BMC Cardiovascular Disorders

RESEARCH

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Prevalence of newly diagnosed hypertension and its associated factors in an opportunistic screening program in Addis Ababa, Ethiopia: an institution-based cross-sectional study

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Abstract

Background Hypertension is a recognized risk factor that underlies the epidemic of cardiovascular diseases. Guidelines, including those from the European Society of Hypertension, recommend opportunistic screening for hypertension in all adults. However, there have been no institution-based studies on the prevalence of hypertension and its associated factors with an opportunistic screening program in Ethiopia. Hence, this study aimed to assess the prevalence of newly diagnosed hypertension and its associated factors in an opportunistic screening program in Ethiopia.

Methods This was an institution-based cross-sectional study conducted on adult participants in an opportunistic hypertension screening program at Yekatit 12 Hospital Medical College, Addis Ababa, Ethiopia, from November 1, 2023, to February 1, 2024. Data were collected using a structured questionnaire, constructed as per the WHO STEPwise approach to non-communicable disease risk factor surveillance (STEPS). The data was analyzed using Statistical Package for Social Sciences (SPSS), version 26. Descriptive analysis was used to compile the sociodemographic and clinical characteristics of the participants, and logistic regression analyses were performed to determine the factors associated with hypertension.

Results A total of 301 adult participants were included in this study. The mean age of the participants was 47.6 years (standard deviation: 13.5), and 62.5% were males. The prevalence of newly diagnosed hypertension was 36.2% (95% confidence interval [CI]: 5.6, 66.8). Male sex (adjusted odds ratio (AOR) = 2.06, 95% (CI): 1.05, 4.04), being married (AOR = 4.8, 95% CI: 1.84, 2.77) or widowed (AOR = 5.14, 95% CI: 1.23, 1.46), less frequent intake of vegetables and/or fruits [< 3 days per week (AOR = 2.88, 95% CI: 1.12, 7.39), and 3 to 5 days per week (AOR = 2.22, 95% CI: 1.02, 4.86)], physical inactivity (AOR = 2.26, 95% CI: 1.21, 4.22), and body mass index (AOR = 1.17, 95% CI: 1.09, 1.26), had significant associations with hypertension.

Conclusion This study demonstrated a high prevalence of newly diagnosed hypertension in an opportunistic screening program in Addis Ababa, Ethiopia. It also revealed that most of the factors significantly associated with

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hypertension were modifiable, underscoring the importance of promoting lifestyle changes. Most importantly, expanding institution-based opportunistic screening programs could be an effective approach to maximize the detection of hypertension and improve access to its treatment.

Keywords Newly diagnosed hypertension, Opportunistic screening, Prevalence, Associated factors, Ethiopia

Background

The burden of non-communicable diseases (NCDs) is still unacceptably high, accounting for 71% of all deaths globally [1]. Hypertension (HTN) is a recognized and significant risk factor that underlies the epidemic of cardiovascular diseases (CVDs), which account for most NCD-related mortalities in low- and middle-income countries (LMICs) [2, 3]. The European Society of Hypertension (ESH) guidelines state that hypertension (HTN) is defined as repeated office-based systolic blood pressure (SBP) of 140 mmHg or higher and/or diastolic blood pressure (DBP) of 90 mmHg or higher [4]. Nevertheless, there is a continuous correlation between blood pressure (BP) and cardiovascular (CV) morbidity or mortality, beginning with an office SBP > 115 mmHg and a DBP > 75 mmHg [5].

According to a recent World Health Organization (WHO) report, the number of adults with hypertension doubled from 650 million in 1990 to 1.3 billion in 2019, and 78% of those adults reside in LMICs [6]. According to reports in 2019, the global age-standardized average prevalence of HTN in adults between the ages of 30 and 79 was 32% in women and 34% in men [7]. A consistent correlation has been observed between elevated blood pressure and the likelihood of stroke, heart failure, coronary artery disease, and chronic kidney disease [8]. Other risk factors associated with hypertension are dyslipidemia, impaired glucose tolerance, and type 2 diabetes mellitus (DM), which further heighten the risk of developing CVDs [9, 10].

A systematic review and meta-analysis to assess the recent burden of HTN in Sub-Saharan Africa revealed a pooled prevalence of 30%, and of those with HTN, only 27% were aware of their hypertensive status [11]. The prevalence of hypertension reported from the national WHO STEPwise approach to NCD risk factor surveillance (STEPS) community-based survey among the Ethiopian adult population in 2015 was 15.8% [12]. In Ethiopia, some community-based studies were conducted to determine the prevalence of newly diagnosed hypertension and its associated factors. According to community-based studies conducted in Debre Markos town (north-west Ethiopia), Durame town (southern Ethiopia), and Gimbi town (western Ethiopia), 12.7%, 14%, and 24.8% of individuals had newly diagnosed HTN, respectively [13–15].

The early detection and treatment of HTN have a major public health implications because of its high prevalence in the general population and its major role as a cause of morbidity and mortality [16]. As per the US Preventive Services Task Force, individuals who are 18 years of age or older should be screened for hypertension, and several countries have also started to advocate opportunistic blood pressure measurements [16, 17]. The ESH guidelines recommend opportunistic screening for HTN in all adults (i.e., ≥ 18 years old), with a class I recommendation, and emphasize the importance of regular BP measurements, particularly in adults from the age of 40 years and in adults at increased risk for HTN (special ethnic groups, individuals with high-normal BP, overweight or obesity) [4].

Institution-based opportunistic screening strategies for hypertension could be an important option for early detection of HTN, improving access to its treatment, and ultimately preventing its complications. Screening and treatment for hypertension have been introduced in several primary healthcare facilities in Ethiopia [18]; however, there have been no institution-based studies on the prevalence of hypertension and its associated factors with an opportunistic screening program. Hence, this study aimed to assess the prevalence of newly diagnosed hypertension and its associated factors in an opportunistic screening program at Yekatit 12 Hospital Medical College (Y12HMC), Addis Ababa, Ethiopia.

Methods

Study design, period and area

This was an institution-based cross-sectional study that was conducted on adults who participated in an opportunistic hypertension screening program at Yekatit 12 Hospital Medical College (Y12MC), Addis Ababa, Ethiopia, over three months (November 1, 2023, to February 1, 2024). Y12HMC is one of the largest public teaching hospitals in Addis Ababa, delivering both clinical and academic services in more than six specialties. In addition to therapeutic services for different disorders, the hospital has been implementing a variety of preventive strategies, one of which is an opportunistic hypertension (HTN) screening program for health-seeking individuals who visit the hospital for different purposes. Of these individuals, those who were found to have hypertension would be linked to specific units for further evaluation and initiation of treatment, and the rest would be given health education.

Source and study population

All adult residents (≥18 years old) of Addis Ababa were taken as the source population, and all adult residents who visited Yekatit 12 Hospital Medical College as an attendant or for another purpose and got screened for hypertension were taken as the study population.

Eligibility criteria

Eligible participants were:

- All adults (≥18 years old) who visited the hospital as an attendant or for another purpose and were willing to participate in the study.

Excluded participants were those:

- Having blood pressure measurements in a year.
- Reporting a previous history of hypertension or other cardiovascular diseases (cardiac disorders, stroke, and peripheral arterial disease).
- Reporting a history of diabetes mellitus, and.
- Being in stressful conditions at the time of data collection.

Participants who reported a history of other cardiovascular diseases or diabetes mellitus were excluded based on the assumption that they would most likely know their blood pressure status before the current study was conducted, and those who were in stressful conditions were excluded to decrease the chance of false high BP records.

Sample size

The sample size was calculated to be 293 using a single proportion population formula, taking a prevalence of 25.6% for newly diagnosed HTN among residents of Addis Ababa in a previous study [19], a 95% confidence level (CI), a standard deviation of 0.5, and a margin of error (d) of 5%.

$$n = \frac{[Z_{\alpha/2}{}^2 \times p\,(1-p)]}{(d)^2} = \frac{[1.96^2 \times 0.256\,(1-0.256)]}{(0.05)^2} = 293$$

After the addition of a 5% non-response rate, the final sample size was corrected to 308, and all participants who fulfilled the eligibility criteria were included using a convenience sampling technique based on the assumption that the expected number of participants meeting the eligibility criteria would be small.

Study variables

The dependent variable was the prevalence of newly diagnosed hypertension. The independent variables were sociodemographic characteristics (age, sex, marital status, educational status, occupation, and income), lifestyle factors (dietary habits, physical inactivity, alcohol intake, and cigarette smoking), and clinical profiles (family history of CVDs, family history of diabetes, body mass index [BMI], and fasting blood sugar [FBS] or random blood sugar [RBS]).

Data collection procedures

Data were collected using a pretested and structured interviewer-administered questionnaire, which was prepared using the WHO STEPwise approach to NCD risk factor surveillance (STEPS), which is a simple, standardized method for collecting, analyzing, and disseminating data on key risk factors [20]. The questionnaire was initially prepared in English and then it was then translated into the commonly spoken local languages (Amharic, Afaan Oromoo, and Tigrinya) with the help of professional translators and available bilingual translators were used for participants who speak the other languages. The data were collected by four nurses, who were able to speak one or more of the languages used in the questionnaire, after being trained for two days on how to conduct interviews and take measurements. The data collectors were supervised by the principal investigator. The interview questionnaire was structured into three sections: sociodemographic characteristics, lifestyle factors, and clinical profiles.

The respondents' weight and height were measured by standard equipment known as "Health o Meter Professional Scales". This equipment had a built-in height rod, which allowed measurement of height by sliding the rod up and down. Weight was measured while the participants were wearing light clothes and recorded in kilograms to the nearest 0.1 kg. Before blood pressure (BP) measurement, participants were ordered to remain seated and relaxed for at least 3 minutes, and this timing was extended for 30 minutes if they consumed caffeinated drinks or did an exercise. The blood pressure (BP) was measured by a clinically validated automated electronic upper-arm cuff device ("Omron M3") in the sitting position, where each participant's arm was maintained at the level of the heart. The BP was measured three times, at least 1 minute apart, for each participant, and the average of the last two records was taken as the final BP level [4]. FBS (if the study participants had fasted overnight for at least 8 hours) or RBS level was measured using a glucometer.

Operational definitions

Optimal blood pressure: SBP of <120 mmHg and DBP of <80 mmHg [4].

Normal blood pressure: SBP of 120–129 mmHg and DBP of 80–84 mmHg [4].

High-normal blood pressure: SBP of 130–139 mmHg and/or DBP of 85–89 mmHg [4].

Hypertension: SBP of ≥140 mmHg and/or DBP of ≥90 mmHg [4].

Impaired fasting glucose (IFG): FBS of 110 to 125 mg/dL [21].

Diabetes mellitus: RBS≥200 mg/dL or FBS≥126 mg/dL [21].

Intake of a high sugar diet: The consumption of free sugars (added to foods by the manufacturer or naturally present in honey, syrups, and fruit juices) or added sugars (used in processed and prepared foods and drinks; sugars added to foods) to ≥25 g/day (≥6 teaspoons/day) and the consumption of sugar-sweetened beverages (soft drinks, fruit drinks, and sports and energy drinks) to ≥one serving/week (≥200–355 mL/week) [22].

Intake of fatty foods: Consumption of foods containing saturated fatty acids (fatty meat, dairy foods, and hard fats and oils such as butter, ghee, lard, palm oil and coconut oil) and foods containing trans-fatty acids (baked and fried foods, pre-packaged snacks, and meat and dairy foods from ruminant animals, such as cows or sheep) [23].

High salt intake: ≥ 5 g of salt (equivalent to about one teaspoon) per day [24].

Intake of fruits and vegetables (as per recommendations): consumption of 1.5–2 cup-equivalents of fruits and 2–3 cup-equivalents of vegetables daily [25].

Physical inactivity: Lack of physical activities as per the recommendations set by the World Health Organization (performance of at least 150 min of moderate-intensity or 75 min of vigorous-intensity aerobic physical activity throughout the week) [26].

Data quality assurance

The quality of the data was ensured through the training of data collectors, close supervision, and prompt feedback. The training consisted of instruction on interview techniques as per the prepared tool. Standard instruments were used, and their accuracy was checked before the beginning of each data collection session by the principal investigator and/or data collectors. The data were checked for any inconsistencies, coding errors, completeness, and accuracy, with appropriate corrections made by the principal investigator. To assure the completeness of the data abstraction form, a pre-test was conducted among 15 participants, and the proper modifications were made, especially on the frequency of dietary intake. The modifications were necessary as standardized classifications couldn't be applied due to inconsistent daily dietary habits among the interviewed participants.

Data entry and statistical analysis

Statistical Package for Social Sciences (SPSS), version 26 was used to enter and analyze the data. The descriptive analysis was used to compile the sociodemographic data, lifestyle factors, and clinical profiles. Continuous variables were expressed as the mean (standard deviation [SD]) when normally distributed or the median (interquartile range [IQR]) when not normally distributed. Categorical variables were expressed as frequency and percentage. Bivariate and multivariable logistic regression models were utilized to determine the factors associated with HTN by calculating the crude odds ratio (COR) and adjusted odds ratio (AOR), respectively, with the accompanying 95% confidence interval (CI). The model assumptions were fulfilled based on the Hosmer-Lemeshow test results. Variables with a P value<0.25 in the bivariate analysis were subsequently used in the multivariable analysis, and a two-tailed P value<0.05 in the multivariable regression model was regarded as statistically significant.

Results

Sociodemographic characteristics

A total of 468 participants visited the opportunistic hypertension (HTN) screening program at Yekatit 12 Hospital Medical College, Addis Ababa, Ethiopia, during the study period. Of these participants, 310 (66.2%) were found to be eligible, and 301 (64.3%) completed the study, giving a response rate of 97.1%. The mean (SD) age of the participants was 47.6 (13.5) years, and among the age categories, those aged 60 years and older had the highest prevalence of hypertension [HTN] (46.8%) as compared to those between 40 and 59 years (42.9%) and between 18 and 39 years (16.9%). Males constituted the majority of the study participants (62.5%). The majority (68.8%) were married, and hypertension primarily affected widows (42.9%) and married (42.5%) individuals [Table 1].

The majority of participants (93.4%) received formal education, and hypertension was more common in those who completed secondary school (44.8%) and higher education (33.8%) than in other levels of education. The majority of participants had a private job (44.2%) or worked as civil servants (28.6%). Though retired participants were the least represented (10.3%) in this study, over half (51.6%) were found to have newly diagnosed hypertension [Table 1].

Lifestyle factors and clinical profiles

Of all the participants, the majority had the habit of taking high sugar diets (55.1%), fatty foods (64.1%), and high salt intake (55.7%) for 3 to 5 days a week, and most of the participants were consuming vegetables and/or fruits (81.4%) for ≤5 days a week. Of all the participants, 6% and 19.9% were cigarette smokers and alcohol consumers, respectively. Physical inactivity was seen among 62.5% of the participants, and the prevalence of HTN was higher in those who had physical inactivity (42.5%) as compared to those with physical activity (27.4%). Almost

Table 1 Socio-demographic characteristics of participants screened for hypertension at Yekatit 12 Hospital Medical College (November 1, 2023, to February 1, 2024)

Characteristics	Overall (*n* = 301) n (%)	Hypertension		*P* value
		Yes, *n* (%)	No, *n* (%)	
Age (years) – mean (SD)	47.6 (13.5)	52.1 (10.2)	45.1 (14.4)	0.001
Age category				< 0.001
≥ 60	79 (26.2)	37 (46.8)	42 (53.2)	
40–59	133 (44.2)	57 (42.9)	76 (57.1)	
18–39	89 (29.6)	15 (16.9)	74 (83.1)	
Sex				0.007
Male	188 (62.5)	79 (42)	109 (58)	
Female	113 (37.5)	30 (26.5)	83 (73.5)	
Marital status				0.001
Married	207 (68.8)	88 (42.5)	119 (57.5)	
Divorced	18 (6)	5 (27.8)	13 (72.2)	
Widowed	21 (7)	9 (42.9)	12 (57.1)	
Never married	55 (18.3)	7 (12.7)	48 (87.3)	
Educational status				0.174
No formal education	20 (6.6)	6 (30)	14 (70)	
Elementary school	49 (16.3)	14 (28.6)	35 (71.4)	
Secondary school	96 (31.9)	43 (44.8)	53 (55.2)	
Higher education	136 (45.2)	46 (33.8)	90 (66.2)	
Occupation				0.149
Civil servant	86 (28.6)	27 (31.4)	59 (68.6)	
Private job	133 (44.2)	51 (38.3)	82 (61.7)	
Unemployed	51 (16.9)	15 (29.4)	36 (70.6)	
Retired	31 (10.3)	16 (51.6)	15 (48.4)	
Monthly income (ETB)				0.921
None	63 (20.9)	20 (31.7)	43 (68.3)	
≤ 3,000	70 (23.3)	25 (35.7)	45 (64.3)	
> 3,000–5,000	32 (10.6)	13 (40.6)	19 (59.4)	
> 5,000–10,000	107 (35.5)	40 (37.4)	67 (62.6)	
> 10,000	29 (9.6)	11 (37.9)	18 (62.1)	

The *P* values were obtained using chi-square test for the categorical variables and the independent samples T-test for the continuous variable (age). SD, standard deviation; ETB, Ethiopian birr

one-fifth (20.3%) of the study participants had a family history of cardiovascular diseases, including HTN, coronary artery disease, and/or stroke [Table 2].

The median BMI of the participants was 25 kg/m2 (IQR: 23–27); 13% of them had obesity (BMI: ≥ 30 kg/m2), and 38.5% of them were overweight (BMI: 25–29.9 kg/m2). Newly diagnosed HTN was more prevalent among obese (56.4%) and overweight (46.6%) individuals as compared to those with a normal BMI (22.6%). Of the 98 participants who had FBS measurements, 9.2% had impaired fasting glucose (prediabetes). Newly diagnosed diabetes (RBS≥200 mg/dL or FBS≥126 mg/dL) was found in 25 (8.3%) of the participants, and HTN was more common in those who were found to be diabetic (56%) as compared to non-diabetic ones (34.4%) [Table 2].

Prevalence of hypertension

Newly detected HTN (SBP≥140 mmHg or DBP≥90 mmHg) was found in 109 participants (36.2%, 95% CI: 5.6, 66.8), and 62 participants (20.6%) had high-normal BP ranges (SBP of 130–139 mmHg and/or DBP of 85–89 mmHg) [Fig. 1].

Factors associated with hypertension

In the bivariate analysis, age (crude odds ratio [COR] = 1.04, 95% confidence interval [CI]: 1.02, 1.06, *P* value < 0.001), male sex (COR = 2.01, 95% CI: 1.21, 3.33, *P* value = 0.007), being married (COR = 5.07, 95% CI: 2.19, 11.74, *P* value < 0.001), or being widowed (COR = 5.14, 95% CI: 1.59, 16.62, 0.006), physical inactivity (COR = 1.88, 95% CI (1.13, 3.12), *P* value = 0.015), BMI (COR = 1.14, 95% CI: 1.07, 1.22, *P* value < 0.001), and newly diagnosed diabetes (COR = 2.43, 95% CI: 1.06, 5.55, *P* value = 0.036) were significantly associated with the development of newly diagnosed HTN. The odds of

Table 2 Lifestyle factors and clinical profiles among participants screened for HTN at Yekatit 12 Hospital Medical College (November 1, 2023, to February 1, 2024)

Characteristics	Overall (*n* = 301) *n* (%)	Hypertension		*P* value
		Yes, *n* (%)	No, *n* (%)	
Intake of high-sugar diets (days/week)				0.710
> 5	68 (22.6)	23 (33.8)	45 (66.2)	
3–5	166 (55.1)	59 (35.5)	107 (64.5)	
< 3	67 (22.3)	27 (40.3)	40 (59.7)	
Intake of fatty foods (days/week)				0.637
> 5 times	37 (12.3)	16 (43.2)	21 (56.8)	
3–5	193 (64.1)	68 (35.2)	125 (64.8)	
<3	71 (23.6)	25 (35.2)	46 (64.8)	
High salt intake (days/week)				0.904
> 5	73 (24.3)	28 (38.4)	45 (61.6)	
3–5	167 (55.7)	59 (35.3)	108 (64.7)	
< 3	61 (20.3)	22 (36.1)	39 (63.9)	
Vegetables and/or fruits (days/week)				0.112
< 3	53 (17.6)	23 (43.4)	30 (56.6)	
3–5	192 (63.8)	72 (37.5)	120 (62.5)	
> 5	56 (18.6)	14 (25)	42 (75)	
Cigarette smoking				0.808
Yes	18 (6)	7 (38.9)	11 (61.1)	
No	283 (94)	102 (36)	181 (64)	
Alcohol consumption				0.113
Yes	60 (19.9)	27 (45)	33 (55)	
No	241 (80.1)	82 (34)	159 (66)	
Physical inactivity				0.014
Yes	188 (62.5)	78 (41.5)	110 (58.5)	
No	113 (37.5)	31 (27.4)	82 (72.6)	
Family history of CVDs*				0.357
Yes	61 (20.3)	19 (31.1)	42 (68.9)	
No	240 (79.7)	90 (37.5)	150 (62.5)	
Family history of diabetes				0.810
Yes	63 (20.9)	22 (34.9)	41 (65.1)	
No	238 (79.1)	87 (36.6)	151 (63.4)	
BMI (kg/m^2) – median (IQR)	25 (23.0–27.3)	25.7 (24.3–28.5)	24.5 (22.2–26.7)	< 0.001
BMI category (kg/m^2)				< 0.001
≥ 30	39 (13)	22 (56.4)	17 (43.6)	
25 – 29.9	116 (38.5)	54 (46.6)	62 (53.4)	
< 25	146 (48.5)	33 (22.6)	113 (77.4)	
IFG – no. /total no. (%)				0.500
Yes	9/98 (9.2)	5 (55.6)	4 (44.4)	
No	89/98 (90.8)	39 (43.8)	50 (56.2)	
Newly diagnosed diabetes				0.032
Yes	25 (8.3)	14 (56)	11 (44)	
No	276 (91.7)	95 (34.4)	181 (65.6)	

The *P* values were obtained using the chi-square test for categorical variables and the median test for the continuous variable (BMI). CVDs, cardiovascular diseases; BMI, body mass index; IFG, impaired fasting glucose.* CVDs include hypertension, coronary artery disease and/or stroke

developing hypertension were lower among participants who had government jobs (COR=0.38, 95% CI: 0.17, 0.89), *P* value=0.026), and those who were unemployed (COR=0.39, 95% CI: 0.16, 0.99, *P* value=0.047) as compared to the retired individuals [Table 3].

In the multivariable analysis, male sex, being married or widowed, poor intake of vegetables and/or fruits, physical inactivity, and BMI were significantly associated with HTN. The odds of developing HTN were twofold higher among males as compared with females (adjusted odds ratio [AOR]=2.06, 95% CI: 1.05, 4.04, *P* value=0.036). The odds of developing HTN were fivefold higher among married (AOR=4.84, 95% CI: 1.84, 2.77, *P* value=0.001) or widowed participants (AOR=5.14, 95%

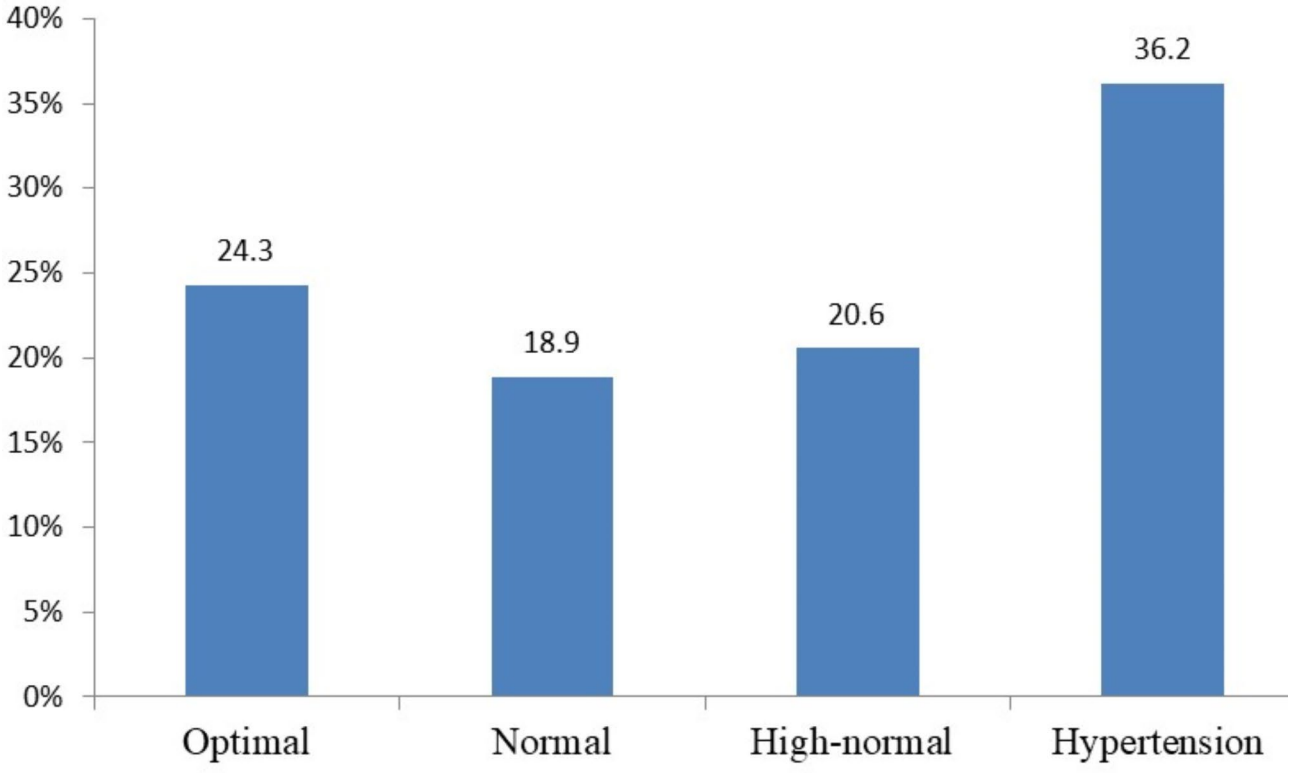

Fig. 1 Percentages of the participants based on their blood pressure classification at Yekatit 12 Hospital Medical College (November 1, 2023, to February 1, 2024

CI: 1.23, 1.46, *P* value=0.025) as compared with never-married ones. Consumption of vegetables and/or fruits for <3 days per week (AOR=2.88, 95% CI: 1.12, 7.39, *P* value=0.028) and for 3 to 5 times per week (AOR=2.22, 95% CI: 1.02, 4.86, *P* value=0.046)] had higher odds of developing HTN as compared with consumption for >5 days per week. The odds of developing HTN were two-fold higher among participants with physical inactivity compared to those with physical activity (AOR=2.26, 95% CI: 1.21, 4.22, *P* value=0.011). Each 1 kg/m2 increase in BMI increased the odds of developing HTN by 17% (AOR=1.17, 95% CI: 1.09, 1.26, *P* value<0.001) [Table 3].

Discussion

This study aimed to assess the prevalence of newly diagnosed hypertension (HTN) and its associated factors in an opportunistic screening program in Addis Ababa, Ethiopia. Of the 301 participants, 36.2% were found to have newly diagnosed HTN. This underscores the public health importance of institution-based opportunistic HTN screening in unmasking the high burden of undiagnosed HTN and improving access to its treatment in developing countries like Ethiopia. Male sex, being married or widowed, less frequent intake of vegetables and/or fruits, physical inactivity, and body mass index were strongly associated with HTN. Most of these factors associated with HTN were modifiable, emphasizing on the necessity of promoting lifestyle changes.

The prevalence of newly diagnosed HTN (36.2%) in this study was higher than the overall prevalence of hypertension reported in the national NCDs STEPS community-based survey among the adult Ethiopian population (15.8%) [12], community-based studies in Addis Ababa, central Ethiopia (29.2%) [19], and Dire Dawa city, eastern Ethiopia (24.43%) [27], and a multicentre facility-based study in Addis Ababa, central Ethiopia (32.3%) [28]. It was also much higher than the prevalence of newly diagnosed HTN reported from studies done in Debre Markos town, north-west Ethiopia (12.7%) [13], Durame town, southern Ethiopia (14%) [14], and Gimbi Town, western Ethiopia (24.8%) [15]. The prevalence of HTN in our institution-based study was disproportionally higher than that of the community-based studies, which might be explained by the higher tendency of at-risk individuals for hypertension to get screened at a health institution than at the community level.

The burden of hypertension was remarkably higher among men (42%), as compared to women (26.5%) in the present study. This was consistent with other cross-sectional studies done in Addis Ababa, albeit with less disparity [19, 29, 30]. On the contrary, according to the national NCDs STEPS survey among the adult Ethiopian

Table 3 Bivariate and multivariate analysis to determine factors associated with HTN

	HTN		Bivariate Analysis		Multivariable Analysis	
Characteristics	**Yes**	**No**	**COR**	**95% CI**	**AOR**	**95% CI**
Age (years)			1.04	(1.02, 1.06)*	1.03	(0.99, 1.06)
Sex						
Male	79	109	2.01	(1.21, 3.33)*	2.06	(1.05, 4.04)*
Female	30	83	1		1	
Marital status						
Married	88	119	5.07	(2.19, 11.74)*	4.84	(1.84, 2.77)*
Separated/divorced	5	13	2.64	(0.72, 9.69)	3.57	(0.74, 7.25)
Widowed	9	12	5.14	(1.59, 16.62)*	5.14	(1.23, 1.46)*
Single	7	48	1		1	
Educational status						
No formal schooling	6	14	0.84	(0.30, 2.33)	0.59	(0.17, 2.05)
Elementary school	14	35	0.78	(0.38, 1.60)	0.55	(0.23, 1.29)
Secondary school	43	53	1.59	(0.93, 2.72)	1.90	(0.98, 3.65)
Higher education	46	90	1		1	
Occupation						
Governmental	27	59	0.43	(0.19, 0.99)*	0.61	(0.19, 1.98)
Non-governmental	51	82	0.58	(0.27, 1.28)	0.72	(0.24, 2.13)
Unemployed	15	36	0.39	(0.16, 0.99)*	0.73	(0.20, 2.58)
Retired	16	15	1		1	
Intake of fruits and/or vegetables (days/week)						
<3	23	30	2.30	(1.02, 5.19)*	2.88	(1.12, 7.39)*
3–5	72	120	1.90	(0.92, 3.52)	2.22	(1.02, 4.86)*
> 5	14	42	1		1	
Alcohol consumption						
Yes	27	33	1.59	(0.89, 2.82)	1.25	(0.60, 2.59)
No	82	159	1		1	
Physical inactivity						
Yes	78	110	1.88	(1.13, 3.12)*	2.26	(1.21, 4.22)*
No	31	82	1		1	
BMI (kg/m^2)			1.14	(1.07, 1.22)*	1.17	(1.09, 1.26)*
Newly diagnosed diabetes						
Yes	14	11	2.42	(1.06, 5.55)*	2.49	(0.96, 6.47)
No	95	181	1		1	

HTN, hypertension; COR, crude odds ratio; AOR, adjusted odds ratio; BMI, body mass index. *P value <0.05

population, HTN was slightly more prevalent in females (16.3%) as compared to males (15.5%) [12]. The reason for the discrepancy in the distribution of HTN by sex in the present study as compared with the national NCDs STEPS survey might be due to the higher representation of males (62.5%) in the present study as compared with the higher percentage of females (59.4%) in the latter study.

The present study showed that being married or widowed was significantly associated with HTN as compared with being never married, and likewise, another study done in Hosanna town, southern Ethiopia, showed that married participants had a higher prevalence of HTN as compared with their unmarried counterparts [31]. Similarly, this finding was consistent with that of a country-wide survey done in Nigeria [32]. However, there was no significant effect of marital status on the prevalence of HTN in other studies done in Addis Ababa [19, 28].

In the present study, less frequent intake of vegetables and/or fruits (≤5 days a week) was observed in most of the participants (81.4%), and this was significantly associated with the development of HTN; likewise, a community-based study in Addis Ababa revealed that 96.2% of participants consumed vegetables and/or fruits<5 times per day, and consumption of vegetables for ≤3 days per week had a strong association with HTN [29]. Besides, a community-based study done in Lubumbashi City, Democratic Republic of the Congo, showed that nonconsumption of vegetables was significantly associated with HTN [33].

Being overweight and obese were evident in 38.5% and 13% of the participants, respectively, in this study, and similar findings were observed in another study done in

Addis Ababa public health facilities, where 36.5% and 10.8% of the participants were overweight and obese, respectively [28]. Body mass index was significantly associated with hypertension in the current study, and this was also replicated in other studies done in different regions of Ethiopia [13, 15, 28]. Similarly, other studies in Sub-Saharan Africa (Angola and Kenya) have also demonstrated the presence of a significant association between overweight or obesity and hypertension [34, 35]. The highly prevalent state of overweight and obesity might reflect the epidemiological transition linked to dietary changes and lifestyle modifications, and the clinical implication is that appropriate weight-management strategies need to be implemented in obese patients to prevent the development of HTN.

Physical inactivity was found in 62.5% of the participants in the current study, which was higher than that of the studies done in Durame town, Southern Ethiopia (36%) [14], Nigeria (30.7%) [32], Wolkait Tegedie Zone, Northwest Ethiopia (35.2%) [36], and physical inactivity was significantly associated with hypertension in all of these studies, including the present one. The higher prevalence of physical inactivity in the current study might partly explain the higher prevalence of hypertension in the current study as compared with most other studies.

Our study has some limitations. First, the cross-sectional nature of the study precludes determining a cause-and-effect relationship between hypertension and its associated factors. Second, renal function tests and lipid profiles were not determined to identify the other associated conditions of HTN. Finally, cautious interpretation is required regarding the generalizability of the findings of this study because of the small sample size, the absence of repeat blood pressure measurements on subsequent days, and the possibility of white coat effect.

Conclusion

More than one-third of individuals had newly diagnosed hypertension in an opportunistic screening program at a single teaching institution in Addis Ababa, Ethiopia. Male sex, being married or widowed, less frequent intake of vegetables and/or fruits, physical inactivity, and body mass index were strongly associated with hypertension. Most of these factors were found to be modifiable, underscoring the importance of promoting lifestyle changes. Besides, targeted interventions are required to improve public awareness about hypertension and its associated factors. Most importantly, expanding institution-based opportunistic screening programs could be an effective approach to maximize the detection of hypertension and improve access to its treatment.

Abbreviations

AOR	Adjusted odds ratio
BMI	Body mass index
BP	Blood pressure
COR	Crude odds ratio
CVDs	Cardiovascular diseases
DBP	Diastolic blood pressure
ESH	European Society of Hypertension
FBS	Fasting blood sugar
HTN	Hypertension
IFG	Impaired fasting glucose
NCDs	Noncommunicable diseases
RBS	Random blood sugar
LMICs	Low- and middle-income countries
SBP	DBP
WHO	World Health Organization

Acknowledgements

The authors express their sincere gratitude to the data collectors for their dedication and time.

Author contributions

GS was involved in the conceptualization of the study along with its design, data analysis, and drafting and edition of the initial manuscript. BA, ET, RA, SK, and SL were involved in the drafting and the edition of the initial manuscript. All the authors read and approved the final manuscript.

Funding

This study received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Data availability

All data generated or analyzed during this study are included in this manuscript.

Declarations

Ethical approval and consent to participate

Ethical clearance was obtained from the Institutional Review Board (IRB) of Yekatit 12 Hospital Medical College (Ref. No.: RPO/529/23), and informed written consent was obtained from each participant.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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Received: 8 May 2024 / Accepted: 6 September 2024
Published online: 14 September 2024

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