

Magnitude and associated factors of hypertension in Addis Ababa public health facilities, Ethiopia

Abstract

Background: According to WHO's world health report in 2008 13% of the global death attributed by raised blood pressure. The Objective of the study was to assess the prevalence and associated factors of hypertension in Addis Ababa public health facilities.

Methodology: Cross-sectional study design was used to assess the prevalence and associated risk factors of hypertension in Addis Ababa public health facilities. A total of 758 participants were selected by using simple random sampling. WHO STEPS wise approach to surveillance of NCDs risk factors was used to collect the data. The result was analyzed using SPSS program and descriptive summary using frequencies, proportions, graphs and cross tabs was used to present study results. Bivariate and multivariate logistic regression analyses were conducted to identify determinant factors.

Result: The overall prevalence of overweight was 47% with 36.7% and 10.8% of the participants were overweight and obese respectively. The prevalence of hypertension in the study area was also high, which affected 32.3% from the total participants. Sex, marital status, age, educational status, occupation, history of alcohol consumption, BMI and physical activity, lipid profiles had significant statistical association with hypertension.

Conclusion and recommendation: the prevalence of hypertension in the study area was high and the lifestyles and socio-demographic characteristics of the study participants were the risk factors associated with the development of hypertension and diabetes mellitus. Improving healthy lifestyles of the population should be strengthening to prevent hypertension.

Keywords: hypertension, associated factors, BMI, overweight, obesity

Volume 7 Issue 6 - 2018

Getabalew Endazenaw Bekele,¹ Trhas Tadesse,¹ Roman Negaw,¹ Taye Zewde²

¹Department of social and population health, Yekatit 12 Medical College, Ethiopia

²Department of biochemistry, Yekatit 12 Medical College, Ethiopia

Correspondence: Getabalew Endazenaw, Bekele, Yekatit 12 hospital medical college, Ethiopia, Tel +251-911570138, Email eyobgetabalew@gmail.com

Received: October 26, 2018 | **Published:** November 23, 2018

Introduction

World health organization reported that non communicable diseases are the leading causes of death globally. Mainly cardiovascular diseases, cancers, chronic respiratory diseases and diabetes represent a leading threat to human health and development. These four diseases are the world's biggest killers, causing an estimated 35 million deaths each year - 60% of all deaths globally-with 80% in low- and middle-income countries.¹ According to literature most people who live in urban are more affected by hypertension. These diseases are also more commonly affect the population who rarely eat fruit and vegetables than who frequently consume fruit and vegetables.² Hypertension and diabetes are higher in males than women and among individuals who have high BMI and waist circumference.³ According to the study done in England the prevalence of hypertension was 31% and 28% among males and females respectively with increasing prevalence by the age of the population in both sexes.⁴ A large-scale prevalence study of hypertension in the elderly population of the sub-Saharan Africa (SSA) reported prevalence of hypertension to be 69.9% of which 62.3% had not been previously diagnosed this report can clearly show the case to be a large problem in the elderly population.⁵ In some African countries like Cameroon Community-based multicentre cross-sectional study conducted by the year 2012 in major cities showed the overall prevalence of hypertension to be 47.5% which shows a higher prevalence like similar study done in Tunisia adolescents, prevalence of hypertension to be 35.1% [32.9-37.4] through a national cross-sectional study.⁶

Cross-Sectional Surveys in Rural and Urban Communities of four Sub-Saharan Africa countries (Nigeria, Kenya, Tanzania and Namibia) reported prevalence of hypertension ranging from 19.3% in rural Nigeria to 38% in urban Namibia.⁷ Hypertension is now a day becomes one of the common public health problems in Ethiopia. According to the different study conducted in Ethiopia the prevalence of hypertension increased as the age of the individuals increased. For example according study done in Dabat district and Gondor town the overall prevalence of hypertension was 27.9% with increased the odd of hypertension occurrence by 6% as the age of the participants increased by one year. In this study the prevalence of hypertension was higher (29.3%) in women than men (23.3%).⁸ Cross-sectional studies done among adults in Addis Ababa City showed the age-adjusted prevalence of high blood pressure or reported use of anti-hypertensive medication to be 31.5% among males and 28.9% among females. In this study, age and BMI were significantly associated with mean systolic blood pressure and diastolic blood pressure in males and females, while educational level was inversely associated with both blood pressures in males. Current daily smoking was associated with hypertensive, while level of total physical activity was inversely associated with SBP in males.⁹ A cross sectional survey conducted in Sidama Zone showed the prevalence of hypertension to be 9.9%. Being over 30 years, having a family history of hypertension, BMI ≥ 25 kg/m² and excess meat consumption where found to be significantly associated with hypertension whereas tea drinking was found as a protective factor for hypertension.¹⁰ The overall prevalence of hypertension was found to be 28.3% in a community based cross

sectional study conducted among adults in Gondar city. It was also found out that Participants who had self-reported diabetes were about four times more likely to be hypertensive. Those who did not walk at least for 10 minutes continuously on daily basis were about three times more likely to be hypertensive. Compared to those having normal BMI obese were significantly associated with hypertension.¹¹ A community based study in the same region with this study showed the prevalence of hypertension to be 22.4%. The study reported 40% of those hypertensive patients in the study were newly screened.¹²

Methods and materials

Study area and period-This study was conducted in Addis Ababa city Administration from March to September 2016 by using structured interviewed questionnaire. Addis Ababa city administration is one the city administration in Federal Democratic Republic of Ethiopia. The total population of the city according to the census 2007 projection is 3.65 million, of which, 1.89 million is females and 1.76 million is male. Administrational the city is divided into 10 sub-cities and 99 kebeles. The city administration has 6 hospitals and 103 health centers which give health services for the population. Study design -facility based cross-sectional study design was used to collect the data. Source population is all individuals lived in Addis Ababa city administrations that are above 18 years age and used health services in public health facilities in Addis Ababa as outpatient. Study population is all individuals used health services in selected public health facilities in Addis Ababa as outpatient and above 18 years of age.

Sample size determination

Minimum sample size was determined by using single population proportion sample size calculation formula with the assumption of 37.7% of raised blood pressure in Addis Ababa,¹³ a 95% confidence level ($Z_{\alpha/2}$), a 5% margin of error (d), multiple by the design effect of 2 and add 10% non-response rate. The total sample size was 758 persons.

Sampling technique and procedure

Multistage sampling technique was used. First from 10 sub-cities 3 sub-cities are selected randomly by using lottery method (Arada, Yeka and Kirkos). Secondly from each selected sub-cities 30% of the hospitals (one hospital) and health centers (10 health centers) are selected randomly to get more representative participants. The required sample size was calculated and allocated to each health facilities equally. Finally to select the individual participant simple random sampling technique was used based on the card number.

Data collection

A structured pretested questionnaire which was derived from WHO STEPS wise approach to surveillance of NCDs risk factors was used to interview the participants. The questionnaire was divided in to two part: Part I about information on socio demographic variables of participants such as; age, sex, marital status, family history of any of the NCDs, educational level, monthly income, employment status, nature of work, work environment, area of residence and type of family. Part II about information on individual's behavioral variables. Data collection moves along a sequential three-step process as follows:

i. Step 1: Interview-based questionnaire on selected major health risk behaviors including smoking, alcohol consumption, poor fruit and vegetable consumption, and physical inactivity.

ii. Step 2: Physiological measures of health risks such as height, weight, blood pressure, body mass and waist girth circumference.

The height of the participants was measured in standing erect position using standometer with 0.1cm resolution. The weight of the participants was measured using beam balance with barefoot and wearing light clothes with 0.1kg resolution. The waist circumference was measured using measuring tape of 0.1cm resolution from midpoint between the last rib and iliac crest. Blood pressure of the participants was measured using sphygmamometer after 10 minutes rest on their left hand at sitting position and for those whose blood pressure is high second measurement was taken after 10 minutes additional rest.

iii. Step 3: Biochemical measures of health risks including blood lipids. Blood sample was taken after 8-12 hours fasting to measure lipid profile (total cholesterol, triglyceride, high density lipoprotein cholesterol (HDL-C))

Data quality management

The quality of data was ensured through using structured questionnaire first developed in English then translated into Amharic version, proper training of data collectors and pre testing of the questionnaire on 5% of the sample size (39 people) in health facilities which is not selected to conduct the main study and the result of the pretest was discussed & some corrections and changes was made if necessary. As well close supervision of data collectors. All the instruments which were used in measurement and sample collection was checked for their functionality before the actual data collection every day based.

Data processing and analysis

First the data was checked for completeness and consistency. Then it was coded and entered in the computer using SPSS version 23 software for analysis; descriptive summary using frequencies, proportions, graphs and cross tabs was used to present study results. P-value less than 0.05 was consider as statistically significant. A bivariate and multivariate logistic regression analysis was conducted to identify determinant factors.

Ethical consideration

Ethical clearance was obtained from Yekatit 12 hospital medical college and Addis Ababa Health Bureau IRB as well a formal letter was prepared and submitted to the selected health facilities to get their permission. Verbal consent was obtained from each selected participant to confirm willingness. Honest explanation of the survey purpose, description of the benefits and an offer to answer all inquiries was made to the respondents. Also affirmation that they are free to withdraw consent and to discontinue participation without any form of prejudice was made. Privacy and confidentiality of collected information was ensured throughout the process.

Results

This research involved 758 individuals that make the response rate 100%. The majority (58.3%) of the participants were female. More than half (57.3%) of the participants were married and 26.1% of them were single in marital status. Regarding the age of the participants ranges from 19 to 96 years of old with the mean age of 43 ± 14 SD. The distribution of age of the participants was 10.4%, 19.1%, 22.0% and 17.2% in the group of 19-25 years, 33-39years, 40-46 years and 54-60 years of age respectively. More than 35% of the participant's

educational status was vocational/college/university while 15.3% of the participants were illiterate. Among the total participants 27.4% of the participants were government employed, 29.7% private workers, 34.7% were unemployed (Table 1). Among the total participants, 5.9% of the participants were smokers and 10.9% and 24.3% participants had exposed to smokers in their home and working area respectively. Regarding alcohol consumption history of the study participants, 33.6% of the study participants were current drinkers. Among those

who drank alcohol 18.8% of the participants were drank alcohol 5-7 days per week whereas 20.1% of them drank less than once per month. The majorities (49%) of the participants were drank 1-3 standards of alcohol and 6.7% of them drank more than 5 standards of alcohol within single occasion. The large amount consumed by the participants in single occasion, among those who drank alcohol 61.6% of them were drank 5-10 standards of alcohol and 4.7% of the participants were drank more than 10 standards of alcohol (Table 2).

Table 1 The distribution of socio-demographic characteristics of the participant in Addis Ababa December, 2016. N=758

Variables	Frequency	Percent
Sex		
Male	316	41.7
Female	442	58.3
Age in years		
19-25	79	10.4
26-32	87	11.5
33-39	145	19.1
40-46	167	22
47-53	130	17.2
54-60	65	8.6
>60	85	11.2
Marital status		
Single	198	26.1
Married	434	57.3
Widowed	87	11.5
Divorced	39	5.1
Educational status		
Illiterate	116	15.3
Primary	163	21.5
Secondary	211	27.8
Vocational/College/University	268	35.4
Occupation		
Governmental employee	208	27.4
NGO employee	44	5.8
Private	225	29.7
Unemployed	263	34.7
Daily labor	18	2.4

Table 2 Lifestyle patterns of the study participants in Addis Ababa, December 2016

Variables	Frequency	Percent
History of smoking		
Yes	45	5.9
No	713	94.1
Exposure to smoking in the home		
Yes	83	10.9
No	675	89.1
Exposure to smoking outside the home		
Yes	184	24.3
No	574	75.7
Alcohol drinking experience		
Yes	255	33.6
No	503	66.4
Frequency of alcohol drinking		
5-7days/week	48	18.8
1-4 days/week	73	28.6
1-3 days/month	83	32.5
Less than once/month	51	20.1
Amount of alcohol consumed at single occasions		
1-3 standard of alcohol	125	49
4-5 standard of alcohol	113	44.3
>5 standard of alcohol	17	6.7
Larger amount of alcohol consumed at single occasions		
1-4 standard of alcohol	86	33.7
5-10 standard of alcohol	157	61.6
>10 standard of alcohol	12	4.7
Vagarious physical activity		
Yes	145	19.1
No	613	80.9
Average hours spent for Vagarious physical activity per week		
1-3 hours	26	17.9
4-6 hours	67	46.2
7 or more hours	52	35.9
Moderate physical activity		
Yes	450	59.4
No	308	40.6
Average hours spent for moderate physical activity per week		
1-3 hours	103	22.9
4-6 hours	209	46.4
7 or more hours	138	30.7

Regarding the physical activity habit, the majorities of the participants were participated in vagarious and moderate physical activity. Among the total participants 19.1% and 59.4% were involved in vagarious and moderate physical activity respectively. Among those involved in vagarious physical activity, 46.2% of them spent 4-6 hours per week to perform vagarious physical and 46.4% of the participants also spent similar hours to perform moderate physical activity (Table 2). The prevalence of overweight and obesity was high. The overall prevalence of overweight was 47% with 36.7% and 10.8% of the participants were overweight and obese respectively (Table 4). Among the total female participants, 37.6% of them had waist circumference greater or equal to 80cm or abdominal obesity. From male participants 28.8% the participants had waist circumference greater or equal to 80cm or abdominal obesity (Fig 1). Remarkable proportion of the participants had abnormal lipid profile. Among the total study participants, 41.8% of them had total plasma cholesterol greater or equal to 200mg/dl. Similarly 41.2% and 33.9% of the participants had plasma triglyceride level greater or equal to 130mg/dl and plasma HDL-C less than 40mg/dl respectively (Table 3). The prevalence of hypertension in the study area was also high, which affected 32.3% from the total participants. The prevalence of hypertension was slightly higher in female participants than male participants (Table 4). To identify associated factors with hypertension bivariate and multivariate analysis was done. Based on the findings of bivariate analysis sex, marital status, age, educational status, occupation, history of alcohol consumption, high FBG level, BMI and physical activity had significant statistical association with hypertension. Female participants were 27% less risk to develop hypertension. The prevalence of hypertension increase with the age of the study participants, the participants in the age group of 26-32 years and 33-39 years of age were 6.16 times and 12.25 times more likely at risk to develop hypertension when compared to participants in the age group of 19-15 years of age respectively. Participants who had vocational/ college/university educational status was 53% less likely to develop hypertension when compared to illiterate participants. Unemployed participants were 1.91 times more likely develop hypertension when compared with governmental employed. Those who had alcohol drinking experience were 1.98 times more likely affected by hypertension when compared to their counterparts. Overweight and obese participants were 3.48 and 3.99 times more likely develop hypertension when compared to participants who had normal BMI (Table 5).

Table 3 The pattern of BMI and lipid profile of the study participants in Addis Ababa, December 2016

Variables	Frequency	Percent
BMI		
≤ 24.9	402	53
25-29.9	274	36.2
≥ 30	82	10.8
Total cholesterol		
<200mg/dl	441	58.2
≥200mg/dl	317	41.8
Triglyceride		
<130mg/dl	446	58.8

Table continued...

Variables	Frequency	Percent
≥130mg/dl	312	41.2
HDL		
<40	257	33.9
≥40	501	66.1

Table 4 Distribution hypertension by sex of the study participants in Addis Ababa, December 2016

Hypertension	Sex		Total No (%)
	Male No (%)	Female No (%)	
Yes	115 (15.2)	130(17.2)	245(32.4)
No	201 (26.5)	312 (41.2)	513 (67.6)
Total	316 (41.7)	442(58.3)	758 (100)

Table 5 Factors associated with hypertension among study participants in Addis Ababa, December 2016

Variables	Hypertension		COR (95% CI)	AOR (95% CI)
	Yes	No		
Sex	No (%)	No (%)		
Male	115(15.2)	201(26.5)	1	1
Female	130 (17.2)	312 (41.2)	0.73(0.536,0.990)*	0.61(0.400,0.930)*
Marital status				
Single	33(4.4)	165(21.8)	1	1
Married	156 (20.6)	278 (36.7)	2.81(1.84,4.279)*	1.48(0.854,2.569)
Widowed	43(5.7)	44(5.8)	2.5(1.165,5.364)*	1.25(0.508,3.095)
Divorce	13 (1.7)	26 (3.4)	4.89(2.784,8.575)*	1.73(0.781,3.820)
Age in year				
19-25	2(0.3)	77(10.2)	1	1
26-32	12(1.6)	75(9.9)	6.16(1.333,28.458)*	5.38(1.138,25.466)*
33-39	35(4.6)	110(14.5)	12.25(2.86,52.454)*	8.28(1.845,37.169)*
40-46	67(8.8)	100(13.2)	25.80(6.127,108.6)*	14.56(3.227,65.73)*
47-53	53(7.0)	77(10.2)	26.5(6.237,112.6)*	14.37(3.151,65.61)*
54-60	28(3.7)	37(4.9)	29.14(6.58,128.91)*	12.16(2.45,60.24)*
>60	48(6.3)	37(4.49)	49.95(11.51,216.75)*	29.39(6.072,142.24)*
Education status				
Illiterate	50(6.6)	66(8.7)	1	1
Primary	56(7.4)	107(14.1)	0.69(0.432,1.127)	1.04(0.579,1.878)
Secondary	69(9.1)	142(18.7)	0.641(0.402,1.023)	0.98(0.535,1.814)
Vocational/College/University	70(9.2)	198(26.1)	0.47(0.295,0.737)*	0.91(0.482,1.705)
Occupation				
Governmental employee	53(7.3)	155(20.4)	1	1
NGO Employee	16(2.1)	28(3.7)	1.67(0.839,3.328)	0.98(0.442,2.185)
Private	68(9.0)	157(20.7)	1.267(0.830,1.932)	0.98(0.595,1.617)
Daily labor	4(0.5)	14(1.8)	0.84(0.263,2.65)	0.66(0.168,2.612)
Unemployed	104(13.7)	159(21.0)	1.91(1.285,2.848)*	1.17(0.677,2.005)
Alcohol drinking				
No	231(30.5)	482(63.6)	1	1
Yes	31(4.1)	14 (1.8)	1.98(1.135,3.454)*	1.21(0.558,2.619)
HDL level				

Table continued...

Variables	Hypertension		COR (95% CI)	AOR (95% CI)
<40mg/dl	80 (10.6)	177(23.4)	1	1
≥40mg/dl	165 (21.8)	336 (44.3)	1.07(0.786,1.501)	1.41(0.937,2.118)
Triglyceride level				
<150mg/dl	92 (12.1)	220 (29.0)	1	1
≥150mg/dl	153 (20.2)	293 (38.3)	1.25(0.914,1.706)	1.02(0.690,1.508)
Total cholesterol				
≥200mg/dl	96 (12.7)	221 (29.2)	1	1
<200mg/dl	149(19.7)	292(38.5)	0.85(0.624,1.161)	0.43(0.284,0.647)*
FBG level				
<126mg/dl	196(25.9)	450(59.4)	1	1
≥126mg/dl	49(6.9)	63(8.3)	1.79(1.186,2.689)*	1.45(0.882,2.383)
BMI				
Normal	79(10.4)	323(42.6)	1	1
overweight	126(16.6)	148(19.5)	3.48(2.473,4.90)*	3.11(2.096,4.622)*
Obesity	40(5.3)	42(5.5)	3.99(2.419,6.578)*	4.08(2.319,7.181)*
Vagarious physical activity				
Yes	35(4.6)	110(14.5)	1	1
No	210(27.7)	403(53.2)	1.64(1.081,2.481)*	1.52(0.926,2.510)
Moderate physical activity				
Yes	149(19.7)	301(39.7)	1	1
No	96(12.7)	212(28.0)	0.92(0.67,1.248)	0.79(0.549,1.126)

N.B.* means P-value less than 0.05

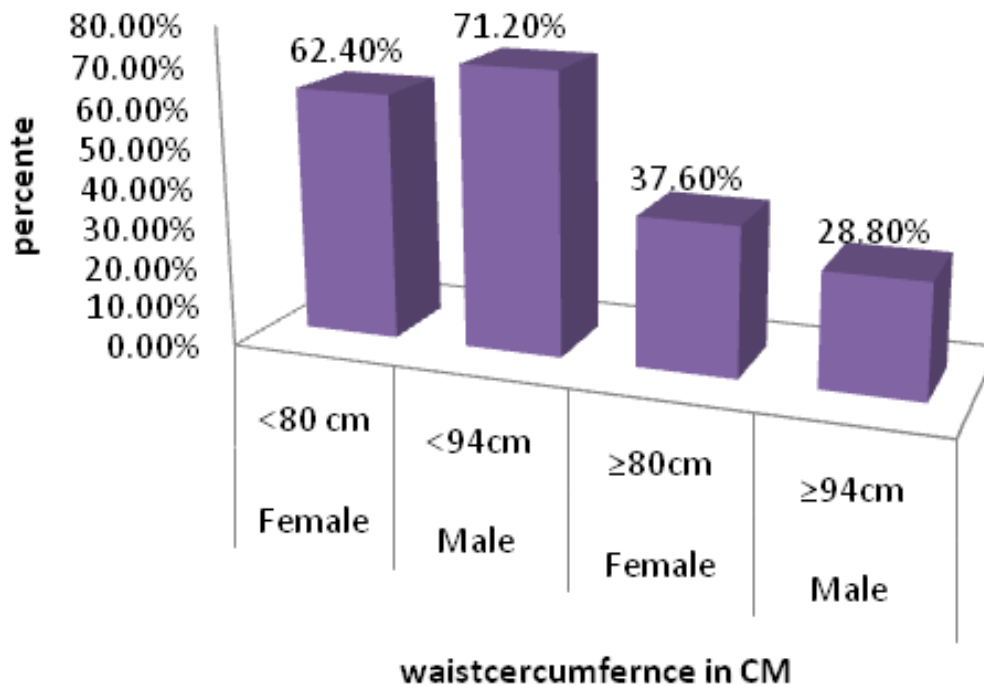


Figure 1 The pattern of waist circumference among the participants in Addis Ababa December 2016.

Discussion

This research was used to determine the prevalence and associated factors of hypertension in public health facilities in Addis Ababa city administration. More than 33% of the study participants were current drinkers and 18.8% of them were frequent drinkers. Even if the prevalence of drinking in this study was lower than the study finding done in Bishoftu it contribute a significant contribution for the occurrence of hypertension.¹⁴ In this study more than 78% of the participants had habit of physical activity (either vigorous or moderate physical activity). This finding was comparably with study done in Bisheftu in which 78.3% of the participants were physically active.¹⁴ On the hand the proportion of individuals who had physical activity habit was higher in this study when compared to previously done study in Debrebrehan referral hospital.¹⁵ The overall prevalence of overweight was 47% with 36.7% overweight and 10.8% obesity. This finding indicated overweight was the common public health problem of the society in the study area. The prevalence of overweight and obesity in this study was found higher when compared with the prevalence of overweight (10%) and obesity (5.3%) in the study done in Hosanna town.¹⁶ The overall prevalence of hypertension in this study was 32.3%. The finding of this study was higher than the findings of previously done researches in different parts of Ethiopia. For example in Dabat district and Gondor town and Sidama zone the prevalence of hypertension was 27.9% and 9.9% respectively.^{8–12} According to the finding of study done in Hosanna town 30% of the study participants were hypertensive.¹⁶ The reason for this discrepancy may be due to the variation and change in lifestyle of the population as result of study site difference and advancement of technology. In this study the prevalence of hypertension was slightly higher in women than men. This finding was comparable with the finding of study done in Dabat district and Gondor town but in contrast with the finding of study done in Addis Ababa.^{8,9}

Conclusion

The prevalence of hypertension was higher in the study area. The overall prevalence of hypertension was 32.3% and 14.8% respectively. Age of the participants, alcohol consumption habit, BMI, physical activity habit of the participants, history of smoking, lipid profile of the participants were some of the factors which had statistical significant association with hypertension. The responsible body should provide health education on lifestyles and it is good to conduct analytical research to investigate why hypertension become common in this area.

Acknowledgments

We would like to express our sincere gratitude to Yekatit 12 hospital medical college to give us this prodigious chance to develop the proposal. Our special thanks also go to Addis Ababa city health office for their cooperation and assistance by giving relevant information. At last but not least we want to give our deepest gratitude for all friends who are helping us through proposal development.

Conflicts of interest

Authors declare that there is no conflicts of interest.

References

1. WHO. 2008-2013 Action Plan for the Global Strategy for the Prevention and Control of Non-communicable diseases. Geneva, Switzerland; 2008.
2. Okoduwa SI, Umar IA, Ibrahim S, et al. Socio-Economic Status of Patients with Type 2 Diabetes and Hypertension Attending the Ahmadu Bello University Teaching. *Global Journal of Health Science*. 2014;7(1):280–287.
3. Na L, Wu X, Feng R, et al. The Harbin Cohort Study on Diet, Nutrition and Chronic Non-Communicable Diseases: Study Design and Baseline Characteristics. *PLoS ONE*. 2015;10(4):e0122598.
4. Craig Knott, Jennifer, Mindell. Hypertension. The Health and Social Care Information Center; 2012.
5. Dewhurst M, Dewhurst F, Gray W, et al. The high prevalence of hypertension in rural-dwelling Tanzanian older adults and the disparity between detection, treatment and control: a rule of sixths? *Journal of Human Hypertension*. 2013;27:374–380.
6. Aounallah-Skhiri H, El Ati J, Traissac P, et al. Blood pressure and associated factors in a North African adolescent population. a national cross-sectional study in Tunisia. *Bio Med Center public health*. 2012;12:98.
7. Hendriks ME, Wit FWNM, Roos MTL, et al. Hypertension in Sub-Saharan Africa: Cross-Sectional Surveys in Four Rural and Urban Communities. *PLoS One*. 2012;7(3):e32638.
8. Abebe SM, Berhane Y, Worku A, et al. Prevalence and Associated Factors of Hypertension: A Cross-sectional Community Based Study in Northwest Ethiopia. *PLoS ONE*. 2015;10(4):e0125210.
9. Tesfaye, F, Byass P, Wall S. Population based prevalence of high blood pressure among adults in Addis Ababa: uncovering a silent epidemic. *Bio Med Center*. 2009;9(39).
10. Giday A, Tadesse B. Prevalence and determinants of hypertension in rural and urban areas of southern Ethiopia. *Ethiop Med J*. 2011;49(2):139–147.
11. Awoke A, Awoke T, Alemu S, et al. Prevalence and associated factors of hypertension among adults in Gondar, Northwest Ethiopia: a community based cross-sectional study. *Bio Med Center Cardiovascular Disorders*. 2012;12(113).
12. Paulose T, Assefa Y, Awoke A. Prevalence and Associated Factors of Hypertension among Adults in Durame Town, Southern Ethiopia. *PLoS One*. 2014;9(11).
13. Gunchiye Brehanu, Enqueselasia Fikre. Prevalence and associated factors among workers of steel factories Akaki Kalitiy Addis Ababa. 2014.
14. Megerssa, Mistire Wolde Gebre, Samuel Kinde Birru, et al. The prevalence of undiagnosed diabetes mellitus and its risk factors in selected institutions at Bishoftu town East Shoa, Ethiopia. *Journal of diabetes and metabolism*. 2013.
15. Habtoweld TD, Tsega WD, Wale BY. Diabetes mellitus in outpatients in Debrebrehan referral hospital in Ethiopia. *Journal of diabetes research*. 2016.
16. Likawunt SA, Samuel YA, Fiseha LG. Hypertension and its associated factors in Hosanna town, Southern Ethiopia: community based cross-sectional study. *BMC Res Notes*. 2018;11:306.