Original article

Prevalence of hypertension and pre-hypertension in Addis Ababa, Ethiopia: A survey done in recognition of World Hypertension Day, 2014

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Abstract

Background: Hypertension, the leading global risk factor for mortality and the third leading risk factor for disease burden, is an increasing public health problem in sub-Saharan Africa. This study aims to evaluate the prevalence of hypertension in an urban population of Addis Ababa, the capital city of Ethiopia in recognition of World Hypertension Day 2014.

Methods: We performed a cross-sectional survey in May 2014 in 10 sub cities of Addis Ababa. Data were collected by trained clinical nurses and then entered into SPSS version 21 for analysis. Categorical data were analyzed univariately by χ^2 tests. Logistic regression was used to identify independent factors associated with hypertension.

Results: A total of 2716 adults were included in this study and the mean age is 36.9 +/-14.2 years with males (mean age 38 years) older than females (mean age 36 years). More than half (58.1%) were females. Six hundred and seventy seven (25%, (95% CI 23.4-26.7)) were found to have hypertension, 1/3rd of them had stage 2 hypertension. And 47.3% had prehypertension. Men had significantly higher prevalence than women (AOR 1.4 (1.2-1.7), P < 0.0001). The prevalence significantly increased with increasing age with an increase of 10% per decade (AOR for age group ≥ 65 years is 23 [95%CI: 14.0-37.4] compared to those under 25 years of age).Residents of sub cities in the inner part of Addis Ababa had significantly higher prevalence of hypertension.

Conclusion: Findings of this study indicate high prevalence of hypertension and prehypertension among adult residents of Addis Ababa city. The prevalence was higher in males, from inner part of the city and increased with increasing age. With increasing urbanization, this is an alarm for public awareness creation, regular community screening for hypertension, and proper preventive and treatment measures in those with high blood pressure.

***Key words**: Hypertension, prehypertension, prevalence, survey, Ethiopia*. [*Ethiop. J. Health Dev.* 2015;29(1):22-30]

Background

Hypertension is an important public health challenge worldwide because of its high prevalence and concomitant increase in risk of disease (1, 2). In 2008, worldwide, approximately 40% of adults aged 25 and above had been diagnosed with hypertension; the number of people with the condition rose from 600 million in 1980 to 1 billion in 2008.The increasing prevalence of hypertension is attributed to population growth, ageing and behavioral risk factors, such as unhealthy diet, harmful use of alcohol, lack of physical activity, excess weight and exposure to persistent stress (3).

It is the most important modifiable risk factor for cardiovascular, cerebrovascular and renal disease. The comparative Risk Assessment Collaborating Group has identified hypertension as the leading global risk factor for mortality and as the third leading risk factor for disease burden (4, 5). One of the key risk factors for cardiovascular disease (CVD) is hypertension - or raised blood pressure. Hypertension already affects one billion people worldwide, leading to heart attacks and strokes. Researchers have estimated that raised blood pressure currently kills nine million people every year (1).

Hypertension is more prevalent in low- and middle-income countries (LMIC), compared to the high income countries, and there are also more people affected because more people live in those countries than in high-income countries. Across the WHO regions, the prevalence of raised blood pressure was highest in Africa, where it was 46% for both sexes combined. In all WHO regions, men have slightly higher prevalence of raised blood pressure than women. This difference was only statistically significant in the Americas and Europe (1, 6).

In high income countries, numerous studies have been conducted to estimate the prevalence of hypertension. In some countries national studies have provided estimates of the prevalence of hypertension. In sub Saharan Africa (SSA) countries like Ethiopia, published information on the prevalence of hypertension is sparse. From the studies done in Ethiopia, Kenya, Nigeria and Tanzania, the reported prevalence of hypertension ranged from 10.1% in Southern Ethiopia to 23.7% in Tanzania (7-11). Previous reports from Ethiopia on prevalence of hypertension were as high as 31.5% and 28.9% among males and females respectively in Addis Ababa (12) and 28.3% from Gondar (13).

Disease burdens are based on estimates like in the case of hypertension, the WHO estimated prevalence of hypertension to be 25.9% (overall 28% male, 23.9%

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female) (6). Quantification of the burden of hypertension would allow public health policy to assign sufficient priority and resources for its management and prevention. Hypertension prevalence data are also essential to understand the magnitude of the problem, and identify groups at high risk for CVD. World Hypertension Day, annually celebrated on May 17th, provides an opportunity to emphasize opportunities to improve prevention and control of hypertension.

In 2014, the World Hypertension League (WHL) initiated its celebrations by announcing results of its 2013-2014 campaign to assist national hypertension organizations in developing widespread screening programs to identify those with hypertension. It launched the Campaign 'Know your blood pressure' to facilitate the development of programs to screen for hypertension. The Federal Ministry of Health of Ethiopia has committed to the prevention, detection and control of non-communicable diseases, of which hypertension is among the leading, and has produced a National Strategic Action Plan (NSAP) for Prevention and Control of Non Communicable Disease in Ethiopia for the years 2014-2016 to tackle the problem (14).

The purpose of this study was thus to determine the prevalence of hypertension and prehypertension in Addis Ababa city.

Methods

A community-based cross-sectional survey was conducted in May 2014 in Addis Ababa, the capital city of Ethiopia. The city has 10 sub cities (SCs) with a population of more than 2.7 million people according to 2007 Ethiopian Central Statistical Agency (CSA) office report [6].

Permission letter was first obtained from Addis Ababa Health Bureau and the health centers at the respective SCs. The study participants were men and women residents of Addis Ababa city who volunteered to participate in the study. Participants who visited health centers after mobilization campaign were fully informed about the purpose of the study and gave verbal consent. Individuals who were on treatment for hypertension and those under the age of 18 years were excluded. All volunteering and eligible individuals who went to the randomly selected 10 health centers, one in each of the 10 sub cities of Addis Ababa, were included in the survey. A total of 2716 residents aged 18 years or older were finally included in the survey. The questionnaire included age, gender, address, and measurements of blood pressure.

***Terms and Definitions*:**

Hypertension was defined as a sustained high blood pressure (SBP $\geq$140 or DBP $\geq$90mmHg). Stage 1 hypertension was defined as SBP 140–159 mmHg and/or DBP 90–99 mmHg. Stage 2 hypertension was defined as SBP $\geq$160 or DBP $\geq$100mmHg. Severe hypertension was defined as SBP $\geq$180 or DBP $\geq$110mmHg. Prehypertension was defined as SBP 120-139 mmHg or DBP of 80-89 mmHg (15, 16).

Data Collection:

Data were collected through a face-to-face interview technique after a verbal informed consent. Blood Pressure (BP) of participants was measured following standard procedures. Data were collected using a combination of a structured questionnaire and measurements of Blood Pressure (BP). Data collectors were clinical nurses who were trained by Cardiologist on standard BP measurement with practical demonstrations and were also supervised by investigators and representatives from Ethiopian Medical Association and Regional Health Bureaus.

Standard mercury sphygmomanometer BP cuff with the appropriate cuff size that covers two-thirds of the upper arm was used to measure the BP. Blood pressure was measured three times in a sitting position. The first measurement was taken on both arms after the participant rested for at least five minutes and a condition of no smoking or caffeine 30 minutes before measurement was maintained. The Nurses subsequently took the second and third measurements at five to ten minutes difference. The first measurement was discarded and the average of the second and third BP measurements was finally calculated to determine the participant's BP. Study participants who were found to have high blood pressure were advised and linked to the health centers for subsequent management.

Data were analyzed using IBM SPSS Statistics 21 (IBM, New York, USA) and Excel 2013. Continuous variables were provided as mean with standard deviation (SD) or medians. Categorical data were analyzed univariately by Chi- square tests. Odds ratios (OR) with 95% confidence intervals (CI) were calculated. A p valve less than 0.05 was taken to indicate statistical significance and all tests were two-sided. Logistic regression was used to identify independent factors associated with hypertension.

Results

A total of 2716 adults were included in this study. More than half (58.1%) were females. The mean age was 36.9 +/-14.2 years with males (mean age 38 years) older than females (mean age 36 years). More than 50% were in the age group 18-34. Age range for females is 18 to 90 years and for males 18 to 86 years. Most of the study participants were from Yeka (14.2%) and Bole (13.7) sub cities (Table 1).

Table 1: **Sociodemographic characteristics of the study participants in Addis Ababa, November 2014 (n = 2716)**

Variables	Frequency	Percent
Sex		
Male	1138	41.9
Female	1578	58.1
Age		
18-24	504	18.6
25-34	922	33.9
35-44	564	20.8
45-54	320	11.8
55-64	253	9.3
65 and above	153	5.6
Residential area		
Bole SC - Bole 17 Health Center	373	13.7
Kirkos SC - Kasanchis Health Center	200	7.4
Arada SC - Arada Health Center	268	9.9
Gulele SC - Guto Meda Health Center	280	10.3
Nefas-Silk-Lafto SC - Woreda 03 Health Center	222	8.2
Addis Ketema Health center	239	8.8
Akaki kality SC - Kality Health Center	304	11.2
Yeka SC - Yeka Health Center	387	14.2
Lideta Health Center	138	5.1
Kolfe Keraniyo SC - Woreda 09 Sub-City	305	11.2

*SC: Sub-City

Prevalence of hypertension and associated factors

The mean systolic and diastolic BP results were 121.3 mmHg (±18.6 SD) and 78.0 mmHg (±11.5 SD) respectively as shown in table 2. Four hundred and sixty six (17.2%) of the participants had systolic hypertension, while 19.3% and 11.6% of the participants had diastolic hypertension and both systolic and diastolic hypertension respectively. The overall prevalence of systolic or diastolic prehypertension was 47.4%.

As shown in table 3, the overall prevalence of hypertension was 25% (95% CI 23.4-26.7), significantly higher in men (30.2%) than women (21. 2%) (X^2 =29, AOR 1.4 (1.2-1.7), P < 0.0001).

Table 2: **Prevalence of hypertension and hypertension among study participants in Addis Ababa (N = 2716), November 2014**

Variables	Frequency	%
Prehypertension		
Systolic	884	32.5
Diastolic	880	32.4
Total*	1288	47.4
Hypertension		
Systolic	466	17.2
Diastolic	526	19.3
Systolic and diastolic	314	11.6
Total*	678	25.0
Mean systolic BP (±SD)	121.3 mmHg (18.6)	
Mean diastolic BP (±SD)	78.0 mmHg (11.5)	

** The total is less than the sum of systolic and diastolic frequencies as some of the participants have both systolic and diastolic prehypertension or hypertension.*

Table 3: **Bivariate and multivariate logistic regression analysis of factors associated with hypertension among study participants in Addis Ababa (N = 2716), May 2014**

Variables	Hypertension		Crude OR (95% CI)	Adjusted OR (95% CI)
	Yes	No		
Overall	678(25%)	2038		
Sex				
Female	334	1244	1.00	1.00
Male	344	794	1.6 (1.36-1.92) P < 0.0001	1.4 (1.2-1.7) P < 0.0001
Age				
18-24	31	473	1.00	1.00
25-34	149	773	2.94 (1.97-4.4) P < 0.0001	2.87 (1.9-4.3)
35-44	162	402	6.15 (4.1-9.2) P < 0.0001	6.0 (4.0-9.0) P < 0.0001
45-54	121	199	9.3 (6.1-14.2) P < 0.0001	9.1 (5.9-14.1) P < 0.0001
55-64	124	129	14.7 (9.5-22.8) P < 0.0001	15.5 (10.0-24.2) P < 0.0001
65 and above	91	62	22.4 (13.8-36.4) P < 0.0001	22.9 (14.0-37.4) P < 0.0001
Residential area				
Bole SC - Bole 17 Health Center	132	241	2.7 (1.9-3.9) P < 0.0001	3.2 (2.1-4.7) P < 0.0001
Kirkos SC - Kasanchis Health Center	68	132	2.6 (1.7-3.9) P < 0.0001	2.6 (1.6-4.0) P < 0.0001
Arada SC - Arada health Center	66	201	1.6 (1.08-2.45) P = 0.02	1.4 (0.9-2.2) P=0.14
Gulele SC - Guto Meda Health Center	90	190	2.4 (1.6-3.5) P < 0.0001	2.8 (1.8-4.3) P < 0.0001
Nefas-Silk-Lafto SC - Woreda 03 Health Center	59	163	1.8 (1.2-2.8) P = 0.006	1.9 (1.2-3.0) P=0.007
Addis Ketema Health Center	64	175	1.8 (1.2-2.8) P = 0.005	2.2 (1.4-3.4) P=0.001
Akaki kality SC - Kality Health Center	45	259	0.9 (0.6-1.3) P = 0.52	1.2 (0.75-1.9) P=0.44
Yeka SC - Yeka Health Center	51	336	0.8 (0.5-1.2) P = 0.19	0.64 (0.4-1.0) P=0.055
Lideta Health Center	52	86	3.0 (1.9-4.8) P < 0.0001	2.6 (1.5-4.2) P < 0.0001
Kolfe Keraniyo SC - Woreda 09 Sub-City	51	254	1.00	1.00

*SC: Sub-City

The prevalence of hypertension significantly increased with increasing age. Six percent of those under the age of 25 years had hypertension as shown in Figure 1A. When compared to those under 25 years of age, the AOR among subjects aged 65 years and above was 23 [95%CI: 14.0-37.4].

In terms of difference in hypertension prevalence between the sub-cities, the highest prevalence was recorded in Lideta, Bole and Kirkos Sub Cities and lowest in Yeka, Akaki-Kality and Kolfe-Keraniyo sub cities. See figure 1B. Most of them had significantly higher prevalence of HTN when compared to Kolfe-Keraniyo Sub City, except for Arada, Akaki and Yeka SCs.

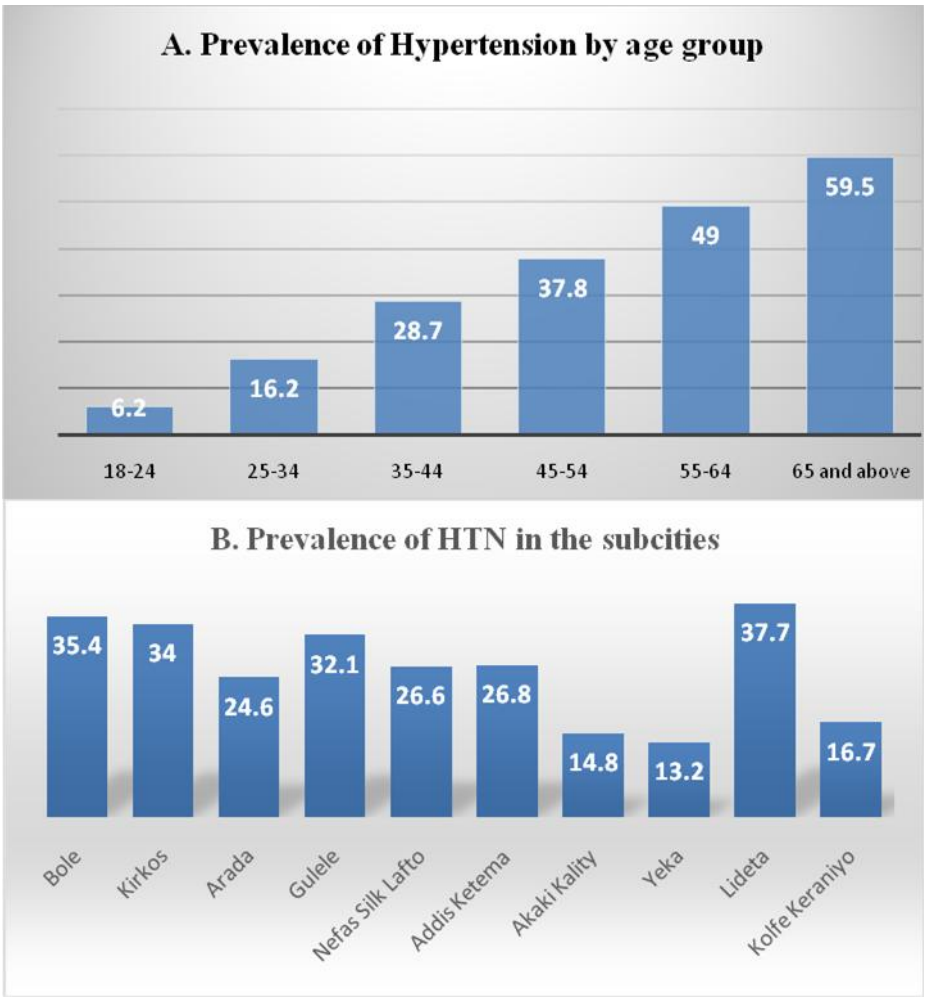

Figure 1: **Prevalence of hypertension A. By age group; B. By Sub-Cities**

Figure 2 illustrates that both systolic and diastolic prehypertension increased until age 45 significantly and then plateaued (X^2 28, P<0.0001). This figure also shows that systolic hypertension prevalence increases with increasing age throughout but prevalence of diastolic hypertension increased until age 64 and then decreased.

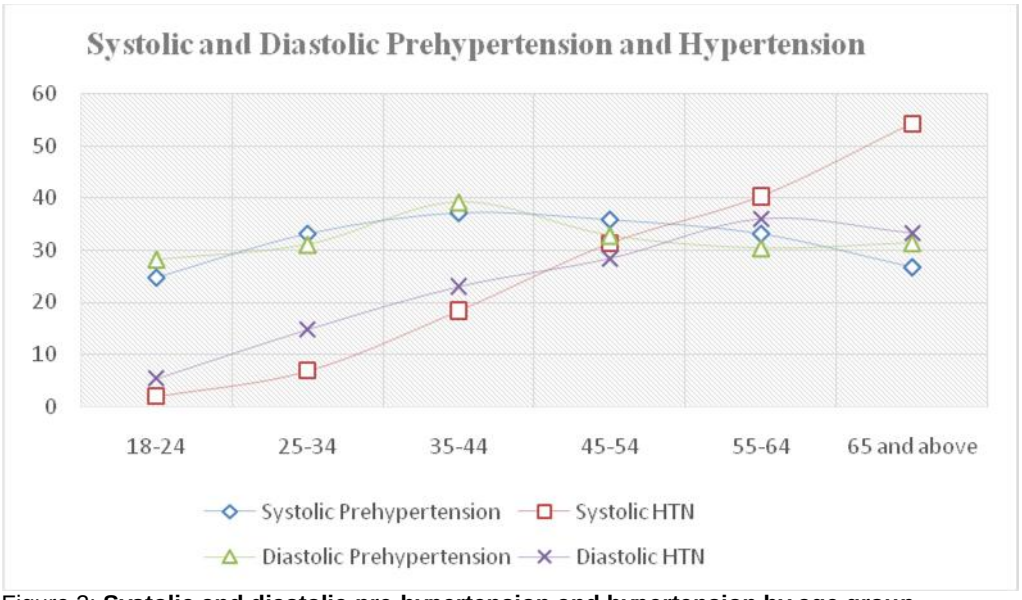

Figure 2: **Systolic and diastolic pre-hypertension and hypertension by age group**

As shown in figure 3, 16.9% of those with high blood pressure had stage 1 HTN, and 8.1 stage 2 HTN from which 2.1% had severe HTN. The linearly increasing pattern in prevalence with increase in age remained the same for both stage 1 and stage 2 hypertension and with severe hypertension.

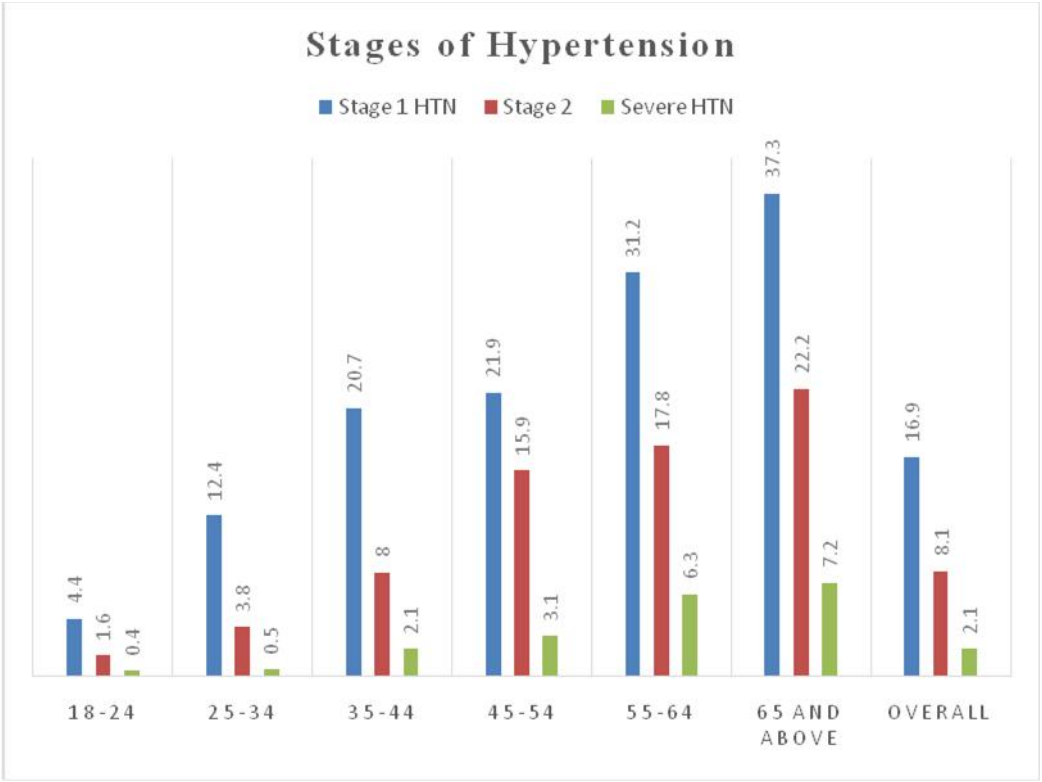

Figure 3: **Stages of hypertension by age group: the staging is based on JNC seven classification. NB. Severe HTN is a subset of stage 2 HTN.**

Discussion

Our study revealed that one in four adults aged 18 and above (30.2% in male, 21.2% in females) have hypertension in Addis Ababa where the population is young with a mean age of 36.9 years. Moreover, the prevalence of prehypertension in this population is 47.3%. This is a high prevalence and is a major public health problem in this population. Complications of hypertension with end organ damages and disabilities are expected to occur more frequently in this community particularly among those not aware of their high blood pressure (17).

These findings are comparable to two other community-based studies reported from Ethiopia that were conducted in Addis Ababa, which reported a 31.5% and 28.9% prevalence of hypertension among males and females, respectively (12) and from Gondar which reported a prevalence of 28.3% (13). The hypertension prevalence in this study is also comparable to that of Jordan (23.9%) (7), Kenya (21.4%), Tanzania (23.7%), Nigeria (21.4%) and a 29.3% prevalence report from the United States (8, 9).

The prevalence in this study is higher than other reports from southern Ethiopia (10.1%) and Vietnam (14.1%) (10, 11). This discrepancy could be because of the setting of the population which in our study is community living in urban setting with potentially higher risk because of less exercise and other life styles.

However, the prevalence of hypertension in our study is lower than other community-based studies that were conducted in Uganda, Eastern Nigeria, Namibia, Mozambique, Northern India and non-Hispanic blacks where the reported prevalence ranged from 30.5 to 44.5% (9, 18-22). The differences in genetic background and prevalence of obesity like in the case of Nigeria (13.3%) and other risk factors may explain these differences in prevalence.

The prevalence of hypertension in our study was significantly higher in men than women. It increased significantly with increasing age by a prevalence of about 10% each decade of life; 6.2% in those in 18-24 age group and 59% in 65 years and above. This is similar to other studies from Kenya, Tanzania, Namibia, Nigeria, Eritrea, Vietnam and Jordan (7, 9, 11, 19, 23). This can be explained by the increasing arterial stiffness with increasing age.

Nearly one-thirds of people with hypertension (8.1% of the study participants) had stage 2 HTN and 2.1% severe HTN, implying the increased risk of target organ damage

and existence of population that should have been on treatment but unaware of their BP. This is similar to reports on stage 2 HTN of 29.2% from Namibia and 43.3% from Nigeria (9).

The highest prevalence of hypertension was found in those sub cities (Lideta, Bole, and Kirkos) that are in the inner part of Addis Ababa while the lowest prevalence (Yeka, Akaki-Kality, and Kolfe-Keraniyo Sub Cities) was in the outer part of the city. This significant difference in prevalence of hypertension between the sub cities might indicate the difference in their living conditions and physical exercise habits.

The results from our study have important public-health and clinical implications for the prevention and treatment of hypertension and other related cardiovascular diseases in Ethiopia and other developing countries. The rapid transitions towards a more Western lifestyle that are happening in countries like Ethiopia and other LMIC is expected to contribute to further increase in the prevalence of hypertension in future (24). Moreover, it was identified that people of black African origin have a higher risk of target organ damage compared to Caucasians for a given blood pressure (25-27). The onset of CVD in developing countries was also found to occur at an earlier age compared to high income countries (28).

Description of burden of diseases in a population is essential for decision-making and prioritization in the planning process of health care. Few data exist on the prevalence of hypertension in Ethiopia and in the studies that had already been done, the sample size was relatively small. In our study the sample size was large and covered all sub cities in Addis Ababa.

Findings of this study indicate the need for population based awareness creation, regular hypertension screening programs and primary prevention of hypertension and other cardiovascular diseases in Ethiopia. Secondary measures in those with diagnosed hypertension need to be promoted in order to prevent potential associated complications.

Our study has potential limitations. First, this study is limited to few demographic and physical measurements and did not include behavioral and biochemical measurements. Second, the prevalence of hypertension found in our surveys might be an over-estimation as the blood pressure values were based on two measurements of blood pressure on one occasion. Some guidelines recommend measurements on two or more different occasions to make a diagnosis of hypertension (15). In addition, as this survey collected the BP measurements in institutions, people with raised BP are more likely to join the campaign. Reports from previous research revealed large regional differences in hypertension prevalence in SSA, depending on urbanization level and other environmental and possibly genetic factors (29-31).

The fact that this study covered a relatively larger sample size and covered all 10 Sub Cities of the capital city of the second populous country in Africa is a major strength. Our data, despite the limitations, thus provides evidence for the high prevalence of hypertension and prehypertension that requires proper measure and follow up with increasing urbanization in the country.

Limited access to health care, particularly in terms of affordability, and in some instances availability, of drugs and travel costs, are potential hurdles to hypertension treatment and CVD prevention in LMIC like Ethiopia. Lifestyle interventions like exercises, salt reduction and weight loss are cheap interventions that might be cost-saving. These interventions are stated to reduce BP by about 3–4 mmHg systolic and 2–3 mmHg diastolic (32, 33). Although essential as part of management, lifestyle interventions alone are not enough for adequate treatment and thus drug treatment will be necessary to achieve target goals. Hypertension, identified as the leading risk factor for mortality worldwide, and ranking third as a cause of disability-adjusted life-years, is an emerging epidemic in Ethiopia and other LMIC and thus needs to be contained through reinforcement of health care systems and public awareness creation. The Ethiopian Medical Association (EMA) currently is undertaking the public awareness creation activities. While this work has to be acknowledged, EMA also needs to enhance the effort being made to improve the detection and control of blood pressure.

Conclusion:

Findings of this study indicated high prevalence of hypertension and prehypertension among adult residents of Addis Ababa. The prevalence of hypertension was high in males and increased by about 10% per decade of life across the age groups. Prevalence of severe hypertension also increased with increasing age. Residents of the inner part of the city had significantly higher prevalence of hypertension than those living in outer part of the city. With the increasing urbanization of the country, this is an alarm for public awareness creation, regular community screening for hypertension, advocating preventive measures and placing proper management for those identified to have high blood pressure.

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