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PREVALENCE AND CONTROL OF HYPERTENSION AMONG RURAL ADULTS IN THE LIKPE SUB-MUNICIPALITY OF THE HOHOE MUNICIPALITY OF GHANA

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Abstract

Background: Hypertension is an important cause of morbidity and mortality worldwide. Its prevalence is highest in Africa. This study was limited to four selected sentinel sites for University of Health and Allied Sciences (UHAS) School of Public Health (SPH). The study assessed the prevalence of hypertension among adults resident in rural communities in the Hohoe Municipality of Ghana.

Methods: A community-based cross-sectional survey involving adults 18 years and above in four rural communities was used. Data was collected using face-to-face interviews with WHO STEPwise questionnaire. Standardized methods were used for blood pressure and anthropometric measurements.

Results: A total of 289 adults were surveyed and 146 (50.5%) including those on treatment were hypertensive. At the time of the survey, 108 (37.4%) of the respondents were hypertensive. There were 87 (30.1%) known hypertensive of which 49 (56.3%) could not control their HPT (uncontrolled HPT). Of the 202 respondents who had never been diagnosed with hypertension, 59 (29.2%) had raised blood pressure (unknown HPT). Age and family history of HPT were found to be associated with HPT. Overall, WHR and WHR for women were found to be positively correlated with HPT (p=0.006 & p=0.036) respectively.

Conclusion: Half of the adult's population in the selected rural communities had HPT. One out of three (29.2%) adults' population had hypertension and were not aware. There is very high (56.3%) uncontrolled HPT in these communities. This may be a reflection of what pertains in rural Ghana. Information from this study would serve as the basis for introducing primary preventive and control interventions including awareness creation, screening, referrals and counselling programmes in these selected communities by the SPH-UHAS. A national mapping of HPT prevalence and control is required.

Introduction

Hypertension is a term used to describe high blood pressure (HBP). According to WHO, hypertension (HPT) is defined as a systolic blood pressure (BP) equal to or above 140mmHg and/or diastolic BP equal to or above 90mmHg. Normal adult BP is defined as a systolic BP of 120 mm Hg and a diastolic BP of 80 mmHg [1].

Globally, the prevalence of hypertension (including those on medication for high blood pressure) in adults aged 25 years and above was around 40% in 2008 [2]. Also, HBP is estimated to cause 7.5 million deaths (about 12.8% of the total of all deaths). This accounts for 57 million disability-adjusted life years (DALYs) or 3.7% of total DALYs [1,3]. The global prevalence of hypertension among the adult population is expected to increase from 26% (972 million) in 2000 to 29% (1.56 billion) by 2025 with associated cardiovascular complications [4,5]. Studies indicate that deaths caused by non-communicable diseases such as hypertension will increase by 17% over the next decade,

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with the greatest increase being in the African region (27%). However, primary prevention has been proposed as the most cost effective approach to the emerging epidemic [2].

Hypertension, which was considered to be non-existent in most African societies, particularly in rural communities, is now emerging as a public health problem in sub-Saharan Africa (SSA). Across the WHO regions, the prevalence of HBP was highest in Africa (46%) for both sexes combined [1]. The rise in prevalence might be attributed to rapid changes in diet, physical activity, an increase in tobacco use, excessive alcohol consumption, urbanization and modernization [6,7].

The prevalence of hypertension in various African communities has varied widely but has generally been higher in urban than in rural communities (with a few exceptions). A study conducted in Ghana between 1973 and 2009 concluded that the prevalence of hypertension was higher in urban than rural areas and increased with increasing age (prevalence ranging from 19.3% in rural to 54.6% in urban areas) [8]. A study in two rural communities in southwestern Nigeria involving 250 respondents showed that the prevalence of hypertension was 13.2% [6]. The findings have shown that some Ghanaians have hypertension but not aware of their condition [9].

In Thailand, a cross-sectional survey among rural Karen residents observed that more than 27% of the population was hypertensive and 12% were pre-hypertensive [10]. Also, a cross-sectional study in Northwest Ethiopia among rural and urban communities reported that the prevalence of hypertension among rural dwellers was 25.3% and that of urban was 30.7%. The study, therefore, concluded that the prevalence of hypertension was considerably higher in rural areas than previously [11].

A blood pressure survey of 20 rural Ghanaian villages in 1973 found a prevalence of 2%–5% and concluded that hypertension was not a significant health problem in rural Ghana [12]. However, recent studies have shown that hypertension is an important public health problem in urban areas and even in the poorest rural communities [13]. A systematic review on hypertension in Ghana from 1977 to 2009 revealed that the prevalence of hypertension (BP≥140/90mmHg ± antihypertensive treatment) ranged from 19% to 48% for various studies on the association of risk factors with hypertension, which include older age, over-nutrition and alcohol consumption [14,15]. A study among Adansi-South Ghanaian residents found that approximately a third (27.1%) of respondents were hypertensive [15].

According to Volta Regional Health Directorate [16] (unpublished), hypertension was ranked third among the top ten morbidity cases in Out-Patient Department (OPD) attendance in the Volta Region, representing 4.8% of the total attendance [17]. In Hohoe municipality, hypertension was ranked among the top ten diseases and it accounted for about 29% of all hospital admissions in 2013 [18]. Also, OPD attendance at the Hohoe municipal hospital HPT clinic recorded 582 cases of hypertension in 2010, 441 cases in 2011, 799 cases in 2012, 2713 cases in 2013 and in 2014, 3808 cases [19].

The School of Public Health (SPH) of the University of Health and Allied Sciences (UHAS) has selected four rural communities in the Likpe sub-Municipality as its field site for disease surveillance activities and therefore has carried out baseline surveys. With the growing and alarming trends of HPT among OPD attendants and the prevalence of HPT among adults in these selected communities, this study was therefore undertaken with the aim of assessing the prevalence and control of hypertension among rural adults in the Likpe sub-Municipality of the Hohoe Municipality.

Materials and methods

Study area

The study was carried out in the Hohoe Municipality, one of the twenty-five administrative districts in the Volta Region of Ghana. It is located at longitude 0 degrees 15 East and 0 degrees 45 East and latitude 6 degrees 45 North

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and 7 degrees 15 North. It shares boundary to the East with Togo, forming part of the International borders, on the southeast by the Afadjato South District and the southwest with Kpando Municipal, on the northwest with Jasikan District and on the North West with Biakoye District. The municipality is located in the central part of Volta Region with a population of 167,743 people of which 48.1% are males and 51.9% being females (Population census, 2010). Hohoe is the Municipal capital with a population of 63,000 people. The municipality covers an area of 1,403 sq. km and has been divided into 7 sub-districts in line with the electoral areas. These are Hohoe, Gbi-Rural, Alavanyo, Agumatsa, Likpe, Akpafu/Santrokofi and Lolobi Sub-districts. The municipality is bounded on the North by Jasikan District, North-west by Biakoye District, West and South-west by Kpando Municipality, South by Afadjato South District and East by the Republic of Togo.

The topography of the Municipality is made up of high and low lands. The three vegetations of the area reflecting the rainfall distribution and the altitude, are the Moist Semi-deciduous Forest, Savannah and Mountain Vegetation. The major economic activity is farming. About 55% of the population grow cash crops such as cocoa, maize, cassava, rice, yam and vegetables. In addition, trading constitutes about 25%, livestock rearing about 15% and other industrial activities represent 5%. The major ethnic groups in the Municipality are Ewes, Akpafu/Lolobi, Santrokofi and Likpe. Hohoe Municipality is endowed with 21 health facilities comprising one Municipal referral hospital, 14 health centres, 1 Reproductive Child Health (RCH), 3 Community-Based Health Planning and Services (CHPS) compounds and 2 outreach child health services (HMHD, 2014).

Study population and setting

The study population was male and female adults aged 18 years and above and residing in the four selected rural communities in the Likpe-sub-Municipality of Hohoe Municipality.

Study design

The design was a descriptive community-based cross- sectional study. The study used pre-tested structured questionnaire modified from the WHO STEPwise approach to non-communicable disease risk factor surveillance for data collection.

Sample Size

The sample size required to be representative of the study population was determined using a sample size calculation formula obtained from "Biostatistics for Health Science Students" [20]. Z score of 1.96 at 95% confidence level, the margin of error of 5% and proportion of 24.6% were entered into the formula to determine a minimum sample size of 285≈289.

Sampling

Purposive sampling technique was used to select the four communities in the study. Stratified sampling technique was employed to assign samples (required number of houses to survey) proportionately to each selected community. Thus, all the houses in the selected communities were identified and numbers were assigned to each house. Simple random sampling technique (lottery) was used to select the houses to be surveyed in each of the selected communities. Where there were more than one qualified households in a selected house, only one household was drawn at random and also one qualified respondent (an adult 18 years and above) in the household was randomly selected using simple random sampling (balloting). Where no qualified household or respondent was found in a selected house, the next house closest to the previously selected house was selected. Only one respondent could be interviewed in a selected house.

Data collection

A research team comprising twenty qualified health personnel were trained to assist in the data collection so as to ensure intra-researcher reliability and consistency. Trained data collectors collected the data in one day, with an average of fourteen (14) participants per data collector. Data was collected by the research team using a structured questionnaire to complete the responses on behalf of the subjects. Information on the socio-demographic

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characteristics and knowledge on awareness about HPT status was obtained. Physiological assessment of arterial blood pressure was measured using a digital sphygmomanometer (Omron M3, HEM- 7131-E). In order to guarantee the reliability of the data, all the equipment for the measurements were calibrated before each respondent was measured.

Blood pressure measurement

Three blood pressure (BP) measurements (at least 1 minute apart) using automated digital blood pressure monitor, model LD7 with appropriate cuff sizes were taken after 5 minutes rest with the participant seated. For each participant's BP, the mean of the three values was calculated to estimate their BP.

Classification of blood pressure

Hypertension is defined by the World Health Organization and the International Society of Hypertension (WHO and ISH, 2003) as systolic blood pressure (SBP) ≥ 140mmHg and/or diastolic blood pressure (DBP) ≥ 90mmHg. Pre-hypertension is defined as systolic blood pressure (SBP) >120mmHg and <140mmHg and/or diastolic blood pressure (DBP) >80mmHg<90mmHg. Normal Blood Pressure is defined as systolic blood pressure (SBP) ≤120mmHg and/or diastolic blood pressure (DBP) ≤80mmHg.

Hypertensive: A participant was classified hypertensive if the mean systolic BP was 140 mmHg or higher, or average diastolic BP was 90 mmHg or higher.

Those who were on anti-hypertensive treatment within the two weeks preceding the survey or had previously been told by a health professional that they had hypertension were also classified as hypertensive.

Controlled hypertension: Is defined as systolic blood pressure <140 mmHg and diastolic blood pressure <90 mmHg among people aware of their hypertension.

Uncontrolled hypertension*:* Hypertensive on treatment or not and blood pressure systolic ≥ 140 and diastolic ≥90 mmHg among people aware of their hypertension.

Blood pressure status Awareness

Participants were classified as hypertensive "aware" if they reported that they had previously been informed by a health professional that they had hypertension or reported current use of antihypertensive drugs prescribed by a health professional, which they had taken within the past two weeks prior to the study.

Aware: Hypertensive and was on anti-hypertensive treatment within the two weeks preceding the survey or had previously been told by a health professional that they had hypertension.

Unaware: Hypertensive, but never been told by a health professional and never been put on anti-hypertensive treatment;
Controlled hypertension: Hypertensive, on treatment and blood pressure systolic <140 and diastolic <90 mmHg.

Uncontrolled hypertension*:* Hypertensive, on treatment or not and blood pressure systolic ≥ 140 and diastolic ≥90 mmHg.

Ethics and consent statement

Ethical clearance was obtained from the Ghana Health Service Ethical Review Committee (GHS-ERC) with the approval identity (GHS-ERC: 09/04/15). Permission was also sought from the Municipal Health Directorate and the Municipal Assembly. Moreover, the participants themselves consented to be part of the study.

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Data Analysis

Data was entered using EPI DATA 3.1 software and then exported to STATA 14.0 for analysis. After data was entered, cleaning and validation were done to ensure data quality before analysis was carried out. Descriptive statistics including proportions and frequency distribution were performed to describe categorical variables and the results are presented in bar charts, pie charts and tables. Inferential statistics such as t-test was used to compare means and Chi-square test and logistic regression were used to assess the associations between the categorical dependent and independent variables. A p-value <0.05 was considered as statistically significant.

Results

Characteristics of respondents

Table 1 indicates the background characteristics of respondents. A total number of 289 respondents with a mean age (50.1±18.7) were surveyed in the four rural communities. Most of the respondents were aged 30-59 years with the majority 100 (30.5%) falling within 40-49 years. Approximately, half of the respondents 147 (50.9%) were married or co-habiting with their partners. The majority of the respondents 264(80.5%) were Guans followed by the Ewes 23(7.0%) and Akans (5.2%). Over 90% of the respondents 301(91.8%) were Christians.

Table 1 Background characteristics and location of respondents (n=289)

Variable	Frequency N (%)
Age group (in years)	
18-29	51(17.7)
30-39	44(15.2)
40-49	41(14.2)
50-59	51(17.7)
60 and above	102(35.3)
Sex	
Male	96 (33.2)
Female	193 (66.8)
Level of education	
None	48 (16.6)
Primary	51(17.7)
JHS/middle school	140 (48.4)
SHS	44 (15.2)
Tertiary	6 (2.1)
Marital Status	
Single	53 (18.3)
Married/co-habiting	147 (50.9)
Divorced	28 (9.7)
Widowed	59 (20.4)
Separate	2 (0.69)
Occupation	

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Unemployed	36 (12.5)
Artisan	42 (14.5)
Farming	177 (61.3)
Trading	31 (10.7)
Civil servant	3 (1.0)
Ethnicity	
Guans	234 (81.0)
Ewes	50 (17.3)
Akan	2 (0.7)
Others	3 (1.0)
Religion	
Christian	274 (94.8)
Muslim	6 (2.1)
Traditional	7 (2.4)
Others	2 (0.7)
Family History of DM2	
Yes	44 (15.2)
No	167 (57.8)
Don't know	78 (27.0)
Family History of HPT	
Yes	84 (29.1)
No	120 (41.5)
Don't know	85 (29.4)
BMI status	
Underweight	47 (16.3)
Normal	168 (58.1)
Overweight	54 (18.7)
Obese	20 (6.9)
WHR (All)	
Low risk	267 (92.4)
Moderate risk	16 (5.5)
High risk	6 (2.1)
WHR (Men)	
Low risk	87 (90.6)
Moderate risk	6 (6.3)
High risk	3 (3.1)
WHR (Women)	
Low risk	180 (93.3)
Moderate risk	10 (5.2)
High risk	3 (1.6)
Location (Landscape)	
Highland	151 (52.3)
Lowland	138 (47.7)
Community size	

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Small	85 (29.4)
Large	204 (70.6)

Prevalence of Hypertension

Table 2 shows that out of the 289 adults surveyed, the overall prevalence of HPT was 146(50.5%) (Including those on treatment). However, the prevalence of high BP at the time of the survey was 108 (37.4%). The overall mean Systolic BP was 132.4±25.6 and diastolic was 80.0±14.7mmHg. Among respondents with normal BP, the mean systolic BP was 116.7±12.1 mmHg and diastolic was 72.0±9.2. The mean systolic pressure among those with high BP was 158.7±19.9 and diastolic was 93.5±12.1mmHg. About 87 (30.1%) of the respondents were aware that they were hypertensive. Of the 87 known hypertensives, 49 (56.3%) could not control their blood pressure. Of the 202 respondents, 143 (70.8%) were not aware of their blood pressure status while 59 (29.2%) were hypertensive.

Table 2: Prevalence and awareness of hypertension among rural adults (N=289)

	Blood Pressure Status		
	Non-hypertensive [n=181] n (%)	**Hypertensive [n=108] n (%)**	**Total N (%)**
Mean BP (SD)			
Systolic BP (mmHg)	116.7 (12.1)	158.7 (19.9)	132.4 (25.6)
Diastolic BP (mmHg)	72.0 (9.2)	93.5 (12.1)	80.0 (14.7)
Mean age (in years)	44.5 (18.2)	59.4 (15.7)	50.1 (18.7)
Awareness of blood pressure status			
Known (Aware)	38 (21.0)	49 (45.4)	87 (30.1)
Unknown (Not aware)	143 (79.0)	59 (54.6)	202 (69.9)
	Aware (n=87)	**Not aware (n=202)**	
Non-hypertensive	38 (43.7)	143 (70.8)	181 (62.6)
Hypertensive	49 (56.3)	59 (29.2)	108 (37.4)
Overall prevalence of HPT (Aware and BP is normal+ HPT at time of survey)	38 (43.7)	108 (53.5)	146(50.5)

Classification of Blood Pressure

Figure 1 shows the classification of BP according to WHO and ISH 2003 classification. Approximately, 37.4% of the adults in the rural communities had HPT (defined as: Systolic BP≥140 mmHg and, Diastolic≥90 mmHg), 28.7% had pre-HPT (defined as: Systolic BP ≥120 <140 and/or Diastolic BP ≥ 80 <90 mmHg), whilst 33.9% had normal BP.

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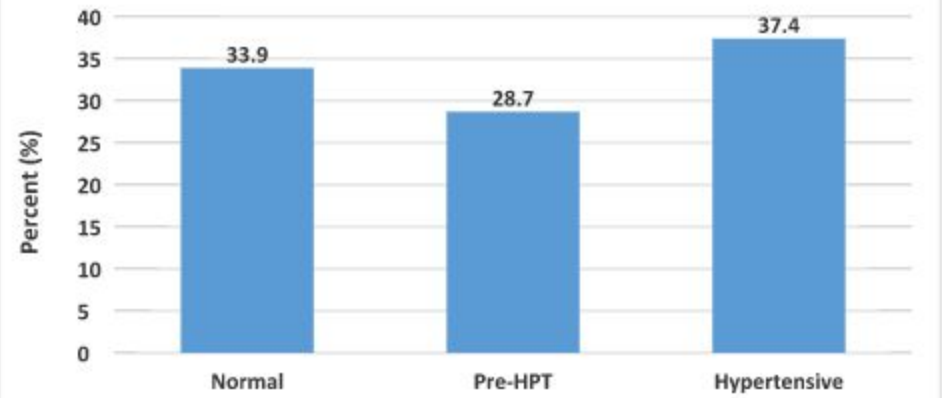

Figure 1. Prevalence of HPT and Pre-HPT in the four rural communities

Association between background characteristics and hypertension status

Table 3 shows the relationship between demographic characteristics of respondents and their hypertension status. There was a significant association between age and HPT (χ^2 =42.7, p<0.001, α=5%).

There was a significant association between marital status and HPT (χ^2=16.88, p=0.002, α=5%). The family history of HPT was also significantly associated with HPT (χ^2 =11.43, p= 0.003, α=5%). However, WHR for all and WHR for women were significantly associated with HPT (χ^2 =11.68, p= 0.003, α=5%) and (χ^2 =6.55, p= 0.038, α=5%) respectively.

There was no significant association between HPT and gender even though the prevalence of hypertension among females was higher 69(63.9%) than the males 39 (36.1%) (χ^2 = 0.651, p-value=0.420, α=5%).
There was a significant association between family history of HPT and HPT (χ^2 =11.43, p= 0.003, α=5%).

Association between Anthropometric Measurements (BMI) and) and Hypertension

There was significant association between Waist-to-Hip Ratio (WHR for all respondents) and WHR for women and HPT (χ^2=11.68; p=0.003; α=0.05) (χ^2=6.55; p=0.038; α=0.05) respectively (Table 3).

Table 3. Blood pressure status in relation with demographical characteristics and Life style (N=289)

	Blood Pressure Status				
Variable	Non-Hypertensive [n=181] n (%)	Hypertensive [n=108] n (%)	Total N (%)	χ^2	p-value
Mean age (in years)	44.5 (18.2)	59.4 (15.7)	50.1 (18.7)	-	-
Age group (in years)					
18-29	45 (24.9)	6(5.6)	51(17.7)	42.7	<0.001
30-39	39(21.6)	5(4.6)	44(15.2)		
40-49	24(13.3)	17(15.7)	41(14.2)		

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50-59	27(14.9)	24(22.2)	51(17.7)		
60 and above	56(30.9)	46(25.4)	102(35.3)		
Sex					
Male	57 (31.49)	39 (36.11)	96 (33.2)	0.651	0.420
Female	124 (68.5)	69(63.9)	193 (66.8)		
Level of education					
None	24(22.2)	24 (13.3)	48 (16.6)	7.33	0.120
Primary	16 (14.8)	35 (19.3)	51(17.7)		
JHS/middle school	45 (41.7)	95 (52.5)	140 (48.4)		
SHS	20 (13.3)	24(18.5)	44 (15.2)		
Tertiary	3 (2.8	3 (1.7)	6 (2.1)		
Marital Status					
Single	39 (21.6)	14 (13.0)	53 (18.3)	16.88	0.002
Married/co-habiting	100 (55.3)	47(43.5)	147 (50.9)		
Divorced	17 (9.4)	11 (10.2)	28 (9.7)		
Widowed	24 (13.3)	35 (32.4)	59 (20.4)		
Separate	1(0.6)	1(0.9)	2 (0.69)		
Occupation					
Unemployed	22 (12.2)	14 (13.0	36 (12.5)	3.15	0.532
Artisan	29 (16.0)	13 (12.0)	42 (14.5)		
Farming	107 (59.1)	70 (64.8)	177 (61.3)		
Trading	22 (12.2)	9 (8.3)	31 (10.7)		
Civil servant	1 (0.6)	2 (1.9)	3 (1.0)		
Ethnicity					
Guan	144 (79.6)	90 (83.3)	234 (81.0)		
Ewe	34 (18.8)	16 (14.8)	50 (17.3)		
Akan	0 (0.0)	2 (1.9)	2 (0.7)		
Others	3 (1.7)	0 (0.0)	3 (1.0)	5.88	0.118
Religion					
Christian	171 (94.5)	103 (95.4)	274 (94.8)		
Muslim	4 (2.2)	2(1.9)	6 (2.1)		
Traditional	5 (2.8)	2(1.9)	7 (2.4)		
Others	1 (0.6)	1 (0.9)	2 (0.7)	0.42	0.937
Family History of DM2					
Yes	27 (14.9)	17 (15.7)	44 (15.2)		
No	105 (58.0)	62 (57.4)	167 (57.8)	0.04	0.982
Don't know	49 (27.1)	29 (26.9)	78 (27.0)		
Family History of HPT					
Yes	40 (22.1)	44 (40.7)	84 (29.1)		
No	82 (45.3)	38 (35.2)	120 (41.5)	11.43	0.003

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Don't know	59 (32.6)	26 (24.1)	85 (29.4)		
BMI status					
Underweight	26 (14.4)	21(19.4)	47 (16.3)		
Normal	112 (61.9)	56 (51.9)	168 (58.1)		
Overweight	33 (18.2)	21(19.4)	54 (18.7)		
Obese	10 (5.5)	10 (9.3)	20 (6.9)	3.66	0.301
WHR (All)					
Low risk	173 (95.6)	94 (87.0)	267 (92.4)		
Moderate risk	8 (4.4)	8 (7.4)	16 (5.5)		
High risk	0 (0.0)	6 (5.6)	6 (2.1)	11.68	0.003
WHR (Men)					
Low risk	54 (94.7)	33 (84.6)	87 (90.6)		
Moderate risk	3 (5.3)	3 (7.7)	6 (6.3)		
High risk	0 (0.0)	3 (7.7)	3 (3.1)	4.87	0.088
WHR (Women)					
Low risk	119 (96.0)	61(88.4)	180 (93.3)		
Moderate risk	5 (4.0)	5 (7.3)	10 (5.2)		
High risk	0 (0.0)	3 (4.4)	3 (1.6)	6.55	0.038
Landscape					
Highland	91 (50.3)	60 (55.6)	151 (52.3)		
Lowland	90 (49.7)	48 (44.4)	138 (47.7)	0.76	0.385
Community size					
Small	59 (32.6)	26 (24.1)	85 (29.4)		
Large	122 (67.4)	82 (75.9)	204 (70.6)	2.37	0.124

Predictors of Hypertension

Association between background characteristics and the odds of hypertension

Table 4 shows that in an adjusted logistic regression model, respondents aged between 30 and 39 years were 1.53 more likely to have HPT as compared to those aged less than 30 years. The difference was however, not statistically significant [OR=1.53 (95% CI: 0.31, 7.62); p=0.601]. Those aged between 40-49, 50-59 and 60 years and above were 11.10, 14.78 and 17.55 times respectively more likely to have HPT as compared to those aged less than 30 years. The differences were however, statistically significant [OR=11.10 (95% CI: 2.45, 50.28); p=0.002], [OR=14.78 (95% CI: 3.29, 66.42); p<0.001] and [OR=17.55 (95% CI: 3.75, 82.17); p<0.001] respectively. Females were 0.87 times less likely to have HPT as compared to males but the difference was not statistically significant [OR=0.87 (95% CI: 0.43, 1.76); p=0. 0.698].

Respondents with primary, Junior High School (JHS)/middle school and tertiary education were 0.80, 0.76 and 0.28 respectively, less likely to have HPT as compared to those with no formal education. However the differences were not statistically significant [OR=0.80 (95% CI: 0.29, 2.23); p=0.677], [OR=0.76 (95% CI: 0.31, 1.87); p=0.547] and [OR=0.28 (95% CI: 0.02, 3.86); p=0.338] respectively. Respondents who attained Senior High School (SHS) level of education were 1.78 times more likely to have HPT as compared to those with no formal education. The difference was not statistically significant [OR=1.78 (95% CI: 0.53, 6.03); p=0.352].

Civil servants and artisans were 6.11 and 1.17, times respectively, more likely to have HPT as compared to those unemployed. The differences were however, not statistically significant [OR=6.11 (95% CI: 0.28, 131.19); p=0.248]

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and [OR=1.17 (95% CI: 0.32, 4.19); p=0.808] respectively. Respondents who were farmers and traders were 0.55 and 0.54 times less likely to have HPT. The differences were however, not statistically significant [OR=0.55 (95% CI: 0.19, 1.55); p=0.256] and [OR=0.54 (95% CI: 0.12, 2.40); p=0.418] respectively.

Respondents who were Married/co-habiting, divorced and widowed were 0.48, 0.69 and 0.78 times respectively, less likely to have HPT as compared to those who were single, though the differences were not statistically significant [OR=0.48 (95% CI: 0.17, 1.33); p=0.159] and [OR=0.69 (95% CI: 0.19, 2.58); p=0.585] and [OR=0.78 (95% CI: 0.21, 2.86); p=0.706] respectively.

Table 4: Background characteristics and the odds of hypertension

	Blood Pressure Status				
Variable	**Non-Hypertensive n (%)**	**Hypertensive n (%)**	**OR**	**(95% CI)**	**p-value**
	181 (62.6)	108 (37.4)			
Age group					
18-29	45 (24.9)	6(5.6)			
30-39	39(21.6)	5(4.6)	1.53	(0.31, 7.62)	0.601
40-49	24(13.3)	17(15.7)	11.10	(2.45, 50.28)	0.002
50-59	27(14.9)	24(22.2)	14.78	(3.29, 66.42)	<0.001
60 and above	56(51.9)	46(25.4)	17.55	(3.75, 82.17)	<0.001
Sex					
Male	57 (31.5)	39 (36.1)			
Female	124 (68.5)	69(63.9)	0.87	(0.43, 1.76)	0.698
Level of education					
None	24(22.2)	24 (13.3)			
Primary	16 (14.8)	35 (19.3)	0.80	(0.29, 2.23)	0.677
JHS/middle school	45 (41.7)	95 (52.5)	0.76	(0.31, 1.87)	0.547
SHS	20 (13.3)	24 (18.5)	1.78	(0.53, 6.03)	0.352
Tertiary	3 (2.8)	3 (1.7)	0.28	(0.02, 3.86)	0.338
Occupation					
Unemployed	22 (12.2)	14 (13.0			
Artisan	29 (16.0)	13 (12.0)	1.17	(0.32, 4.19)	0.808
Farming	107 (59.1)	70 (64.8)	0.55	(0.19, 1.55)	0.256
Trading	22 (12.2)	9 (8.3)	0.54	(0.12, 2.40)	0.418
Civil servant	1 (0.6)	2 (1.9)	6.11	(0.28, 131.19)	0.248
Marital Status					
Single	39 (21.6)	14 (13.0)			
Married/co-habiting	100 (55.3)	47(43.5)	0.48	(0.17, 1.33)	0.159
Divorced	17 (9.4)	11 (10.2)	0.69	(0.19, 2.58)	0.585

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Widowed	24 (13.3)	35 (32.4)	0.78	(0.21, 2.86)	0.706
Separate	1(0.55)	1(0.93)	1.18	(0.04, 33.42)	0.922
Family History of DM2					
Yes	27 (14.9)	17 (15.7)			
No	105 (58.0)	62 (57.4)	2.18	(0.86, 5.56)	0.102
Don't know	49 (27.1)	29 (26.9)	1.57	(0.55, 4.47)	0.396
Family History of HPT					
Yes	40 (22.1)	44 (40.7)			
No	82 (45.3)	38 (35.2)	0.45	(0.20, 0.99)	0.050
Don't know	59 (32.6)	26 (24.1)	0.53	(0.23, 1.24)	0.141
BMI status					
Underweight	26 (14.4)	21(19.4)			
Normal	112 (61.9)	56 (51.9)	0.72	(0.33, 1.60)	0.423
Overweight	33 (18.2)	21(19.4)	0.76	(0.29, 1.98)	0.576
Obese	10 (5.5)	10 (9.3)	0.83	(0.20, 3.47)	0.797
WHR-All					
Low risk	173 (95.6)	94 (87.0)			
Moderate risk	8 (4.4)	8 (7.4)	1.41	(0.40, 5.02)	0.591
High risk	0 (0.0)	6 (5.6)	-	-	-
Location (Landscape)					
Highland	91 (50.3)	60 (55.6)			
Lowland	90 (49.7)	48 (44.4)	0.86	(0.45, 1.62)	0.636
Community size					
Small	59 (32.6)	26 (24.1)			
Large	122 (67.4)	82 (75.9)	1.18	(0.57, 2.44)	0.650
Awareness of HPT status					
Yes	38 (21.0)	49 (45.4)			
No	143 (79.0)	59 (54.6)	0.31	(0.16, 0.59)	<0.001

Association between family history of HPT, awareness and odds of hypertension

Table 4 shows that respondents with no family history of DM2 and those who were not aware of any family member having DM2 were 2.18 and 1.57 times more likely to have HPT as compared to those with a family history of DM2. The differences were however, not statistically significant [OR=2.18 (95% CI: 0.86, 5.56); p=0.102] and [OR=1.57 (95% CI: 0.55, 4.47); p=0.396] respectively. Respondents with no family history of HPT were 0.45 times less likely to have HPT as compared to those with a family history of HPT, and the difference was statistically significant [OR=45 (95% CI: 0.20, 0.99); p=0.050]. Respondents who were not aware of their BP status were 0.31 times less likely to have HPT as compared to those who were aware. The difference was statistically significant [OR=0.31 (95% CI: 0.16, 0.59); p<0.001]. Respondents who were not aware of any family member having HPT were 0.53 times less likely to have HPT as compared to those with a family history of HPT. The difference was not statistically significant [OR=0.53 (95% CI: 0.23, 1.24); p=0.141].

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Association between Anthropometric indices, community size and location, and odds of hypertension

Table 4 also shows that respondents who had normal body weight, overweight and those who were obese were 0.72, 0.76 and 0.83 times respectively, less likely to have HPT as compared to those with underweight. The differences were not statistically significant [OR=0.72 (95% CI: 0.33, 1.60); p=0.423], [OR=0.76 (95% CI: 0.29, 1.98); p=0.576] [OR=0.83 (95% CI: 0.20, 3.47); p=0.797]. Respondents who were residing in lowland communities were 0.86 times less likely to have HPT as compared to those in highland communities, but the difference was not statistically significant [OR=0.86 (95% CI: 0.45, 1.62); p=0.636]. Also, respondents who were residing in large communities were 1.18 times more likely to have HPT as compared to those in small communities, but the difference was not statistically significant [OR=1.18 (95% CI: 0.57, 2.44); p=0.650].

Correlation between blood pressure and body mass index and waist-to-hip ratio

Pearson product moment correlation coefficient was computed to measure the strength and direction of the relationship between BP vs. BMI, and BP vs. WHR for all participants and BP vs. WHR for men and women. There was a weak positive linear relationship between BP and BMI, which was not statistically significant (r=0.04, p=0.508, α=0.05) (Table 5). Even though the table also shows a statistically significant relationship between BP and WHR for all participants, there was a very weak positive linear relationship (r=0.16, p=0.006, α=0.05). There was also a weak positive linear relationship between BP and WHR for men, which was not statistically significant (r=0.17, p=0.096, α=0.05). A weak but not statistically significant linear relationship was observed between BP and WHR for women (r=0.15, p=0.036, α=0.05). Since all the correlation coefficients computed were positive, the variables (BP vs. BMI, BP vs. WHR-all, BP vs. WHR-men and BP vs. WHR-women) were directly related (Table 5).

Table 5: Correlation between HPT and body mass index and waist-to-hip ratio

Variable	**Correlation coefficient (r)**	**p-value**
BMI	0.04	0.508
WHR-All	0.16	0.006**
WHR-Men	0.17	0.096
WHR-Women	0.15	0.036*

*significant at p-value <0.05; ** significant at p-value <0.01

Discussion

Hypertension is an important cause of morbidity and mortality worldwide. The key findings of this study show an overall prevalence of 50.5% of HPT including those on treatment among the adult population in rural areas in Hohoe Municipality. The result of the prevalence of HPT found in this study (50.5%) has exceeded what was reported by [14], which revealed that the prevalence of HPT ranged from 19% to 48%. The high prevalence of HPT in this study might be due to the changing lifestyle (eating habits) in rural areas.

This study also found that the prevalence of HPT increases with age, with the highest prevalence among those aged 40-49 (11.6%). This is in agreement with findings by [6], which reported a significant association between people older than 40 years and having HPT. Another finding from [11] agrees with the current findings that old age was significantly associated with HPT.

This study also revealed that HPT was significantly higher among married respondents (43.5%) (p= 0.002). This is in agreement with other authors who found statistically significant associations between HPT and being married (43%) [21].

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The findings from this study showed that even though there was no statistically significant difference in hypertension prevalence, the prevalence was higher in women (63.9%) than in men (36.1%) (p=0.420). This is in agreement with what was found by other authors in a cross-sectional study in Ghana, who indicated that there was a high prevalence of HPT among women (29.5%) when compared with men (27.6%) [22].

The findings of the study revealed that 28.7% of the respondents were pre-hypertensive (apart from the 37.4%% who were hypertensive), which implies that many more adults were at risk of becoming hypertensive in the nearest future if nothing is done about the situation. This is similar to findings by other authors who reported 40% prevalence of Pre-HPT and 29% of HPT in the Ashanti Region of Ghana [23]. The prevalence of HPT is increasing rapidly because of increasing longevity and the continuous effect of risk factors such as unhealthy diet, obesity and physical inactivity [24]. Though the exact cause of HPT is unknown, several risk factors have been highly associated with various conditions: smoking, obesity, sedentary lifestyle, high salt intake and lack of physical activities [25]. Interestingly, this study found age and high WHR as risk factors associated with HPT.

Conclusion and recommendation

Prevalence of HPT among adults in rural communities in this study was 37.4%, and Pre-HPT was 28.7%. More than half of the adults (56.3%) who had been diagnosed hypertensive could not control their BP. One out of three (29.2%) adults who had not been diagnosed had HPT and were unaware of the hypertensive status. Quite a substantial (29.2%) number of adults are walking about without knowing their BP status, and may only become aware when complications set in. Henceforth, health education needs to be intensified among the rural populations in order to reduce the prevalence of HPT. It is also essential to provide information about how to control HPT. Large-scale population-based screening for HPT is warranted and adequate BP control is imperative to mitigate the mortality and morbidity associated with HPT in rural communities.

Abbreviations

BP- Blood Pressure, HPT- Hypertension, CVD- Cardiovascular disease MICS- Multiple Indicator Cluster Survey, VRHD- Volta Regional Health Directorate, OPD- Outpatient Department, GHS - Ghana Health Service, PI- Principal Investigator, NIH - National Institute of Health, WHO-World Health Organization, DALYs- Disability-Adjusted Life-Years, CHPS- Community Health Planning and Services, CI -Confidence Interval, HMHD-Hohoe Municipal Health Directorate, HMH- Hohoe Municipal Hospital, GHS ERC - Ghana Health Service Ethical Review Committee, ppm- Parts per million. UHAS- the University of Health and Allied Sciences, SPH- School of public Health.

Availability of data and material

Available upon request

Competing interests

The authors declare that they have no competing interests

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Authors' contributions

MK conceived the study, MK, WT, WA, RO MA did the data analysis and wrote the methods section. MK, MT, PP, MA, ET and WT were responsible for the initial draft of the manuscript. All authors reviewed and approved the final version of the manuscript.

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