Magnitude of Hypertension and Its Associated Factors among Adults in South Gondar Zone, Northwest Ethiopia: A Community-Based Study

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Abstract

Introduction: Hypertension is a serious medical illness that knowingly increases the risk of heart, brain, and kidney disease. Therefore, assessing the burden of hypertension and possible risk factors in the community is a good opportunity to update the epidemiological data on hypertension in the South Gondar Zone rural community.

Methods: A community-based cross-sectional study was conducted among the 674-adult population. A multistage systematic sampling technique was employed to select study participants. Data were entered into Epi-Data Manager software version 4.6.0.0, and then exported to STATA MP 16 software for statistical analysis. A multivariable logistic regression model was conducted to identify factors associated with hypertension and presented by an Adjusted Odds Ratio (AOR) with 95% CI. The model's fitness was checked using Hosmer-Lemeshow significance testing at P values 0.05.

Results: Overall, the prevalence of hypertension among adults was 16.1% (95% CI, 13.5-19.26). In multivariable logistic regression analysis, older age (AOR=1.03, 95% CI, 1.01-1.05), female gender (AOR=1.91, 95% CI, 1.15-3.19), divorced or widowed marital status (AOR=3.2, 95% CI, 1.17-8.8), and physically inactive individuals (AOR=4.02, 95% CI, 2.10-7.70) were statistically significant associated factors with hypertension.

Conclusion: The overall prevalence of hypertension was high in the study community. Older age, female sex, and not engaging in vigorous-intensity physical exercise were found to be significant factors associated with the risk of hypertension. Therefore, it is crucial to establish community education programs about hypertension, and its screening, in the study community.

Keywords: Hypertension; Adults; Community; Ethiopia

Introduction

Blood pressure is the force that moves blood through our circulatory system. It is an important force because oxygen and nutrients would not be pushed around our circulatory system to nourish tissues and organs without it (1). Since 2017, the American Heart Association (AHA) has advised that people with high blood pressure should receive treatment at 130/80 mmHg rather than 140/90 mmHg. The current category now forms two separate ranges: Elevated blood pressure, from 120-129/less than 80 mmHg, stage I hypertension, from 130-139/80-89 mmHg. In these new guidelines, the AHA also advises that doctors should only prescribe medication in cases of a previous heart attack or stroke, or the presence of risk factors for these conditions, such as age, a diabetes mellitus diagnosis, or chronic kidney disease [1].

Globally 1.13 billion people are estimated to have hypertension, two-third of them are living in low- and middle-income countries. Hypertension or high blood pressure is defined as a systolic and or diastolic blood pressure ≥ 140/90 mmHg. The burden of hypertension varies across regions and countries. Nowadays the highest prevalence of hypertension occurs in low- and middle-income countries due to a rise in hypertension risk factors in those populations [1].

Hypertension is a serious medical illness that knowingly increases the risk of heart, brain,

and kidney disease which is responsible for 54% of stroke and 47% of coronary heart disease globally. Besides hypertension is one of the major causes of premature death and the silent killer which is accountable for 7.6 million deaths per annum in the world [2].

One of the global targets for non-communicable diseases is to reduce the prevalence of hypertension. However, the awareness and practice on prevention and control of hypertension are low in developing countries including Ethiopia. In low-income countries, there is a double burden of non-communicable and infectious diseases. The health care resources are priory invested in infectious diseases like HIV/AIDS, tuberculosis, and malaria. Due to these issues, prevention and control of hypertension didn't get attention [3].

Environmental and personal lifestyle factors such as excessive alcohol consumption, excessive dietary salt intake, stress, sedentariness, and obesity may play a significant role in the increment of incidence of hypertension [4-6].

Different organizations support low- and middle-income countries including Ethiopia to reduce hypertension as a public health problem and to improve cardiovascular health through launching the global HEARTS (Healthy-lifestyle counseling, evidence-based treatment protocols, access to essential medicines and technology, risk-based management, team-based care, and systems for monitoring) initiative since 2016 [5,7,8]. Besides to reduce the burden of hypertension-related death require the parallel application of the population strategy at the community level and the clinical strategy focusing on new and improved treatments for people with hypertension [3,8,9].

Therefore, assessing the burden of hypertension and possible risk factors in the community is significant for evidence-based interventions and it is a good opportunity to update the epidemiological data of hypertension in the South Gondar zone rural community. This study aimed to assess the prevalence of hypertension and associated factors in the rural community of the south Gondar zone.

Methods and Materials

Study setting and period

A community-based cross-sectional study was conducted among the adult population living in towns of the South Gondar zone from March to June 2021. South Gondar zone is one of the zones in Amhara Regional state which is located 137 km from a regional town, Bahir Dar, and 701 km from Addis Ababa, the capital city of Ethiopia. According to population growth projection, the current total population of the zone is about 2,578,906.

Population

The source population was all adult persons living in South Gondar zone towns and the study population was all selected adult individuals who live in South Gondar zone towns during the study period. All adult persons whose age is ≥ 30 years and who lived at least 6 months in the towns were included in the study. Those who were severely ill to the extent unable to communicate, known hypertensive patients (self-report), pregnant women, and disabled individuals (difficult to measure blood pressure) were excluded from the study.

Sample size and sampling procedure

The minimum sample size required for the study was calculated using single proportion population formula as follows:

$$n = \frac{(Z\alpha/2)^2 \, P(1-p)}{d^2}$$

Were

n = sample size, $Z_{\alpha/2}$ = Confidence Interval (CI) at 95% which is 1.96 (where α=0.05), d = margin of error tolerated which is 5%, P = the highest prevalence of hypertension in the previous studies in Ethiopian adult population which was 28.3% [20]. Based on the above formula and assumptions the sample size was calculated to be 674 by considering design effects of 2.

A multistage systematic sampling technique was used to select study participants. At the first stage, four representative kebeles were selected by lottery method, and then the sample was proportionally allocated to the selected kebeles. In the second stage, a systematic random sampling method was used to select study households. The first household was selected by lottery method.

Data collection procedure

The data were collected using an interviewer-administered structured questionnaire and physical measurement. The questionnaire was adapted from the WHO STEPS instrument [10], to collect socio-demographic profiles, behavioral related factors, and clinical data of eligible participants. To keep its consistency first, the questionnaire was prepared in English and translated to Amharic local language then back-translated to English. Systolic and diastolic blood pressure was measured by a standard adult arm cuff mercury sphygmomanometer after 5-min rest in a sitting position. Two readings were taken in five-minute intervals and the average of the two was recorded as a final blood pressure of the participant.

Study variables

Dependent variable: Hypertension [Yes/No].

Independent variables: Age, sex, educational status, marital status, occupation, resident, income, family history of hypertension, alcohol consumption, cigarette smoking, Khat chewing, and physical activity, fruit consumption, vegetable use, and use of excessive salt.

Operational definitions

Hypertension: Systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg.

Regular physical exercise: Participants who purposively perform any kind of exercise for over 30 min at least 3 times per week.

Data processing and analysis

Data were checked for completeness and entered into Epi-data software version 3.1 then exported to STATA for statistical analysis. All variables were cleaned by running simple frequencies to avoid missing values and checked for normality and fulfillment of assumptions. Descriptive statistics (mean and standard deviation for continuous variables; and frequencies and percentages for categorical variables) were computed. Bivariate logistic regression was used to explore the relation between hypertension and each independent variable. P-value ≤ 0.25 cutoff points were considered to select potential candidates for the full model. Finally, a multivariate logistic regression model was used to identify factors associated with hypertension and presented by Adjusted Odds Ratio (AOR) with 95% of CI. The model fitness was checked using Hosmer-Lemeshow at significance test at P values <0.05.

Data quality management

To ensure data quality, training, and adequate orientation were

Table 1: Sociodemographic characteristics of the study participants in the south Gondar zone, 2021.

Variables	Categories	Frequency (n)	Percentage (%)
Sex	Male	275	40.8
	Female	399	59.2
Age in years	Below the mean [43.5]	381	56.5
	Greater/equal mean [43.5]	293	43.5
Marital status	Single/separated	88	13.1
	Married/cohabited	505	74.9
	Divorced/widowed	81	12.0
Educational status	No education	259	38.4
	Primary	220	32.6
	Secondary	103	15.3
	College and above	92	13.7
Occupational status	Government employ	67	9.9
	Non-Government employ	121	18.0
	Merchant	114	16.9
	Farmer	207	30.7
	Daily labor	165	24.5
The total individual in the household	Less than five	410	60.8
	Five to twelve	264	39.2
Total		**674**	**100**

given for all data collectors and supervisors. For validation of the questionnaire, a pre-test was conducted on 5% of the sample size at Debre Tabor town, before the actual data collection time. Accuracy, clarity, and completeness of data were reviewed and checked daily by the supervisors.

Ethical consideration

Ethical clearance & approval letter was obtained from Debre Tabor University, Ethical Review Committee. Then a formal letter of permission to conduct the study was taken from Kimir Dengay town administrative office and the respective kebele leaders. Written informed consent was obtained from each study participant after a clear orientation of the study objective, benefits, and procedures. Confidentiality of participant's information was kept anonymously using unique codes rather than personal identification. Furthermore, prevention approaches to COVID-19 transmission were strictly followed in every procedure of data collection according to the recommendations set by WHO.

Results

Sociodemographic characteristics of enrolled individuals

Overall, 674 study participants were included in this study. The mean ± (SD) age of the study participants was 43.5 ± 12.3 years. The majority [56.5%] of the study participants were below age 43 years. The majority [59%] of the study participants were females. Approximately 75% of the study participants were married and nearly one-third [32.6%] had primary educational level (Table 1).

Behavioral and food consumption status of the study participants

Overall, 42% of the respondents drank alcohol (Beer, Araki…), and approximately 6% of the respondents currently smoke cigarettes. Of the total of respondents 29.7% and 5.3% of them had regular physical exercise and a history of DM respectively the overall effort

Table 2: Behavioral and food consumption characteristics of the study participants in the south Gondar zone, 2021.

Variables	Categories	Frequency (n)	Percentage (%)
Alcohol use	No	285	42.3
	Yes	389	58.7
Current smoker	No	635	94.2
	Yes	39	5.8
Physical exercise	No	474	70.3
	Yes	200	29.7
History of DM	No	638	94.7
	Yes	36	5.3
Reduce salt in diet	Yes	77	11.4
	No	597	88.6
Reduce fat in diet	Yes	68	10.1
	No	606	89.9
Bodyweight	Obese/overweight	51	7.8
	Normal	623	92.4
Total		**674**	**100**

to decrease sand fat intake was only 11.4% and 10.1% respectively. Among the study participants, approximately 8% had a bodyweight beyond the normal (overweight/obesity) (Table 2).

Prevalence of hypertension

The overall prevalence of hypertension among adults age greater than 30 years in the community was 16.1% [95% CI, 13.5-19.26]. Among hypertensive individuals, approximately 5% were in stage I state with only 2% of stage II (Figure 1).

Hypertension is more than half among physically inactive individuals than active. Females were more hypertensive than males
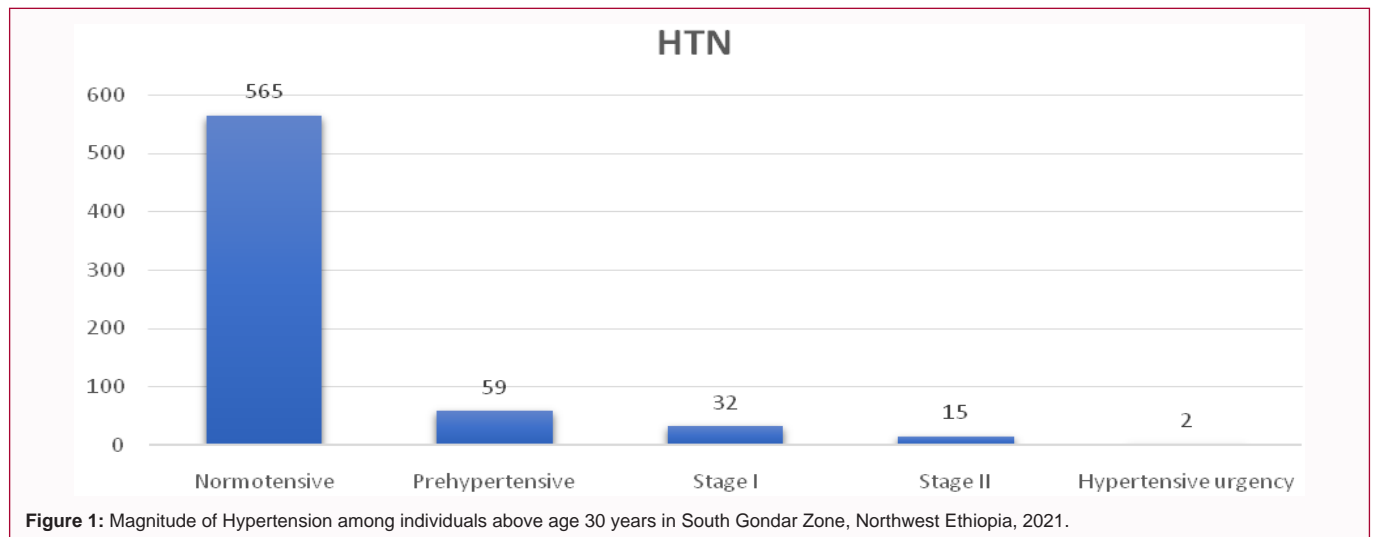
Figure 1: Magnitude of Hypertension among individuals above age 30 years in South Gondar Zone, Northwest Ethiopia, 2021.

Table 3: Magnitude of Hypertension among characteristics of individuals above age 30 years in South Gondar Zone, Northwest Ethiopia, 2021.

Variable		Hypertension		Pearson chi-square	P-value
		Yes, N (%)	No, N (%)		
Sex	Female	71 [17.8]	327 [82.2]	2.32	0.128
	Male	37 [13.5]	238 [86.6]		
Age in years	<43.5	46 [12.1]	334 [87.9]	10.07	0.002
	≥ 43.5	62 [21.2]	231 [78.8]		
Education status	No	50 [19.3]	209 [80.7]	6.92	0.074
	Primary	35 [16.0]	184 [84.0]		
	Secondary	16 [15.5]	87 [84.5]		
	Above	7 [7.6]	85 [92.4]		
Marital status	Single	7 [8.0]	81 [92.1]	17.83	0.001
	Married	76 [15.1]	428 [84.9]		
	Divorced/widowed	25 [30.9]	56 [69.1]		
Household members	< Five	56 [13.7]	353 [86.3]	4.29	0.038
	≥ Five	52 [19.7]	212 [80.3]		
Cigarette smoking	No	9 [23.7]	29 [76.3]	1.74	0.187
	Yes	99 (15.6)	536 (84.4)		
Alcohol use	No	58 [15.0]	330 [85.1]	0.82	0.365
	Yes	50 [17.5]	235 [82.5]		
Physical exercise	Inactive	21 [38.9]	33 [61.1]	22.73	0.001
	Active	87 [14.1]	532 [86.0]		

and HTN was higher in aged individuals (Table 3).

Factors associated with hypertension

In multivariable analysis age, sex, marital status, and level of physical activity were statistically significant with HTN. As age increased by one year, the odds of developing HTN increased by 3% [AOR=1.03, 95% CI, 1.01-1.05]. The odds of developing HTN among female individuals increased by 91% compared to male individuals [AOR=1.91, 95% CI, 1.15-3.19]. The divorced/widowed marital status of the individuals was also statistically significant with HTN. Keeping all other variables constant, divorced/widowed individuals had 3.21 times higher odds of developing HTN as compared to single [AOR=3.2, 95% CI, 1.17-8.8]. The odds of developing HTN among physically inactive individuals were 4.02 times higher than physical

active individuals [AOR=4.02, 95% CI, 2.10-7.70] (Table 4).

Discussion

In countries across the world, regardless of geographic location, size of the population, or stages of social and economic development, Non-Communicable Diseases (NCDs) are responsible for the high proportion of death and disability. Hypertension is one of the global public health issues which contributes to the burden of heart disease, stroke, kidney failure, premature mortality, disability, and disproportionately affects people in low- and middle-income countries where health systems are weak [11,12].

In our community-based cross-sectional study, we identified a high magnitude of hypertension in Kimir Dingay town, Northwest

Table 4: Multivariable logistic regression of the factors associated with hypertension in South Gondar, Northwest Ethiopia, 2021.

Independent variables	Hypertension		COR [95% CI]	AOR [95% CI]
	Yes	No		
Age in years	-	-	1.03 [1.02 - 1.05]	1.03 [1.01 - 1.05] **
Sex				
Male	37	238	1	1
Female	71	327	1.39 [0.91 - 2.15]	1.91 [1.15 - 3.19] *
Marital status				
Single	7	81	1	1
Married	76	428	2.05 [0.91 - 4.62]	
Divorced/Widowed	25	56	5.17 [2.09 - 12.77]	3.21 [1.17 - 8.80] *
Educational status				
No education	50	209	1	
Primary	35	184	0.79 [0.49 - 1.28]	
Secondary	16	87	0.76 [0.42 - 1.42]	
College an my6y6d above	7	85	0.34 [0.15 - 0.79]	
cigarette smoker				
No	99	536	1	
Yes	9	29	1.68 [0.77 - 3.66]	
Physical activity				
Active	21	33	1	1
Inactive	87	532	3.89 [2.15 - 7.04]	4.02 [2.10 - 7.70] ***

Ethiopia in which a large proportion of the hypertension cases were undiagnosed and thus untreated. The prevalence of hypertension among adults was 16.1% which is lower than a study conducted at Dabat demographic and surveillance system, northwest Ethiopia (31.9%) [13] And higher than a study conductor in Bahir Dar city (10%) [14], Mekelle (11%) [15]. The variation might be due to the difference in the study population, sample size, and study setting. Since the study population might have differences in lifestyle in different settings. It might be also due to the age variation of the study population in the study sites. However, the finding is in line with evidence from a systematic review and meta-analysis which showed the overall prevalence of hypertension in the general population ranges from 9.3% to 30.3% [16], and a study conducted in Southwestern Ethiopia (17.7%) [15].

After controlling the effect of potential confounding factors in the multivariable logistic regression analysis, the variables old age, female gender, widowed/divorced marital status, and inactive physical exercise were significantly associated factors with hypertension. The higher the age was the more likelihood to have hypertension in our study. This finding is in line with a study conducted at Northwest Ethiopia, Mekele, and in Southwest Ethiopia in which older patients were more likely to develop hypertension than the younger age group [15,17]. This might be due to the narrowing of blood vessels as age increases.

In our study females were more likely to have hypertension than males. This finding is consistent with a study conducted in southwest Ethiopia [15]. Females were 1.9 times more likely to develop hypertension than males. The result is in line with a study conducted in Zambia [18]. However, this finding is in contrast to studies conducted in Bedele, Gonder, and Mekele which shows female respondents were less likely to have hypertension than males

[19,20]. This difference might be explained by the variation in the age of the study population and sample size.

Another important variable which found to have a significant association with hypertension was marital status (widowed/divorced). The odd of developing hypertension among widowed/divorced was 3.2 times higher than singles. This could be explained as those divorced/widowed people may be at risk for stress and depression which problem leads to overweight or associated with increased blood pressure, consequently hypertension.

Our study also revealed that patients who did not do regular physical exercise (in active physical exercise) were more likely to have hypertension than their counterparts. That is those who didn't involve in vigorous-intensity physical exercise were 4 times increased risk of hypertension when compared with those who did vigorous intensive physical exercise. This finding is in line with a study conducted in North and southwest Ethiopia [13,15]. This implies having regular physical exercise is an important factor for the prevention of hypertension.

Conclusion

In this study, the overall prevalence of hypertension was 16.1% in the study community which was comparatively higher in females than males. Older age, female sex, not engaging in vigorous-intensity physical exercise was found to be a significant factor that likely increased the risk of hypertension in the study population. Therefore, it is crucial to establish Community Education Programs about hypertension, and its screening, in the study community.

What is already know on this topic

• Environmental and personal lifestyle factors play a significant role in the increment of incidence of hypertension

- Hypertension is identified the major chronic disease for adults in Ethiopia.

What this study adds

- The overall magnitude of Hypertension is higher rural adult community in Ethiopia

- Females have more Hypertension diseases compared to Males.

Acknowledgment

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