Determinant of Stroke among Adult Patients with Hypertension in Ayder Comprehensive Specialized Hospital, Tigray, Ethiopia, 2018: A Case Control Study

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Abstract

Background: Stroke is a chronic non-communicable disease results from infraction or spontaneous hemorrhage in the brain. The burden of stroke is increasing in 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. In Ethiopia, 7% of total deaths are attributed by stroke. This study aims to assess the determinants of stroke among patients with hypertension in Ayder Comprehensive Specialized Hospital, Mekelle, Tigray, Ethiopia, in 2018. **Methods:** Hospital-based case-control study was conducted from February to April 2018. Cases were adult hypertensive patients with stroke and controls were adult hypertensive patients without stroke. Using a systematic random sampling technique 89 case and 356 controls were included in this study. Record review, physical measurement and interview techniques were used to collect data. Data was entered and analyzed by using SPSS version 23. Variables with a p-value less than 0.25 in bivariate logistic regression were selected for multivariable logistic regression. The adjusted odds ratio and 95% confidence interval were used to determine the association. P-value <0.05 was used to declare statistical significance in multivariable analysis. **Result:** The mean age of cases were 56.3years (SD±13.53years) and 51.9 years (SD±12.67 years) for controls. Majority 59 (66.3%) of the case and around one third 106(30%) of controls were non-adherent to medication. Lost to follow up (AOR=2.474, 95%CI: 1.368-4.929), alcohol drinking (AOR=2.440, 95%CI: 1.291-4.613), use of salty diet (AOR=3.249, 95%CI: (1.544-6.837), medication non-adherence (AOR=3.967, 95%CI: 2.256-6.973), uncontrolled systolic blood pressure, (AOR=3.196, 95%CI: 1.60-6.382), uncontrolled diastolic blood pressure (AOR=2.204, 95%CI: 1.130-4.297) and high cholesterol level(AOR=2.413, 95%CI: 1.319-4.414) were found to be significant determinants. **Conclusion:** Alcohol consumption, lost to follow up, salty diet, high cholesterol level and uncontrolled systolic and diastolic blood pressure were significantly associated with stroke so, health education on lifestyle practices and hypertension-related complications in each follow-up visit through health professionals are very essential to avert the problem. **Keywords:** Stroke, Hypertension, determinant, Mekelle, Ethiopia

Background

Stroke is a chronic non-communicable disease causes sudden global focal neurological deficit resulting from infraction or spontaneous hemorrhage in the brain[1]. The incidence of stroke on the past four decades (1970-2010) showed, 100% increases in low and middle-income countries but it decreases by 42% in developed countries[2]. In 2013, there were 6.5 million stroke deaths, 113 million disability-adjusted life years due to stroke. Of all, 75.2% of stroke mortality and 81.0% of stroke-related disability-adjusted life years were in developing countries[3].

In addition to the health consequence cardiovascular disease and stroke has a major impact in economic development. World Economic Forum and WHO forecasts above 7 trillion American dollar over the period 2011-2025 in low and middle-income countries (LMIC)[4].

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 decreases risk for stroke, those are not-smoking, physical activity, healthy diet, body weight, and control of cholesterol, blood pressure, and blood sugar[5].

Different studies in different parts of the world stated the common determinant of stroke: age, sex, and smoking, low physical exercise, obesity, alcohol, anti-hypertensive medication non-adherence, uncontrolled blood pressure, being diabetic, and cholesterol level (10)[4, 6-9] But the above factors are different across the studies.

In 2015/16-2019/20 the Ethiopian health sector development program projects to decrease by 12.5% premature mortality from NCDs[10]. In Ethiopia, currently stroke is one of the greatest public health problem, accounts 7% of total deaths[11]. Study in Mekelle, Ethiopia showed that stroke was the third common cause of medical intensive care unit admission (15.2%) and the first cause of death which accounts 17% of all death in medical intensive care unit[12]. Similarly hypertension is responsible for 66.2% of all strokes admission and 38% of all stroke were on anti-hypertensive treatment[13].

In Ethiopia although, admission of stroke patients to the hospitals due to hypertension is increased from time to time, there are limited findings which aim to explore those determinants.

Therefore, this study aims to assess the determinants of stroke among hypertensive patients at Ayder Comprehensive Specialized Hospital, Mekelle, Ethiopia, 2018.

Methods

Study setting

Ayder Comprehensive Specialized Hospital is found in Mekelle, Tigray regional state, Ethiopia. Mekelle is found at 783 Km north of Addis Ababa. Mekelle has total population 586,897. Mekelle city has nine governmental health centers, one referral Hospital and one military Hospital and two general hospitals. Ayder Comprehensive Specialized Hospital begins its referral and non-referral services in 2008 to the 9 million populations in its catchment areas of the Tigray, Afar and parts of the Amhara regional states in Ethiopia[14].

Ayder Comprehensive Specialized Hospital has capacity of about 500 beds in four major departments and other specialty units. Patient flow of ACSH is above 170, 000 per year. The hospital provides hypertensive service in cardiac unit and stroke service in neurology unit. Medical ward, medical ICU, cardiac unit and diabetic unit were the study units[14].

Study design and period

A case-control study was conducted in Ayder comprehensive specialized Hospital, Tigray from February to April 2018.

Population and sampling

Cases were all sampled adult hypertensive patients with stroke diagnosed by the neurologist (consultant internist) or confirmed by brain imaging (CT-scan) or MRI. Controls were all sampled adult hypertensive patients without clinical evidence of stroke and without a history of stroke at ACSH during the data collection period. Cases with less than three follow-ups for hypertension treatment before first stroke occurrence and controls with less than three follow-ups for hypertension treatment were excluded. Pregnant mothers were also excluded from both cases and controls. The sample size was calculated using Epi Info version 7 statistical software using the following assumptions: a proportion of 10.7% and 24.1% of greater alcohol consumption was considered for controls and cases respectively[7] at 95% CI, 80% power. The case to control ratio was 1:4. Using those information 81 cases and 324 controls were selected but after adding 10% non-response rate the total sample becomes 445 of which 89 were cases and 356 were controls. Finally eligible cases and controls recruited using systematic sampling technique.

Data Collection Procedure

Record review of hypertensive and stroke patients was conducted to identify cases and controls. Information on socio-demographic data and behavioral risk factors for stroke was obtained from the patient or close relative (for unconscious cases) by interview.

Medical history like clinical duration of hypertension, type of stroke, the presence of stroke, and complication other than stroke was taken from the patient record. Height, weight, blood pressure, total cholesterol level and fasting blood sugar were taken during data collection.

During data collection data collector measures weight, height, blood pressure, as follows. Weight was measured in light clothing and without shoes by calibrated UNICEF Seca digital weighing scale. Stadiometer in centimeter in erect position at a precision of 0.1cm 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.

Assessment and definition of variables

Outcome variable: Stroke

Independent variables

Scio demographic included: age, sex, marital status, occupation, residency and educational status.

Behavioral factors included: Physical exercise, Smoking, alcohol, frequency of follow up, salty diet, fatty food use, loss to follow up, medication adherence

physical exercise physically active- if patients make regular physical activities 30 minutes and above, 5 days and above per week physically inactive- if patient is make physical exercise less than 30 minutes per week or less than 5 days per week[15]. , Medication adherence was assessed using Morisky

medication adherence score to anti-hypertensive medications having eight questions each with yes=0 and No=1, adherent if they score 7-8 and non-adherent if they score ≤ 6 [16].

Alcohol drinker- a person who drinks 10.5 unites of alcohol and above per week[15].

Physical measurements and clinical factors: Fasting blood glucose (FBG), cholesterol level, blood pressure control, body mass index (BMI) and comorbidities. Normal FBG <126 mg/dl, raised FBG ≥ 126 mg/dl[7].

Cholesterol level: normal if less than 200 and high cholesterol level 200 and above, BMI: underweight(less than 18.5), normal (18.5-24.9), over weight (25-29.9) and obese (30 and above). Systolic blood pressure: controlled(<140) and uncontrolled (≥ 140), diastolic blood pressure: controlled (<90) and uncontrolled(≥ 90)[17]. Comorbidities: yes if patient has any known medical disease.

Data analysis and management

Data were cleaned, coded, entered and analyzed using SPSS version 23. Summary statistics: frequencies tables and graphs were used to present for categorical variables and mean, median for continuous variables in both cases and controls.

First bivariate logistic regression was done to assess the association between each independent variable and the dependent variable. Variable with a P-value < 0.25 significance level in bivariate logistic regression was taken to multivariable logistic regression. Finally multivariable logistic regression was used to assess the association between independent variables with the dependent variable and to control confounding variables. Adjusted odds ratio and P-value <0.05 and with 95% CI was used to declare statistical significance.

Results

Socio-demographic characteristics:

All 445 selected participants (89 cases and 356 controls) were participated in the study and the response rate was 100%. The mean age of cases was 56.3years (SD $\pm$ 13.53years) and 51.9years (SD $\pm$ 12.67 years) for controls.

The majority of subjects were married; 64 % in cases and 66% in controls. Thirty (33.3%) of the cases and 117(32.9%) of controls were self-employee (Table 1).

Behavioral factors of the respondents

Out of 89 cases and 356 controls 32(36%) of cases and 49(13.8%) controls were current alcohol drinkers. Twenty two (24.7%) cases and 28(7.9%) of controls of were not reduce salt in their diet. In this study 66.3% of the cases and 29.8% of controls were non-adherent to medication. Sixty three (70.8%) and

245(68.8%) controls were not on regular exercise.36%of cases and 12.9 of controls had lost to follow up. Fifty two (58.4%) of cases and 215(60.4%) of controls had every two months regular follow up (Table 2).

Biological, physical measurements and Clinical Characteristics of the respondents

Among the study participants, 13(14.6%) of cases and 60(16.9%) of controls were overweight. The clinical characteristics of patients showed that 5(5.6 %) of cases and 25(7%) of controls of the participants had a family history of stroke (Table 3).

The mean of the clinical duration of hypertension was 4.65 ± 3.3 years for cases and 3.94 ± 3.18 years for controls. The mean of total cholesterol was 198 ± 34 among cases and 182 ± 27 for controls. The mean systolic blood pressure was 150 ± 14 in case and 145 ± 17 in controls. The mean diastolic blood pressure was 92 ± 7 in case and 90 ± 9 in controls.

Types of stroke and method used to diagnosis

The type of stroke (ischemic or hemorrhagic) and the tool by what they identified could be diagnosed was from the patients chart. Out of 89 cases 29were ischemic stroke cases and 60 were hemorrhagic stroke. From all stroke 80% were diagnosed by CT scan, 4.5% by MRI and 15.7% clinically.

Bivariate and multivariable logistic regression for factors associated with stroke among hypertensive patients

The bivariate analysis result reveals that age, lost to follow up, alcohol drinkers after he/she know their hypertensive status, use of salty diet, use of fatty diet; medication non non-adherence, high cholesterol level, and uncontrolled systolic and diastolic blood pressure were found be significant predictors of stroke (annex 1).

Multivariable logistic regression lost to follow up (AOR=2.474, 95% CI: 1.368-4.929), alcohol drinkers after he/she know their hypertensive status(AOR=2.440, 95%CI: 1.291-4.613), use of salty diet(AOR=3.249, 95%CI: 1.544-6.837), medication non-adherence(AOR=3.967, 95%CI: 2.256-6.973), high cholesterol level(AOR=2.413, 95%CI: 1.319-4.414), uncontrolled systolic(AOR=3.196, 95%CI: 1.60-6.382) and diastolic blood pressure(AOR=2.204, 95%CI: 1.130-4.297) were found be significant predictors of stroke(Table 4).

Discussion

This case-control study aimed to identify determinant of stroke among hypertensive patients in Ayder comprehensive specialized hospital, Tigray, north Ethiopia. Lost to follow up, current alcohol drinking, eating salty foods, medication non- adherence, high cholesterol level, uncontrolled systolic and diastolic blood pressure were determinants of stroke.

In this study, patients who had history of lost to follow up were 2.5 times more likely to be at high risk for stroke than their counterparts (AOR=2.474, 95% CI: 1.368-4.929). This finding is in agreement with a

study conducted in Gaza Strip, Germany[18]. This similarity might be due to missing their routine medications and life style modification counseling leads to uncontrolled hypertension.

Hypertensive patients, who were alcohol drinkers, were 2.44 times more likely to be at high risk for stroke (AOR=2.440, 95%CI: 1.291-4.613). This finding is in line with a study conducted in Nigeria[7] and in 32 countries (INTERSTROKE)[6]. This similarity might be due to alcohol has direct impact on raising blood pressure.

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). This is similar with a study done in 32 countries (INTERSTROKE)[6]. It is due to the fact salt have an impact on raising blood pressure on circulation then can cause stroke.

In this study 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 patient. This finding is in line with a study done in Dhaka, Bangladesh[19]. and Gaza Strip, Germany[18].

Patients with high cholesterol level were 2.4 times (AOR=2.413, 95%CI: 1.319-4.414) more likely to be at high risk for stroke than patients with low cholesterol level. This finding is consistent with a study conducted in Nigeria[7] and Tanzania [20]. low high-density lipoprotein (HDL) (OR = 6.84, P < 0.001.[21] dyslipidemia (odds ratio, 1.52; 95% CI, 1.24 to 1.87) [22] low high-density lipoprotein cholesterol (OR, 1.81; 95% CI, 1.37–2.40)[23] This might due to cholesterol have a direct impact on block blood circulation and can cause stroke. But study Erbil reveals that there was no statistically significant difference between the groups with and without stroke with respect to Cholesterol variation(9)[8]. This might be due to sample size, study design. The major reasons for these contradictions may be inadequate control for potential confounders or lack of data on total and type-specific stroke since different associations may exist between total cholesterol and total stroke and between total cholesterol and type-specific stroke risk.

Result of this study showed that uncontrolled systolic blood pressure is 3.2 times more likely at high risk for the development of stroke(AOR=3.196, 95%CI: 1.60-6.382) and uncontrolled diastolic blood pressure were 2.2 times more likely for the development of stroke (AOR=2.204, 95%CI: 1.130-4.297) this in lines with a study done in Puget[24](OR, 1.43; 95% CI, 1.17–1.75)[23]. This might be related to the fact that uncontrolled blood pressure cause hemorrhage in the brain.

Limitations

Control subjects were not recruited from general population, so selection bias of control subjects may also have affected the findings of this study. Blood pressure measurements were taken from patient's record review hence no information was available on how BP was measured for the previous two measurements. A case control study design was used which does not allow for temporal relationship to be established.

Conclusions

Among hypertensive patients, alcohol consumption, lost to follow up, salty diet, and high cholesterol level, uncontrolled systolic and diastolic blood pressure found to be associated with stroke. Therefore, further intervention and prevention mechanism shall focus on these determinants.

Abbreviations

ACSH: Ayder Comprehensive Specialized Hospital, AOR: Adjusted Odds Ratio, BMI: Body Mass Index, CI: Confidence Interval, CT: Computed Topography scan, DM: Diabetes Mellitus, ECSA: Ethiopian Central Statistical Agency, EDHS: Ethiopian Demographic Health Survey, MRI: Magnetic Resonance Imaging, NGO: Non-Governmental Organizations, OPD: Out Patient Department, OR: Odds Ratio, SPSS: Statistical Package for the Social Science, SSA: Sub Saharan Africa, WHO: World Health Organization.

Declarations

Ethics approval and consent to participate

Ethical clearance was obtained from Mekelle University, College of health science institutional review board (IRB). Official permission was obtained from ACSH chief executive director and study participants were informed about the purpose of the study. The information was collected after obtaining written informed consent from participant (relatives for patients who were critically ill). The respondents were informed as they have the right to refuse or discontinue participation at any time if unwanted. The information was recorded anonymously and confidentiality and beneficence was assured throughout the study period.

Consent for publication

Not applicable

Availability of data and material

English version questionnaires, tables are included in supplementary additional files.

Dataset is available from the corresponding author on reasonable request.

Competing interests

We declare that there is no competing interests.

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Authors' contributions

HH conception of research idea, study design, coordinated data collection, made analysis and interpreted findings, and drafted the manuscript. MM, TB, HT contributed in design,

analysis, interpretation of the findings, and reviewed the manuscript. All authors read and approved the final version of the manuscript.

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Tables

Table 1: Socio demographic characteristics of hypertensive patients who were attending ACSH, Ethiopia (n=445), 2018

Diagnosis(cases and controls)

Variables

	Control	Cases			
	Frequency	Percentage%	Frequency	Percentage%	
Sex	Male	170	47.8	46	51.7
	female	186	52.2	43	48.3
Age	<45	116	32.6	23	25.8
	45-65	185	52	39	43.8
	>65	55	15.4	27	30.3
Religion	Orthodox Christian	278	78.1	69	77.5
	Muslim	61	17.1	17	19.1
	Other	17	4.8	3	3.4
Ethnicity	Tigray	316	88.8	81	91
	Amhara	22	6.2	4	4.5
	Afar	15	4.2	4	4.5
	Other	3	0.8	-	-
Marital status	Married	235	66	57	64
	Single	64	18	16	18
	Divorce	25	7	6	6.7
	widowed	32	9	10	11.2
Educational status	No formal education	138	38.8	31	34.8
	Primary school	65	18.3	25	29.2
	Secondary school	42	11.8	9	10.1
	diploma	29	8.1	6	6.7
	University and above	82	23	17	19.1
Occupation	Farmer	73	20.5	15	16.9
	Household	27	7.6	5	5.6

	Governmental employee	100	28.1	20	22.5
	Non-Governmental employee	32	9	15	16.9
	Self-employee	117	32.9	30	33.7
	Other	7	2	4	4.5
Residency	Rural	85	23.9	21	24.7
	urban	271	76.1	67	75.3

Table 2: Behavioral determinants of hypertensive patients who were attending ACSH, Ethiopia (n=445), 2018

Diagnosis(cases and controls)

Variables					
	Control	Cases			
	Frequency	Percentage%	Frequency	Percentage%	
Have you ever smoke cigarette	Yes	10	2.8	2	2.2
	No	346	97.2	87	97.8
smoking after you diagnosed hypertension	Yes	3	0.8	0	0
	No	353	99.2	89	100
Regular physical exercise	yes	111	31.2	26	29.2
	No	245	68.8	63	70.8
Medication non-adherence	Yes	106	29.8	59	66.3
	No	250	70.2	30	33.7
Have ever drink alcohol	Yes	255	71.6	67	75.3
	No	101	28.4	22	24.7
Current alcohol drink	Yes	49	13.8	32	36
	No	307	86.2	57	64
Do reduce salt in diet	Yes	328	92.1	67	75.3
	No	28	7.9	22	24.7
Do you eat fatty diet	Yes	71	19.9	27	30.3
	No	285	80.1	62	69.7
Lost to follow-up	Yes	46	12.9	32	36
	No	310	87.1	57	64
Frequency of fellow up	1month	85	23.9	21	23.6
	2month	215	60.4	52	58.4
	3month	56	15.7	16	18

Table 3: Clinical and anthropometric measurements of hypertensive patients who were attending ACSH, Ethiopia (n=445), 2018

diagnosis(cases and controls)

Variable					
	Controls		Cases		
	Frequency	Percentage	Frequency	Percentage	
Duration of diagnosis HTN	<4year	249	69.9	53	59.6
	>=4year	107	30.1	36	40.4
Cholesterol level	Normal	282	79.2	56	62.9
	High level	74	20.8	33	37.1
Blood glucose level	Normal	304	85.4	75	84.3
	High level	52	14.6	14	15.7
BMI	18.5-24.9	288	80.9	74	83.1
	25-29.9	60	16.9	13	14.6
	>=30	8	2.2	2	2.2
Systolic BP	Controlled	156	43.8	15	16.9
	Uncontrolled	200	56.2	74	83.1
Diastolic BP	Controlled	163	45.8	18	20.2
	uncontrolled	193	54.2	71	79.8
Comorbidities	yes	67	19.5	22	24.7
	No	277	80.5	67	75.3
Family history of stroke	Yes	25	7	5	5.6
	No	331	93	84	94.4

Table 4: Bivariate and multivariable logistic regression for determinant of stroke in ACSH, Ethiopia, 2018 (n=445)

Variables	Cases and Controls(n=445)	COR (95%CI)	P-value	AOR(95%CI)	P-value*
	Cases%	Controls%			
Age category				0.006	0.074
<45 years	23(25.8%)	116(32.6%)	1		1
45-65 years	39(43.8%)	185(52%)	1.063(0.604-1.871)	0.832	.811(.418-1.573)
>65years	27(30.3%)	55(15.4%)	2.476(1.303-4.705)*	0.006	1.779(.836-3.787)
Lost to follow up					
Yes	32(36%)	46(12.9%)	3.783(2.222-6.442)*	0.000	2.597(1.368-4.929)*
No	57(64%)	310(87.1%)	1		1
Current alcohol drink					
Yes	32(36%)	49(13.8%)	3.517(2.075-5.961)*	0.000	2.440(1.291-4.613)*
No	57(64%)	307(86.2%)	1		1
Do you reduce salt in diet					
Yes	67(75.3%)	328(92.1%)	1		1
No	22(24.7%)	28(7.9%)	3.846(2.075-7.130)*	0.000	3.249(1.544-6.837)*
Do you eat fatty foods					
Yes	27(30.3%)	71(19.9%)	1.748(1.038-2.944)*	0.036	1.388(.733-2.63)
No	62(69.7%)	285(80.1%)	1		1
Medication adherence					
No adherent	59(66.3%)	106(29.8%)	4.638(2.828-7.607)*	0.000	3.967(2.256-6.973)*
Adherent					

	30(33.7%)	250(70.2%)	1		1	
Cholesterol level						
Normal						
	56(62.9%)	282(79.2%)	1		1	
High level						
	33(37.1%)	74(20.8%)	4.560(2.313-8.989)*	0.002	2.413(1.319-4.414)*	0.004
Systolic BP						
Controlled	15(16.9%)	156(43.8%)	1		1	
Uncontrolled	74(83.1%)	200(56.2%)	3.848(2.126-6.964)*	0.000	3.196(1.60-6.382)*	0.001
Diastolic BP						
Controlled	18(20.2%)	163(45.8%)	1		1	
Uncontrolled	71(79.8%)	193(54.2%)	3.331(1.907-5.818)*	0.000	2.204(1.130-4.297)	0.020

P-value=p-value in bivariate logistic regression, P-value*=p-value in multivariable logistic regression

COR: crude odds ratio, AOR: adjusted odds ratio, CI: confidence interval, *: statically significant

ANEX 1

Table 5: Bivariate and multivariable logistic regression for determinant of stroke in ACSH, Ethiopia, 2018 (n=445)

Variables	Cases and Controls(n=445)	COR (95%CI)	P-value+	AOR(95%CI)	P-value
	Cases%	Controls%			
Sex category					
Male	46(51.7%)	170(47.8%)	1		
Female	43(48.3%)	186(52.2%)	.854(.537-1.360)	0.507	
Age category				0.006	0.074
<45 years	23(25.8%)	116(32.6%)	1		1
45-65 years	39(43.8%)	185(52%)	1.063(0.604-1.871)	0.832	.811(.418-1.573)
>65years	27(30.3%)	55(15.4%)	2.476(1.303-4.705)*	0.006	1.779(.836-3.787)
Marital status				0.934	
Married	57(64%)	235(66%)	1		
Single	16(18%)	64(18%)	1.031(0.555-1.915)	0.924	
Divorced	6(6.7%)	25(7%)	0.989(0.388-2.525)	0.982	
Widowed	10(11.2%)	32(9%)	1.288(0.598-2.774)	0.517	
Educational status				0.266	
No formal education	31(34.8%)	138(38.8%)	1.084(0.565-2.079)	0.809	
Primary school					
High school	25(29.2%)	65(18.3%)	1.929(0.965-3.857)	0.063	
Diploma	9(10.1%)	42(11.8%)	1.034(0.425-2.516)	0.942	
University and above	6(6.7%)	29(8.1%)	0.998(0.359-2.775)	0.997	
	17(19.1%)	82(23%)	1		

Occupation				0.190
Farmer	15(16.9%)	73(20.5%)	1	
House wife	5(5.6%)	27(7.6%)	0.901(0.299-2.719)	0.854
Governmental employee	20(22.5%)	100(28.1%)	0.973(0.467-2.028)	0.942
Non-governmental employee	15(16.9%)	32(9%)		0.051
Self-employee			2.281(0.997-5.219)	
Other	30(33.7%)	117(32.9%)		0.527
	4(4.5%)	7(2%)	1.248(0.629-2.476)	0.137
			2.781(0.722-10.709)	
Residency				
Rural	21(23.6%)	85(23.9%)	0.985(0.570-1.701)	0.956
Urban	68(76.4%)	271(76.1%)	1	
Family history of stroke				
Yes	5(5.6%)	25(7%)	.788(.293-2.120)	0.637
No	84(94.4%)	331(93%)	1	
Clinical duration of hypertension				
<4years				
>=4years	53(59.6%)	249(69.9%)	1	
	36(40.4%)	107(30.1%)	1.581(0.978-2.555)	0.062
Frequency of follow up				0.874
Every 1month	21(23.6%)	85(23.9%)	1	
Every 2month				

Every 3month	52(58.4%)	215(60.4%)	0.979(0.556-1.723)	0.941		
	16(18%)	56(15.7%)	1.156(0.556-2.406)	0.697		
<hr/>						
Have you ever lost to follow up						
Yes	32(36%)	46(12.9%)	3.783(2.222-6.442)*	0.000	2.597(1.368-4.929)*	0.004
No	57(64%)	310(87.1%)	1		1	
<hr/>						
Ever alcohol drink						
Yes	67(75.3%)	255(71.6%)	1.206(.707-2.057)			
No	22(24.7%)	101(28.4)	1			
<hr/>						
Have you drink alcohol after you diagnosed						
Yes						
No	32(36%)	49(13.8%)	3.517(2.075-5.961)*	0.000	2.440(1.291-4.613)*	0.006
	57(64%)	307(86.2%)	1		1	
<hr/>						
Do you reduce salt in diet						
Yes	67(75.3%)	328(92.1%)	1		1	
No	22(24.7%)	28(7.9%)	3.846(2.075-7.130)*	0.000	3.249(1.544-6.837)*	0.002
<hr/>						
Do you eat fatty foods						
Yes	27(30.3%)	71(19.9%)	1.748(1.038-2.944)*	0.036	1.388(.733-2.63)	0.314
No	62(69.7%)	285(80.1%)	1		1	
<hr/>						
Regular exercise						
Active	26(29.2%)	111(31.2%)	1			
Inactive	63(70.8%)	245(68.8%)		0.719		

1.098(0.66-
1.826)

Comorbidities						
Yes	22(24.7%)	67(19.5%)	1.358(0.783- 2.354)	0.277		
No	67(75.3%)	277(80.5)	1			
Medication adherence						
No adherent	59(66.3%)	106(29.8%)	4.638(2.828- 7.607)*	0.000	3.967(2.256- 6.973)*	0.000
Adherent	30(33.7%)	250(70.2%)	1		1	
Fasting blood sugar level						
Normal	75(84.3%)	304(85.4%)	1			
High level	14(15.7%)	52(14.6%)	1.091(0.574- 2.074)	0.790		
BMI						
				0.877		
Normal weight	74(83.1%)	288(80.9%)	1			
Over weight	13(14.6%)	60(16.9%)	0.843(0.439- 1.618)	0.608		
Obesity	2(2.2%)	8(2.2%)	0.973(0.202- 4.679)	0.973		
Cholesterol level						
Normal	56(62.9%)	282(79.2%)	1		1	
High level	33(37.1%)	74(20.8%)	4.560(2.313- 8.989)*	0.002	2.413(1.319- 4.414)*	0.004
Systolic blood pressure						
Controlled	15(16.9%)	156(43.8%)	1		1	
Uncontrolled	74(83.1%)	200(56.2%)	3.848(2.126- 6.964)*	0.000	3.196(1.60- 6.382)*	0.001
Diastolic blood pressure						

Controlled

Uncontrolled	18(20.2%)	163(45.8%)	1		1	
	71(79.8%)	193(54.2%)	3.331(1.907-5.818)*	0.000	2.204(1.130-4.297)	0.020

P-value+=p-value in bivariate logistic regression, P-value++=p-value in multivariable logistic regression

COR: crude odds ratio, AOR: adjusted odds ratio, CI: confidence interval, *: statically significance

Supplementary Files

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