



## RESEARCH ARTICLE

## Magnitude of Cardiovascular Risk Factors among Adult Hypertensive Patients Attending in Ayder Comprehensive Specialized Hospital, Ethiopia, 2018

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### Abstract

**Objective:** This study aimed to assess the magnitude of cardiovascular risk factors among adult hypertensive patients attending at Ayder Comprehensive Specialized Hospital, Ethiopia, 2018.

**Result:** A total of 578 hypertensive patients were taken from cardiac follow-up. Among the hypertensive patients the magnitude of cardiovascular risk factors was 212 (36.7%). The magnitude of each cardiovascular risk factor was high. Magnitude of overweight and obesity was 33.7%. Concurrently 30.4% had habit of taking high salt diet and 27.3% were patients with dyslipidaemia. Patients with less physically active were 89.1% and 23.5% were consuming alcohol regularly. Whereas 15.9% was smoker. This study also showed that 43.3% had uncontrolled blood pressure among the hypertensive patients. After adjustment, the independent significant risk factors of cardiovascular disease among hypertensive clients were: Age [AOR (95% CI = 3.13 (1.72, 5.67))], obesity and overweight [AOR (95% CI = 9.45 (4.92, 18.15))], diabetic mellitus [AOR (95% CI = 2.13 (1.07, 4.26))], smoking [AOR (95% CI = 8.39 (2.57, 27.39))], and less physical activity [AOR (95% CI = 7.07 (1.98, 25.27))].

### Keywords

Ayder Comprehensive Specialized Hospital, Ethiopia, Cardiovascular disease, Hypertension, Magnitude

### Abbreviations

ACSH: Ayder Comprehensive Specialized Hospital; BMI: Body Mass Index; BP: Blood Pressure; CHF: Congestive Heart Failure; CKD: Chronic Kidney Disease; CVD: Cardiovascular Disease; DM: Diabetic Mellitus; IHD: Ischemic Heart Disease; MI: Myocardial Infarction; NCD: Non-Communicable Disease; SDG: Sustainable Developmental Goal

### Introduction

Cardiovascular diseases (CVD) are a group of disorders of the heart and blood vessels. Globally cardiovascular disease is the most common cause of death which accounts for about 31% of deaths worldwide. According to world health organization (WHO), 17.7 million of death in the world is caused by cardiovascular disease. Of these death 7.4 million were due to coronary heart disease and 6.7 million were due to stroke. Eighty percent of those death were in of Sub-Saharan Africa [1,2]. Currently African populations are extremely affected by cardiovascular disease. The future risk of non-communicable forms of CVD (predominantly driven by increased rates of hypertension, smoking, and obesity) is a growing public health concern [3]. It becomes severe issues

for the people living in developing countries [4,5].

World Health Organization (WHO) report that more than one third of annual death of Ethiopia population was due to NCDs. From these cardiovascular diseases was the most common which accounted for 15% [6]. A cross-sectional study in South West Ethiopia reported that hypertension contributed 30.9% of cardiac cases [7]. Another study done also showed that hypertension is responsible for at least 45% of deaths due to heart disease and 51% of deaths due to stroke [8].

High blood pressure also affects almost 1 billion people worldwide and is a leading cause of mortality and morbidity. In most cases, this disease remains asymptomatic until it followed by stroke, myocardial infarction, renal dysfunction, visual problems and others [9]. Ischemic heart disease (heart attack) and stroke are among the top ten causes of death in all low- and middle-income regions [10]. Individuals at risk of CVD had raised blood pressure, glucose, and lipids as well as overweight and obesity. In Ethiopia, the magnitude of cardiovascular disease among hypertensive patients was 22%. Even in countries which have good health care system the cause of death due to CVD is high [11].

Ethiopia ten years report of CVD increased by half from the previous that indicated highly alarming of CVD [6]. Other study done in Addis Ababa showed that 51% deaths were due to non-communicable diseases [12]. In the same study, amongst the non-communicable diseases, cardiovascular disease was the leading cause of death (24%). Study conducted in Ayder comprehensive specialized hospital shows that the leading cause of intensive care unit admissions was patients with cardiovascular diseases (26%). Other study in the same area revealed that the prevalence of stroke among hypertensive patient who were on treatment of anti-hypertensive was about 38%. About 66.2% of patients were hypertensive at hospital arrival [13].

Investigating the risk factors of cardiovascular disease among hypertension is very important for prevention and control of CVD. Ethiopia was signed to achieve sustainable development goal (SDG) from 2016 to 2030 and to reduce by one third premature death from non-communicable diseases [14]. In addition to SDG, the five-year transformation plan of Ethiopia shows that there is focus on comprehensive prevention and control of NCD including CVD and other risk factors. The plan also indicates that about three-quarters (73%) of all health facilities provide services for cardiovascular diseases including hypertension [6]. Therefore, knowing the magnitude of cardiovascular disease risk factors can help to control premature death from CVD. In addition this research helps to prepare prediction model and used as a baseline for future researchers and other concerned bodies.

The overall of different study showed that there is

increment of CVD from year to year and that initiate us to do this research. In addition, there is a little research done Ethiopia related to magnitude of CVD risk factors specifically among hypertensive patients. So, the purpose of this study was to assess the magnitude of cardiovascular risk factors among adult hypertensive patients attending at Ayder Comprehensive Specialized Hospital, Tigray, Ethiopia.

## Methods

### Study area and study period

The study was conducted in Ayder Comprehensive Specialized Hospital. The data were collected from February to April 2018 patients' medical cards that recorded from January, 2013 to January, 2018.

### Study design

A hospital based retrospective cross-sectional study.

### Study population

All adult hypertensive patients who had hypertension treatment follow-up at Ayder comprehensive specialized hospital from January 2013 to January 2018.

### Sample size determination

All hypertensive patients from January 2013 to January 2018, who met the inclusion criteria, were included in the study. All patients were included in the study.

### Data collection tools

Standardized questionnaire and checklist was used. Questionnaire in English language was employed for data collection tools. Four BSc nurses as data collectors and one BSc nurse as supervisor. Secondary data was used to collect the required variable.

### Study variable

#### Dependent variable

Cardiovascular Risk factors.

#### Independent variable

Socio-demographic characteristics, Hypertension status, Anti-hypertension condition, Medical history, Life style.

### Operational definition

**Reduce salt intake:** About 1 tsp. of table salt [15].

**Reduced HDL Cholesterol:** < 40 mg/dL (1.03 mmol/L) in male < 50 mg/dL (1.29 mmol/L) in female or specific treatment for this lipid abnormality [16].

**Physically active:** An individual who perform physical exercise for at least 30 minutes per day for at least 5 day per week [15].

**Cigarette smoking:** Subject who smoked at least one cigarette per day at the time follow-up period was

classified as current smokers and those who have for at least three years in the past but had stopped by the time of the follow-up period was classified as previous smokers.

**Alcohol intake:** A patient consider as alcohol drinker if the patient drinks more than 2 bottle of beer for men or 1 bottle of beer for women per day.

### Data analysis

Data was coded, entered, edited, and cleaned by Epic-data manager version 4.2 and then exported in to SPSS version 23 for analysis. The data was cleaned and edited using simple frequencies and cross-tabulation before regression analysis. The data was describing the patient follow-up characteristics in terms of mean/median value for continuous variables and frequency and percentage for categorical variables. The main outcome other risk factors of cardiovascular disease among hypertension was considered. Cardiovascular disease risk factors were confirmed by reviewing medical chart in the hospital and appointment registration book. Base-line demographic, clinical, laboratory and social characteristics were used as independent variables in the analysis.

Binary logistic regression was analysed to see the association between the outcome variable with each independent variables and multinomial

logistic regression analysis was checked to control for confounders. P-value < 0.25 was used as a cut-off value to include variables for multivariate binary logistic regression. Odds ratio with 95% confidence level was computed and p-value < 0.05 was described as a significant association.

## Results

### Socio-demographic characteristics

A total of 900 hypertensive patients' medical cards were reviewed from January, 2013 to January, 2018 in Ayder comprehensive specialized hospital. Among all of them 578 hypertensive patient's card were fulfilling the inclusion criteria and included in this study. Out of the cohort half, 290 (50.2%), of the documents were females and the rest 288 (49.8%), male. Educational status of the participants showed 242 (41.9%) were not formal educated followed by 146 (25.4%) achieved primary level. Almost the ethnicity of the participants were from Tigray 556 (96.2%) followed by Afar 13 (2.3%). Majority of the participants were married 498 (86.2%). The documented age of the patients ranges from 30 to 87 years with the median age of 54.14 years. From the patients more than half were urban in residence 323 (55.9%) and the rest rural. Out of the total participants almost all were orthodox in religion 539 (93.3%).

Based on the socio-demographic characteristics the

**Table 1:** Socio-demographic characteristics among adult hypertensive patients attending at Ayder comprehensive specialized hospital, Tigray, Ethiopia, 2018 (n = 578).

Variables	Category	Frequency	Percept
Sex	Male	288	49.8%
	Female	290	50.2%
Marital status	Married	498	86.2%
	Single	35	6.1%
	Widow	34	5.9%
	Divorced	11	1.9%
Level of education	No formal education	242	41.9%
	Primary	146	25.3%
	Secondary	123	21.3%
	University	67	11.6%
Religion	Orthodox	539	93.3%
	Muslim	38	6.6%
Occupational status	Governmental employee	114	19.7%
	Trader	131	22.7%
	Farmer	190	32.9%
	Student	14	2.4%
	House wife	122	21.1%
Ethnicity	Tigray	556	96.2%
	Afar	13	2.3%
	Amhara	9	1.5
Residence	Urban	323	55.9
	Rural	255	44.1

finding showed that the distribution of cardiovascular complication slight higher among male participant 78 (53.1%), participant with urban residence 114 (77.6%) and illiterate participant 76 (51.7%) when they compare with their counterpart (Table 1).

### Medical history and risk behaviour

Among the total participants patient one quarter were patient with chronic kidney disease 128 (22.1%), diabetic mellitus 163 (28.2%) and dyslipidemia 158 (27.3). From the total card reviewed about 15.9% had history of smoking when they start follow-up and more than half of the patients were uncontrolled hypertension. Based on medical condition and life style risk assessment cardiovascular complication among hypertensive patients were common in patient co-morbid with DM, CKD, dyslipidemia and patient with protein urea. It was also common among patient with unadvisable life style like smoker, alcohol drinker and not exercising. Almost all of the cardiovascular complication occurs in patient with uncontrolled hypertension (Table 2).

### Bivariate and multi-variable analysis of Binary logistic regression model

Variables like age, blood pressure, Protein urea, CKD, BMI, Dyslipidaemia, DM, alcohol, Smoking, High salt intake and Less physical activity was found to have

relatively strong association with cardiovascular risks among hypertensive patients. In the multivariable analysis of Binary logistic regression model, factors independently associated with cardiovascular risk factors after adjusting for other patient characteristics were Age, BMI, DM, Smoking and Less physical activity (Table 3).

### Discussion

This study tried to assess the magnitude of cardiovascular risk factors among hypertensive patients. In this study, the socio-demographic and clinical characteristics of 578 patients who had follow-up in Ayder comprehensive specialized hospital over five year period were analyzed. From the total patients' 212 (36.7%) with 95% CI (32.7-40.7) were had cardiovascular risk factors in the five years retrospective study period. This result was higher than study done in Bahir-dar (22%) [17] its difference may be due the difference in study design, study population, follow-up period. On the other hand study conducted in Kenya also show that the prevalence of CVD was 33.4% [18] which is in line with our study. Our study also higher than with systematic review done in Spain that was (9%) [19]. The difference may be socio-demographic characteristics, living standards and qualities of the service provided and follow up period.

**Table 2:** Medical history and risk behavior among adult hypertensive patients attending at Ayder comprehensive specialized hospital, Tigray, Ethiopia, 2018 (n = 578).

Variables	Category	Frequency	Percent
Type of Hypertension(HTN)	Systolic HTN	93	16.1%
	Mixed	485	83.9%
Number drug	One	343	59.3%
	Two	218	37.7%
	Three and above	17	2.9%
Protein urea	YES	146	25.3%
	NO	432	74.7%
Chronic Kidney Disease	YES	128	22.1%
	NO	450	77.9%
DM	YES	163	28.2%
	NO	415	71.8%
Dyslipidaemia	YES	158	27.3%
	NO	420	72.7%
Alcohol use	YES	23	4.0%
	NO	555	96.0%
Smoking	YES	92	15.9%
	NO	486	84.1%
Exercise	YES	13	2.2%
	NO	565	97.8%
Salt reduce	YES	176	30.4%
	NO	402	69.6%
BP status	Controlled	328	56.7%
	Uncontrolled	250	43.3%

**Table 3:** Bivariate and multivariable Cox proportional regression analysis among adult hypertensive patients attending at Ayder comprehensive specialized hospital, Tigray, Ethiopia, 2018 (n = 578).

Variables	Category	Bivariate				Multivariable			
		p-value	COR	95.0% CI		p-value	AOR	95.0% CI	
				Lower	Upper			Lower	Upper
Blood Pressure	Controlled (Ref)								
	Uncontrolled	0.001*	7.76	5.29	11.38	0.83	2.330	1.78	6.96
Age	> = 60 years	0.001*	6.67	4.58	19.70	0.001*	3.13	1.72	5.67
	< 60 years (Ref)								
Protein urea	Yes	0.001*	183.59	65.79	512.24	0.06	5.068	1.93	27.43
	No (Ref)								
CKD	Yes	0.001*	29.34	18.91	45.50	0.081	9.204	1.76	111.38
	No (Ref)								
BMI	Over weight and obese	0.001*	32.69	20.27	52.73	0.001*	9.450	4.92	18.15
	Normal (Ref)								
Dyslipidaemia	Yes	0.001*	11.26	7.31	17.34	0.14	1.874	1.83	4.32
	No (Ref)								
DM	Yes	0.001*	5.01	3.40	7.38	0.031*	2.137	1.07	4.26
	No (Ref)								
Alcohol	Yes	0.02	1.57	1.06	2.32	0.96	2.983	1.27	11.23
	No (Ref)								
Smoking	Yes	0.001*	34.33	15.47	76.15	0.001*	8.391	2.57	27.39
	No (Ref)								
High salt in take	Yes	0.001*	0.061	0.025	0.150	0.37	2.452	1.18	10.17
	No (Ref)								
Less physical activity	Yes	0.001*	6.33	2.68	14.96	0.003*	7.075	1.981	25.276
	No (Ref)								

Note: \*= Variables with significant association; Ref: Reference category; COR: Crude Odds Ratio; AOR: Adjusted Odds Ratio.

A study conducted in Kenya explains that males had the highest (47.8%) occurrence of CVD outcomes compared to females (29.2%). The sex of study participants was significantly associated with CVD outcomes. Females were less likely to develop a CVD compared to males. This study is lower than with our study that was about 53.1% and 46.8% males and females were develop cardiovascular complications respectively [18]. The difference may be due the study design and sample size difference.

In the multiple binary logistic regression model analysis age of a patient was an important risk factors of cardiovascular disease among hypertension patients with Odds ratio [AOR (95% CI = 3.13 (1.72, 5.67)]. This study shows that the Odds Ratio of being at risk by cardiovascular disease increased as the age of hypertensive patient increase. This result is in accordance with the study conducted Ethiopia, Spain and Australia [17]. On the other hand systematic review conducted in Spain showed that two times higher in hypertension which is higher than our study [19].

Based on study conducted in Kenya behavioral factors including cigarette smoking and alcohol consumption significantly associated with CVD which is similar

with our study. It may be due to similar living standard and characteristics of the study population. On contrary, systematic review conducted Spain showed that based on binary logistic regression model smoking status, the relative risk of cardiovascular events was two times higher in hypertension. The same study in Spain showed that based on binary logistic regression model two to three times and one and half times among hypertension with diabetes and high BMI and hyperlipidemia respectively [19]. This study is similar with our study with high BMI and hyperlipidemia and diabetic.

The study conducted in Japan, protein urea had a significant association with the risk of cardiovascular disease which is in line with this study this may be due to the nature of the study design. Similarly systematic review and meta-analysis study conducted in Australia indicated that the presence of proteinuria was associated with an approximate 50% increase in coronary heart disease risk (odds ratio 1.47, 95% confidence interval [CI] 1.23-1.74) after adjustment for known risk factors which is lower than our study OR 5.06 (95% CI 1.93 to 27.43) [20]. But this result finding was opposite study conducted in Bahir-dar this difference may be due to nature of population, geographical difference, study

type, sample size and including of additional independent variables [21].

## Conclusion

Cardiovascular Disease risk factors are highly prevalent among the hypertensive patients in this study.

## Limitations

Excluding of patient's card those with incomplete records.

## Declarations

### Ethics approval and consent from the participant

Ethical clearance and waiver letter was obtained from Institutional Review Board (IRB) of College of Health Sciences, Mekelle University. A subsequent permission was also obtained from Ayder Comprehensive Specialized Hospital, HMIS unit and department heads. Confidentiality was assured for all the information provided, no personal identifiers was used on the questionnaire. To maintain confidentiality, data collector was recruited from the study unit.

### Competing interests

The authors declare that they have no competing interests.

### Funding

Funding information is not applicable/No funding was received.

### Consent for publication

Not applicable.

### Availability of data and materials

The datasets used and/or analysed during the current study are presented within the manuscript and available from the corresponding author on reasonable request.

### Author's contributions

DB were involved in proposal writing, designed the study and participated in coordination, supervision and the overall implementation of the project, analysed the data, drafted and finalized the manuscript. TM: Conceived and designed the study, supervised the data collection, performed the analysis, interpretation of data and drafted the manuscript. GG: Assisted in analysis, interpretation and reviewed the manuscript critically. AG: Assisted in the study design, analysis, and interpretation and reviewed the manuscript critically. AK: Assisted in designing the study, data interpretation and critically reviewed the manuscript. GT: Assisted in data interpretation and reviewed the manuscript critically. HT: Assisted in analysis, interpretation and reviewed the manuscript critically. HB: Assisted in analysis, interpretation and reviewed the manuscript

critically. YA: Assisted in analysis, interpretation and reviewed the manuscript critically. All authors were read and approved the final manuscript.

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