Prevalence and associated factors of hypertension complications among hypertensive patients at University of Gondar Comprehensive Specialized Referral Hospital

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Abstract

Background: Cardiovascular diseases (CVDs) were non-communicable diseases that remain the leading cause of disability and death in the world. Therefore, this study aimed to assess the prevalence and associated factors of hypertension complications among hypertensive patients at University of Gondar comprehensive specialized referral hospital.

Method: A cross-sectional study was conducted to assess the prevalence and associated factors of hypertension complications, from 1st June 2020 to 30th August 2020. Interview-guided self-administered questionnaire and a chart review were used for data collection. Statistical significance was set at a 95% confidence interval using a P-value of ≤0.05 as a cutoff point.

Results: Out of 428 hypertensive patients, 261 (61.0%) were males. They were from 19 to 84 years age group and the mean age of participants was 53.55 ± 16.65 years. Participants with a family history of hypertension were 5 times more likely to develop complications than those with no family history of hypertension (AOR = 5.372, 95% CI = 2.378, 12.134, p = 0.001). Participants who had sedentary physical activity were 4 times more likely to develop complications than those doing vigorous physical activity (AOR = 4.049, 95% CI = 1.463, 11.206, p = 0.007). Participants who had high waist circumference were 7 times (AOR = 7.229, 95% CI = 1.436, 36.394, p = 0.016) more likely to develop complications than those with low waist circumference.

Conclusion: In this study, being female, illiterate participants, having a family history of hypertension, doing sedentary exercise and obesity are factors associated with hypertension complications.

1. Background

Non-communicable diseases were a major people’s health challenge in the past 2 decades, and CVDs were non-communicable diseases that remain the leading cause of death and disability in the world according to the report from the World Health Organization published in September 2011. So that disability is a major global public health problem as it causes CVDs, and affects an estimated 1.13 billion people worldwide, two-third of this lives in low and middle-income countries. It is predicted to be increased by 30% and 1.56 billion adults will suffer from hypertension in 2025 and among this about 75% of the world’s hypertensive population will be in developing countries.

It has been an important risk factor for coronary heart disease, congestive heart failure, ischemic and hemorrhagic stroke, renal failure, and peripheral arterial diseases. It also contributes to the pathogenesis of microvascular complications in diabetes and is also included as a risk factor for diabetic retinopathy. Because there is a continuous association between blood pressure (BP) rise and relative risk for CV endpoints. Furthermore, the incidence of heart failure and mortality from cardiovascular complications of HTN is high among patients with uncontrolled BP. So that hypertension caused at least 45% of mortality due to cardiovascular problems and 51% of stroke mortality rate. Therefore, the incidence of hypertension and its complications is increasing which has resulted in significant morbidity and mortality.

Hypertension is a chronic medical condition characterized by
elevated blood pressure (BP) where systolic blood pressure (SBP) is \( \geq 140 \) mmHg or diastolic blood pressure (DBP) is \( \geq 90 \) mmHg in the arteries. It makes the heart work harder to circulate blood through the blood vessels. In some age groups, the risk of CVDs doubles for each increase of 20 mmHg in SBP and 10 mmHg in DBP starting from 115/75 mmHg. Treating SBP and DBP until they are less than 140/90 mmHg is associated with a reduction in cardiovascular complications. Many studies in different parts of the world show that uncontrolled BP is a common phenomenon among hypertensive patients on treatment. Thus, BP was controlled for only less than 50% of the hypertensive patients in Japan, 31.7% in Turkey, and 48.3% in Malaysia. Controlling BP is a difficult experience in Africa too; BP control was accomplished for only 47.7% of the hypertensive patients on follow-up in Tanzania, 35.9% in Uganda, 32.8% in Zimbabwe, 33.4% in Kenya, and 40.1% in Addis Ababa, Ethiopia. As the available evidence showed that HTN is a public health problem in Ethiopia, mortality is high indicating that increased complications of the disease such as stroke, heart failure, and renal failure. Uncontrolled blood pressure predisposes patients and it is an independent risk factor to cerebrovascular, cardiovascular, and renal events. It is evident in previous study that in spite of accessible therapeutic alternatives, blood pressure remained above 140/90 in a large number of hypertensive patients in Ethiopia. Studies have shown that multiple factors were found to contribute to inadequate HTN control, particularly, non-adherence is a potentially modifiable risk factor that affects BP control. Similarly, a study in India showed a large proportion of participants perceived absence of salt restriction, lack of physical exercise, and irrational use of anti-hypertensive medications were the major risk factors for development of complications of hypertension. Moreover, among the commonly known risk factors for hypertension and its complication from modifiable risk factors are obesity, physical activity, diet, smoking, alcohol consumption, and diabetes mellitus whereas gender, age, genetics, and race are not amenable to change risk factors. Additionally, common risk factors for hypertension, such as a family history of hypertension, diabetes, or being overweight, have been found to be strongly associated with high BP. The aim of this study assesses prevalence and associated factors of hypertension complications among hypertensive patients at university of gondar comprehensive specialized hospital.

2. Methods

2.1. Study design, study area, and period

A cross-sectional study was conducted to identify the major risk factors inducing hypertensive complications at the University of Gondar Comprehensive Specialized Referral Hospital, Northwest Ethiopia. The study was conducted at the University of Gondar Comprehensive Specialized Hospital, Chronic ambulatory care clinic from 1st June 2020 to 30th August 2020. University of Gondar Comprehensive Specialized Hospital is found in the historical town of Gondar located 750 km Northwest of Addis Ababa in the North Gondar zone of the Amhara National Regional State.

2.2. Study participants and sampling

All adult hypertensive patients (age \( \geq 18 \) years) who visited the hypertension care services of University of Gondar Comprehensive Specialized Hospital through the study period were included. Hypertensive patients with a duration of hypertension of less than one year, pregnant women, and participants with mental problems were excluded from the study. Single population proportion formula was used with the assumption of 95% CI, 5% margin of error, the prevalence (p) of (50%), and 5% for possible non-response to determine a final adjusted sample size of 372. Then, a systematic random sampling method was used to recruit the final participants. However, to increase the power of the study, the sample size was extended to 428.

2.3. Data collection process

The data collectors were appropriately skilled in the data collection tool before data collection. Several published articles were reviewed to prepare the data collection tool. Interview-directed self-administered questionnaires and a chart review were employed for data collection. Patients with hypertension who were unable to write and read were interviewed. The questionnaire includes both the socio-demographic characteristics and clinical status of the patients.

The presence of complications was diagnosed by the physician, the laboratory findings and complications were obtained from the patient charts. The collected data were checked and cleared every day for consistency and completeness before processing. During data gathering, two trained health professionals were recruited and supervised by two MSc graduate health professionals. Finally, the fulfillment and completeness of all questions were checked by the data collectors and principal investigator.

2.4. Operational definitions

- **Hypertension:** A sustained high blood pressure (SBP \( \geq 140 \) or DBP \( \geq 90 \) mmHg).
- **Pre-hypertension:** SBP is 120–139 mmHg or DBP 80–89 mmHg.
- **Normal:** SBP is 90–119 mmHg and DBP 60–79 mmHg.
- **Complications of hypertension:** are clinical outcomes that result from persistent elevation of blood pressure. Hypertension is a risk factor for all clinical manifestations of atherosclerosis since it is a risk factor for atherosclerosis itself.
- **Body Mass Index:** Calculated as weight in kilograms divided by height in square meters and interpreted as underweight (BMI <18.5), normal (18.5–24.9), overweight (25.0–29.9), and obese (≥30.0).
- **Vigorous physical activity:** Intensity activity on at least 3 days achieving a minimum of at least 1500 MET minutes/week OR 7 or more days of any combination of walking, moderate- or vigorous intensity activities achieving a minimum of at least 3000 MET-minutes per week.
- **Moderate physical activity:** Three or more days of vigorous-intensity activity of a least 20 min per day or, 5 or more days of moderate-intensity activity or walking of at least 30 min per day OR 5 or more days of any combination of walking, moderate- or vigorous intensity activities achieving a minimum of at least 600 MET-minutes per week.
- **Sedentary physical activity:** A person not meeting any of the above-mentioned criteria falls in this category.

2.5. Data management and statistical analysis

Data were entered using the Epi-info version 7.2.2.6 and analyzed using the SPSS version 26. Descriptive statistics, like frequency distribution, mean, and percentage were employed for most variables. A forward stepwise binary logistic regression analysis was done to assess the relative importance of the explanatory variables on the dependent variable (hypertension and its complications). Statistical significance was set at a 95% confidence interval using a P-value of ≤0.05 as a cutoff point.

3. Results

Out of 428 hypertensive patients, 261 (61.0%) were males. They were from 19 to 84 years age group and the mean age of participants was 53.55 ± 16.65 years. Nearly two-half of the participants (61.0%) were urban residence and 73.4% had orthodox religion with near to half participants were self-employed. (91.3%) were living with extended family. Of the participants, 123 (28.7%) had hypertension for a duration...
of greater than 20 years (Table 1).

From the sociodemographic characteristics sex was significantly associated; female participants with hypertension were 3 times more likely to develop complication compared to males (AOR = 2.865, 95% CI = 1.169, 7.021, p = 0.021). Divorced participants were about 80% less likely to have complication compared to those who were single (AOR = 0.200, 95% CI = 0.059, 0.678, p = 0.010). Muslim participants were about 80% less likely to have complication whereas protestant with hypertension were 4 times more likely to develop complication compared to orthodox (AOR = 0.184, 95% CI = 0.067, 0.508, p = 0.001 and AOR = 24.271, 95% CI = 5.059, 116.450, p = 0.001 respectively). Compared to government employed participants, farmers were 5 times more likely to develop complication (AOR = 5.135, 95% CI = 1.064, 24.773, p = 0.042). Iiterate participants were 7 times more likely to develop complication than those who attained higher education (AOR = 6.772, 95% CI = 1.415, 32.404, p = 0.017). Participants with family history of hypertension were 5 times more likely to develop complication compared to those with no family history of hypertension (AOR = 5.372, 95% CI = 2.378, 12.134, p = 0.001). Participants who had sedentary physical activity were 4 times more likely to develop complication than those who had vigorous physical activity (AOR = 4.049, 95% CI = 1.463, 11.206, p = 0.007). Participants who had high waist circumference (obesity) were 7 times ((AOR = 7.229, 95% CI = 1.436, 36.394, p = 0.016) more likely to develop complications than those who had low waist circumference (underweight). Participants with normal and prehypertension 90% and 97% less likely develop complication compared to stage II hypertension (AOR = 0.099, 95% CI = 0.027, 0.363, p = 0.001 and AOR = 0.028, 95% CI = 0.010, 0.080, p = 0.001, respectively). Participants with less than 5 years duration of hypertension were 3 times more likely to develop complication than those with greater than 20 years duration of hypertension (AOR = 3.091, 95% CI = 3.349, 12.349, p = 0.001) (Table 2).

In this study, the overall prevalence of hypertension complications was 203 (52.7%). Diabetic mellitus 151 (35.3%) was the most reported complication by hypertensive patients, followed by dyslipidemia 135 (31.5%), kidney disease 123 (28.7%), Stroke 99 (23.1%), eye problem 48 (11.2%), and heart disease 45 (10.5%) (Table 3).

### Table 1

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<th>Percent</th>
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<td></td>
<td>&gt;20</td>
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4. Discussion

Raised blood pressure is a major risk factor for CVDs, moreover elevated BP is also positively correlated with the risk of CVDs, and so CVDs include stroke, coronary heart disease, chronic heart disease, peripheral vascular disease, retinal hemorrhage, renal impairment, visual impairment, and heart failure. The most common complications of hypertension in this study include diabetes mellitus, dyslipidemia, kidney disease, stroke, eye problem, and heart disease. Among these, diabetes mellitus was the most common complication followed by dyslipidemia, kidney disease, and stroke. Being female, farmers, illiteracy, family history, sedentary activity, and obesity were significantly associated risk factors for hypertension and its complications, whereas divorced and Muslims were protective risk factors for hypertension and its complications. Moreover, alcohol and smoking were not associated risk factors for complications of hypertension in this study due to low prevalence as a result of health education. Health education is important in this concern.

Several studies have revealed that good control of blood pressure is vital to avoid risky complications. In this study, participants with normal and prehypertension were less likely to develop complications when compared to stage II hypertension. Furthermore, the development of complications was a significantly associated risk factor with a duration of hypertension. This result is consistent with the finding of studies conducted in Ethiopia and Nigeria which suggested the possible reason might be an increase in awareness and adherence to antihypertensive treatment as the patient stays on treatment for longer years. Illiterate participants developed more complications than those participants with higher education levels. This is consistent with the studies which reported lower control on hypertension among individuals with lower education and that low rates of control and treatment of hypertension have been considered as a major risk to increase CVDs and stroke.

In this study, age was not an associated risk factor for hypertension and its complication, unlike other studies that reported age was independently associated with hypertension that hypertension-related morbidity increases with increased age along with subsequent complications. Participants with a family history of hypertension developed more complications than those participants having no family history. This is in line with other findings and reported that the association was due to family history increases the risk of developing hypertension. Because it exposed the patient to high blood pressure, heart disease, and stroke or their family had the same lifestyle habits.

The present study also revealed that family history and obesity were
associated risk factors for hypertension and its complications. This is consistent with the finding reported that a family history of hypertension, diabetes, and being obese was strongly associated with high blood pressure and a strong association between elevated blood pressure and complications. This finding is also consistent with the study conducted in Saudi Arabia, and India.

Participants with sedentary activity developed more complications than participants doing vigorous activity. This is in agreement with other studies and such association was because of the decreased activity in less than 10 min daily increased risk of hypertension, and also it was as a result of increased peripheral vascular resistance due to an increase in neuro-hormonal and structural responses with enhancement in sympathetic nerve activity and a decrease in arterial lumen diameters. Similarly, a study in India showed lack of physical exercise was the major risk factor for the development of complications of hypertension. Moreover, a Canadian study showed that excess body weight and living a sedentary lifestyle predispose an individual to hypertension and its complications.

In this study, participants with obesity were 7 times more likely to have complications than those underweight participants (AOR = 7.229, Table 2).
95% CI = 1.436, 36.394, p = 0.016), similar to the current finding other studies reported that obesity was a significant risk for developing hypertension than those with normal or overweight subjects.\(^5\) Besides another study found that overweight subjects had a two-fold risk of being hypertensive and obese had more than the three-fold risk for the same in comparison to underweight subjects.\(^6\) Furthermore, other studies showed that obesity (BMI >25) is 2.62 times more risk for developing hypertension as compared to those not having BMI < 25.\(^6 -10\) So obesity is not only linked to the risk of hypertension, but it can also predict uncontrolled hypertension,\(^11\) and other studies also revealed that overweight and obese patients have a less chance of controlled BP.\(^12\) Studies reported that the possible reasons between overweight and complication of hypertension could be that increased weight increases cardiac output and peripheral resistance of arterioles which causes elevated arterial pressure and structural changes in the kidney.\(^13\)\(^-14\) It may also be due to obesity inducing a state of chronic volume overload as a result of increased requirements to circulate blood through large and relatively low resistance adipose tissue.\(^5\)\(^-6\)

5. Conclusion

In this study Being female, illiterate participants, having a family history of hypertension, doing sedentary exercise, and obesity are strongly associated risk factors for hypertension and its complication. Health education should be given to hypertensive patients on the risk factors for hypertension and complications as well as prevention. Implementation of proper training programs and offering essential services to health care services by health professionals is necessary. The other approach to control hypertension and its complications by patients includes taking prescribed medicines, maintaining regular physical activities, weight control, and good nutrition. It is also important to note that all patients taking regular medicines are the best way of preventing complications of hypertension.

Ethical consideration

The school of Pharmacy on behalf of the University of Gondar institutional ethical review committee provided ethical clearance. Upon this clearance, additional written informed consent was taken with included study subjects before the interview. Confidentiality of information was maintained by avoiding the recording of patients’ names and keeping the data anonymously. Finally, personal identifiers were excluded during the data presentation.

Availability of data and materials

Most of the data is included in the manuscript. Additional can be found from the corresponding author based on reasonable request.

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Declaration of competing interest

The authors declare that he has no competing interests.

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References