Vascular Health and Risk Management

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ORIGINAL RESEARCH

Prevalence of Hypertension and Associated Factors Among Public Servants in North Wollo Zone, Amhara Region, Ethiopia, 2020

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Background: The leading preventable risk factor for premature death and disability worldwide is hypertension. Globally, 31.1% of adults (1.39 billion people) have hypertension and 9.4 million deaths are recorded annually, accounting for 13% of overall mortality.

Objective: The objective of this study is to assess the prevalence of hypertension and associated factors among public servants in North Wollo Zone, Amhara Region, Ethiopia.

Materials and Methods: An institutional-based cross-sectional study was conducted among 627 public servants. To classify candidate variables for multivariable logistic regression, a binary logistic regression model was applied. In order to analyze factors associated with hypertension among participants, all variables with a P-value<0.2 were entered into the multivariable logistic regression model. In order to determine statistical significance, a p value of less than 0.05 was taken. The assumptions of Chi square and multi-collinearity were verified. For model fitness, the Hosmer–Lemeshow goodness-of-fit was checked.

Results: The total hypertension rate was 27.6% (95% CI: 24.1–31.3). The prevalence was higher in males 129 (32.5%) than in females 444 (19.1%). History of diabetes mellitus (AOR= 9.64, 95% CI: 3.20–29.30), age >35 years (AOR= 2.94, 95% CI: 1.91–4.51) and body mass index 25kg/m^2 and above (AOR= 3.44, 95% CI: 2.21–5.34) have been found to be separately associated with hypertension.

Conclusion and Recommendation: Among public servants in the study setting (study area), hypertension has become a major public health issue. Half of the newly reported cases is hypertensive. The conclusion of this study calls for a more holistic approach to hypertension in terms of hypertension prevention, screening, and proper management.

Keywords: prevalence of hypertension, high blood pressure

Background

The leading preventable risk factor for premature death and disability worldwide is hypertension.[1] Globally, 31.1% (1.39 billion people) of the adult population have hypertension, and the rate is estimated to rise to 1.56 billion by 2025,[1,2] resulting in 9.4 million deaths at present.[3,4] Approximately 75% (1.04 billion) of people with hypertension live in low- and middle-income countries because of their understanding, treatment, and control.

From 2000 to 2010, the incidence of hypertension decreased by 2.6% in high-income countries, and recognition, care, and control increased dramatically. Low and middle-income countries saw a 7.7% rise in prevalence and little change in recognition, care, and control over the same 10-year period.[5]

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Received: 25 March 2021
Accepted: 9 June 2021
Published: 21 June 2021

The prevalence of hypertension (using a partition value of 140/90 mm Hg) is increasing in Africa and typically exceeds 20–25% in rural areas and over 30% in urban and semi-urban areas.[6,7] The overall prevalence of hypertension is approximately 30.8% in Africa and 30.0% in Sub-Saharan Africa.[8]

Currently, hypertension prevention and control disparities are believed to be a concern for metropolitan areas and developed countries, but over the past few decades, the burden of hypertension in low and middle income countries has increased. A large proportion of the hypertensive population remains undiagnosed, untreated or inadequately managed, leading to a growing burden of cardiovascular disease in Africa, particularly Ethiopia.[2,9]

The majority of research performed in Ethiopia are on the general population and public servants have no knowledge of hypertension. This study will therefore contribute to the assessment of hypertension burdens and will identify contributing factors among public servants in the North Wollo region. This helps to develop hypertension prevention and control mechanisms in these population groups.

Methods

Study Area and Population

The research was performed in the North Wollo district of northeastern Ethiopia, 521 km from Addis Ababa. Of the total population of the district, 1,703,566 were females, 855,190 (50.2), and 221,464 (13%) were urban dwellers. In the zone, there are 14 districts and 9856 public servants work in all districts. In order to determine the prevalence and the associated hypertension factor, an institutional cross-sectional analysis was used.

All public servants were included in the study those on annual leave and pregnant were excluded. For both prevalence and factors linked to hypertension, the sample size was determined and the greater was taken as a final sample size. The assumptions for calculating the sample size were 27.3%[10] 95% confidence interval, 5% error margin, two and 5% non-response rate design effect.

To select study participants, a two-stage sampling technique was used. Initially, 5 districts were chosen using a simple random sampling technique from a total of 14 districts in North Wollo. Then, based on population size, the total sample size was assigned proportionally to each of the randomly chosen districts. Secondly, through a systematic random sampling technique, 641 public servants who met the inclusion criteria were selected using lists of public servants from public service offices. By lottery method, the first participant of each district was selected and then the respondents were taken as study participants in the kth interval.

Data Collection Procedure and Measurements

With some adjustment, the WHO STEPS instrument and global physical activity questionnaire (GPAQ) have been used. There are three main components of the instrument: socio-demographic attributes, behavioral profile, and physical measurements. The instrument has been converted into Amharic, the local language. Via self-administered and physical measurement methods, data was collected. Five BSC data collection nurses and two supervisors (MPH) were trained for one day in the fields of research ethics, data collection procedures and data quality enhancement tool material. During the data gathering period, supervision was carried out on a daily basis. The completed questionnaires were examined for their completeness and consistency on a daily basis.

Data collection instruments were BP apparatus, measuring of anthropometry and questionnaires. The questionnaires were adapted from the WHO STEP wise approach recommended for non-communicable disease surveillance. Blood pressure was measured using aneroid sphygmomanometer with stethoscope after respondents waited for at least five minutes. Participants were asked for smoking taking caffeine and alcohol consumed after having a rest for 30 minutes before measurement. Three consecutive blood pressure measurement was taken five minute apart for all study respondents in a sitting position with the appropriate cuff size that covers 2/3 of the upper arm. Finally, by taking an average of the three BP measurements, the status of the participants was determined.

Height was determined in the upright position using a fixed height measuring board with the heel, shoulder and buttock of the participant touching the vertical board behind. The measurement value was reported to the nearest centimeter and weight was calculated using a calibrated weight scale in which light clothing and bare foot participants were measured. The BMI was measured as underweight (BMI <18.5), average (18.5–24.9), overweight (25.0–29.9) and obese (>30.0) in kilograms, separated by height in square meters.

Using a non-stretchable measuring tape, the waist circumference was measured (in cm). At the end of expiration, it was estimated at the smallest horizontal girth

between the costal margins and the iliac crest. By using non-stretchable measuring tape, the hip diameter (in cm) was measured at the widest part of the hip. The waist-to-hip ratio was determined as the circumference of the waist separated by the circumference of the hip. The person who measure the blood pressure of the participants was nurses, health extension workers and sometimes physicians.

Statistical Analysis

EPI INFO (Version 7.00) entered the data and exported it to STATA (Version 14.0) for statistical analysis. To identify candidate variables for multivariable logistic regression, a binary logistic regression model was applied. In order to analyze factors related to hypertension among participants, variables with a p-value <0.2 were entered into the multivariate logistic regression model. In order to determine statistical significance, a p value of less than 0.05 was taken. Both crude and adjusted odds ratio were presented with a 95% confidence interval. Chi square and multicollinearity assumptions were checked. The Hosmer–Lemeshow goodness-of-fit was tested for model fitness.

Ethical Considerations

Ethical clearance was obtained from the ethical committee of the institute of public health, college of medicine and health science, University of Gondar by Ref No/IPH/ … / 6/2020. A support letter was obtained from the North Wollo zonal administration office. Data was collected after informed the study participants about the objectives and purpose of the study. Their anatomized response will be published. They also informed that they have the right to withdraw from the study at any time with no further explanation. We received verbal informed consent from each study participant who were willing to participate in the study. The verbal informed consent was approved by the ethics committee of the institute of public health, college of medicine and health science, University of Gondar. The verbal informed consent also included the publication of anatomized responses of the study participants. The collected data were kept in secret and was not disclosed to anyone except the investigator. This study protocol was conducted in accordance with the World Medical Association (WMA) Declaration of Helsinki.

Results

A total of 627 public servants were participated in the study with response rate of 97.8%. Majority, 397 (63.32%), of the study participants were males. The median age of study participants was 32 years with IQR of 27–39 years. The educational level of study participants was 66.3% degree and above (Table 1). 20 (3.2%) and 19 (3%) of participants were existing and still cigarette smokers from the overall study subjects. In their lifetime, 420 (67%) of participants drank alcohol and 400 (64%) are active users of alcohol. Of public servants, 487 (77.7%) and 435 (69.4%) ate fruit and vegetables less than 3 days per week, respectively. Of the total of 173 hypertensive public servants, 87 (50.3%) were previously conscious of their status, of which 38 (43.7%) took hypertensive medicines (Table 2).

Prevalence of Hypertension

A total of 173 (27.6%) prevalence of hypertension among public servants was (95% CI: 24.1–31.3%). Prevalence of 129 (32.5%) in males and 44 in females

Table 1 Sociodemographic Characteristics of Public Servants in North Wollo Zone, 2020

Variables	Frequency	Percent
Sex		
Male	397	63.3%
Female	230	36.7%
Age		
<35 years	395	63%
≥ 35 years	232	37%
Educational level		
Certificate and lower	57	9.1%
Diploma	154	24.6%
Degree and above	416	66.3%
Family size		
≤ 4 families	508	81%
>4 families	119	19%
Marital status		
Single	201	32.2%
Married	391	62.4%
Others	32	5.4%
Work place		
Gidan	138	22%
Gubalafto	106	17%
Habru	141	22.5%
Kobo	130	20.7%
Woldia	112	17.8%
Monthly income(ETB)		
<2500	72	11.5%
2500–5000	304	48.5%
5001–7500	148	23.6%
>7500	103	16.4%

Table 2 Description of Behavioral and Physical Measurements Factors for Hypertension Among Public Servants of North Wollo Zone, North East Ethiopia, 2020

Variables		Frequency	Percent
Current smoker			
	Yes	20	3.2%
	No	607	96.8%
Previous smoker			
	Yes	19	3%
	No	607	97%
Ever drinks an alcohol			
	Yes	420	67%
	No	207	33%
Current drinks an alcohol			
	Yes	400	64%
	No	225	36%
Alcohol consumption per day			
	<3	291	92.1%
	≥3	25	7.9%
Number of days ate fruit			
	<3 days per week	487	77.7%
	≥ 3days per week	140	22.3%
Fruit consumption			
	<3 servings per day	601	95.9%
	≥3 servings per day	26	4.1%
Number of days ate vegetable			
	<3 days per week	435	69.4%
	>3days per week	192	30.6%
Vegetable consumption			
	<3 servings per day	550	88.4%
	≥ 3 servings per day	72	11.6%
Vigorous physical activity			
	Yes	175	27.9%
	No	452	72.1%
Moderate			
	Yes	263	42.2%
	No	361	57.8%
History of hypertension			
	Yes	87	13.9%
	No	540	86.1%
Drugs or medication have taken for hypertension			
	Yes	38	6.1%
	No	585	93.9%
History of DM			
	Yes	22	3.5%
	No	604	96.5%
BMI			
Under-weight		59	9.4%
Normal		403	64.3%
Overweight		147	23.4%
Obesity		18	2.9%
Waist Circumference for male			
Normal		330	83.1%
Risks		67	16.9%
Waist Circumference for female			
Normal		125	54.4%
Risk		105	45.6%

(19.1%). Eighty seven (50.3%) of the 173 cases of hypertension were previously identified and 86 (49.7%) were newly screened in the time of data collection. In the age group, the prevalence of hypertension was greater than 35 years 103 (44.4%) and less than 35 years 70 (17.7%). Participants who never drank alcohol were 129 (30.7%) and who did not consume alcohol 44 (30.7%) (21.3%). Public servants with 81 (49.1%) BMI

Table 3 Multivariable Logistic Regression results Among Public Servants in North Wollo Zone, North East Ethiopia, 2020

Variables	Hypertension Status		P value	COR	AOR(95% CI)
	Yes (%)	No (%)			
Sex					
Male	129(32.5%)	268(67.5(%)	0.01***	2.03	1.92(1.17–3.18)
Female	44(19.1)	186(80.9%)	1	1	1
Age					
<35 years	70(17.7%)	325(82.3%)	1	1	1
≥35 years	103(44.4%)	129(55.6%)	0.000***	3.71	2.94(1.91–4.51)
Educational level					
Certificate and below	20(35.1%)	37(64.9%)	0.755	1.27	0.88(0.41–1.91)
Diploma	46(29.9%)	108(70.1%)	0.221	1.75	1.56(0.76–3.2)
Degree and above	107(25.7%)	309(74.3%)	1	1	1
Family size					
Family size ≤ 4	134(26%)	374(73.6%)	1	1	
Family size >4	39(32.8%)	80(67.2%)	0.381	1.36	0.79(0.47–1.33)
Current Alcohol drinker					
Yes	129(31.9%)	275(68.1%)	0.370	1.72	1.89(0.97–2.28)
No	44(19.8%)	178(80.2%)	1	1	1
History of DM					
Yes	17(77.3%)	5(22.7%)	0.000***	9.76	9.64(3.20–29.30)
No	156(25.8%)	448(74.2%)	1	1	1
Moderate Physical Activity					
Yes	81(30.8%)	182(69.2%)	1	1	1
No	92(25.4%)	270(74.6%)	0.073	1.32	1.45(0.97–2.17)
BMI					
<25 kg/m2	92(19.9%)	370(80.1%)	1	1	1
≥25 kg/m2	81(49.1%)	84(50.9%)	0.000***	3.89	3.44(2.21–5.34)

Note: ***Indicates that factors which are statistical significance with hypertension.

25 and above and 92 (19.9%) average BMI participants. The prevalence of hypertension among males with a waist circumference greater than 94 cm is 34 (50.7%) and WC less than 94cm 95 (28.88%)

The prevalence of hypertension among males with a waist to hip ratio of 0.9 and above is 75 (40.8%) and participants with WHR 54 (25.4%) below 0.9. Female participants with WHR 0.85 and above had hypertension of 25 (22.5%). Seventeen (77.7%) of 22 DM patients were hypertensive cases (Table 3).

Discussion

Prevalence of Hypertension

Hypertension was described by this study as a major health problem among public servants in North Wollo. A result from our study indicates that about one-third of government officials are hypertensive. The prevalence in older age groups (>35 years old) was 44.4%, male participants 32.5%, alcohol users 30.7%, BMI 25% and above 49.1% and male participants 50.7% had >94cm waist circumference.

This finding is consistent with that of a study conducted in Addis Ababa federal public servants 27.3%[10] Northwest Ethiopia 27.9%[11] Southern Ethiopia 30%[12] Gondar City 28.3%[13] Ghana 25.4%[14] Tanzania, Egypt, South Africa and Kenya 30%[15] This high prevalence of hypertension was found to be 27.6% may be related to with a desire for modern conveniences, such as the adoption of unhealthy food habits with the transition from with a low glycemic index and a higher fiber content to a diet rich in salt, saturated fats, and poor-quality carbohydrates such as fast foods.[16–18]

The prevalence, however, is higher than studies conducted in Aksum town, 18.1% in Northern Ethiopia, 22.4% in Durame town, 23% in Angola and 19.9% in Nepal. This difference could be due to study time, differences in study population and settings, and increased consumption of energy-rich foods and reduced energy expenditure (less physical activity) may also contribute to higher BP levels.[19,20]

The prevalence of hypertension was 50.3% and 49.7% by self-reported and physical measurement, respectively. Half of the hypertensive public servants were not aware of the status of their hypertension, which needs effective and timely intervention. Most people with elevated blood pressure are known to have no signs before complications result in sudden death from heart attack or sudden intracranial bleeding or serious injury, such as stroke and heart failure.[21]

The prevalence of hypertension in this study was significantly higher in males than in females. Similarly, different studies have shown that males have a higher percentage of hypertension than females.[11,12,22,23] The potential reasons for this gender difference in the prevalence of hypertension may be attributed to behavioral risk factors such as alcohol intake, cigarette smoking and dietary factors.[24]

The prevalence of hypertension in males with a waist circumference greater than 94 cm is 50.7%, which is 28.8% greater than 94 cm compared to WC. Likewise, a woman whose waist circumference is 13.6% less than 80 cm and 25.7% greater than 80 cm. Different studies have shown a stronger link between waist circumference and hypertension.[25,26] This may be because vasoconstriction is caused by sympathetic activity and increases cardiac production. It can also promote reabsorption of renal tubular sodium, particularly at proximal sites.[27]

Determinants of Hypertension

The findings of this study revealed that the risk of developing hypertension rise with increasing age. Being males history of DM patients and BMI with 25 and above were independently determinant factors developing hypertension.

The odd of being male is nearly 2 times higher developing hypertensive than female. This is consistent with the study conducted Adults in Ethiopia,[23] Durame town,[12] residents of Gondar city in Ethiopia[22] and north west Ethiopia.[11] The higher prevalence among male could be due to factors related to harmful alcohol consumption, low intake of vegetables and fruits and cigarette smoking.[28]

The likelihood of hypertensive research subjects whose age is >35 years is 2.94 times greater than those under 35 years of age. The rise in higher-age blood pressure is consistent with several studies performed in Ethiopia and Ghana.[29,30] This may be due to increased aorta rigidity, and with increased age, the arterial wall may lead to the development of hypertension. Aging is related to progressive arterial stiffening and pulse pressure widening, resulting in a high prevalence of systolic hypertension.[31]

The risk of developing hypertensive DM is 9.64 times higher than public servants with no DM. This result is confirmed by research in Gondar,[11] Addis Ababa[10] and north west Ethiopia[13] in adults. Evidence has shown that hypertension and diabetes significantly share similar mechanisms, such as obesity, inflammation, oxidative stress, insulin resistance, and mental stress.[32]

The risk of developing hypertension is 3.44 times greater than those with less than 25 kg/m2 of BMI 25 and above. This result is consistent with the Community Based Cross-sectional Analysis of Northwest Ethiopia,[13] Durame Town, Southern Ethiopia,[13] northern Ethiopia,[33] residents of Gondar city[22] and Federal public servants in Ethiopia.[10] Overweight and obesity are attributed to changes in lifestyle and eating patterns that ultimately contribute to an increased risk of high blood pressure.[34] The body mass index (BMI) is generally referred to as the hypertension proxy and mediator factor.[35] The correlation between overweight, obesity, and hypertension observed may be due to the disparity in study participants' eating patterns and physical inactivity. Significant numbers of public workers were listed in this study under unhealthy diets such as poor intake of fruit and vegetables, higher number of public servants labeled as heavy drinkers, and physically inactive.

Limitation of the Study

This study was conducted among public servants in urban environments, which could not be generalized among

general populations to rural and urban environments. There was no evaluation of biochemical measures such as total cholesterol, high density lipoprotein (HDL), fasting blood glucose, environmental and workforce-related variables. In response to behavioral factors such as cigarette smoking, alcohol intake and eating patterns, social desirability bias may be introduced.

Conclusion

This study shows that the prevalence of hypertension among civil servant groups was relatively high as compared to other studies. Sex, age, family history of DM and BMI were independently deciding factors in public servants for hypertension. In terms of prevention, screening, and careful treatment of hypertension and other comorbidities, the finding calls for more systematic action against hypertension. We recommend that environmental and workforce-related causes of hypertension in public servants be evaluated. Periodic blood pressure screening and health risk management services are better extended to the workplace through the health department and district health offices.

Author Contributions

All authors made a significant contribution to the work reported in or in all of these areas in the conception, design of the study, execution, data acquisition, analysis and interpretation; took part in the drafting, revision or critical review of the article; gave final approval of the version to be published; agreed on the journal to which the article was submitted; and agreed to be accountable.

Disclosure

All authors declare that they have no conflict of interest in this work.

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