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Risk Factors Associated with Hypertension among Adults in the Hohoe Municipality, Ghana

Sedoafia Amelor[1], Margaret Kweku[1], Eric Agboli[1], Isaac Agbemafle[2], Wisdom Takramah[1], Elvis Tarkang[3*], Wisdom Kudzo Axame[1], Prince Kubi Appiah[2] and Fred Newton Binka[4]

[1]Department of Epidemiology and Biostatistics, School of Public Health, University of Health and Allied Sciences, Ho, Ghana.
[2]Department of Family and Community Health, School of Public Health, University of Health and Allied Sciences, Ho, Ghana.
[3]Department of Population and Behavioural Sciences, School of Public Health, University of Health and Allied Sciences, Ho, Ghana.
[4]University of Health and Allied Sciences, Ho, Ghana.

Authors' contributions

This work was carried out in collaboration among all authors. Authors SA and MK conceived the study. Authors MK, WT, IA, SA and WKA did the data analysis and wrote the methods section. Authors MK, SA, IA, EA, PKA and ET were responsible for the initial draft of the manuscript. Author ET critically reviewed the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Background: Hypertension (HPT) is a major cause of morbidity and mortality worldwide and is increasingly becoming an important medical and public health issue. Identification of major risk factors, their prevention and control form the basis of the prevention of the disease. We set out to determine risk factors associated with HPT among adults in the Hohoe Municipality, Ghana.
Methods: A matched case control study was conducted in February 2016 using 65 cases of HPT recruited from the municipal hospital HPT clinic and 130 controls from communities of the cases to trace various exposures to hypertension. Information on the background characteristics, family

**Corresponding author: E-mail: ebeyang1@yahoo.com;*

history and lifestyle practices were collected using the WHO STEPWISE questionnaire. Blood pressure (ABP) and glucose levels were measured using a digital sphygmomanometer (Omron M3, HEM-7131-E) and glucometer (*ONETOUCH UltraEasy*). Weight, height, waist and hip circumference were measured with a digital weighing scale, Stadiometer and an inextensible tape measure respectively. Chi-square test and Odds Ratios were used to determine the relationships and associations between the dependent and independent variables at the 0.05 level.

Results: About 84% of the respondents were females, majority (72.3%) were between the ages of 45-74 years, 61% were married, 37.9% had no formal education and most (43.6%) were traders. There was no significant difference in background characteristics between the cases and controls. The odds of those with Diabetes developing HPT is 3.80 times higher compared to those without Diabetes [OR=3.80 (95% CI: 1.07-3.45); p=0.039]. The odds of developing HPT among those with Family history of HPT/Diabetes was 5 times more compared to those with no family history of HPT/Diabetes [OR=5.45 (95% CI: 0.28-1.02; p<0.001]. The odds of current consumers of alcohol developing HPT was 2 times higher compared to those who never consumed alcohol [OR=2.24 (95% CI: 0.99-5.06; p=0.052]. Palm oil consumption was 4.9 times higher among those with hypertension compared to vegetable oil [OR=4.90 (95% CI: 2.58-9.0; p<0.001], and those with hypertension were 1.5 times more likely to consume low salt, 2 times more likely to consume fruits 2 to 3 days a week and 3 times more likely to consume vegetables 2 to 3 days a week.

Conclusion: Alcohol consumption, diabetes and family history of hypertension were risk factors associated with hypertension. Those with hypertension were more likely to consume palm oil, take in less salt, eat more fruits and vegetables as a control measure based on dietary counselling at the hypertension clinic. Dietary counselling should not only be used as a tool for controlling hypertension but be extended to the general population as a preventive measure.

Keywords: Hypertension; cases; controls; risk factors; diabetes; Hohoe Municipality; Ghana.

ABBREVIATIONS

BP: Blood Pressure; HBP: High Blood Pressure; HPT: Hypertension; DALYs: Daily Adjusted Life Years; NCDs: Non-Communicable Diseases; WHO: World Health Organization; SSA: Sub Saharan Africa; GDHS: Ghana Demographic and Health Survey; UHAS: University of Health and Allied Sciences; SPH: School of Public Health; GHS-ERC: Ghana Health Service- Ethical Review Board.

1. INTRODUCTION

Hypertension is an important cause of morbidity and mortality worldwide [1]. According to the Global Brief Report on Hypertension [2], hypertension is defined as a systolic blood pressure equal to or above 140 mm Hg and/or diastolic blood pressure equal to or above 90 mm Hg. Hypertension is also known as high BP and is an increasingly important medical and public health issue worldwide. According to WHO [3] global status report on non-communicable diseases, high blood pressure was the leading cause of deaths worldwide and currently responsible for 13-14% of global mortality. The global prevalence of the disease is on the increase. In 2000, 972 million people had hypertension (HPT) with a prevalence rate of 26.4% and this rate is projected to increase to 1.54 billion affected individuals with a prevalence rate of 29.4% in 2025 [4]. Hence it is not surprising that the year 2013 was dedicated by the World Health Organization to hypertension because its prevalence had reached pandemic levels [5]. Hypertension has always been regarded as a disease of wealth but this has changed drastically in the last two decades with average blood pressures now higher in Africa than in Europe and USA and the prevalence increasing among the poor sections of society [6].

In sub-Saharan Africa (SSA), the direct healthcare cost attributable to non-optimal blood pressure in 2001 was estimated at two billion US dollars [7]. The current prevalence in many developing countries particularly in rural societies is said to be as high as those seen in developed countries [8]. Hypertension was thought to be rare in rural Africa however it is now becoming more prevalent as urbanization increases and this has been shown in several studies in Africa [9].

Diabetes and hypertension are found in the same individual more often than would occur by chance, whereas the overlap between dysglycemia and raised blood pressure is even more substantial than that between diabetes and hypertension [10]. Identification of major risk factors, their prevention and control, form the basis of the prevention of hypertension. Risk factors of today eventually become the disease and the public burden in the days after. Basically, risk factors are measurable under field conditions and amenable to intervention. Hence, identification of risk factors and their quantification is of great importance in order to calculate the avoidable burden of disease and framing of cost-effective strategies for prevention [11]. Hypertension is mainly associated with environmental and lifestyle factors rather than with genetics. It has stronger association and causal link with five particular behaviours: tobacco use, excessive use of alcohol, physical inactivity, unhealthy diet (high salt intake and, insufficient fruit and vegetable consumption) and obesity [12].

In Ghana, few population-based studies on hypertension have been carried out. Hypertension was found to be a major cause of heart failure in the Ashanti Region [13]. Reported cases of newly diagnosed outpatient hypertension in Ghana have increased from about 60,000 in 1990 to about 700,000 in 2010. These figures exclude reported cases from the Teaching Hospitals in Accra and Kumasi. Hypertension was ranked as the fifth commonest newly diagnosed outpatient disease for about two decades in Ghana [14].

Statistics available from the District Health Information Management System (DHIMS 2) shows that from 2012 to 2014, hypertension cases have increased and it is now the second ranked prevailing ailment in the Hohoe municipality. In 2012, the Hohoe municipality recorded 799 cases of hypertension. The number of cases rose to 2713 in 2013 and statistics from 2014 indicates a very rapid increase in hypertension cases in the municipality with 5603 cases. Among the top-10 causes of institutional death in the municipality, Cardio-Vascular Diseases (CVDs) especially hypertension ranked 5th in death cases reported [15].

The prevention and control of HPT has not received due attention in many developing countries like Ghana, although it is one of the most modifiable risk factors for cardiovascular diseases. Awareness, treatment and control of HPT are extremely low in Ghana as health care resources are overwhelmed by other priorities. The depiction of HPT in the municipality from the previous years to date makes this study so critical for the documentation of the distribution of risk factors amongst indigenes in the Hohoe municipality. We therefore sought to determine the determinants of HPT and its associated risk factors amongst adults in Hohoe Municipality. Information obtained will be used to develop strategies and measures to control and prevent HPT among adults.

2. METHODS

2.1 Study Design and Setting

This was a matched case control study. The cases were participants with diagnosed hypertension selected from the hypertension clinic at the Hohoe municipal hospital. Two controls who resided in the same community as the cases with similar characteristics (age and sex) were then selected to match each case. The study was conducted in the Hohoe municipality. The Hohoe Municipality is one of the 25 administrative districts/municipalities in the Volta Region of Ghana. The municipality has a total land surface area of 1,172 km square and lies in the central part of the Volta Region. It shares boundary with Togo on the East, on the southeast by the Afadzato South District and the Southwest with Kpando Municipality, on the North with Jasikan District and on the Northwest with Biakoye District. The capital, Hohoe, is located about 78 km away from Ho, the Regional Capital of the Volta region and 220 km from Accra, the National Capital. According to the 2010 population census, Hohoe municipality has a total population of 167,016 representing 7.9 percent of the total population of the Volta Region. The major ethnic groups in the municipality are Ewe, Akpafu, Lolobi, Santrokofi and Likpe. Some economic activities engaged by the people of the municipality include agriculture, petty trading, construction and formal sector employment.

2.2 Sampling and Sample Size Determination

The population of the study consisted of adults in the Hohoe municipality within the age range of 18-64+ years. Adults residing in the Hohoe municipality and who consented to participate in the study were included. Pregnant women and adults who did not reside in the Hohoe municipality were excluded from the study. A sample size of 195 clients (65 cases and 130 controls) was obtained using the formula as stated by [16]. Briefly, the sample size was calculated assuming a power of 80%, an expected prevalence of 25%, 5% level of significance, Odds Ratio (OR) of 1 in the control and OR of 0.3 among cases and a ratio of proportionality of 1 case: 2 controls. A convenient sampling technique was employed to select cases from the HPT clinic. A one to two (1:2) matching technique was employed to select controls with similar characteristics (age ±5 years and sex) who also resided in the same communities as cases.

2.3 Data Collection

Data was collected with reference to the WHO STEPWISE approach for non-communicable disease surveillance (Hypertension) on risk factor assessment with particular emphasis on steps 3. STEP 1 was used to capture information related to nutritional habit, sedentary lifestyle and socio-demographic characteristics with the use of a semi-structured questionnaire, which was administered through a face-to-face interview. STEP 2 was used to capture information on weight, height, and blood pressure level, waist to hip circumference and BMI. STEP 3 was used to collect finger prick blood samples, which were used to measure the level of both random and fasting blood glucose using a digital glucometer (*ONETOUCH* Ultra Easy blood glucose monitoring system (*LIFESCAN Johnson & Johnson company*).

2.3.1 Anthropometric measurements

Height of participants was measured with a Stadiometer (SECA Leicester height measure with a fixed foot plate and movable headboard) to the nearest 0.1 centimeter. Weight was measured with a digital weighing scale (BednBath model BB-3018A) with the participants dressed in light clothing to the nearest 0.1 kilogrammes. Waist circumference (WC) and hip circumference (HC) was measured to the nearest 0.1cm using an inextensible tape measure and the measurements were done at the naval region for WC and at the level of the greater trochanter for HC. All anthropometric measurements were taken in triplicates and in accordance with WHO standard anthropometry guidelines.

2.3.2 Blood pressure measurement

Blood pressure levels of participants were measured with the aid of the (Omron M2 Basic) digital blood pressure monitor. Participants were made to rest for at least 10 minutes before their blood pressure (BP) was measured and was done between in one minute intervals for 3 consecutive BP measurements of which the average reading was recorded.

2.3.3 Blood glucose measurement

Capillary blood (10 µl) of clients was obtained from their index finger after cleaning the finger with 70% ethanol and pricking with a sterile lancet. The blood obtained was used to determine their blood glucose level using a glucometer (OneTouch Ultra Easy). Fasting blood glucose (FBG) was obtained for the clients who observed an overnight fast and random blood sugar (RBG) was obtained for the clients who had not observed an overnight fast. All measurements were recorded to the nearest 0.1 mmol/L. Aseptic techniques were ensured during and after the blood collection procedure to prevent infection.

2.4 Data Analysis

Body mass index (BMI) was calculated as weight (kg) divided by height squared (m^2). Waist-to-Hip Ratio (WHR) was calculated by dividing WC by HC. BMI and WHR were classified based on WHO [17] recommendations. Diabetes was diagnosed as fasting blood glucose of ≥126 mg/dl or random blood glucose of ≥ 200 mg/dl FBG and RBG were classified based on recommended cut-offs [18]. Grade 1 HPT (Mild HPT) was defined as Systolic BP (140–159 mmHg) and diastolic BP (90 – 99 mmHg); Grade 2 HPT (Moderate HPT) was defined as systolic BP (160-179 mmHg) and diastolic BP (100 – 109 mmHg) and Grade 3 HPT (Severe HPT) was defined as systolic BP (≥180 mmHg) and diastolic BP (≥ 110 mmHg) [19].

Data was entered into Epi Info 7 and analyzed with STATA 12. Frequencies and percentages were used to summarize categorical variables whilst means and standard deviations were used for continuous variables. Data was analyzed for proportions for qualitative variables using chi-square and differences in means for quantitative variables were analyzed using t test. Binary logistic regression analysis was used to measure associations between dependent and independent variables. A p-value less than 0.05 was considered statistically significant.

3. RESULTS

3.1 Background Characteristics of Respondents

Sixty-five (65) cases and 130 controls were involved in the study. The mean age of the respondents was 55.5 ± 13.3 years. The mean age of cases and controls were 58.2 ± 13.4 years and 54.2 ± 13.2 years respectively. Only 6.2% of the cases with 6.9% of the controls were aged less than 35 years and 10.8% of cases with 8.5% of the controls were aged above 75 years. Majority of the respondents were between the ages of 45-74 years as shown in Table 1. Majority (83.1%) of cases and 84.6% of controls were females while only 16.9% of cases and 15.4% of control were males. Most (61%) of the respondents were married, with 5.1% of them separated and 13.8% divorced (Table 1). More than a third (37.9%) of the respondents had no formal education, 19.5% and 12.3% had Senior High School (SHS) and tertiary education respectively. Moreover, 26.2% of the respondents were unemployed, 43.6% were traders, 11.3% engaged in farming and 6.7% were involved in other occupations such as driving. Majority (85.6%) of the respondents were Christians with the remaining 14.4% being Muslims (Table 1).

Table 1. Characteristics of respondents

Characteristics	Cases number (%)	Controls number (%)	Total (%)
Number recruited	65(100)	130(100)	195(100)
Mean age (SD)	58.2 (13.4)	54.2 (13.2)	55.5 (13.3)
Age group (in years)			
<35	4 (6.2)	9 (6.9)	13 (6.7)
35-44	5 (7.7)	18 (13.9)	23 (11.8)
45-54	15 (23.1)	40 (30.8)	55 (28.2)
55-64	22 (33.9)	35 (26.9)	57 (29.2)
65-74	12 (18.5)	17 (13.1)	29(14.9)
>75	7 (10.8)	11 (8.5)	18(9.2)
Gender			
Male	11 (16.9)	20 (15.4)	31 (15.9)
Female	54 (83.1)	110 (84.6)	164 (84.1)
Marital status			
Single	0(0.0)	11 (8.5)	11(5.64)
Married	35 (53.8)	84 (64.6)	119(61.0)
Divorce	6 (9.2)	21 (16.2)	27(13.8)
Widow/Widower	17 (26.1)	11 (8.5)	28(14.4)
Separated	7 (10.8)	3 (2.3)	10(5.1)
Educational level			
Never	20 (30.8)	54 (41.5)	74 (37.9)
JHS	16 (24.6)	43 (33.1)	59 (30.3)
SHS	23 (35.4)	15 (11.5)	38 (19.5)
Tertiary	6 (9.2)	18 (13.9)	24 (12.3)
Occupation			
Farming	7 (10.8)	15 (11.5)	22(11.3)
Sewing	3 (4.6)	5 (3.9)	8(4.1)
Teaching	2 (3.1)	14 (10.8)	16(8.2)
Trading	28 (43.1)	57(43.9)	85(43.6)
unemployed	22 (33.9)	29(22.3)	51(26.2)
Others (driving etc.)	3(4.6)	10 (7.7)	13(6.7)
Religion			
Christians	58 (89.2)	109(83.9)	167(85.6)
Muslims	7 (10.8)	21(16.2)	28(14.4)
Classification of blood pressure			
Normal Blood pressure	14 (21.5)	125 (96.2)	139 (71.3)
Mild HPT	27 (41.5)	4 (3.1)	31(15.9)
Moderate HPT	15(23.1)	0 (0.0)	15 (7.7)
Severe HPT	9 (13.8)	1 (0.8)	10 (5.1)

Table 1 also shows that overall, out of the 195 respondents, 139 (71.3%) had normal blood pressure at the time of the survey, 31(15.9%) had mild HPT, 15 (7.7%) had moderate HPT and 10 (5.1%) had severe HPT. Among the 65 case 14 (21.5%) had normal blood pressure at the time of the survey, 27 (41.5%) had mild HPT, 15(23.1%) had moderate HPT and 9 (13.8%) had severe HPT. Majority 125 (96.2%) out of 130 had normal blood pressure at the time of the survey, 4 (3.1%) had mild HPT, and 1 (0.8%) had severe HPT. There was no case of moderate HPT among the controls.

3.2 Risk Factors and Odds of Hypertension

Table 2 shows that respondents with educational level of SHS consisted of 35.4% cases and 11.5% controls compared to participants with no education consisting 30.8% cases and 41.5% controls. Tertiary level education also constituted 9.2% of cases and 13.9% of controls. Muslims consisted 10.8% of cases and 16.2% of controls whilst Christians made up 89.2% of cases and 83.9% controls.

In Table 2, binary logistic regression test was performed to determine the risk factors of hypertension. The test shows that respondents who attended SHS were more likely to become hypertensive than those who did not go to school (OR=4.14; 95% CI: 1.81- 9.48; p=0.001). This also gave a statistically significant association between hypertension and educational level of SHS. Table 2 also shows that respondents with BMI less than 18.5 (underweight) were 3.42 times more likely to develop hypertension than respondents who have BMI of 18.5-24.9(normal) even though the binary logistic test performed was not significant (OR=3.42; 95% CI: 0.52-22.24; p=0.199).

Table 2. Socio-demographic risk factors and odds of hypertension

Characteristics	Cases number (%)	Controls number (%)	Crude odds ratio (95% CI)	P-value
Number recruited	65(100)	130(100)		
Age group				
< 35 (ref)	4 (6.2)	9(7)		
35-44	5 (7.7)	18(13.9)	0.63(0.13-2.91)	0.549
45-54	15(23.1)	40(30.8)	0.84(0.23-3.15)	0.801
55-64	22(33.9)	35(26.9)	1.41(0.39-5.15)	0.599
65-74	12(18.5)	17(13.1)	1.59(0.40-6.38)	0.514
>75	7(10.8)	11(8.5)	1.43(0.32-6.49)	0.642
Educational level				
Never (ref)	20(30.8)	54(41.5)		
JHS	16(24.6)	43(33.1)	1.00(0.47-2.17)	0.991
SHS	23(35.4)	15(11.5)	4.14(1.81-9.48)	0.001
Tertiary	6(9.2)	18(13.9)	0.9(0.31 -2.59)	0.845
Religion				
Christian (ref)	58(89.2)	109(83.9)		
Muslim	7(10.8)	21(16.2)	0.63(0.25 -1.56)	0.315
Anthropometric measurement				
BMI categories				
18.5-24.9(normal) (ref)	18(27.7)	41(31.5)		
25.0-29.9(overweight)	23(35.4)	42(32.3)	1.25(0.59 - 2.65)	0.565
Above 30(obesity)	21(32.3)	45(34.6)	1.06(0.49 - 2.27)	0.875
<18.5 Below normal(underweight)	3(4.6)	2(1.5)	3.42(0.52-22.24)	0.199
Waist to hip ratio				
Excellent (ref)	3(4.6)	12(9.2)		
Good	3(4.6)	12(9.2)	1.00(0.17 - 5.98)	>0.999
Average	7(10.8)	36(27.7)	0.78(0.17 - 3.49)	0.743
At risk	52(80)	70(53.9)	2.97(0.79 -11.07)	0.105

Table 3. Dietary behaviours among participants

Dietary behaviour	Cases number (%)	Controls number (%)	Crude odds ratio (95% CI)	P-value
Fruit intake per week				
One day (ref)	18(27.7)	72(55.4)		
Two days	28(43.1)	26(20.0)	4.31(2.05 - 9.05)	<0.001*
Three days	14(21.5)	13(10.0)	4.31(1.73 - 10.6)	0.002*
Four days	5(7.7)	19(14.6)	1.05(0.35 - 3.20)	0.928
Vegetable intake per week				
One day (ref)	7(10.8)	31(23.9)		
Two days	21(32.3)	25(19.2)	3.72(1.36 -10.16)	0.010*
Three days	25(38.5)	45(34.6)	2.46(0.95 - 6.39)	0.065
Four days	12(18.5)	29(22.3)	1.83(1.63- 5.29)	0.263
Oil used				
Vegetable oil (ref)	27(41.5)	101(77.7)		
Palm oil	38(58.5)	29(22.3)	4.90(2.58 - 9.34)	<0.001*
Salt intake				
Low (ref)	32(49.2)	28(21.5)		
Moderate	25(38.5)	91(70.0)	0.24(0.12 - 0.47)	<0.001*
High	8(12.3)	11(8.5)	0.64(0.22- 1.80)	0.395

3.2.1 Dietary intake

Dietary behaviour such as fruit intake as a protective factor against hypertension was compared among the cases and controls. Table 3 shows that 43.1% of cases and 20.0% of controls took fruits twice per week as compared to 27.7% cases and 55.4% controls who took fruits once per week. This trend of fruit consumption was continuously higher for the cases as compared to the controls. The odds of those with HPT consuming fruits 2 or 3 days in a week was 4.31 times higher compared to those without HPT [OR=4.31(95% CI: 2.05-9.05); p<0.001].

Frequent vegetable intake is protective against hypertension. This study compared vegetable intake among the cases and controls. Those who took vegetables two days per week were 32.3% cases and 19.2% controls compared to those who took vegetables once per week with 10.8% cases and 23.9% controls. The odds of those with HPT consuming vegetables two or three days in a week was 3.72 times higher than those without HPT (OR=3.72, p-value =0.010; Table 3). On the contrary, there was no statistically significant difference between cases and controls who ate vegetable three or four times in a week as compared to those who ate vegetables once per week as shown in Table 3. Also, more of the cases (58.5%) used palm oil than to the controls (22.3%) while more controls (77.7%) consumed vegetable oil than the cases (41.5%). The result indicated a continuously higher trend among cases as compared to controls. [OR=4.90 (95% CI: 2.58-9.34); p<0.001], (Table 3). This is due to the fact that cases may indulge in good dietary practices hence the increase in higher trend of palm oil usage among cases than controls. Low salt intake was 49.2% among the cases and 21.5% among the controls while moderate salt intake was 38.5% among the cases and 70.0% among the controls. The odds of moderate salt intake were 0.24 times less among those with HPT compared to those without HPT [OR=0.24 (95% CI: 0.12-0.47); p<0.001]. There was no statistically significant difference between the cases (12.3%) and the controls (8.5%) comparing high salt intake with low salt intake [OR=0.64 (95% CI: 0.22-1.80); p=0.395].

3.2.2 Body mass index (BMI)

Body mass index was also considered as a risk factor of hypertension. Normal BMI defined as 18.5-24.9 was used as a reference. Respondents overweight defined as 25.0-29.9 consisted of 35.4% of cases and 32.3% of controls compared to normal BMI with 27.7% of cases and 31.5% of controls was not statistically significant [OR= 1.25(95% CI: 0.59 - 2.65); p=0.565]. Obesity defined as BMI above 30 among respondents consisted of 32.3% cases and 34.6% controls. The difference was not statistically significant [OR=1.06 (95% CI: 0.49-2.27); p=0.875]. Although underweight (BMI below normal) was higher (4.6%) among the cases than in the controls (1.5%) compared to those with normal BMI, the difference was also not statistically significant [OR= 3.42(95% CI: 0.52-22.24); p=0.199].

3.2.3 Waist to hip ratio

Excellent waist to hip ratio was used as a reference to compare good, average and at risk categories of waist to hip ratio. There was no statistically significant difference between good waist to hip ratio which consisted of 4.6% cases and 9.2% controls compared to excellent which also consisted of 4.6% cases and 9.2% controls [OR= 1.00 (95% CI: 0.17 - 3.49); p>0.999]. There was also no statistically significant difference between average waist to hip ratio, which also consisted of 10.8% cases and 27.7% controls [OR= 0.78 (95% CI: 0.17 - 3.49); p=0.743). the difference between the at risk waist to hip ratio which consisted of 52(80%) cases and 70(53.9%) controls compared to compared to those with excellent waist to hip ratios consisting 4.6% cases and 9.2% controls was also not statistically significant [OR=2.97(95% CI: 0.79 - 11.07); p=0.105].

3.3 Alcohol Consumption and Odds of Hypertension

Alcohol consumption and smoking status were compared among cases and controls. Twenty percent (20%) of cases and 12.3% of controls were current smokers as compared to adults who never consumed alcohol with 63.3% of cases and 86.9% of controls. Current consumers risk of developing HPT was 2 times higher compared to those who never consumed alcohol [OR= 2.24(95% CI: 0.99-5.06); p=0.052, Table 4]. Also 16.7% of cases and 0.8% of controls were ex-consumers of alcohol and this was statistically different from adults who never consumed alcohol. The odds of ex-consumers of alcohol developing HPT was 30 times higher compared to those who never consumed alcohol [OR= 30.32(95% CI: 3.79-242.20); p=0.001]. Out of 195 respondents, 97.4% had never smoked, 0.5% were current smokers and 2.1% were ex-smokers as shown in Fig. 1. In all 92.3% of cases had never smoked, 1.5% were current smokers and 6.2% were ex-smokers as compared to the controls of which all of them had never smoked (p=0.06) (Table 4).

3.4 Diabetes and Odds of Hypertension

Table 4 shows the association between diabetes and hypertension among cases and controls. Family history of HPT/diabetes was used as a reference. Respondents who do not have family history of HPT or diabetes consisted of 27.7% of cases and 50.8% controls compared to respondents with family history of HPT or diabetes with 61.5% of cases and 21.5% of controls. The difference was statistically significant with an odds ratio of 0.19 **(**95% CI: 0.09-0.39; p<0.001), (Table 4). Similarly the difference between those who were diabetic but did not know their family history were 10.8% of cases and 3.1% of controls and those with family history of diabetics (61.5%) were cases and

Table 4. Alcohol consumption, diabetes and odds of hypertension

	Cases n (%)	Controls n (%)	Crude odds ratio (95% CI)	p-value
Alcohol status				
Never consumed (ref)	38(63.3)	113(86.9)		
Current consumers	12(20.0)	16(12.3)	2.24(0.99-5.06)	0.052
Ex-consumers	10(16.7)	1(0.8)	30.32 (3.79-242.20)	0.001
Diabetes and odds of hypertension				
Family history of HPT/diabetes				
Yes(ref)	40(61.5)	28(21.5)		
No	18(27.7)	66(50.8)	5.45 (0.28-1.02)	<0.001*
Don't know	7(10.8)	36(27.7)	0.14 (0.05 - 0.35)	<0.001*
Diabetic status				
Absent (ref)	58(89.2)	126(96.9)		
Present	7(10.8)	4(3.1)	3.80 (1.07 - 13.45)	0.039
Smoking status				
Never smoke	60(92.3)	130(100.0)	-	
Current smoker	1(1.5)	0(0.0)	-	
Ex-smoker	4(6.2)	0(0.0)	-	0.060

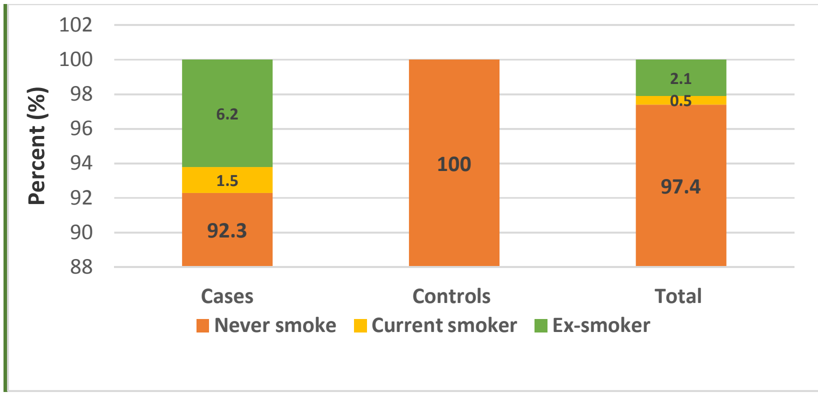

Fig. 1. Smoking status of respondents

21.5% were controls and this difference was statistically significant with an odds ratio of 0.14 (95% CI: 0.05 - 0.35; p<0.001), (Table 4). The odds of those with DM2 developing HPT was 3.80 times higher compared to those without diabetes [OR=3.80(1.07-13.45); p=0.039], (Table 4). The odds of those with family history of HPT/DM2 developing HPT was five times higher compared to those without a family history of the disease [OR=5.45 (0.28-1.02); p<0.001], (Table 4).

4. DISCUSSION

4.1 Awareness of Hypertension Status

Most individuals were unaware of their status for most non-communicable diseases including hypertension. This is because of individual unwillingness to visit a healthcare centre to undergo screening particularly in Africa. Our study indicates that overall, 32.8% of the respondents were aware of their hypertension status. This is similar to what was found in Malaysian adults where a population-based study reported that 33% were aware of their hypertension status of which 23% were on treatment and only 6% had their hypertension under control [20]. Another study in Kenya, reported that 22.8% of adults were aware of their hypertension status [21]. This is also similar to what was reported in in the Astana region of Kazakhstan, where the overall prevalence of hypertension was 70% and majority (91%) of cases were aware of their condition [22].

4.2 Risk Factors Associated with Hypertension

The increasing prevalence of hypertension is attributed to population growth, ageing and behavioural risk factors, such as unhealthy diet, harmful use of alcohol, lack of physical activity, excess weight and exposure to persistent stress [23]. The University of California San Francisco Medical Centre [24], also indicates top risk factors that pre-disposes an individual to hypertension which include; overweight or obesity, high salt intake, less potassium in diet, physical inactivity, binge alcohol consumption, stress**,** Non-steroidal Anti-inflammatory Drugs (NSAIDs), Cough and Cold Medications (Sudafed and other brands that contain pseudoephedrine and phenylephrine), certain chronic conditions (such as diabetes, kidney disease and sleep apnea) and low vitamin D in diet. However, this study it was found that risk factors such as age, educational level, BMI, waist to hip ratio, alcohol consumption, smoking status, family history and diabetes that contributes to hypertension. Fruits and vegetable intake, oil used, low salt intake was adhered to by those with hypertension compared to those without. This is due to the fact that there is a hypertension clinic at the municipal hospital where the cases were recruited and counselling on diet is done during clinic sessions.

4.3 Association between Alcohol Consumption as a Risk Factor to Hypertension

This study reveals that age range of 55-64 years reports 33.9% of cases and 26.9% of controls compared to ages less than 35 years with 6.2% of cases and 7% of controls showed a positive association which was not statistically significant (OR 1.41:95% CI: 0.39-5.15; p=0.599). In contrast, a study in Costa Rica revealed that, the prevalence of hypertension among alcoholics is very high compared to non- drinkers irrespective of the sex or age of the participants. However, it was reported that, the risk of developing the condition increases with age no matter your alcoholic status [25]. A more recent study in Gondar, northern Ethiopia reported that, among 679 participants who took part in the study, 64% of them were hypertensive and had ever consumed alcohol before or were still consuming alcohol as compared to 28.9% who were non-alcoholics or had never taken alcohol before [26]. This study shows that current consumers of alcohol consisted 20% of cases and 12.3% of controls compared to those who never consumed alcohol with 63.3% of cases and 86.9% of controls. Although, the differences were not statistically significant, a positive association that current consumers of alcohol were 2.24 times more likely to develop hypertension than those who never consumed alcohol was observed. This study showed that ex-consumers of alcohol had higher odds 30 times more likelihood) of developing hypertension as compared to those who never consumed alcohol. Another study in Uganda found that, current alcohol consumers users were 1.6 times more likely to be hypertensive, while past consumers were 2.3 times more likely to be hypertensive, all compared to those who had never used alcohol [27]. Also in Ethiopia it was found that alcohol users were 2.84 times [95% CI (1.64 – 4.85)] more likely to be hypertensive than non-users [28]. A review among 66,510 women revealed that, the prevalence of hypertension was lower among respondents who drank very little alcohol a day [29].

4.4 Association between Smoking as a Risk Factor to Hypertension

Smoking is believed to be the number one major known cause of hypertension [30]. A study in Ethiopia among 679 respondents showed that, 7.5% had ever smoked or are still smoking with the overall prevalence of 40.8% of the smokers having hypertension [25]. This is to say, that about 40 in 100 of tobacco users in Ethiopia are at a risk of hypertension disorders. Another study among 1270 Indians proposed that, the prevalence of tobacco use was 88% and about half of these respondents were hypertensive [31]. However, the same study reported that, this risk and the prevalence of hypertension is slightly higher in previous smokers than current smokers, with the percentage of 25% and 15.8% respectively. In this study, the risk of developing hypertension was higher among ex-smokers as compared to current smokers and this is in agreement with findings from previous studies in Ethiopia and India. Also in southern Ethiopia, the prevalence of hypertension among smokers was 16.4% and smokers were 2.02 times more likely to develop hypertension than non-smokers [27].

4.5 Association between Diabetes Mellitus as a Risk Factor to Hypertension

Diabetes and hypertension are found in the same individual more often than would occur by chance, whereas the overlap between dysglycemia and raised blood pressure is even more substantial than that between diabetes and hypertension [9]. A study in Gondar, northern Ethiopia publicized that, among the total of 679 respondents of which 6.9% were diabetic and about 7 in 10 of the diabetic had hypertension [25]. In the United States, the prevalence of hypertension from 2005-2008 was higher in diabetics (57.3%) compared to non-diabetics (28.6%) [32]. Similarly, this current study confirmed that those with hypertension are 3.8 times more likely to develop diabetes than those without hypertension and this is in agreement with previous studies.

5. LIMITATIONS

This study was constrained with resources to carry out a lipid profile on the cases and controls.

6. CONCLUSION

Educational level, alcohol consumption, family history and diabetes were associated with an increased risk of hypertension. Also individuals with hypertension were more likely to develop diabetes as compared to individuals without diabetes. Most of the risk factors identified in this study are modifiable, hence public education should be intensified to create awareness and encourage the adoption of these modifiable healthy lifestyle behaviours. Also individuals should be encouraged to frequently undergo screening to enable early detection and management of these diseases. Persons with hypertension were more likely to consume more fruits and vegetable, palm oil and less salt as a control measure based on medical advice from the hypertension clinic. This should not be limited to the clinic alone but be extend to the general population as a preventive measure.

ETHICS AND CONSENT STATEMENT

Ethical clearance was obtained from the Ghana Health Service Ethical Review Committee (GHS-

ERC) with the approval identity (GHS-ERC: GHS-ERC: 42/02/16. Permission was also sought from the Municipal Health Directorate and the Municipal Assembly. Moreover, the participants themselves consented to be part of the study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Lozano R, Naghavi M, Foreman K, Lim S, Shibuya K, Aboyans V, Stephanie Y. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: A systematic analysis for the global burden of disease study 2010. The Lancet. 2013;380(9859):2095-2128.
2. World Health Organization. A global brief report on hypertension: Silent killer, global public health crisis: World Health Day; 2013.
3. World Health Organization. WHO Global Status Report on Non-Communicable Diseases; 2008.
4. Kearney PM, Whelton M, Reynolds K, Munter P, Whelton PK, He J. Global burden of hypertension: Analysis of worldwide data. Lancet. 2005;365:217-223.
5. Peer N, Steyn K, Lombard C, Gwebushe N, Levitt N. A high burden of hypertension in the urban black population of Cape Town: The cardiovascular risk in black South Africans (CRIBSA) study. PLoS One. 2013;8(11):e78567.
6. Van de Vijver S, Akinyi H, Oti S, Olajide A, Agyemang C, Aboderin I, Kyobutungi C. Status Report on Hypertension in Africa-Consultative Review for the 6th Session of the African Union Conference of Ministers of Health on NCD's. Pan African Medical Journal. 2014;16:1.
7. Bosu WK. Epidemic of hypertension in Ghana: A systematic review. BMC Public Health. 2010;10(1):418.
8. Addo J, Smeeth Liam, Leon, David A. Hypertension in Sub-Saharan Africa a review. Hypertension. 2007;50(6):1012-1018.
9. Cappuccio FP, Micah FB, Emmett L, Kerry SM, Antwi SM, Eastwood R, John B. Prevalence, detection, management, and control of hypertension in Ashanti, West Africa. Hypertension. 2004;43(5):1017-1022.
10. Cheung BM, Wat NM, Tso AW, Tam S, Thomas GN, Leung GM, Lam TH. Association between raised blood pressure and dysglycemia in Hong Kong Chinese. Diabetes Care. 2008;31(9):1889-1891.
11. Gyamfi E. The prevalence and awareness of non-communicable diseases in Sekyere West District. A Thesis Submitted to the Department of Enviromental Science KNUST; 2007.
12. World Health Organization. STEPS Fact Sheet. Brazzaville: WHO AFRO; 2008.
13. Owusu IK, Boakye YA. Prevalence and aetiology of heart failure in patients seen at a teaching hospital in Ghana. J Cardiovasc Dis Diagn. 2013;1(131):2.
14. Bosu William K. Accelerating the control and prevention of non-communicable. Postgraduate Medical Journal of Ghana. 2013;2.
15. Hohoe Municipal Health Directorate. Annual Health Report; 2014. Available:http://www.fsdaghana.org/downloads/FS-%20Ghana-Anual-Report-2014 On 30/09/15
16. Asare Kwasi Poku OP. Models for characterising hypertensive and non-hypertensive diabetic patients: A case. Research Journal of Mathematics and Statistics. 2015;1.
17. Consultation WE. Waist circumferecne and wasit-hip ration. Report of a WHO expert consultation. World Health Organization. 2008;8-11.
18. Somannavar S, Ganesan A, Deepa M, Datta M, Mohan V. Random capillary blood glucose cut points for diabetes and pre-diabetes derived from community-based opportunistic screening in India. Diabetes Care. 2009;32(4):641-643.
19. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo Jr JL, Rocella EJ. The seventh report of the joint national committee on prevention, detection, evaluation and treatment of high blood pressure: The JNC 7 report. Jama. 2003;289(19):2560-2571.
20. Lim TO, Morad Z. Prevalence, awareness, treatment and control of hypertension in the Malaysian adult population: Results from the national health and morbidity survey 1996. Singapore Medical Journal. 2004;45(1):20-27.

21. Joshi MD, Ayah R, Njau EK, Wanjiru R, Kayima JK, Njeru EK, Mutai KK. Prevalence of hypertension and associated cardiovascular risk factors in an urban slum in Nairobi, Kenya: A population-based survey. BMC Public Health. 2014; 14(1):1-10.
DOI: 10.1186/1471-2458-14-1177.
22. Supiyev A, Kossumov A, Nurgozhin T, zhumadilov Z, Peasey A, Bobak M. Diabetes prevalence, awareness and treatment and their correlates in older persons in urban and population in the Astana Region, Kazakhstan. Diabetes Research and Clinical Practice. 2016;112: 6-12.
23. World Health Organization. Global Status Report on Non-communicable Diseases 2010. Geneva, World Health Organization; 2011.
24. University of Califonia San Francisco Medical Centre (UCSF); 2016.
25. Méndez-Chacón E, Santamaría-Ulloa C, Rosero-Bixby L. Factors associated with hypertension prevalence, unawareness and treatment among Costa Rican elderly. BMC Public Health. 2008;8(1):1.
26. Awoke A, Awoke T, Shitaye A, Berihum M. Prevalence and associated factors of hypertension among adults in Gondar, Northwest Ethiopia: A community based cross-sectional study. 2012;12:113. BMC.
27. Wamala JF, Karyabakabo Z, Ndungutse D, Guwatudde D. Prevalence of factors associated with hypertension in Rukungiri District, Uganda - A Community-Based Study. 2009;9(3):153-160.
28. Sisay B, Andualem M, Teshome G. Prevalence of hypertension and its association with substance use among adults living in Jimma Town, South West Ethiopia, 2012. World Journal of Medicine and Medical Science. 2014;2(1):01-11.
29. Klatsky AL, Gunderson E. Alcohol and hypertension: A review. Journal of the American Society of Hypertension. 2008; 2(5):307-317.
30. Tonstad S, Johnston JA. Cardiovascular risks associated with smoking: A review for clinicians. European Journal of Cardiovascular Prevention & Rehabilitation. 2006;13(4):507-514.
31. Manimunda SP, Sugunan AP, Benegal V, Balakrishna N, Rao MV, Pesala KS. Association of hypertension with risk factors & hypertension related behaviouramong the aboriginal nicobarese tribe living in Car Nicobar Island, India. The Indian Journal of Medical Research. 2011;133(3):287.
32. Keenan NL, Rosendorf KA. Centers for Disease Control and prevention (CDC). Prevalence of hypertension and controlled hypertension—United States, 20052008. MMWR Surveill Summ. 2011;60(Suppl):94-97.

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