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Assessment of Risk Factors Associated with Hypertension in Adult Population in Letlhakane, Botswana

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Abstract

Hypertension is an important public health challenge because of its associated morbidity, mortality, and the cost globally. Hypertension is the leading cause for cardiovascular disease in both developed and developing countries including Botswana. Only 3 population-based studies of hypertension have been conducted in Botswana and the latest 2010 STEPS survey reported a prevalence rate of 28.6%. This study was the first of its type to examine the prevalence of Hypertension and its associated risk factors among adults in Central Botswana. The objectives of this study were to estimate the prevalence of hypertension and assess the associated risk factors among adults in Letlhakane, Boteti Sub District-Botswana. A community based descriptive cross-sectional study was carried out on 377 participants (149 males and 228 females) aged 18 years and above, using simple random sampling method. The overall prevalence of hypertension among the study population was 38.5%. Females had a higher prevalence of hypertension (55.2%) as compared to males (44.8%). Age, body mass index, waist circumference, alcohol consumption and tobacco use were found significantly associated with hypertension ($p<0.05$). Regular screening for hypertension among adults should be done throughout the community for knowledge regarding their individual blood pressure status. Among those who already have hypertension and are on anti -hypertensive drugs; timely blood pressure check-up, screening for cardio vascular diseases and proper self-care management need to be promoted. Intervention measures should be undertaken at the community level; particular emphasis should be placed on primary prevention through adherence to healthy life style.

Keywords: *hypertension, risk factors, prevalence, cross sectional, community-based, blood pressure*

Acronyms

BP	:	Blood Pressure
CVDs	:	Cardiovascular Diseases
BMI	:	Body Mass Index
LMICs	:	Low-income and Middle-income countries
WHO	:	World Health Organization

Introduction

Hypertension is an important public health challenge because of its associated morbidity, mortality, and the cost globally. Hypertension is one of the main leading causes of cardiovascular disease (CVD) worldwide. Kearney et al. (2005)[10] describes the disease as a silent threat to the health of a population because records indicate that about 1 billion adult population worldwide had hypertension in 2000 and, this figure is expected to increase to about 1.56 billion by 2025. According to global health viewpoint the overall prevalence of raised blood pressure was 40% in adults aged 25years and over in 2008 globally. Drivers of the hypertension epidemic are urbanization and changes in lifestyle associated with economic development. These include changes in diet, alcohol consumption, tobacco use, obesity, family history, body fat, increased stress and decreased physical exercise.

An increase in hypertension prevalence will invariably lead to dramatic rises in the incidence of CVDs and their consequences, which has the potential to overwhelm health care systems. It will also have financial implications for national and local treatment plans because there is increasing evidence that the majority of patients with hypertension will require two or more drugs to achieve blood pressure control (Twagirumukiza et al 2001)[24].

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The burden of hypertension is high in Africa, and due to rapid population growth and ageing, the exact burden on the continent is still far from being known. A report from the World Bank (2012)[29] indicates that in Africa, about 80 million people had hypertension in 2000 and this figure is expected to rise by 2025. More than one-third of adults in Africa are hypertensive; as in the urban populations of most developing countries.

In Botswana, the Ministry of Health and Wellness STEPS 2007 report showed that the national prevalence of hypertension was estimated to be 16.9 %, whereas the 2010 STEPS report showed an increase in prevalence at 28.6%. According to the latest WHO data published in May 2014 Hypertension Deaths in Botswana reached 472 or 3.16% of total deaths. The age adjusted Death Rate is 49.18 per 100,000 of population, which ranks Botswana number 4 in the world.

The present study was undertaken to estimate the prevalence of hypertension and to assess the associated risk factors among adults of Letlhakane village. It was my observation that many people in Letlhakane follow unhealthy life styles such as eating lots of fast foods, alcohol abuse, tobacco smoking and physical inactivity that could predispose to the Hypertension disease.

Methods

A community based descriptive cross-sectional study was conducted to estimate the prevalence and associated risk factors of hypertension among adults of Letlhakane village during the period of August and November 2018. A cross-sectional study was selected considering cost and the limited time to complete the study. Letlhakane village is situated in Boteti Sub District in Central District, Botswana and it is comprised of 9 clusters called wards (catchment areas within the village). According to the 2011 census the population size of Letlhakane was 19, 539. The sampling frame was all adults aged 18 years and older who consented to be recruited. Individuals who rejected the recruitment process, pregnant women; those who were unable to give response due to serious physical or mental illnesses and with whom anthropometry measurements could not be performed were excluded from the study. Known cases of hypertension, those individuals who were already on medication for hypertension and those who were found to have high BP on this study were included in the sample.

The study used multiple variables at a time and the findings of this study can be used to explore further studies required. In this study a multi-stage sampling technique was applied to select study subjects. Sample size was 377 which was calculated using the Epi-info version 6 at 95 % Confidence interval and a margin of error (5% or 0.05). A Simple Random Sampling technique was used to select 3 wards from the total of 9. The sampling fraction from each of the selected wards was determined proportionate to the total households of each selected ward. Then systematic sampling method was employed to select the households from each wards where the sampling interval was the total number of households in each wards divided by the corresponding number of households to be interviewed in the respective wards. The first household to be interviewed was determined from the ward house number using simple random sampling method. The next household was identified systematically (H/hth) household by going clockwise direction. Eligible respondents aged 18 years and above were then selected as study subjects. Whenever more than one eligible respondent was found in the same selected household, only one respondent was chosen by lottery method (simple random sampling). In case no eligible was identified in the selected household, the interviewer would go to the next household in the clockwise direction until an eligible participant is obtained.

The WHO STEPS survey questionnaire tool for non-communicable diseases was adopted for data collection from the eligible subjects. During data collection the Expanded Demographic information (education level, marital status, income etc) and Biochemical Measurements section was excluded as the information was not needed to fulfill the purpose of the study but this did not compromise the reliability or validity of the study in any way. This questionnaire was administered by the principal investigator to one participant at a time and pretested. Data collected includes demographic characteristics, anthropometric data, blood pressure readings, history about smoking, alcohol consumption, dietary habit and physical activity. During the data collection process, subjects were administered the questionnaire. Height, weight, waist circumference and blood pressure were

measured and recorded. For anthropometric data, a tape measure, standardized weighing scale and a flexible non-stretchable tailor's tape were used.

Blood pressure was measured in (mmHg) using a standardized calibrated electronic Sphygmomanometer device. This device was reset after every measurements of each individual to ensure the authenticity and calibration of the tool. Three sitting BP readings were taken on the left upper arm in a sitting posture of the subject after having a sitting rest period of about 5-10minutes. The first reading was discarded and the average of the last two BP readings was used for analysis. BP for adults aged 18 years or older was classified as follows: (i) Normotensive: Systolic <120 mmHg, Diastolic< 80 mmHg; (ii) Pre-hypertension: Systolic from 120-139 mm Hg, Diastolic from 80-89 mm Hg; (iii) Hypertensive: Systolic from 140-179 mm Hg, Diastolic from 90-120 mmHg; (iv) Hypertensive Crisis: Systolic ≥180 mmHg, diastolic≥120 mmHg.

Hypertension was defined as a subject that had an average systolic blood pressure equal to or greater than 140 mmHg and/or an average diastolic blood pressure equal to or greater than 90 mmHg or a self-report of being treated for hypertension. Body Mass Index (BMI) was calculated using the following formula: BMI = weight (kg)/height (meters) ^{2}. Normal BMI was defined as between 18 to 25kg/m^2; below 18 kg/ m^2 is underweight and above 25km/m^2 is overweight. Data on dietary practices was defined by intake of fruits and vegetables in a period of 7 days. Data on physical activity was defined by its intensity and frequency in a period of 7 days.

An informed and written consent was taken from the individuals who were willing to participate in the study. Epi-info version 6 and IBM SPSS 22.0 were used for data processing, collection and analysis. Percentages were calculated for categorical variables, while mean and standard deviations were calculated for continuous variables. Chi – square test was used to ascertain significant differences in categorical variables. A p-value of less than 0.05 was considered as being statistically significant.

Ethical clearance for the study was obtained from the Committee on Human Research Publication and Ethics of the School of Public Health, Texila American University (TAU). Ethical clearance was also acquired from Ministry of Health and Wellness Botswana, Health Research Unit and further clearance was acquired from the local research committee of Boteti District Health Management Team in Letlhakane. Informed verbal and written consent was obtained from the subjects who volunteered to participate in the study before interview and the purpose of the interview was explained in detail to each participant. Confidentiality was assured through anonymous recording and coding of questionnaire and placed them in safe place after they have been collected and was used for the purpose of the study only. Identified hypertensive subjects were referred to the nearby clinic for treatment.

Results

Among the 377 participants 145 (38.5%), were found to be hypertensive, of which 122(84.1%) are known cases of hypertension and 23(15.9%) were newly diagnosed as hypertensive. 105(27.9%) were found to be pre-hypertensive and 126 (33.4%) were normotensives. In **Figure 1** though females had a higher prevalence of hypertension (55.2%) compared with males (44.8%), it was not statistically significant (p>0.05), **Table 1.**

The study result indicates that there is statistically significant association between age and being hypertensive p<0.05. Prevalence of hypertension was highest among age group 50-64 years (26.1%); this group also recorded the highest prevalence of hypertensive crisis, BP> 180/120 mmHg at 37.5%. Individuals aged between 18 and 30years old had the lowest frequency of hypertension at 6.5 %(**Figure 2**). There was also a significant increase in systolic BP with age.

The prevalence of hypertension was higher among those who were in the habit of smoking tobacco (62.5%) and alcohol consumption (48.3%). These differences were found to be statistically significant p<0.05 (**Table 1**). Statistical significant difference (p<0.05) was found in the prevalence of hypertension between individuals with a high BMI, 36.3% Overweight, 54.2% Obese compared to 1.4% in underweight and 8.1% in normal BMI participants.

Among participants who were hypertensive, 73.1% were physically inactive and only 26.9% were physically active. From these findings, there was statistically significant association between physical

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activity and hypertension (p<0.005). There was no statistical significant difference between fruits and vegetables consumption and hypertension, p=0.773 and p=0.767 respectively as shown in **Table 1**.

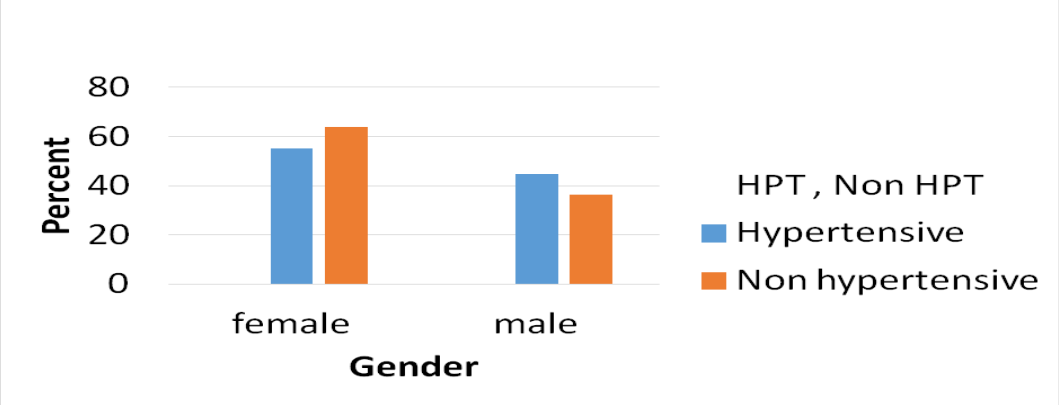

Figure 1. Prevalence of hypertension defined by gender

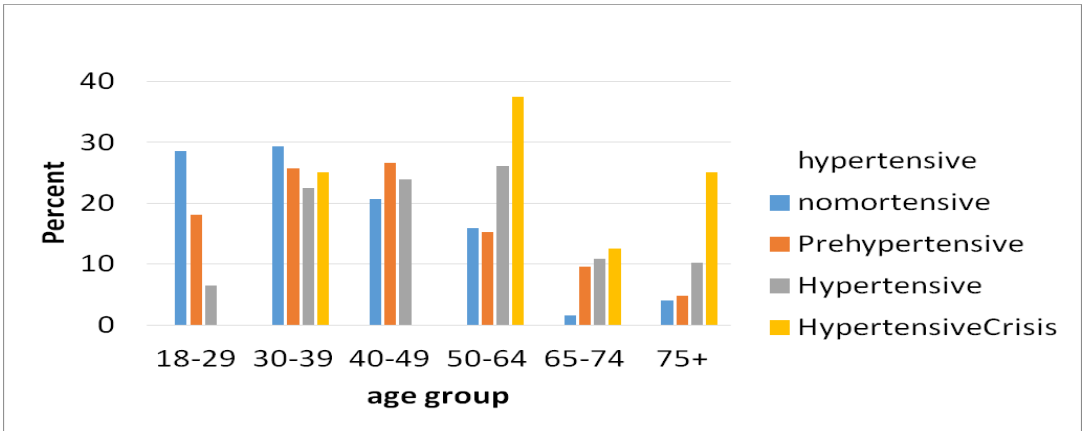

Figure 2. Distribution of Hypertension defined by Age Groups

Table 1. Hypertension risk factors in different blood pressure statuses

	Hypertensive %				Chi-Square Test
	Normotensive	Pre-hypertensive	Hypertensive	Hypertensive Crisis	
Gender: Male	40(26.8%)	43(28.9%)	64(43.0%)	2(1.3%)	p=0.79
Gender: Female	86(37.7%)	62(27.2%)	74(32.5%)	6(2.6%)	p=0.82
Tobacco Use	10(13.9%)	17(23.6%)	43(59.7%)	2(2.8%)	p=0.00
Alcohol consumption	20(20.4%)	13(13.3%)	61(44.2)	4(4.1%)	p=0.00
Physical activity	29(37.7%)	9(11.7%)	38(49.4%)	1(91.3%)	p=0.03
BMI - Overweight	41(33.1%)	38(30.6%)	43(34.7%)	2(1.6%)	p=0.00
BMI- Obese	15(15.6%)	29(30.2%)	48(50.0%)	4(4.2%)	p=0.00
Diabetic	10(19.2%)	14(26.9%)	27(51.9%)	1(1.9%)	p=0.57

Discussion

According to Addo et al (2007)[1], whereas high blood pressure was almost non-existent in African societies in the first half of the twentieth century, estimates now show that the prevalence of hypertension in Africa ranges from 40% to 50 % of adults and several of these are undiagnosed. The overall prevalence of hypertension in this study was found to be 38.5 % i.e. 145 participants among 377 study participants. Report by Tollman et al (2008)[22] also depicts high prevalence of hypertension ranges from 15% in the west of southern Africa; 25% in the east of southern Africa; between 42% and 54% in South Africa. Out of the 145 hypertensive patients 84.1% of them were aware of their hypertensive status while the remaining 15.9% were not. Findings of this study show that pre-hypertension has a prevalence of 27.9% and normotensive 33.4%, similarly Khanam et al (2015)[11] conducted a study following the WHO STEPS approach, and observed a prevalence of 31.9% pre hypertensive.

The prevalence of hypertension among females was (55.2%) which was higher compared to that of males (44.8%), however this study failed to show significant association between hypertension and sex ($p>0.05$) which is in line with a study by Tshitenge & Mabuza (2015)[23] which reported no significance in sex difference and the prevalence rate in men (28%) versus women (34%). Steve van de Vijver et al (2013)[20] however stated that in Africa, hypertension is usually more pronounced in males than in females.

Positive statistical significance was found with risk factors such as increasing age, higher BMI, larger waist circumference, tobacco use and alcohol consumption to hypertension. It was found that participants with these risk factors had higher prevalence of hypertension than participants without these characteristics. In this study, the frequency of hypertension increased with age, with a more steep increase at the age 50 years and older (47.1%). Though undocumented participants reported high levels of stress to be the cause of their increased hypertensive state as they grow older. This age group also recorded the highest prevalence of hypertensive crisis, BP> 180/120 at 75%. On another note, individuals aged between 18 and 30years old had the lowest frequency of hypertension (6.5%). Similar findings were reported in a population based study conducted in South Africa, by Van Rooyen et al (2000)[26] and Wiysonge et al (2004)[28] who found that age was positively correlated with blood pressure.

Elevated systolic blood pressure is a leading global health risk responsible for 14% of total deaths and 143 million disability-associated life-years (Huffman 2017)[8]. There was also a significant increase in Systolic BP with age in this study. From 50 years and above systolic blood pressure (≥140 mmHg) had a prevalence of 51.4%, whereas there was no significant increase in Diastolic BP among this age group. These findings are supported by Halley et al (2007)[7] and Shah et al. (2001)[18] who reported that after the age of 50, the diastolic blood pressure tends to fall or remain constant, whereas the systolic blood pressure rises consistently with age. Chobanian et al (2003)[4] stated that in those older than age 50, systolic blood pressure (BP) of greater than 140 mmHg is a more important CVD risk factor than diastolic BP; beginning at 115/75 mmHg, CVD risk doubles for each increment of 20/10 mmHg. Those who are normotensive at 55 years of age will have a 90% lifetime risk of developing hypertension; pre-hypertensive individuals (systolic BP 120–139 mmHg or diastolic BP 80–89 mmHg) require health-promoting lifestyle modifications to prevent the progressive rise in BP and CVD. (Chobanian et al 2003)[4]

The use of tobacco products was shown to be associated with an increase in prevalence of hypertension. Elevated blood pressure and tobacco smoking are, respectively, the first and second leading causes of preventable mortality worldwide (Danaei et al 2009)[5]. A person's risk of hypertension greatly increases with how frequent they use tobacco. The more frequent the use of tobacco, the greater their risk of being hypertensive. However, the chronic effects of tobacco smoking on blood pressure and the development of hypertension are uncertain. (Appel et al 2017)[2]. The prevalence of hypertension was observed to be higher (27.6%) among those who were in the habit of daily tobacco use than those that did not at 1.4% ($p<0.05$). Men show an insignificant higher prevalence of tobacco use 24.8% than females 15.4%, $p>0.05$ and smokeless tobacco i.e. snuff reported 31% among tobacco users. Similar prevalence of tobacco use was reported by Hunt et al (2005)[9], that there was a high prevalence of tobacco use for men (57%) and women (35.4%), with

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women (28.1%) predominantly using smokeless tobacco. Unlike other study findings, Tadesse and Alemu (2014)[21], found no relationship between cigarette smoking and alcohol with hypertension.

In this study there was a strong association (p=0.00) of the prevalence of hypertension with alcohol consumption. Out of 377 individuals, 98 (25.9%) were found to be consuming alcohol. Among those who consume alcohol 64(44.1%) had hypertension. The association between alcohol and high blood pressure is particularly noticeable in participants who drink weekly with a prevalence of 17.2%. Men show a significantly higher prevalence of alcohol consumption 38.9% than females 17.5 %. Raja & Muthukumar (2017)[17], in their study observed alcohol consumption as one of the major risk factor for hypertension and the alcohol consumption among hypertensive participants varied from 13 to 54%. According to Macmahon (1987)[12], of 30 cross-sectional population studies reviewed, the majority reported small but significant elevations in blood pressure in those consuming three drinks or more per day in comparison with nondrinkers. Other studies such as Pileggiet et al (2005)[16], Nielsen and Anderson (2003)[14], Monego and Jardim (2006)[13] however found no relationship between alcohol intake and hypertension.

There was no positive association and statistical significance between fruits and vegetables consumption and hypertension in the present study. A study by Utsugi et al (2007)[25], however suggested that high-level consumptions of fruits and vegetables is potentially associated with a lower risk of hypertension.

Physical inactivity was not a statistically significant risk factor as reported in this study. The overall prevalence of physical inactivity was 79.6% which means most of the participants live a sedentary lifestyle. A study by Beunza *et al.* (2007)[3] however showed that sedentary behavior was associated with likelihood of developing hypertension, independent of leisure-time physical activity. Diaz and Shimbo (2013)[6], further pronounced one of the recommended guidelines in preventing the risk of hypertension as increasing physical activity levels.

In this study, BMI contributed significantly to the hypertension status of participants. The hypertension prevalence increased with increase in BMI, BMI of <18.9 had 1.4% hypertensive and BMI of between 25 and 30kg/m^2 had 36.3% (Table 11). Similarly, a study by Wilson et al (2002)[27] and Pang et al (2008)[15] showed participants with a BMI $\geq$ 24.9 were more likely to be hypertensive compared to those with a BMI of 24.9 or lower, which is consistent with multiple previous studies that have reported a strong association between hypertension and BMI. A study conducted at Ajman also revealed that there is 14% increased chance for hypertension due to increase in BMI (Sreedharan et al., 2010)[19]

Conclusion

Findings of this study indicated that a significant proportion of adults aged 18 years and above had Hypertension in Letlhakane village with an overall prevalence rate of 38.5% of which 15.9% of the hypertensive did not know they had hypertension. Consequently the newly diagnosed hypertensives were not on treatments who are likely to be predisposed to all known outcomes of untreated hypertension. Moreover significant proportions of the participants (27.9%) were found to be in pre hypertensive state. The study also indicated that factors such as increased age, over weight and obesity, tobacco & alcohol consumption are associated with being hypertensive. This study will help in setting the baseline by which the risk factor can be ranked and specific control strategies can be planned to promote healthy life style among the adult population.

Recommendations

The following recommendations are given for the prevention and control of the Disease. There is an urgent need to design programs that increase access to Blood pressure Screening services to all age groups of 15years and above, through intensifying routine screening of all clients visiting the health facilities for any reason. Periodic Awareness creation campaigns with BP screening need to be conducted in the district that can subsequently enhance prompt care and treatment to those diagnosed with hypertension. Intensify promoting healthy lifestyle practices among community members with behavior for regular screening.

Lifestyle modification is the main strategy of preventing hypertension, thus particular emphasis on discouraging alcohol abuse, tobacco smoking and obesity is essential. Ensure consistent adherence to prescribed regimen of treatment to those who already have developed hypertension to prevent complications. Further study is required to assess the cause effect relationship of identified risk factors to the development of hypertension in the community and the nation as a whole ., it is important for the government to accelerate efforts and increase investments and resources to address this disease, in order to reduce the health and socioeconomic burden of the disease.

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