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# Case Detection of Hypertension and Diabetes Mellitus in Addis Ababa, Ethiopia

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**Abstract:** Hypertension and diabetes mellitus are the commonly public health problems among non-communicable chronic diseases globally. In Ethiopia non-communicable diseases become the major public health problems which contribute significant contribution in morbidity and mortality. The main objective of this study was to determine new case of hypertension and diabetes mellitus. Community based cross-sectional study was conducted in Addis Ababa two sub-cities. Four hundred twenty five participants were selected systematically and each participant was interviewed by using structured questionnaire and measured their blood pressure and blood glucose level with trained health extension workers. The collected data were entered in to SPSS version 25 for data analysis. Frequency distribution, bivariate and multivariate logistic analysis were conducted. P-value less 0.05 were considered to declare statistical significant association at 95% CI with the outcome variables. Most of the study participants, 403 (94.8%) were not ever smoke any type of cigarette in their life time. One hundred fifty nine (37.4%) of them were drunk alcohol in the life time. From the total participants, 70 (16.5%) of them were hypertensive and 36 (8.5%) of them had diabetes mellitus in the study area. Age, marital status, smoking and drinking alcohol were significantly associated with hypertension and occupation and drinking alcohol were factors associated with diabetes mellitus. The prevalence of hypertension and diabetes mellitus in the study area was high. Age, smoking and drinking alcohol were significantly associated with hypertension and diabetes mellitus.

**Keywords:** Diabetes Mellitus, Hypertension, Prevalence, Case Detection

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## 1. Introduction

Globally, both morbidity due to diabetes mellitus is increasing from time to time. For instance between 2000 and 2016 early/premature mortality due to diabetes mellitus was increased by 5%. Similarly, in 2014, 8.5% of the adult population had diabetes mellitus and in 2016, 1.6 million populations were died due to diabetes mellitus [1]. According to WHO report, non-communicable diseases (NCD) kills around 41 million people each year worldwide and the majority of the death occurs in developing countries. Among these deaths, 17.9 million and 1.6 million deaths caused by cardiovascular diseases and diabetes mellitus annually respectively. Every year around 15 million people between the age of 30 and 65 years died which accounts 85% of

premature death occurred in low and middle income countries [2].

The magnitude of non-communicable diseases including hypertension and diabetes mellitus are at increasing rate that contribute the major causes of morbidity and mortality worldwide. According to WHO report, the four major risk factors for the development of NCD are smoking, physically inactive, harmful use of alcohol and unhealthy eating habit [2]. Based on community based cross sectional study done in rural Khammam, the prevalence of type II diabetes mellitus was 8% with increasing with the age of the population. In similar study among diabetes mellitus patients, most of them had smoking (83.8%) and alcohol consumption (67.6%) habit which has statistical significant contribution for the development of diabetes mellitus [3]. According to the study done in Guinea, 5.7% of the population had diabetes mellitus,

but most of them had no aware about their diabetes status. Only 445 of them were aware about their diabetes status. In this study more than 58% of the diabetes participants were undiagnosed until the time of the study [4]. This indicates most of the population have low health seeking behaviours and unable to take blood glucose/diabetes test. According to the meta-analysis conducted, the prevalence of undiagnosed diabetes mellitus in African population vary from 4.57 to 6.81 with mean prevalence of 5.37. The prevalence of undiagnosed diabetes mellitus was higher in urban than the rural population [5], this indicates the urban population is more vulnerable to NCD than the rural population. Hypertension is one of cardiovascular diseases that affect remarkable proportion of population in Africa. For instance in Cameroon, the prevalence of hypertension was 47.5% with slightly higher in men than women and increased prevalence as the age increases. But only 31.7% of the population were aware about their hypertensive status and the remaining were not aware about their hypertensive status until the time of the study [6].

According to one study done in Kenya, the overall prevalence of hypertension was 5.85% and 1% of the population had diabetes mellitus. In this study, hypertension was more prevalent in women population than men population but the prevalence of diabetes mellitus was the same in male and female [7].

The overall prevalence of diabetes mellitus and hypertension was 13.3% and 28.7% respectively and from this confirmed cases 41.2% and 53% of the cases did not know their diabetes and hypertensive status before the time of the survey. The overall proportion of newly diagnosed (diagnosis at the time of survey) diabetes was 5.6% and 7.3% in men and women respectively and 12.2% of newly diagnosis hypertensive. In this study the proportion of both diabetes mellitus and hypertension increases with the age of the population [8].

The proportion of undiagnosed diabetes mellitus and hypertension was high in developing countries like Ethiopia. For instance, undiagnosed diabetes mellitus in African countries accounts 66.7% and it is almost two times higher (37%) than developed countries [9]. Economic burden of undiagnosed diabetes mellitus was higher than the cases which was diagnosed and treated early due to the development of different complications including permanent organ damage (disabilities) and death [10].

According to the study done in Ghana, 28.1% of the community was hypertensive. Smoking, high body mass index were factors significantly increased the risk of hypertension whereas doing vigorous activity significantly decrease the risk of developing hypertension [11].

According to the study done in Gondor town, among the total 49 DM cases, 40 (81.6%) them were not previously diagnosed. And in the same study, the prevalence of prediabetes was 9.31% [12]. According to the study done in Gurage Zone the prevalence of undiagnosed hypertension was 15.3. [13]. In Wolaita zone, the

prevalence of hypertension was 31.1%. Obesity, male sex and advanced age were factors significantly increased the risk of developing hypertension [14].

## 2. Methods and Materials

### 2.1. Study Area and Period

The study was conducted in Addis Ababa Bole and Yeka Sub-cities in four Woredas. Addis Ababa is the capital city of Ethiopia and the city contain different international organizations and embassies of different countries. The city is divided in to eleven sub-cities.

### 2.2. Study Design

Community based cross sectional study was carried out.

### 2.3. Source and Study Population

The source population was all adult population living in Addis Ababa selected sub-cities and all adult population who are living in selected woredas was taken as study population.

### 2.4. Study Variables

#### 2.4.1. Dependent Variable

Hypertension and diabetes mellitus

#### 2.4.2. Independent Variables

Socio-demographic characteristics (age, sex, marital status, educational status, occupation, monthly income), Behavioral condition/lifestyles (alcohol consumption, smoking, physical exercise, sedentary lifestyle, dietary habit).

### 2.5. Sample Size Determination

The sample size was calculated using Epi-Info 7.2 statistical software package by considering single population proportion formula: by taking new case detection rate of hypertension in Gurage zone 15.3% and 95% confidence level, at 0.05 margin of error. Sample size =199 and 10% non-response rate and design effect of 2 and the final sample size was 430.

### 2.6. Sampling Technique and Procedures

Multistage sampling technique was used. First among eleven sub-cities two sub-cities were selected randomly. Secondly from each selected sub-cities two woredas were selected randomly. Then the household in selected woredas was selected using systematic sampling technique and the head of the household or the elder in the household was interviewed and assessed for hypertension and diabetes mellitus.

### 2.7. Data Collection Tools and Procedure

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:

STEP 1: Interview-based questionnaire on selected major health risk behaviour including smoking, alcohol

consumption, fruit and vegetable consumption, and physical activity. Additional issues deemed to be of importance includes; history of high blood pressure, diabetes.

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

STEP 3: Biochemical measure of health risks including fasting blood glucose and blood pressure.

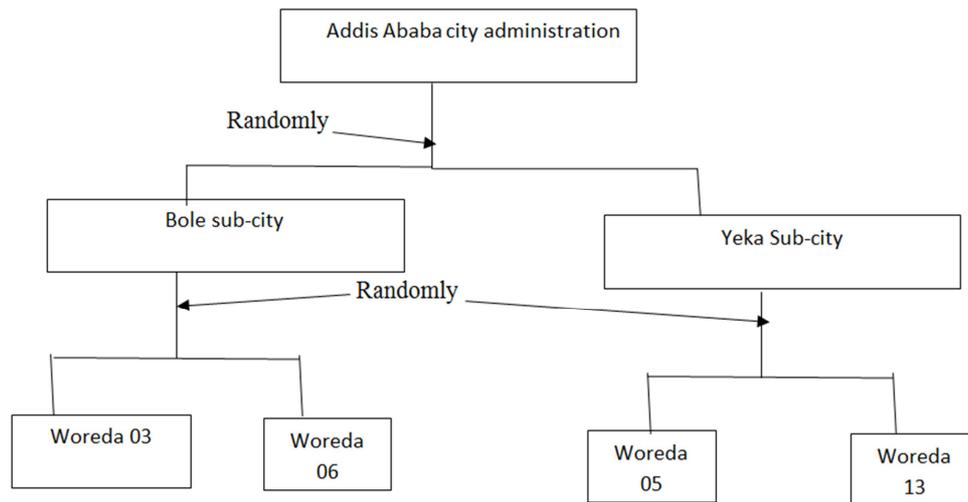


Figure 1. Sampling procedure in the study area.

## 2.8. Data Quality Assurance

The quality of data was ensured through proper training of data collectors and pre testing of the questionnaire and the result of the pretest was discussed & some corrections and changes were made. As well close supervision of data collectors were done. All the instruments which were used in measurement and sample collection were checked for their functionality before the actual data collection every day based. All collected data was checked for completeness, accuracy and consistency by supervisors every day. And anything which was unclear was corrected and communicated to the data collectors on the next day.

## 2.9. Data Processing and Analysis

First the data was checked for completeness and consistency. Then it was coded and entered and analyzed using SPSS version 25. Descriptive summary using frequencies, proportions, graphs and cross tabs were used to present study results. Bivariate and multivariate logistic regression analyses were conducted to identify determinant factors. Variables which had p-value less than 0.25 in bivariate analysis were taken for multivariate analysis. P-value less than 0.05 were considered as statistically significant.

## 2.10. Ethical Consideration

The research was approved by Institutional Review Board

(IRB) of Y12HMC before the conduct of the study. The objective and purpose of the study were explained to the study subjects to obtain written informed consent before data collection. Participants were informed that they can discontinue or decline to participate in the study at any time. Confidentiality of the information was maintained and the data was recorded anonymously throughout the study.

## 2.11. Result Dissemination Plan

The results of the study will be disseminated to Yekatit 12 Hospital Medical College, Addis Ababa Health Bureau; health facilities included in this study. Findings will be presented to the scientific community on conferences and effort will also be made to publish the paper.

# 3. Result

## 3.1. Socio-Demographic Characteristics

In this research 425 study participants were participated that make the response rate of 98%. Three hundred nine (72.7%) of the participants were female and 116 (27.3%) were male. The mean age of the participants were 37.3 years  $\pm$  14 SD. One hundred thirty seven (32.2%) of them were less than 30 years of age, 145 (34.1%) from 30-39 years and 81 of them were aged above 50 years. The majority 306 (72%) of the participants were married in their marital status. Regarding their education status, 147 (34.6%) primary school completed, 91 (21.4%) secondary school completed but 47

(11.1%) of them were illiterate. Half of the participants, 215 (50.6%) were unemployed and 93 (21.9%) were employed. (Table 1)

**Table 1.** Socio-demographic characteristics of the study participants in Addis Ababa March, 2022.

Variables	Frequency	Percent
Sex		
Male	116	27.3
Female	309	72.7
Age in year		
<30	137	32.2
30-39	145	34.1
40-49	62	14.6
≥50	81	19.1
Marital status		
Single	78	18.4
Married	306	72
Others	41	9.6
Educational status		
Illiterate	47	11.1
Primary school	147	34.6
Secondary school	91	21.4
Vocational and above	140	32.9
Occupation		
Employed	93	21.9
Private jobs	117	27.5
Unemployed	215	50.6
Monthly income in EBR		
<1000	168	39.5
1000-2999	108	25.4
3000-4999	90	21.2
≥5000	59	13.9

**3.2. Behaviour of Study Participants and Family History of NCDs**

Most of the study participants, 403 (94.8%) were not ever smoke any type of cigarette in their life time. One hundred fifty nine (37.4%) of them were drunk alcohol in the their life time. Regarding their physical activity habit, most of them 385 (90.6%) and 364 (85.6%) had no rigorous and moderate physical activity practice respectively. Majority of the participants had no family history of non-communicable diseases. Three hundred seventy six (88.5%), 374 (88%) and 411 (96.7%) of them had no family history of hypertension, diabetes mellitus, and other non-communicable diseases respectively. Majority, 313 (73.6%) of them had normal body mass index (BMI) but the rest of the participants were overweight and obese (Table 2).

**Table 2.** Behavioral characteristics and family history of NCDs among study participants in Addis Ababa. March, 2022.

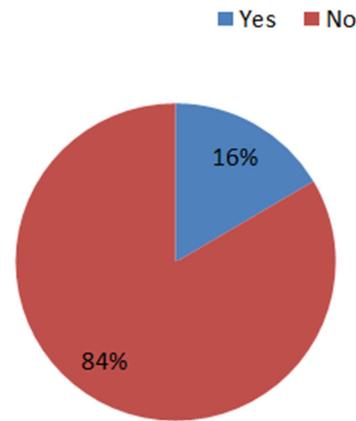
Variables	Frequency	Percent
Ever smoke		
Yes	22	5.2
No	403	94.8
Ever drink alcohol		
Yes	159	37.4
No	266	62.6
Rigorous activity		
Yes	40	9.4
No	385	90.6
Moderate activity		

Variables	Frequency	Percent
Yes	61	14.4
No	364	85.6
Family history of hypertension		
Yes	49	11.5
No	376	88.5
Family history of diabetes mellitus		
Yes	51	12
No	374	88
Family history of other NCDs		
Yes	14	3.3
No	411	96.7
Level of BMI		
Normal	313	73.6
Overweight	96	22.6
Obesity	16	3.8

**3.3. Prevalence of Hypertension and Diabetes Mellitus**

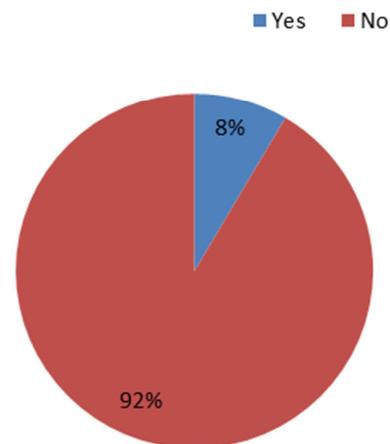
From the total participants, 70 (16.5%) (95% CI: 13.1%-20.3%) of them were hypertensive and 36 (8.5%) (95% CI: 6.0%-11.5%) of them had diabetes mellitus in the study area.

**Hypertension Status**



**Figure 2.** Hypertension status among study participants in Addis Ababa. March, 2022.

**Diabetes Mellitus Status**



**Figure 3.** Diabetes Mellitus status among study participants in Addis Ababa. March, 2022.

### 3.4. Factors Associated With Hypertension and Diabetes Mellitus

To identify factors associated with hypertension, bivariate and multivariate logistic regression analysis were conducted. All variables which had p-value less than 0.25 were taken for multivariate analysis. Sex, age, marital status, educational status, occupation, smoking, drinking alcohol and BMI were significantly associated with hypertension in bivariate logic regression analysis. Age, marital status, smoking and drinking alcohol were the factors maintained their significant statistical association in multivariate logistic analysis. Participants whose age less than 30 years old were 83% less

likely develop hypertension (AOR: 0.168, 95% CI: 0.047-0.599) when compared with participants whose age greater or equal to 50 years. Participants who were single in their marital status were 81% less likely develop hypertension (AOR: 0.192, 95% CI: 0.040-0.925) when compared with widowed participants. Participants who did not ever smoke were 77% less likely develop hypertension (AOR: 0.277, 95% CI: 0.094-0.813) when compared with ever smoker and participants who did not ever drink alcohol were 47% less likely develop hypertension (AOR: 0.53, 95% CI: 0.288-0.976) when compared with ever drinking alcohol (Table 3).

**Table 3.** Factor associated with hypertension among study participants in Addis Ababa. March, 2022.

Variables	Hypertension status		COR at 95% CI	AOR at 95% CI
	Yes	No		
Sex				
Male	28 (24.1)	88 (75.9)	2.023 (1.184,3.455)*	1.958 (0.957,4.005)
Female	42 (13.6)	267 (86.4)	1	1
Age in year				
<30	5 (3.6)	132 (96.4)	0.076 (0.028,0.207)*	0.168 (0.047,0.599)*
30-39	15 (10.3)	130 (89.7)	0.231 (0.114,0.468)*	0.455 (0.187,1.109)*
40-49	23 (37.1)	39 (62.9)	1.179 (0.590,2.356)	1.436 (0.640,3.223)
≥50	27 (33.3)	54 (66.7)	1	1
Marital status				
Single	5 (6.4)	73 (93.6)	0.064 (0.020,0.207)*	0.192 (0.040,0.925)*
Married	46 (15)	260 (85)	0.164 (0.073,0.372)*	0.118 (0.066,0.538)*
Divorce	5 (35.7)	9 (64.3)	0.516 (0.137,1.948)	0.555 (0.123,2.509)
Widowed	14 (51.9)	13 (48.1)	1	1
Educational status				
Illiterate	13 (27.7)	34 (72.3)	3.735 (1.586,8.800)*	0.963 (0.287,3.339)
Primary school	31 (21.1)	116 (78.9)	2.611 (1.303,5.230)*	1.313 (0.516,3.339)
Secondary school	13 (14.3)	78 (85.7)	1.628 (0.718,3.693)	1.120 (0.402,3.122)
Vocational and above	13 (9.3)	127 (90.7)	1	1
Occupation				
Employed	9 (9.7)	84 (90.3)	0.405 (0.189,0.869)*	0.667 (0.241,1.846)
Private jobs	16 (13.7)	101 (86.3)	0.598 (0.322, 1.114)	0.612 (0.284,1.320)
Unemployed	45 (20.9)	170 (79.1)	1	1
Ever smoking				
No	61 (15.1)	342 (84.9)	0.258 (0.106,0.629)*	0.277 (0.094,0.813)*
Yes	9 (40.9)	13 (59.1)	1	1
Ever drink alcohol				
No	33 (12.4)	233 (87.6)	0.467 (0.278,0.784)*	0.530 (0.288,0.976)*
Yes	37 (23.3)	122 (76.7)	1	1
BMI				
Normal	36 (11.5)	277 (88.5)	0.167 (0.059,0.476)*	0.367 (0.104,1.296)
Overweight	27 (28.1)	69 (71.9)	0.503 (0.170,1.486)	0.865 (0.239,3.128)
Obesity	7 (43.8)	9 (56.3)	1	1

\* means P-value less than 0.05

Sex, educational status, occupation, drinking alcohol was significantly associated with diabetes mellitus in bivariate logic regression analysis. Occupation and drinking alcohol were the factors maintained their significant statistical association in multivariate logistic analysis. Employed participants were 5.24 times more likely develop diabetes

mellitus (AOR: 5.24, 95% CI: 1.563-17.598) when compared to unemployed participants. Participants who were not ever drink alcohol were 82% less likely develop diabetes mellitus (AOR: 0.18, 95% CI: 0.059-0.546) when compared to with participants who were ever drinking alcohol.

**Table 4.** Factor associated with diabetes Mellitus among study participants in Addis Ababa. March, 2022.

Variables	DM		COR at 95% CI	AOR at 95% CI
	Yes	No		
Sex				
Male	4 (3.4)	112 (96.6)	3.24 (1.118,9.358)*	1.84 (0.564,5.989)

Variables	DM		COR at 95% CI	AOR at 95% CI
	Yes	No		
Female	32 (10.4)	277 (89.6)	1	1
Age in year				
<30	7 (5.1)	130 (94.9)	2.04 (0.709,5.840)	2.34 (0.682,16.074)
30-39	17 (11.7)	128 (88.3)	0.83 (0.339,2.006)	0.69 (0.223,2.158)
40-49	4 (6.5)	58 (93.5)	1.59 (0.456,5.539)	1.77 (0.436,7.172)
≥50	8 (9.9)	73 (90.1)	1	1
Educational status				
Illiterate	2 (4.3)	45 (95.7)	1.36 (0.279,6.66)	2.93 (0.436,19.685)
Primary school	20 (13.6)	127 (86.4)	0.39 (0.164,0.905)	0.68 (0.207,2.223)
Secondary school	6 (6.6)	85 (93.4)	0.86 (0.288,2.561)	1.01 (0.266,3.811)
Vocational and above	8 (5.7)	132 (94.3)	1	1
Occupation				
Employed	4 (4.3)	89 (95.7)	3.33 (1.134,9.787)*	4.07 (0.87,19.024)
Private jobs	4 (3.4)	113 (96.6)	4.23 (1.446,12.373)*	5.24 (1.563,17.598)*
Unemployed	28 (13.0)	187 (87.0)	1	1
Ever drink alcohol				
No	32 (12.0)	234 (88)	0.19 (0.065,0.544)*	0.18 (0.059,0.546)*
Yes	4 (2.5)	155 (97.5)	1	1
Moderate physical activity				
No	34 (9.3)	330 (90.7)	3.04 (0.711,12.993)	0.42 (0.066,2.723)
Yes	2 (3.3)	59 (96.7)	1	1
Vigorous physical activity				
No	35 (9.1)	350 (90.9)	0.26 (0.034,1.923)	0.46 (0.038,5.680)
Yes	1 (2.5)	39 (97.5)	1	1

\* means P-value less than 0.05

## 4. Discussion

This study was done in Addis Ababa with the objective of detecting new hypertensive and diabetes mellitus cases in the community. In this study, prevalence of hypertension was 16.5% and that of diabetes mellitus was 8.5%. The prevalence of diabetes mellitus in this study was consistent (8%) with study done in rural Khammam [3]. In contrast, the prevalence of diabetes mellitus in the current study was higher than the study done in Guinea (5.7%) and meta-analysis conducted in Africa the prevalence ranges from 4.57 to 6.81 with mean prevalence of 5.37 and in Kenya (1%) [4, 5, 7]. But, the prevalence of diabetes mellitus in this study was lower than another study findings 13.3% and 14.8% [8, 15].

The prevalence of hypertension in this study was lower than the study done in Cameroon, 47.5% of the population were hypertensive [6] and another study finding 28.7% [8]. It was also lower in the studies done in Ghana (28.1%) and Ethiopia, Wolaita Zone (31.3%) [16, 17]. But, the prevalence of hypertension in this study was higher than the prevalence (5.85%) of hypertension in Kenya [7].

This study identified factors associated with hypertension and diabetes mellitus. Age, marital status, smoking and drinking alcohol were the factors significantly associated with hypertension and occupation and drinking alcohol were the factors significantly associated with diabetes mellitus. Similarly with our findings, male sex and advanced age were significantly associated with hypertension in Ethiopia, Wolaita zone [17].

Private occupation significantly increase the risk of developing diabetes mellitus whereas never drinking alcohol in

the life time of the participants decrease the likely hood of developing diabetes mellitus. This finding was supported by the research done in Addis Ababa public health facilities [15].

## 5. Conclusion

In this study, 16.5% (95% CI: 13.1%-20.3%) of the population were identified as new hypertensive patients and 8.5% (95% CI: 6.0%-11.5%) of them had diabetes mellitus. This indicates that remarkable proportion of the population was affected by hypertension and diabetes mellitus. Age, marital status, smoking and drinking alcohol were significantly associated with hypertension and diabetes mellitus.

## 6. Recommendation

To reduce the prevalence of hypertension and diabetes mellitus, health office should work to avoid or minimize smoking and alcohol intake in the community.

## Conflict of Interest

The authors have no any conflict of interest.

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