

# Hypertension complications: common complications, awareness and associated factors in hypertensive patients in Ethiopia: multicenter cross sectional study

## Abstract

**Background:** Hypertension (HTN) is one of the major risk factors of coronary artery disease, stroke, heart failure, and chronic kidney disease. The aim of this study was to assess common complications, awareness hypertension complications (HTNC) and associated factors in hypertensive patients.

**Method:** Cross-sectional survey was done on four hundred study participants at selected public hospitals in Arsi Zone (PHAZ) from March 10, 2019 to April 8, 2019. EpiData version 4.2.0.0 was used for data entry and Statistical Package for the Social Sciences (SPSS) version 21.0 was used for statistical analysis.

**Results:** The level of good awareness towards HTNC in study participants was 32.5% [95% confidence interval (CI); 28.3, 37.0]. Secondary education (adjusted odds ratio (AOR)=3.95, 95% CI [2.33, 14.92]), higher education (AOR=4.37, 95% CI [2.57, 15.16]), employed (AOR=3.59, 95% CI [1.76, 17.77]), urban residents (AOR=1.68, 95% CI [1.47, 4.24]), monthly income of  $\geq$  3000 ETB (AOR=3.76, 95% CI [1.36, 10.43]), positive family history of HTN (AOR=2.14, 95% CI [1.92, 8.93]), duration of HTN  $>$  10 years (AOR=2.41, 95% CI [1.81, 10.73]), health insurance (AOR=3.35, 95% CI [1.81, 10.48]), having comorbidities (AOR=1.73, 95% CI [1.55, 8.93]), non-smoker (AOR=1.72, 95% CI [1.35, 10.85]) and having regular health professional visit (AOR=8.20, 95% CI [5.31, 17.59]) were factors significantly associated with awareness of HTNC.

**Conclusion:** Awareness of HTNC among the study participants was low. There is a need to initiate programs that could create public awareness about HTNC. Educational level, occupation, residency, monthly income, family history of hypertension, duration of hypertension, health insurance, presence of comorbidities, current smoking status, and regular healthcare professional visits were factors significantly associated with awareness of HTNC.

**Keywords:** Awareness, Hypertension, Hypertension complications, Arsi zone, Oromia Region, Ethiopia

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**List of abbreviations:** AOR, adjusted odds ratio; BMI, body mass index; CI, confidence interval; COR, crude odds ratio; CVD, cardiovascular disease; DBP, diastolic blood pressure; HTN, hypertension; HTNC, hypertension complications; PHAZ, public hospitals in Arsi Zone; SBP, systolic blood pressure; SSA, sub-saharan Africa; WHR, waist-hip ratio

## Background

Globally, hypertension (HTN) is a considerable health burden.<sup>1</sup> It is a significant medical and community health problem,<sup>2</sup> affecting about one billion people.<sup>3</sup> It causes of morbidity and premature mortality in working-age individuals.<sup>4</sup> It is a lethal disease due to its prevalence and the health consequences of uncontrolled HTN.<sup>5</sup> HTN is a problem, which is not well controlled.<sup>6</sup> It remains a health and economic burden irrespective of current upgrading in blood pressure (BP) control.<sup>7</sup> It is a significant challenge and this situation should obtain high priority.<sup>8</sup>

Globally, hypertension complications (HTNC) cause around 9.4 million deaths each year. Three out of ten deaths occurred due

to cardiovascular disease (CVD).<sup>9</sup> Between 1990 and 2015, deaths related to elevated systolic (SBP) were also raised.<sup>10</sup> HTN is one of the key risk factors for most of different CVD.<sup>11</sup> It increases the development of heart failure and other adversative cardiovascular consequences.<sup>12</sup>

In Africa, HTNC such as stroke and heart failure are becoming increasing.<sup>13</sup> The figure of resistant HTN in hypertensive person is 10–20% globally. It would lead to renal outcomes, cardiovascular, and death compared to nonresistant HTN.<sup>14</sup> The prevalence of HTN is 37.4% in Ghana,<sup>15</sup> 46% in African region,<sup>16</sup> 35% in Nigeria,<sup>17</sup> 35% in Americas,<sup>16</sup> and 28.1% in Haryana.<sup>18</sup>

In Ethiopia, HTN is the main cause of morbidity and mortality in the country,<sup>19</sup> CVD mortality was 54.7%, and all-cause mortality was 53.4% as per 1990 to 2017 data report.<sup>20</sup> Generally, that HTNC accounted for 11.3% of all medical admissions, 63.6% of them were stroke and 24.7% heart disease.<sup>21</sup>

The study done in China revealed that the prevalence of awareness was 23.6 to 56.2%.<sup>22</sup> There were low levels of awareness of HTN

in Africa.<sup>23</sup> The compliance with antihypertensive medications was improved after an education about HTNC.<sup>24</sup> The aim of this study was to determine HTNC, awareness of HTNC and associated factors among adult hypertensive patients.

## Methods

### Study area, period and design

The study was done in Arsi zone. Arsi Zone is one of the zones which is found in Oromia regional state and is located in the southeast of Ethiopia. Arsi Zone has around 3.5 million populations with 24 Woredas classified into 499 rural villages and 58 towns with 1 administrative town. Multisite cross-sectional survey was done from March 10, 2019 to April 8, 2019.

### Source and study population

All hypertensive patients visited public hospitals in Arsi Zone (PHAZ) were source population and selected hypertensive patients were the study population.

### Inclusion criteria and exclusion criteria

≥18 years old patients and who were on follow-up ≥6 months and willing to participate were included. Severely ill patients and who were incapable to be interviewed were excluded.

### Sample size determination, sampling technique and procedures

A complete survey or census was done on four hundred hypertensive patients visiting the selected four PHAZ, which were randomly selected from the seven public hospitals. The patient's medical chart was reviewed on first stage of the study. Then, all patients who were presented at the study period were included in the study.

### Study variables

#### Dependent variables

Awareness of HTNC.

#### Independent variables

- Sociodemographic variables:** Age, gender, educational level, marital status, occupation, residency, and monthly income.
- Health profile of the patients:** Family history of HTN, duration of HTN, health insurance, presence of comorbidities, and current smoking status.
- Sources of information about HTN:** healthcare professionals, mass media, books, family members, and friends.
- Individual factors:** Regular healthcare professional visits.

### Operational definitions

**Awareness of HTNC:** Was assessed by a yes or no response to each question raised on HTNC on target organs.<sup>25-27</sup>

**Good awareness of HTNC:** When patients respond the mean or above the mean score on awareness of HTNC on target organs questions.<sup>26</sup>

**Poor awareness of HTNC:** When patients respond below the mean score on awareness of HTNC on target organs questions.<sup>26</sup>

### Data collection instrument and procedures

The questionnaire includes sociodemographic questions, questions on the health profile of the patients, questions on the source of information about hypertension, questions related to individual factors, and awareness of HTN questions. The questionnaire was adapted from relevant literature with modification fit to the local context.<sup>25-27</sup> The questionnaire was prepared in English and translated to Afan Oromo and finally translated back to English to maintain consistency. A semi-structured interviewer-administered questionnaire and patients' medical records review were used to collect data. Data was collected by 4 Bachelors of Science degree nurses and supervised by 2 Master of Science degree nurses.

### Data quality control

Translation and retranslation was done keep the quality of the data. Two days training was given for data collectors and supervisors. The questionnaire was pretested on 5% of the sample size.

### Data processing and analysis

EpiData version 4.2.0.0 was used for data entry and SPSS version 21.0 was used for statistical analysis. Multi-collinearity was tested and there was no sign of multicollinearity. Descriptive statistics and logistic regression was performed. Bivariable and multivariable logistic regression analysis was done to find variables associated with awareness of HTNC. Crude odds ratio (COR) and AOR with the corresponding 95%CI used to show the association. Hosmer-Lemeshow's goodness-of-fit test was used to determine the model fitness and the *p*-value = 0.321. Finally, variables with *p*-value <0.05 in the multivariable logistic regression were considered as statistically significant.

## Results

### Sociodemographic characteristics

Four hundred participants were included and a response rate was 97.6%. 150 (37.5) of patients were aged 40 to 59 years (Table 1).

### Health profile related and individual related factors

Of the total participants', more than one-third, 154 (38.5) of them had a family history of HTN. More than half 219(54.8) of them had ≤ 5 years of duration of HTN since diagnosis. A bit less than one-fourth 88 (22) of them had comorbidities. More than half 221(55.2) of them had no regular health professional visit.

From the participants' who had a family history of HTN, the majority 76(49.4) of them had a good awareness regarding to HTNC and from those who had >10 years duration of HTN since diagnosis more than half 37(54.4) of them had a good awareness regarding HTNC. From those who had health insurance, nearly two-third 45(62.5) of them had a good awareness regarding HTNC. From those who had comorbidities, 38(43.2) of them had a good awareness regarding HTNC (Table 2).

**Table 1** Sociodemographic Characteristics of study participants who were Attending a selected PHAZ, Ethiopia (n=400)

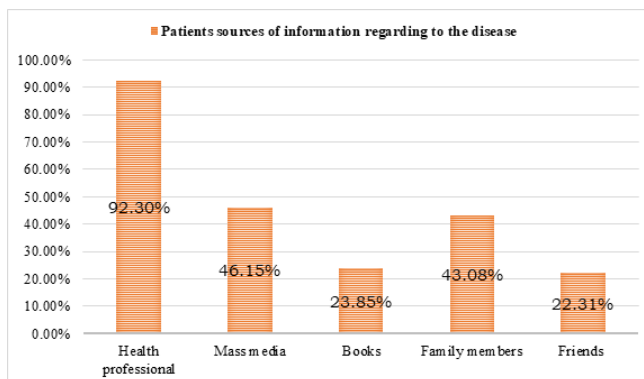
Variable	Category	Frequency	Percent
Age in years	20-39	142	35.5
	40-59	150	37.5
	≥60	108	27.0
Gender	Male	225	56.2
	Female	175	43.8
Ethnicity	Oromo	282	70.5
	Amhara	87	21.8
	Gurage	27	6.7
	Other	4	1.0
Religion	Orthodox	187	46.7
	Muslim	159	39.8
	Protestant	51	12.7
Educational level	Other	3	0.8
	No formal education	79	19.7
	Primary education	179	44.8
	Secondary education	78	19.5
Marital status	Higher education	64	16.0
	Single	95	23.8
	Married	160	40.0
	Divorced	72	18.0
Occupation	Widowed	73	18.2
	Farmer	137	34.2
	House wife	80	20.0
	Governmental employee	96	24.0
	Private business	43	10.8
Residency	Unemployed	44	11.0
	Urban	242	60.5
	Rural	158	39.5
Average monthly income in Ethiopian Birr (ETB)	≤ 999	127	31.8
	1000-1999	79	19.7
	2000-2999	60	15.0
	≥ 3000	134	33.5

**Table 2** Health Profile related, Source of Information related and Individual related factors Among study participants Attending at Selected PHAZ, Ethiopia (n=400)

Variables	Category	Response N (%)	Awareness of HTNC	
			Good N (%)	Poor N (%)
Family history of HTN	Present	154 (38.5)	76(49.4)	78(50.6)
	Not sure	104(26.0)	26(25.0)	78(75.0)
	Absent	142(35.5)	28(19.7)	114(80.3)
Duration of HTN since diagnosis in years	≤ 5	219(54.8)	57(26.0)	162(74.0)
	6-10	113(28.2)	36(31.9)	77(68.1)
	> 10	68(17.0)	37(54.4)	31(45.6)
Health insurance	Yes	72(18.0)	45(62.5)	27(37.5)
	No	328(82.0)	85(25.9)	243(74.1)
Presence of co-morbidities	Yes	88(22.0)	38(43.2)	50(56.8)
	No	312(78.0)	92(29.5)	220(70.5)
Current smocking status	Yes	65(16.2)	15(23.1)	50(76.9)
	No	335(83.8)	115(34.3)	220(65.7)
Regular professional visits	Yes	179(44.8)	106(59.2)	73(40.8)
	No	221(55.2)	24(10.9)	197(89.1)

### Patients Sources of Information about HTNC

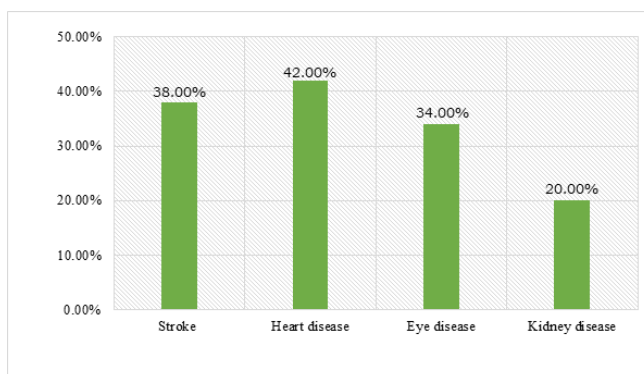
Regarding to the source of information about HTN, the majority 120(92.30) of them receive information from health professionals, 60(46.15) of them from mass media, 31(23.85) of them from Books, 56(43.08) of them from family members, and 29(22.31) of them get information about the HTNC from their friends (Figure 1).



**Figure 1** Source of information about the disease for study participants attending at selected PHAZ, Ethiopia.

### Awareness towards HTNC on target organs

About (42%) of the participants were aware that HTN could prone them to heart disease. Only (20%) of the participants were aware that HTN could prone them to kidney disease (Figure 2).



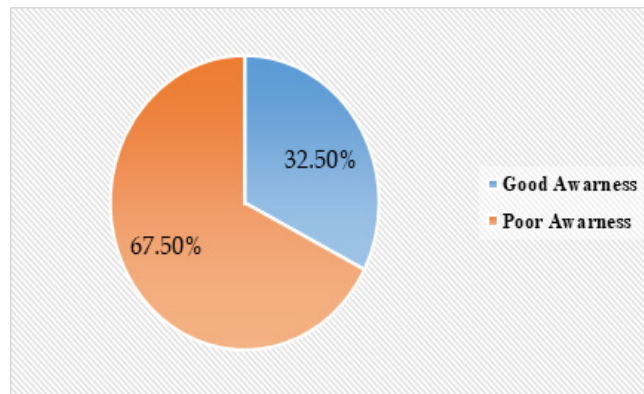
**Figure 2** Patients' awareness towards HTNC on target organs among study participants attending at selected PHAZ, Ethiopia.

Participants who had a monthly income of  $\geq 3000$  ETB were 3.76 times [AOR=3.76, 95% CI (1.36, 10.43)] more likely to have a good awareness of HTNC when compared to participants who had a monthly income of  $\leq 999$  ETB.

Moreover, the odds of having a good awareness of HTNC among participants who had a family history of HTN were 2.14 times [AOR=2.14, 95% CI (1.92, 8.93)] higher than participants who had no family history of HTN respectively. Similarly, the odds of having a good awareness of HTNC among participants who had duration of HTN  $> 10$  years were 2.41 times [AOR=2.41, 95% CI (1.81, 10.73)] higher than participants who had duration of HTN diagnosis  $\leq 5$  years. Besides, those participants who had health insurance were 3.35

### Awareness about HTNC

The level of good awareness about HTNC in hypertensive patients" were 32.5% [n=130, 95%CI; 28.3, 37.0] (Figure 3).



**Figure 3** Patients' Awareness level about HTNC among study participants attending at PHAZ, Ethiopia.

### Factors Associated with Awareness of HTNC

Age, gender, educational level, marital status, occupation, residency, monthly income, family history of HTN, duration of HTN, health insurance, presence of comorbidities, current smoking status and regular healthcare professional visits were entered into multivariable logistic analysis. Educational level, occupation, residency, monthly income, family history of HTN, duration of HTN, health insurance, presence of comorbidities, current smoking status and regular healthcare professional visits were the factors significantly associated with awareness of HTNC.

The odds of having a good awareness of HTNC among participants who have attended secondary and higher education were 3.95 times [AOR=3.95, 95% CI (2.33, 14.92)] and 4.37 times [AOR=4.37, 95% CI (2.57, 15.16)] higher than who had no formal education respectively. Participants who were governmental employed were 3.59 times [AOR=3.59, 95% CI (1.76, 17.77)] more likely to have a good awareness of HTNC when compared to farmers. Likewise, the likelihood of having a good awareness of HTNC among participants who were urban residents were 1.68 times [AOR=1.68, 95% CI (1.47, 4.24)] folds more when compared to rural residents.

times [AOR=3.35, 95% CI (1.81, 10.48)] more likely to have a good awareness of HTNC when compared to their contraries. The odds of having a good awareness of HTNC among participants who were with comorbidities were 1.73 times [AOR=1.73, 95% CI (1.55, 8.93)] higher than participants who had no comorbidities.

Furthermore, those participants who were nonsmoker were 1.72 times [AOR=1.72, 95% CI (1.35, 10.85)] more likely to have a good awareness of HTNC when compared to their contraries. The likelihood of having a good awareness of HTNC among participants who had regular health professional visits were 8.20 [AOR=8.20, 95%CI (5.31, 17.59)] folds more when compared to their contraries (Table 3).

**Table 3** Bivariable and Multivariable Logistic Regression Analysis of Factors Associated with Awareness of HTNC Among Study Participants Attending at PHAZ, Ethiopia

Variables	Category	Awareness of HTNC		COR (95%CI)	AOR (95%CI)	P-value
		Good	Poor			
Age in years	20-39	67(47.2%)	75(52.8%)	1.65(0.98, 2.75)	0.82(0.35, 1.90)	0.642
	40-59	25(16.7%)	125(83.3%)	0.37(0.21, 0.66)	0.89(0.32, 2.45)	0.816
	≥60	38(35.2%)	70(64.8%)			
Gender	Male	85(37.8%)	140(62.2%)	1.75(1.14, 2.71)	1.23(0.60, 2.51)	0.570
	Female	45(25.7%)	130(74.3%)			
Educational level	No formal education	13(16.5%)	66(83.5%)			
	Primary education	38(21.2%)	141(78.8%)	1.37(0.68, 2.74)	1.61(0.75, 12.16)	0.235
	Secondary education	42(53.8%)	36(46.2%)	5.92(2.82, 12.45)	3.95(2.33, 14.92)	<b>0.011</b>
	Higher education	37(57.8%)	27(42.2%)	6.96(3.21, 15.09)	4.37(2.57, 15.16)	<b>0.001</b>
Marital status	Single	20(21.1%)	75(78.9%)			
	Married	70(43.8%)	90(56.3%)	2.92(1.63, 5.23)	2.11(0.22, 9.02)	0.143
	Divorced	25(34.7%)	47(65.3%)	1.99(0.99, 3.98)	1.93(0.72, 5.16)	0.129
	Widowed	15(20.5%)	58(79.5%)	0.97(0.46, 2.06)	0.83(0.29, 2.32)	0.942
Occupation	Farmer	25(18.2%)	112(81.8%)			
	House wife	23(28.8%)	57(71.3%)	1.81(0.94, 3.46)	2.30(0.78, 6.76)	0.135
	Governmental employed	50(52.1%)	46(47.9%)	4.87(2.70, 8.79)	3.59(1.76, 17.77)	<b>0.014</b>
	Private business	12(27.9%)	31(72.1%)	1.73(0.78, 3.84)	1.94(0.63, 6.01)	0.108
Residency	Unemployed	20(45.5%)	24(54.5%)	3.73(1.79, 7.79)	3.65(0.10, 12.97)	0.440
	Urban	90(37.2%)	152(62.8%)	1.75(1.12, 2.72)	1.68(1.47, 4.24)	<b>0.041</b>
	Rural	40(25.3%)	118(74.7%)			
	≤ 999	24(18.9%)	103(81.1%)			
Monthly income in ETB	1000-1999	21(26.6%)	58(73.4%)	1.55(0.79, 3.03)	1.88(0.62, 5.68)	0.264
	2000-2999	18(30.0%)	42(70.0%)	1.84(0.91, 3.74)	1.81(0.71, 9.85)	0.420
	≥ 3000	67(50.0%)	67(50.0%)	4.29(2.46, 7.50)	3.76(1.36, 10.43)	<b>0.012</b>
Family history of HTN	Present	76(49.4%)	78(50.6%)	3.97(2.36, 6.67)	2.14(1.92, 8.93)	<b>0.023</b>
	Not sure	26(25.0%)	78(75.0%)	1.36(0.74, 2.49)	1.80(0.12, 6.99)	0.270
Duration of HTN in years	Absent	28(19.7%)	114(80.3%)			
	≤ 5	57(26.0%)	162(74.0%)			
	6-10	36(31.9%)	77(68.1%)	1.33(0.81, 2.19)	1.48(0.72, 3.02)	0.193
Health insurance	> 10	37(54.4%)	31(45.6%)	3.39(1.93, 5.97)	2.41(1.81, 10.73)	<b>0.021</b>
	Yes	45(62.5%)	27(37.5%)	4.77(2.78, 8.15)	3.35(1.81, 10.48)	<b>0.015</b>
Presence of co-morbidities	No	85(25.9%)	243(74.1%)			
	Yes	38(43.2%)	50(56.8%)	1.82(1.12, 2.96)	1.73(1.55, 8.93)	<b>0.030</b>
Current smoking status	No	92(29.5%)	220(70.5%)			
	Yes	15(23.1%)	50(76.9%)			
Regular professional visit	No	115(34.3%)	220(65.7%)	1.74(0.94, 3.24)	1.72(1.35, 10.85)	<b>0.032</b>
	Yes	106(59.2%)	73(40.8%)	11.92(7.10, 20.01)	8.20(5.31, 17.59)	<b>0.000</b>
	No	24(10.9%)	197(89.1%)			

**Notice:** Bold sign refers to factors significantly associated, p-value <0.05 in final model.

## Discussion

This study was done to assess the patients' level of awareness about HTNC and associated factors in hypertensive patients. This is because knowing the level of awareness about HTNC and associated factors is a cornerstone for HTN management in order to control the burden of HTN because of its associated morbidity and mortality.

This study showed that the level of participants who had a good awareness about HTNC was 32.5% [95%CI; 28.3, 37.0]. This study finding was lower than a study conducted in Sri Lanka and Nepal where the proportion of awareness of HTNC were (48.2%) and (86.6%),<sup>26,28</sup> respectively. This study finding was lower compared with the study

done in Saudi Arabia 70.3%.<sup>29</sup> This study finding was consistent with the study conducted in Jeddah, Saudi Arabia, where the proportion of awareness of HTN was 32%.<sup>30</sup> However, this study finding was higher than the study done in Tanzania where the awareness level of HTNC was (11.3%).<sup>31</sup>

Regarding to the proportion of common HTNC, this study revealed that about 38%, 42%, 34% and 20% of participants were aware that HTN can lead them to stroke, heart disease, eye disease, kidney disease, respectively. This study finding was lower compared to the study conducted in Karachi, South Asia where the awareness HTNC was 100% for stroke, 95.5% for heart diseases, 59.1% for kidney disease and 54.5% for eye disease.<sup>32</sup>



This study finding was lower compared with the study done in Saudi Arabia where the awareness levels of HTNC were 68.2% for heart attack and 38.4% for stroke.<sup>29</sup> This study finding was also lower than the study done in southern Tanzania where the awareness of HTNC were 58.9% for stroke, 83.3% for heart disease, 32.0% for kidney diseases and 44.2% for eye diseases.<sup>31</sup> This study finding was also lower than the study done in Nigeria where awareness of HTNC were 70%, 60.6%, 59.4% and 25.9% for stroke, heart disease, eye disease and kidney disease respectively.<sup>33</sup> This finding is also lower than the study conducted in India for awareness of heart disease and kidney damage which were 66.7% and 35.71% respectively. However, it is higher than the awareness of brain damage and other complications (eye damage and arterial damage) which were 34.7% and 19% respectively.<sup>34</sup>

This study finding was also lower compared with the study conducted in northern Sri Lanka where 23.7% and 46.7% of the participants were aware that HTN could lead them to kidney damage and brain damage respectively. This finding was in line with for the awareness of heart damage which was 42.2%. However, it is higher compared with the same study for the awareness of eye damage which was 13.8%.<sup>28</sup> Similarly, when this finding is compared with a study done in India; it is higher for the awareness of brain damage which was 34.7%, while lower than the awareness for heart damage and kidney damage which were 66.7% and 35.7% respectively.<sup>35</sup>

This study finding was lower compared with the study done in Saudi Arabia where the study reported of the awareness level of HTNC were 83.2% for stroke, 82.7% for heart disease, 79.9% for kidney disease, and 65.8% for blindness.<sup>36</sup> This study finding was lower compared to the study conducted in Turkey where the awareness level for stroke was 89%.<sup>37</sup> This study finding was higher compared to the study conducted in Korea where the awareness for stroke was 31%.<sup>38</sup>

This study finding was higher than the study done in Russia where the awareness of HTNC were 24.9% for stroke and 17.9% for heart damage.<sup>39</sup> Likewise, this finding was also higher than a study done in Pakistan where the awareness of HTNC was 27.9%, 9.9% and 14.8% for stroke, kidney disease and eye disease, respectively. While, it is lower than the awareness of HTNC for heart disease, which was 56.3%.<sup>27</sup> This study finding was higher than the study done in Korea where 80% and 98% of the participants were unaware that HTN would lead them to heart disease and kidney disease respectively.<sup>40</sup>

The odds of having a good awareness of HTNC among participants who have attended secondary and higher education were 3.95 times [AOR=3.95, 95% CI (2.33, 14.92)] and 4.37 times [AOR=4.37, 95% CI (2.57, 15.16)] higher than who had no formal education respectively. This finding was supported by studies in southern Tanzania and Russia.<sup>31,39</sup> The participants who were governmental employed were 3.59 times [AOR=3.59, 95% CI (1.76, 17.77)] more likely to have a good awareness of HTNC when compared to farmers. This might be due to relatively thinking most of the governmental employed individuals are well educated.

Likewise, the likelihood of having a good awareness of HTNC among participants who were urban residents were 1.68 times [AOR=1.68, 95% CI (1.47, 4.24)] folds more when compared to rural residents. The participants who had monthly income of  $\geq$  3000 ETB were 3.76 times [AOR=3.76, 95% CI (1.36, 10.43)] more likely to have a good awareness of HTNC when compared to participants who had monthly income of  $\leq$ 999 ETB. Moreover, the odds of having a good awareness of HTNC among participants who had a positive family history of HTN were 2.14 times [AOR=2.14, 95% CI (1.92, 8.93)]

higher than participants who had no family history of hypertension. This finding is supported by a study done in southern Tanzania.<sup>31</sup>

Similarly, the odds of having a good awareness of HTNC among participants who had duration of HTN > 10 years were 2.41 times [AOR=2.41, 95% CI (1.81, 10.73)] higher than participants who had duration of HTN diagnosis  $\leq$  5 years. This finding was consistent with a study done in southern Tanzania.<sup>31</sup> Besides, those participants who had health insurance were 3.35 times [AOR=3.35, 95% CI (1.81, 10.48)] more likely to have a good awareness of HTNC when compared to their contraries.

The odds of having a good awareness of HTNC among participants who were with comorbidities were 1.73 times [AOR=1.73, 95% CI (1.55, 8.93)] higher than participants who had no comorbidities. Furthermore, those participants who were non-smoker were 1.72 times [AOR=1.72, 95% CI (1.35, 10.85)] more likely to have a good awareness of HTNC when compared to their contraries. The likelihood of having a good awareness of HTNC among participants who had regular health professional visit were 8.20 [AOR=8.20, 95%CI (5.31, 17.59)] folds more when compared to their contraries.

## Limitations of the study

Cross-sectional study design does not help to determine the cause and effect. Furthermore, there is no study conducted that shows the common complications, awareness of HTNC and associated factors in Ethiopia and also in different counties adequately.

## Conclusion

The awareness about HTNC among study participants who were was low. Educational level, occupation, residency, monthly income, family history of hypertension, duration of hypertension, health insurance, presence of comorbidities, current smoking status, and regular healthcare professional visits were factors significantly associated with awareness of HTNC.

This study finding offers a foundation to help health care providers for the management of HTNC. This study also aids them to emphasis on and design strategies to address this problem. Finally, we recommend that there is a need to initiate programs that could create public awareness about HTNC among hypertensive patients residing in the area in order to improve their awareness. Furthermore, any concerned bodies such as policy makers and implementers should highly focus and create the strategies that would enhance the awareness of these patients about HTNC. Moreover, special attention should be provided to these patients in the clinical practice area also. All health care providers including the nurses, they have to incorporate the health education about HTNC during follow-up time of these patients.

## Author contributions

The authors have contributed to the conception of the study, data analysis, drafting or revising the article, gave final approval of the version to be published, and agrees to be accountable for all aspects of the work.

## Ethics approval and consent to participate

The protocol was approved by the Institutional Review Board (IRB) of the Addis Ababa University. Besides, the letter of permission was gained from the Zonal health bureau and hospital director. For the purpose of privacy and confidentiality, personal identifiers were not used and participants were insured about the confidentiality of information attained. Finally, they have signed a written consent agreement.

## Human and animal rights

No animals were used in this research. During this study, all human procedures were performed as per the 1975 Declaration of Helsinki, as revised in 2013.

## Standards of reporting

STROBE guidelines were followed.

## Availability of data and materials

The data used to support the findings of this study are included in the manuscript.

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## Competing interests

The authors declare that there are no conflicts of interest.

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## References

1. Wang X, Hao G, Chen L, et al. Hypertension-mediated organ damage and established cardiovascular disease in patients with hypertension: the China Hypertension Survey, 2012–2015. *J Hum Hypertens*. 2022;36(12).
2. The seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure; national heart, lung and blood institute; national high blood pressure education program. 2004.
3. Acelajado MC, Calhoun DA. Resistant hypertension, secondary hypertension, and hypertensive crises: diagnostic evaluation and treatment. *Cardiol Clin*. 2010;28(4):639–654.
4. Kothavale A, Puri P, Yadav S, The burden of hypertension and unmet need for hypertension care among men aged 15–54 years: a population-based cross-sectional study in India. *J Biosoc Sci*. 2022;54(6):1078–1099.
5. Bromfield S, Muntner P. High blood pressure: the leading global burden of disease risk factor and the need for worldwide prevention programs. *Curr Hypertens Rep*. 2013;15(3):134–136.
6. Mirzaei M, Mirzaei M, Bagheri B, et al. Awareness, treatment, and control of hypertension and related factors in adult Iranian population, *BMC Public Health*. 2020;20(1):667.
7. Akinseye OA, Akinseye LI, Home blood pressure monitoring and hypertension control. *Primary health care: open access*. 2015;5(1):182.
8. Kearney PM, Whelton M, Reynolds K, et al. Global burden of hypertension: analysis of worldwide data, *Lancet*. 2005;365(9455):217–223.
9. Peberdy V. Hypertension: putting the pressure on the silent killer, 2016.
10. Forouzanfar MH, Liu P, Roth GA, et al. Global burden of hypertension and systolic blood pressure of at least 110 to 115 mm Hg, 1990–2015. *JAMA*. 2017;317(2):165–182.
11. Kjeldsen SE, Hypertension and cardiovascular risk: General aspects. *Pharmacol Res*. 2018;129:95–99.
12. Iyer A, Ahmed MI, Filippatos G, et al. Uncontrolled hypertension and increased risk for incident heart failure in older adults with hypertension: findings from a propensity-matched prospective population study. *J Am Soc Hypertens*. 2010;4(1):22–31.
13. van de Vijver S, Akinyi H, Oti S, et al. Status report on hypertension in Africa – consultative review for the 6th session of the African union conference of ministers of health on NCD’s. *Pan Afr Med J*. 2013;16(38).
14. Caldeira Brant LC, Passaglia LG, Pinto-Filho MM, et al. The burden of resistant hypertension across the world. *Curr Hypertens Rep*. 2022;24(3):55–66.
15. Tannor Ek, Nyarko OO, Adu-Boakyee Y, et al. Burden of hypertension in Ghana – Analysis of awareness and screening campaign in the Ashanti Region of Ghana. *JRSM Cardiovasc Dis*. 2022;11:20480040221075520.
16. Dzudie A, Kingue S, Dzudie A, et al. Roadmap to achieve 25% hypertension control in Africa by 2025. *Cardiovasc J Afr*. 2017;28(4):261–272.
17. Okafor CN, Obikeze E, Young E, et al. Economic burden of diabetes and hypertension: a study of direct and indirect cost of treatment in southeast Nigeria. *International Journal of Social Determinants of Health and Health Services*. 2023;53(2):168–175.
18. Sindwani P, Sharma S, Ahmad A, et al. The burden of hypertension and prehypertension in a community health centre of Haryana. *Cureus*. 2023;15(1):e33569.
19. National strategic action plan (NSAP) for prevention & control of non-communicable diseases in Ethiopia; federal democratic republic of Ethiopia ministry of health; 2014–2016.
20. Ali S, Misganaw A, Worku A, et al. The burden of cardiovascular diseases in Ethiopia from 1990 to 2017: evidence from the global burden of disease study. *International Health*. 13(4):318–326.
21. Zeru A B, Muluneh M A. Admission and inpatient mortality of hypertension complications in addis ababa. *Integr Blood Press Control*. 2020;13:103–110.
22. Yin R, Yin L, Nash JS, et al. Hypertension in China: burdens, guidelines and policy responses: a state-of-the-art review. *Journal of human hypertension*. 2022;36(2):126–134.
23. Kayima J, Wanyenze R K, Katamba A, et al. Hypertension awareness, treatment and control in Africa: a systematic review. *BMC Cardiovasc Disord*. 2013;13:54.
24. Gupta M, Gupta D D, Sood A. Impact of awareness about hypertension on compliance to antihypertensive medication. *International Journal of Basic & Clinical Pharmacology*. 2018;7(2):244–251.
25. Yennawar BS, Chavan YB, Giri AP. Socio-demographic determinants and awareness regarding hypertension among adult population in an urban slum of Mumbai, India, *International Journal of Community Medicine and Public Health*. 2015;2(4):666–671.
26. Karmacharya R, Paudel K. Awareness on hypertension and its self-management practices among hypertensive patients. *Janapriya Journal of Interdisciplinary Studies*. 2017;6(3):4–6.
27. Bilal M, Haseeb A, Lashkerwala SS, et al. Knowledge, awareness and self-care practices of hypertension among cardiac hypertensive patients. *Glob J Health Sci*. 2015;8(2):9–19.
28. Pirasath S, Kumanan T, Guruparan M. A study on knowledge, awareness, and medication adherence in patients with hypertension from a tertiary care centre from northern Sri Lanka. *Int J Hypertens*. 2017;9656450.
29. Bakhsh LA. Awareness and knowledge on hypertension and its self-care practices among hypertensive patients in Saudi Arabia. *Annals of International medical and Dental Research*. 2017;2(5).
30. Hazaa A. Awareness of hypertension, risk factors and complications among attendants of a primary health care center in jeddah, Saudi Arabia. *IOSR Journal of Nursing and Health Science*. 2017;6(1):16–21.

31. Mandago KM, Mghanga FP. Awareness of risk factors and complications of hypertension in Southern, Tanzania. *Journal of Community Health Research*. 2018;7(3):155–163.
32. Zafar S, Gowani S, Irani F, et al. Awareness of the risk factors, presenting features and complications of hypertension amongst hypertensives and normotensives. *J Park Med Assoc*. 2008;58(12):711–715.
33. Isczuo AS, Opara TC. Hypertension awareness among Nigeria hypertensives in a Nigerian tertiary health institution. *Sahel Medical Journal*. 2000;3(2):93–97.
34. Anoop K, Abhishek D, Chaturvdi A K, et al. Hypertension – the silent killer, awareness of risk factors and complications in Rohilkhand Region. *International Journal of Contemporary Medical Research*. 2018;5(3):35–37.
35. Kumar CA, Sekhar TVDS, Sahithi B, et al. Hypertension – the silent killer, awareness of the risk factors and complications of hypertension among hypertensives. *International Journal of Advanced Research*. 2016;4(6):1277–1281.
36. Duraihim H AI, Alghamdi G, Al Nemer M, et al. Blood pressure control, lifestyle and disease awareness of Saudi hypertensive patients. *Saudi J Kidney Dis Transpl*. 2019;30(1):33–38.
37. Ozkan S, Ata N. Stroke awareness in people with hypertension. *Medicine Science International Medical Journal*. 2019;8(3):651–653.
38. Kim YS, Park SS, Heo JH, et al. Public awareness of stroke in Korea: a population-based national survey. *Stroke*. 2012;43(4):1146–1149.
39. Sooväli EM, Simm P, Animägi L. Awareness of risk factor management, complications, and prevention among adult patients with recently diagnosed hypertension. *NERP (Kaunas)*. 2015;5(1):2–10.
40. Petrella RJ, Campbell NRC. Awareness and misconception of hypertension in Canada: results of a national survey. *Can J Cardiol*. 2005;21(7):589–593.
41. Dabi A. Blood pressure self-monitoring, awareness of hypertension complication and associated factors among adult hypertensive patients on follow up at selected public hospitals in Arsi Zone, Southeastern. *Thesis Addis Ababa University*. 2019.