The hidden magnitude of raised blood pressure and elevated blood glucose in Ethiopia: A call for initiating community based NCDs risk factors screening program

Abebe Bekele[1], Terefe Gelibo[1], Kassahun Amenu[1], Theodros Getachew[1], Atkure Defar[1], Habtamu Teklie[1], Tefera Taddele[1], Girum Taye[1], Misrak Getnet[1], Geremew Gonfa[1], Alemayehu Bekele[3], Tedla Kebede[2], Yeweyenhareg Feleke[2], Dejuma Yadeta[2], Mussie G/Michael[4], Mulugeta Guta[1], Fassil Shiferaw[5], Feyissa Challa[1], Yabetse Girma[1], Kissi Mudie[1], Yewondwossen Tadesse[2], Yibeltal Assefa[1], Amha Kebede[1], Kebede Worku[4].

Abstract

Introduction: The burden of raised blood pressure and elevated blood glucose in sub-Saharan Africa has been increasing over the last couple of decades. However, a large proportion of the population with raised blood pressure and elevated blood glucose remain undiagnosed contributing to the increasing burden of the problem. There is paucity of published studies describing the burden of major NCDs in sub –Saharan Africa. Likewise, except very few studies in some pocket areas, there was no representative NCD risk factor survey undertaken in Ethiopia. This paper focuses on the data extracted from the survey on the prevalence of selected NCDs to elaborate more on the issues and to show the invisible magnitude of the two major health problems for policy and program development.

Methods: A cross sectional study was conducted in Ethiopia using the WHO step-wise approach to the surveillance of NCD risk factors. The survey was carried out between April and June 2015. The data collection processes included three steps. Step 1: This step comprised of a questionnaire to gather demographic and behavioural characteristics of the study population; Step 2: Physical measurement was done to build on the core data in Step 1 and to determine proportion of the study population with raised blood pressure, overweight and obesity; and Step 3: Biochemical measurements were undertaken to build on the core data in step 1 and step 2 to measure proportion of the study population with diabetes, raised blood glucose and abnormal lipid level. Data were collected digitally using personal digital assistants (PDAs) from which data were transferred to central server using internet file streaming system (IFSS). Data were cleaned and analysed using a combination of softwares namely, SPSS, Stata and Epi Info version 3.5.4.

Results: The survey included 9,788 study participants and of this, 77% had never been measured for blood pressure prior to current survey. However, based on the measurements made during the present survey among all respondents who were not taking medication for raised blood pressure, 15.6% (95% CI: 14.4-16.9) had raised blood pressure level (SBP of ≥140 mmHg and/or a DBP of ≥90 mmHg). Likewise, among all respondents, 97 % had never been tested for blood sugar level prior to present survey. However, the current study revealed a total of 5.7 % of the study population had a blood glucose level of ≥ 110 mg/dl, with 6% (95% CI: 4.7-7.2) in men, and 5.8 %(95% CI: 4.6-7.0) in women.

Conclusions: The prevalence of undiagnosed raised blood pressure and elevated blood sugar was high in Ethiopia and only very small percentage of people had been aware of their high blood pressure and elevated blood sugar. Policy makers in the health sector including other health development partners need to strengthen health system and design nation-wide population based strategy to establish community based screening program for blood pressure and blood glucose. [*Ethiop. J. Health Dev.* 2017;31(Special Issue):362-369]

Key words: Hidden magnitude, history, blood pressure, blood glucose, NCDs.

Background

In countries across the world, regardless of geographic location, size of population or stages of social and economic development, non-communicable diseases (NCDs) are responsible for high proportion of death and disability. As the leading cause of death globally, NCDs particularly cardiovascular diseases (CVDs), diabetes, chronic respiratory diseases and cancer were responsible for 38 million (68%) of the World's 56 million deaths in 2012. Almost three quarters of all NCD deaths (28 million), and the majority of premature deaths (82%) occur in low-and middle-income countries(1).In many low–income countries it is estimated to exceed as the most common causes of death by 2030 (2). Diabetes mellitus and hypertension

are among the commonest non-communicable diseases in both developed and developing countries(3).The burden of raised blood pressure and elevated blood glucose in sub-Saharan Africa have been increasing over the last couple of decades. However, a large proportion of the population with raised blood pressure and elevated blood glucose remain undiagnosed, contributing to the increasing burden of the problem. Epidemiologic studies indicate that non-communicable diseases are emerging as a major disease burden in Africa and hence continue to be a challenge with a double burden of disease from pre-existing communicable diseases and the emerging NCD epidemic (8, 9). Hypertension, also known as high or raised blood pressure, is a global public health issue. It

[1]Ethiopian Public Health Institute, Addis Ababa, Ethiopia, contact person E-mail: Address: abebe1277belay@gmail.com;
[2]Addis Ababa University, Addis Ababa, Ethiopia;
[3]Ethiopian Public Health Association, Addis Ababa, Ethiopia;
[4]Federal Ministry of Health, Addis Ababa, Ethiopia;
[5]World Health Organization, Addis Ababa, Ethiopia

contributes to the burden of heart disease, stroke and kidney failure and premature mortality and disability. It disproportionately affects populations in low- and middle-income countries where health systems are weak. WHO estimates that globally cardiovascular disease accounts for approximately 17 million deaths a year, nearly one third of the total (13) .Of these, complications of hypertension account for 9.4 million deaths worldwide every year (4). Hypertension is responsible for at least 45% of deaths due to heart disease and 51% of deaths due to stroke (13).There are significant health and economic gains attached to early detection, adequate treatment and good control of hypertension. Treating the complications of hypertension entails costly interventions such as cardiac bypass surgery, carotid artery surgery and dialysis which drains individual and government budget. Addressing behavioural risk factors, e.g. unhealthy diet, harmful use of alcohol and physical inactivity, can prevent hypertension. Tobacco use increases the risk of complications of hypertension. If no action is taken to reduce exposure to these factors, cardiovascular disease incidence, including hypertension, will increase. Prevention and control of hypertension is complex, and demands multi-stakeholder collaboration, including governments, civil society, academia and the food and beverage industry. In view of the enormous public health benefits of blood pressure control, now is the time for concerted action (13).

Hyperglycaemia, or elevated blood sugar, is a common effect of uncontrolled diabetes and over time leads to serious damage to many of the body's systems, especially the nerves and blood vessels (14). While blood glucose level is an important prognostic parameter, it is the central or most important feature determining prognosis in people with hyperglycaemia in terms of screening asymptomatic people, to decrease the burden and gain medical, social and economic benefits accordingly. Early diagnosis and treatment of diabetes is the major determinant in preventing premature mortality as well as delaying or preventing long term diabetic complications leading to a more healthy life. The longer a person lives with undiagnosed and untreated diabetes, the worse their health conditions are likely to be. Easily accessible basic diagnostics, such as blood pressure and glucose testing/measurement, and referral system should therefore be available in primary health-care settings (15). For those who are diagnosed with diabetes, a series of cost-effective interventions can improve their outcomes, regardless of what type of diabetes they may have. These interventions include blood glucose control, through a combination of diet, physical activity and, if necessary, medication; control of blood pressure and lipids to reduce cardiovascular risk and other complications, and regular screening for chronic complications such as damage to the eyes, kidneys and feet, in order to facilitate early detection and treatment (15).

Except very few studies in some pocket areas and national estimations like GBD, there is no national representative quantitative information on the burden of chronic diseases or their risk factors in Ethiopia. Furthermore, the existing health management information system (HMIS) fails to capture complete information. In one of the administrative zones of Ethiopia, a population-based cross-sectional STEPS survey was conducted in 2009 at Gilgel Gibe, one of the Ethiopian demographic and surveillance sites. In this study, a random sample of 4,469 individuals' age 15-64 years were studied and overall prevalence of NCDs was 8.9%. Prevalence of 3.1% for diabetes, 9.3% for hypertension, 3.0% for cardiovascular diseases (11). Despite the limitations in the health management information system (HMIS) of Ethiopia, non-communicable diseases such as hypertension and diabetes mellitus appear on the list of leading causes of morbidity and mortality in the hospitals and regional health bureaus across the country(12). In response to the above challenges, several efforts were exerted by the Ethiopian government to tackle the problem of NCDs. FMOH is responding with measures that lessen the risk factors that are associated with NCDs. In accordance with the 2011 UN political declaration on NCDs, the FMOH has developed and launched the National NCD Prevention and Control Strategic Plan. The government of the Federal Democratic Republic of Ethiopia has endorsed the WHO Framework Convention on Tobacco Control, following which the Food, Medicine and Health care Administration and Control Authority developed directives for implementation of the convention. Data on prevalence of NCD risk factor will inform policy makers to design evidence-based public health interventions to prevent and control the epidemics of NCDs. In the present study the investigators have used data extracted from NCD STEPS survey to produce this particular article. The main purpose of this investigation is to disclose the invisible magnitude of raised blood pressure and elevated blood glucose in Ethiopia. Existing evidences inform us that the epidemic can be reduced by preventing and controlling the four behavioural risk factors for NCDs: tobacco use, insufficient physical activity, harmful use of alcohol, and consumption of unhealthy diet. According to EDHS 2011, some of behavioural risk factors (tobacco use, alcohol consumption, and khat chewing) were considered (10).

Methods
Study setting: The survey was conducted in the 9 regions and two city administrations (Addis Ababa and Dire Dawa) in Ethiopia. Each region is divided into administrative zones and the two city administrations are divided into sub-cities. The administrative zones in the nine regions and sub-cities in the two city administrations are subdivided into districts or (*Woreda*). The districts (*Woredas*) are also further divided into *Kebele*. The *Kebeles* are the smallest administrative units with clear geographic delineation in Ethiopia. Within *Kebeles*, there are Enumeration Areas (EAs) which are delineated by the Central Statistical Agency (CSA) of Ethiopia. According to the 2007 population and housing census, there were a total of 15,837 *Kebeles* in Ethiopia i.e. 14,364 rural and 1,473 urban *kebeles*. A single population-proportion

formula was used to determine the sample size. To adjust for the design effect, a complex sampling design effect coefficient of 1.5 was used to compute the sample size. In the present study, a mix of sampling approach: stratified, three-stage cluster sampling, simple random sampling and Kish method were employed to select the study areas and the study participants. Twenty households were selected from each EA using systematic sampling. Eligible individuals were selected from each household using Kish method. A total of 10,260 study participants were sampled to be included in the study. The study was actually conducted in 513 selected enumeration areas from mid-April to end-June 2015.

Study population: The target population for this survey included all men and women age 15-69 years old who consider Ethiopia to be their primary place of residence who are living at their place of residence for at least six months.   This definition included those individuals residing in Ethiopia regardless of their citizenship status.   Individuals who were not a permanent resident of Ethiopia, those who were institutionalized-including people residing in hospitals, prisons, nursing homes, and other similar institutions or residents whose primary residences are military camps or dormitories, critically ill, and mentally disabled were excluded from this study.

Data collection procedures: The data collection processes included three steps. Step 1:This step comprised of a questionnaire to gather demographic and behavioural characteristics of the study population; Step 2: Physical measurements were done to build on the core data of step 1 and to determine proportion of the study population with raised blood pressure, overweight and obesity; and Step 3: Biochemical measurements were undertaken to build on the core data in step 1 and step 2 to measure proportion of the study population with diabetes, raised blood glucose and abnormal lipid level.

Blood pressure and heart rate measurements were taken three times on the right arm of the survey participants in a sitting position, using a Boso-Medicus Uno instrument (Boso is the Bosch + Sohn GmbH & Co. KG, Germany) with a universal cuff and automatic blood pressure and heart rate monitor. The mean of three measurements was taken for analysis. The measurements were taken after the participant had rested for 15 minutes, and each measurement was done with three minutes interval (maximum deviation of cuff pressure measurement $\pm$ 3 mmHg, and of pulse rate display $\pm$ 5%). Regarding blood test, Cardio Check PA analyser (manufactured by BHR Pharmaceuticals Ltd) was used to test fasting blood glucose, and the next day after STEPS 1 and 2 of the data collection, concentrations of glucose were measured in capillary blood on a fasting blood sample.

Data analysis: Descriptive weighted analysis was done along with bivariate and multivariate analysis. Further statistical analyses were done by using chi-squared tests and logistic regression models. Chi-squared tests were used when comparing groups. All factors with a p-value <0.05 in the bivariate analysis were further entered into the multivariate model to control for confounding effects. Odds ratios (OR) with 95% confidence intervals (CI) were calculated. Statistical significance was accepted at the 5% level (p<0.05). To identify the association of raised blood pressure and elevated blood glucose with socio demographic characteristics, bivariate and multivariate logistic regression analysis was conducted. After performing bivariate analysis, based on the significance levels and categories of risk factors (modifiable and non-modifiable risk factors) of each independent variable multivariate analysis was conducted.

Ethical considerations: Ethical clearance was obtained first from the EPHI Institutional review board (IRB) then from national research and ethics review committee. Data were collected unlinked anonymously, without any personal identifiers. For the purpose of data collection, informed consent was obtained from the study participants before administering the questions/collecting blood sample, and objective of the study was explained to the study participants. For participants under 18 years of age, assent and consent from their parents or guardians was obtained. Individuals with abnormal physical and biochemical results were referred to the near-by health facilities for further investigation, diagnosis and follow up.

Results
Characteristics of survey participants: Table 1 shows a total of 9,800 respondents, age 15-69 years were involved in the survey and the response rate was 95.5%. Of the total 9,800 respondents of STEPS survey, about six in ten were women. Nearly three fourth 7,113 (73%) of the respondents were from rural area. High proportion of the respondents (40%) were within the age group of 15 – 29 followed by age group of 30-44 years.

Experience of blood pressure measurement and magnitude of hidden raised blood pressure: Table 2 shows 77% of study participants had never been measured for blood pressure prior to the current survey. The results of those who had never been measured ranged from 40.2 % in Addis Ababa to 91.7 % in Harari.   The present study has also collected information on raised BP by history and revealed that 0.5% of the respondents were diagnosed to have raised BP prior to this survey and were under medication whereas 15.6 % were unaware of their raised blood pressure level. However, based on the measurements made during the present survey among all the respondents, 15.6% were found to have raised blood pressure with a SBP of $\geq$140 mmHg and/or a DBP of $\geq$90 mmHg. The result also showed increasing trend of elevated blood pressure with age advancement among those who were unaware of their raised blood pressure. The proportion of men in this category was 15.3% and that of women was 16.0%.

There were administrative regions with low and high prevalence of blood pressure in reference to national

average. Among the regions, the highest prevalence was seen in Gambella 24.6% followed by Addis Ababa 22.6%. Likewise, administrative regions with low prevalence were Afar and Tigray 8.0%, 8.9%, respectively.

Table 1: **Survey respondent distribution by age, sex, area of residence and administrative region, Ethiopia NCD STEPS 2015**

Characteristics	Sex					
	Male		Female		Total	
	n	%	n	%	n	%
Age Group						
15 - 29	1441	36.4%	2518	63.6%	3959	40.4
30 - 44	1438	41.1%	2061	58.9%	3499	35.7
45 - 59	781	46.2%	909	53.8%	1690	17.2
60 - 69	317	48.6%	335	51.4%	652	6.7
Total	3977	40.6%	5823	59.4%	9800	100
Place of residence						
Urban	777	28.9%	1910	71.1%	2687	27.4
Rural	3200	45.0%	3913	55.0%	7113	72.6
Total	3977	40.6%	5823	59.4%	9800	100
Administrative region						
Tigray	360	37.7%	595	62.3%	955	9.7
Afar	176	45.8%	208	54.2%	384	3.9
Amhara	827	44.3%	1040	55.7%	1867	19.1
Oromiya	995	43.1%	1313	56.9%	2308	23.6
Somali	215	35.0%	400	65.0%	615	6.3
Benishangul Gumuz	185	48.2%	199	51.8%	384	3.9
SNNPR	730	42.8%	976	57.2%	1706	17.4
Gambela	147	49.8%	148	50.2%	295	3.0
Harari	88	41.1%	126	58.9%	214	2.2
Dire Dawa	96	37.4%	161	62.6%	257	2.6
Addis Ababa	158	19.4%	657	80.6%	815	8.3
Total	3977	40.6%	5823	59.4%	9800	100

Table 2: **Proportion of respondents who were unaware of their raised blood pressure, history of blood pressure measurement and treatment among those previously diagnosed with raised blood pressure by age, sex, area of residence and administrative region, Ethiopia NCD STEPS, 2015**

Variables	Never measured for blood pressure among total respondents (N=9,788)			Treatment for raised blood pressure by history (N=9,671)			Respondents who were unaware of their raised blood pressure status (N=9,599)		
Age group	n	%	95% CI	n	%	95% CI	n	%	95% CI
15-29	3230	81.7	79.8-83.6	12	0.3	**0.1-0.5**	413	10.6	8.9-12.2
30-44	2556	73.1	70.7-75.5	14	0.4	0.1-0.7	645	18.80	16.7-20.8
45-59	1128	66.9	63.2-70.6	13	0.8	0.4-1.2	387	23.7	21.0-26.4
60-69	413	63.4	57.5-69.3	12	1.8	0.0-4.1	238	37.6	31.8-43.5
Sex	0			0			0		
Male	3240	81.6	79.6-83.6	16	0.4	0.2-0.7	596	15.3	13.5-17.1
Female	4113	70.7	68.4-73.0	29	0.5	0.3-0.7	913	16	14.6-17.5
Area of residence	0			0			0		
Urban	1704	63.5	57.3-69.7	32	1.2	0.6-1.8	492	19	16.4-21.7
Rural	5662	79.7	77.9-81.6	21	0.3	0.1-0.5	1044	14.9	13.4-16.3
Region	0			0			0		
Addis Ababa	327	40.2	35.1-45.3	14	1.7	0.7-2.7	179	22.6	18.1-27.0
Afar	348	90.5	82.8-98.2	2	0.4	0.0-1.1	30	8	4.0-11.9
Amhara	1486	79.7	75.8-83.7	7	0.4	0.1-0.8	265	14.5	12.0-17.0
B.Gumuz	297	77.6	70.6-84.6	0	0	0.0-0.0	68	18	6.9-29.1
Diredawa	214	83.3	77.3-89.3	2	0.8	0.0-1.6	35	14.1	8.9-19.4
Gambella	250	85.4	75.9-95.0	0	0	0.0-0.0	72	24.6	12.3-36.8
Harari	196	91.7	85.8-97.6	4	2.1	0.5-3.7	42	20	12.5-27.6
Oromia	1700	73.7	70.6-76.8	16	0.7	0.3-1.0	309	13.6	11.8-15.4
SNNPR	1388	81.4	77.8-85.1	2	0.1	0.0-0.2	367	22	18.6-25.4
Somali	488	79.6	71.8-87.4	6	0.9	0.1-1.7	72	11.9	8.2-15.6
Tigray	702	73.6	69.3-77.9	0	0	0.0-0.0	83	8.9	6.7-11.0
TOTAL	7498	76.6	74.8-78.5	48	0.5	0.3-0.6	1497	15.6	14.4-16.9

Experience of blood glucose measurement and hidden magnitude of elevated blood glucose: As can be seen from Table 3, among those never tested (97%) for blood glucose the lowest was in Addis Ababa and the highest was in Gambella 80.3% and 99%, respectively.

Table 3: **Proportion of respondents who were unaware of their elevated blood sugar, history of blood glucose test and treatment among those previously diagnosed with elevated blood sugar by age, sex, area of residence and administrative region, Ethiopia NCD STEPS, 2015**

Variables	Never measured for blood sugar among total respondents (N=9,790)			Treatment for elevated blood sugar by history (n=8,511)			Respondents who were unaware of their elevated blood sugar status (N=8,435)		
	n	%	95% CI	n	%	95% CI	n	%	95% CI
Age group									
15-29	3888	98.3	97.8-98.8	7	0.2	0.0-0.4	161	4.9	3.6-6.3
30-44	3370	96.4	95.5-97.2	12	0.4	0.1-0.6	179	5.9	4.5-7.2
45-59	1586	94	92.5-95.6	21	1.4	0.6-2.2	105	6.9	5.2-8.6
60-69	603	92.5	89.9-95.2	10	1.6	0.7-2.5	64	10.8	7.2-14.3
Sex									
Male	3868	97.4	96.7-98.1	16	0.4	0.2-0.7	209	5.9	4.6-7.1
Female	5610	96.4	95.8-97.1	33	0.6	0.3-0.8	269	5.5	4.3-6.7
Area of residence									
Urban	2430	90.5	88.3-92.6	31	1.4	0.8-2.1	149	6.7	4.2-9.1
Rural	6998	98.5	98.1-98.9	19	0.3	0.1-0.5	341	5.5	4.4-6.6
Addis Ababa	652	80.3	76.9-83.7	17	2.5	1.0-4.1	29	4.4	2.6-6.1
Afar	385	98.2	95.2-100.0	1	0	0.0-0.0	30	10	2.2-17.8
Amhara	1819	97.9	97.1-98.8	5	0.3	0.1-0.6	29	1.8	0.6-2.9
B.Gumuz	377	98.3	95.9-100.0	2	0.4	0.0-1.0	30	9.4	0.0-22.8
Diredawa	242	93.3	86.3-100.0	2	0.6	0.0-1.6	28	13.9	6.3-21.5
Gambella	271	98.6	96.9-100.0	2	0.2	0.0-0.6	24	9	0.0-19.0
Harari	205	97.4	96.0-98.8	2	1	0.0-2.5	31	18.1	0.5-35.8
Oromia	2267	97.2	96.3-98.1	8	0.4	0.1-0.7	116	5.7	4.1-7.4
SNNPR	1658	97.6	96.4-98.8	11	0.7	0.2-1.2	160	10.5	7.4-13.7
Somali	559	91.1	86.5-95.7	5	0.9	0.0-1.9	115	22.8	15.7-30.0
Tigray	925	96.9	95.2-98.6	3	0.4	0.0-0.8	18	2.1	1.0-3.3
TOTAL	9496	97	96.4-97.5	43	0.5	0.3-0.7	481	5.7	4.7-6.7

This study h as also collected information about elevated blood glucose by history and found 0.5% of the respondents were diagnosed to have diabetes and they were under medication. The results obtained by history ranged from 0% in Afar and 0.2% in Gambella to 1% in Harari and 2.5% in Addis Ababa.

However, the current study revealed a total of 5.9 % of the study population had a blood glucose level of greater than or equal to 110 mg/dl, with 6% in men, and 5.8 % in women. The proportion of the study population with elevated blood glucose values was found to increase with advancement of age from 4.9% (age group 15–29 years) to 10.8% in those age group 60–69 years.

Among the administrative regions of the country, the hidden magnitude ranged from 1.8 % in Amhara and 2.1% in Tigray to 22.8 % in Somali and 18.1% in Harari.

Discussion

The findings disclosed the prevalence of undiagnosed raised blood pressure and elevated blood glucose. Our study adds to the limited body of evidence on raised blood pressure and elevated blood glucose in Ethiopia which will contribute to the efforts of Ministry of Health to develop and implement policies to reduce death and disability from non-communicable diseases.

Prevention and control of raised blood pressure and elevated blood glucose are one of the cornerstones of these efforts.

In this study, the findings mainly focused to describe the invisible prevalence of raised blood pressure and elevated blood glucose among adults in Ethiopia. It was found that 77 % and 97% of study participants had never been measured/tested for their blood pressure and blood glucose level prior to the present survey, respectively. This suggests that the greater proportion of individuals with raised blood pressure and/or blood sugar are unaware of their health condition which is consistent with other similar studies within Ethiopia (16). Evidences suggest that our findings were much higher than other similar studies outside the country such as 39.2 % in Bangladesh (17), 42.6% Mongolia (18), 33.6% in Myanmar (19), 50% in Uganda, South Africa, Tanzania and Nigeria (20) but lower than Botswana (21) and Malawi (22) where more than 8 and 9 in ten never measured for raised blood pressure and elevated blood glucose, respectively. This indicates that despite variations in study area, study design, sample size and other underlying differences in study population characteristics (e.g. age distributions, gender, urban or rural residents etc), available evidence suggests that the health seeking behaviour of the community and screening for hypertension and diabetes at health facility is found to be poor in Ethiopia (16, 23).

Moreover, the practice to be screened for elevated blood sugar is more uncommon among Ethiopians which is comparable with other similar studies in different countries where more than 8 in ten participants in Myanmar (84.4%), Bangladesh (83.0%). Mongolia (85.2%). and Botswana (98.3%) were never tested for elevated blood glucose (17-19, 21).

In this survey, 15.6 % of 9,788 study participants were found to have raised blood pressure. High number of study participants with raised blood pressure suggests that there is low awareness of these risk factors among the study population. Raised blood pressure is highly prevalent among the urban population and people aged 45 years and above which is slightly higher than the study at Gondar where one in every four adults(28.3%) aged 35 years or older had hypertension in Gondar city (23). A study conducted among civil servants in Addis Ababa also showed a higher prevalence for raised blood pressure where the overall prevalence of hypertension was 27.3 % (24), similarly a study conducted among general population of Addis Ababa also revealed higher prevalence of raised blood pressure where 1 in 4 had raised blood pressure (25) . The overall prevalence rate of hypertension in SSA for 2008 was estimated at 16.2% (6), ranging from 10.6% in Ethiopia to 26.9% in Ghana(6). The estimated prevalence was 13.7% in rural areas, 20.7% in urban areas, 16.8% in males, and 15.7% in women (26). The possible explanation for the differences in the findings could be due to the differences in the methodological approaches (study setting being urban and rural, study population, sample size etc…).

Even though the type of diabetes was not yet specified, 5.7% of 9,790 study participants were newly diagnosed and found to have elevated blood glucose level. Studies revelled that Type 2 diabetes accounts for well over 90% of diabetes in sub-Saharan Africa, and population prevalence proportions ranged from 1% in rural Uganda to 12% in urban Kenya (27) whereas reported type 1 diabetes prevalence was low and ranged from 4 per 100,000 in Mozambique to 12 per 100,000 in Zambia (27). This suggests that elevated blood sugar prevalence is increasing in developing countries, and Ethiopia is no exception in which diabetes exerts a significant burden and this is expected to increase if there is no mechanism to screen in its early stage at community level. Studies suggest that the awareness of hypertension and diabetes among the population largely depends on the capacity of health system to provide diagnostic services to the general population (28, 29). Condition of raised blood pressure and elevated blood glucose is mainly asymptomatic and in order to make population aware of their health condition, there is a need to screen all adults at health facility and community outreach programs. Detecting major NCDs early will help to prevent complications like myocardial infarction, stroke, kidney failure, amputations and visual impairment that are costly to treat (30).

Limitation and strength of the study: Possible limitations of this study include the cross sectional nature of the study that cannot be used to establish temporal relationship between the exposures and outcome variables (raised blood pressure and elevated blood glucose). The adequacy of sample size with good response rate from the population and the weighted analysis of findings make it generalizable to all populations of Ethiopia. Furthermore, the study used steps approach (behavioural, physical measurements and biochemical measurements) which enabled the study to be comprehensive.

Conclusion:
The prevalence of undetected raised blood pressure and elevated blood sugar is high in Ethiopia and only very small percentage of people had been aware of their high blood pressure and elevated blood sugar. Therefore, the high prevalence of raised blood pressure and elevated blood sugar in general and the majority of undetected risk factor status of these population in particular is an indication for community based NCD risk factor screening programs.

Recommendations
Policy makers in the health sector need to strengthen the health system and design nation-wide population based strategy in collaboration with other health development partners to establish screening program for raised blood pressure and elevated blood sugar. The screening program can be implemented at primary health care level, especially the health extension program and health centre level. There is also a need to increase community awareness on the risks of raised blood pressure and blood sugar through community mobilization.

Competing Interest
Authors declare that they have no competing interests.

References
1. World Health Organization. Global Status Report on Non-communicable Diseases , 2014. In: World Health Organization, editor. Geneva2014.
2. World Health Organization. World health statistics 2011. In: World Health Organization, editor. Geneva 2011.

3. Mufunda J, Chatora R, Ndambakuwa Y, Nyarango P, Kosia A, Chifamba J, et al. Emerging non-communicable disease epidemic in Africa: preventive measures from the WHO Regional Office for Africa. Ethn Dis. 2006;16(2):521-6.

4. Lim SS, Vos T, Flaxman AD, Danaei G, Shibuya K, Adair-Rohani H, et al. A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. Lancet. 2012;380(9859):2224-60.

5. Addo J, Smeeth L, Leon DA. Hypertension in sub-saharan Africa: a systematic review. Hypertension. 2007;50(6):1012-8.

6. Twagirumukiza M, De Bacquer D, Kips JG, de Backer G, Stichele RV, Van Bortel LM. Current and projected prevalence of arterial hypertension in sub-Saharan Africa by sex, age and habitat: an estimate from population studies. J Hypertens. 2011;29(7):1243-52.

7. World Health Organization. The Global Strategy for the Prevention and Control of Non-communicable Diseases, 2008. In: World Health Organization, editor. Geneva2008.

8. World Population Statistics. World population prospects – the 2008 revision. . In: United Nations Population Division, editor. New York,2009.

9. Jacob Mufunda, Rufaro Chatora, Yustina Ndambakuwa, Peter Nyarango, Jephat Chifamba, Andrew Kosia. Prevalence of Non-communicable Diseases in Zimbabwe: Results from analysis of data from the National Central Registry and Urban Survey, Ethnicity & Disease ETHNICITY & DISEAS. 2006;16(3):718-22.

10. Central Statistical Authority [Ethiopia] and ORC Macro. 2011. Ethiopia Demographic and Health Survey 2011. In: Authority CS, editor. Addis Ababa, Ethiopia, and Calverton, Maryland,: Central Statistical Authority and ORC Macro.; 2012.

11. Ayalew T. Muluneh, Abraham Haileamlak, Fassil Tessema, Fessahaye Alemseged, Kifle Woldemichael, Makonnen Asefa, et al. Population based survey of chronic noncommunicable diseases at gilgel gibe field research center, southwest ethiopia. Ethiop J Health Sci August 2012;22(Special Issue):7-18.

12. Federal Minstry of Health. Situation Analysis on Chronic Diseases and their risk factors in Ethiopia-FMOH/WHO,2008 Strategic Framework for prevention & control of chronic non-communicable diseases, FMOH,   . In: FMOH, editor. Addis Ababa, Ethiopia 2010.

13. WHO. A global brief on Hypertension: Silent killer, global public health crisis. In: WHO Press WHO, 20 Avenue Appia, 1211 Geneva 27, Switzerland, editor. World Health Organization 2013.

14. WHO, IDF. Definition and diagnosis of diabetes mellitus and intermediate hyperglycemia: RepoR t of a WHo/IDf Consultatation. In: Organization WH, editor. WHO Press Swizerland, Geneva: World Health Organization 2006.

15. WHO. Global report on diabetes 2016. In: (http://www.who.int) WHOaaotWw, editor. Swizerland, Geneva: WHO Press, World Health Organization,; 2016.

16. Lemba D. Nshissoa ARBGSLY, Berhane MAW. Prevalence of Hypertension and Diabetes among Ethiopian. Diabetes Metab Syndr. 2012;6(1):36-41.

17. Directorate General of Health Services Ministry of H, Family W. Non-communicable disease risk factor survey Bangladesh 20102011.

18. World Health O. Mongolian STEPS survey on the prevalence of noncommunicable disease and injury risk factors 2009. WHO Library. 2010.

19. Who. Noncommunicable Disease Risk Factor Survey Myanmar 2009. 2011.

20. Guwatudde D, Nankya-Mutyoba J, Kalyesubula R, Laurence C, Adebamowo C, Ajayi I, et al. The burden of hypertension in sub-Saharan Africa: a four-country cross sectional study. BMC Public Health. 2015;15(1):1211.

21. Ministry of Health Republic of Botswana World Health O. Chronic disease risk factor surveillance report2007. 142- p.

22. Msyamboza KP, Ngwira B, Dzowela T, Mvula C, Kathyola D, Harries AD, et al. The Burden of Selected Chronic Non-Communicable Diseases and Their Risk Factors in Malawi: Nationwide STEPS Survey. PLoS One. 2011;6(5):e20316.

23. Awoke A, Awoke T, Alemu S, Megabiaw B. Prevalence and associated factors of hypertension among adults in Gondar, Northwest Ethiopia: a community based cross-sectional study. BMC cardiovascular disorders. 2012;12(1):113-.

24. Angaw K, Dadi AF, Alene KA. Prevalence of hypertension among federal ministry civil servants in Addis Ababa, Ethiopia: a call for a workplace-screening program. BMC Cardiovascular Disorders. 2015;15:76.

25. Guteta S, Feleke Y, Awol M. Prevalence of hypertension and pre-hypertension in Addis Ababa, Ethiopia: A survey done in recognition of World Hypertension Day, 2014. Ethiopian Journal of Health Development. 2015;29(1):22-30. Epub November 2015.

26. Poulter NR. Current and projected prevalence of arterial hypertension in sub-Saharan Africa by sex, age and habitat: an estimate from population studies. Journal of hypertension. 2011;29(7):1281-2.

27. Hall V, Thomsen RW, Henriksen O, Lohse N. Diabetes in Sub Saharan Africa 1999-2011: Epidemiology and public health implications. a systematic review. BMC Public Health. 2011;11(1):564.

28. Pereira M, Lunet N, Azevedo A, Barros H. Differences in prevalence, awareness, treatment and control of hypertension between developing and developed countries. J Hypertens. 2009;27(5):963-75.

29. Kamadjeu RM, Edwards R, Atanga JS, Unwin N, Kiawi EC, Mbanya JC. Prevalence, awareness and management of hypertension in Cameroon: findings of the 2003 Cameroon Burden of Diabetes Baseline Survey. J Hum Hypertens. 2005;20(1):91-2.

30. WHO. Package of Essential Non-Communicable Diseases for Primary Health Care in Low Resource Settings, 2010.