†
	Rural	3	15	1		1	
Duration of HTN	≥5 years	85	104	1.0 (0.7 to 1.7)	0.702		
	<5 years	50	67	1		1	
Previous history of stroke	Yes	9	19	0.5 (0.2 to 1.3)	0.185*	0.4 (0.1 to 1.0)	0.069
	No	126	152	1		1	
Family history of stroke	Yes	20	22	1.1 (0.6 to 2.2)	0.623		
	No	115	149	1		1	
DM	Yes	52	56	1.2 (0.8 to 2.0)	0.295		
	No	83	115	1		1	

*COR at p<0.25.

†AOR at p<0.05.

AOR, adjusted OR; COR, crude OR; DM, diabetes mellitus; HTN, hypertension.

Table 6 Multivariable analysis of factors associated with knowledge of stroke prevention 2022 (N=306)

Variable	Category	Prevention knowledge		COR		AOR	
		Good	Poor	95% CI	P value	95% CI	P value
Age	<45	109	112	0.9 (0.5 to 1.5)		0.843	
	≥45	43	42	1		1	
Sex	Male	85	59	2.0 (1.3 to 3.2)		0.002*	
	Female	67	95	1		1	
Educational level	Secondary education and above	114	89	2.1 (1.3 to 3.5)		0.002*	
	Primary education and below	38	65	1		1	
Residency	Urban	147	141	2.7 (0.9 to 7.8)		0.064*	
	Rural	5	13	1		1	
Duration of HTN	≥5 years	93	96	0.9 (0.6 to 1.5)		0.836	
	<5 years	59	58	1		1	
Previous history of stroke	Yes	12	15	0.8 (0.4 to 1.9)		0.719	
	No	139	139	1		1	
Family history of stroke	Yes	22	20	1.1 (0.6 to 2.1)		0.706	
	No	130	134	1		1	
DM	Yes	63	45	1.7 (1.0 to 2.7)		0.026*	
	No	89	109	1		1	

*COR at p<0.25.
†AOR at p<0.05.
AOR, adjusted OR; COR, crude OR; DM, diabetes mellitus; HTN, hypertension.

Tanzania, the majority of people (85.4%) expressed stress, obesity (67.7%), high cholesterol (64.3%) and physical inactivity (63.3%). Although just 6.9% of participants were unable to identify any risk factor, the majority of individuals (51.4%) were able to list five or more risk factors.²⁷ Studies on patients with hypertension in north-west Ethiopia are comparable to our study, which reveals that 96.8% of respondents recognised high blood pressure as a risk factor for stroke.²⁸ This study's findings are also generally in line with a study of patients with hypertension at Debre Tabor Hospital, which revealed that 96.6% of them classified hypertension as a risk factor for stroke.¹⁹ This similarity might be due to a similar study design used in the study and socioeconomic status. Contrary to what was said above, research done at the Felege Hiwot hospital reveals that hypertension was the number 1 risk factor for stroke (3.6%). The majority of participants in this study did not identify any risk factors.²⁵ About half of the participants (46.1%) in a different study conducted in Gondar were found to be ignorant of any of the stroke risk factors indicated.²⁸ The difference might be due to the educational status and residency of the participants.

In our analysis, patients with hypertension with secondary education or higher were about three times more likely (AOR 2.6; 95% CI 1.5 to 4.5, p=0.001) than those with elementary education or lower to have a strong understanding of stroke risk factors. Urban inhabitants had a fourfold higher likelihood of being well informed

about stroke risk factors (AOR 4.0; 95% CI, 1.1 to 15, p=0.036). The findings of this study are generally in line with a study done in Nigeria, which found that respondents with formal education were more than four times as likely to understand stroke risk factors as those with no formal education or only religious education (AOR 4.24, 95% CI 1.68 to 10.67, p=0.002)²⁴ and a tertiary education is associated with having a strong understanding of stroke risk factors, according to a Ugandan study (AOR 5.96; 95% CI, 2.94 to 12.06).²¹ Our research is also generally in line with a study from northwest Ethiopia that found patients from urban regions had a 2.9-fold better knowledge of stroke warning signs than patients from rural areas (AOR 2.9; 95% CI 1.04 to 8.11).²² In accordance with another conclusion from the Felege Hiwot study, hypertension patients who can read and write (AOR 7.128, 95% CI 2.298 to 22.108) and urban inhabitants (AOR 3.2, 95% CI 1.042 to 9.874) have good knowledge of the risk factors for stroke.²⁵ Contrary to our study, other data in Tanzania suggest that participants who reported smoking and having DM were adequately informed about the risk factors for stroke.²⁷

About half of the participants in this study (49.7%) had good awareness of stroke prevention strategies, which is less than studies done in Austria's Vienna (77%), Nigeria (90.7%) and Gondar (51.7%).^{7 24 28} The difference in socioeconomic position and the education provided to patients with hypertension by healthcare facilities may

be the cause of this variance. Participants had a greater understanding of stroke prevention techniques than those in research from Debre Tabor (24.9%) and India.^{19 23} Assuring proper hypertension treatment (71.6%) was the most frequently mentioned stroke prevention strategy, followed by cutting back on fatty food consumption (67.3%), exercising regularly (64.4%), eating a regular diet of fruits and vegetables (48%), and losing weight (if overweight) (38%). The results of the study in Nigeria are consistent with those of our study, which showed that the most widely known stroke prevention measures among respondents were appropriate treatment of hypertension (93.7%), a reduction in the consumption of fatty foods (88.7%) and control of overweight or obesity (87.9%). However, in contrast to our study, 90.7% of the study participants had good knowledge of the methods for stroke prevention in Nigeria.²⁴ This difference might be due to health facility education to patients with hypertension on prevention methods of stroke. Also, our study's findings are generally in line with those from Debre Tabor, which demonstrate that the most frequently mentioned preventive strategy among respondents was 391 (95.4%) guaranteeing effective treatment for hypertension.¹⁹

In our study, men were 1.6 times more likely than women to be well informed on ways to prevent strokes (AOR 1.6; 95% CI 1.0 to 2.7, $p=0.045$). Higher educated individuals (those with a secondary education or higher) were 1.7 times more likely to be knowledgeable about stroke prevention strategies (AOR 1.7; 95% CI 1.0 to 2.9, $p=0.037$). The findings of this study are in line with a study conducted in Nigeria, which discovered that people with formal education were about three times more likely to be well versed in stroke prevention techniques than those with no formal education or only Quranic education (AOR 2.983, 95% CI 1.351 to 6.588, $p=0.007$).²⁴ Another study in Debre Tabor on patients with hypertension supports our conclusion that urban inhabitants are more likely to be knowledgeable about stroke preventive strategies (AOR 3.230; 95% CI (1.665 to 6.267)).¹⁹

Limitations of the study

The study has some limitations, among which the following are mentioned by the researchers: due to the study's institution-based design and exclusivity to one hospital, there are drawbacks, including a limited capacity to generalise the findings to the wider public. Since the study was only carried out in a public hospital, other patients with hypertension who could afford it might receive their follow-up care at a private facility and could not get the chance to participate in this study. On the other hand, it is a cross-sectional study so the relationship between cause-and-effect cannot be identified.

Conclusion and recommendation

This study indicates that patients with hypertension who participated in the study had poor knowledge of stroke risk factors and preventions. The mean score of knowledge on risk factors and prevention strategies of stroke is

44.1% and 49.7%, respectively, and needs improvement. As a recommendation, the health system should organise awareness creation campaigns through mass media, social media and in areas with a high population like cities and towns. Health professionals also have to do patient and family education within the health institution through interactive programmes, posters and brochures on stroke risk factors and prevention.

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Patient consent for publication Consent obtained directly from patient(s).

Ethics approval This study involves human participants and was approved by Departmental Research Ethics Committee: Addis Ababa University, College of Health Sciences, Department of Emergency medicine with a reference number EM/SM/547/2022. Participants gave informed consent to participate in the study before taking part.

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