The Journal of Medical Research

Research Article

JMR 2017; 3(3): 136-145
May- June
ISSN: 2395-7565

www.medicinearticle.com
Received: 17-05-2017
Accepted: 26-06-2017

Prevalence and awareness of hypertension among urban and rural adults in Hohoe Municipality, Ghana

Incoom Solomon[1], Martin Adjuik[1], Wisdom Takramah[1], Wisdom Kudzo Axame[1], Richard Owusu[1], Phyllis AttaParbey[1], Mohammed Takase[3], Elvis Tarkang[2], Margaret Kweku[1]

1 *Department of Epidemiology and Biostatistics, School of Public Health, University of Health and Allied Sciences, Ho, Ghana*

2 *Department of Population and Behavioural Sciences, School of Public Health, University of Health and Allied Sciences, Ho, Ghana*

3 *School of Biological Sciences, University of Cape Cast, Cape Coast, Central Region, Ghana*

Abstract

Background: Hypertension is increasingly becoming an important public health issue among adults worldwide. This study determined the prevalence of hypertension among urban and rural adults in Hohoe Municipality. **Method:** A population-based cross-sectional study involving 350 adults from urban 162 (46.3%) and rural 188(53.7%) settings. Face-to-face interview using pre-tested questionnaire was used to collect data. Blood pressure (BP) and anthropometric measurements were done following standard procedures. Differences in means were determined using t-test.Chi-square test and logistic regression model were used to determine theassociation between independent variables and hypertension. Pearson product moment correlation coefficient was used to measure the strength and direction of the relationship between blood pressure and some variables. **Results:** The prevalence of hypertension at the time of the survey was 89 (25.4%), with 38 (23.5%) from urban and 51 (27.1%) from rural areas(p=0.432). Uncontrolled hypertension was higher among rural adults than urban (53.2% vs. 37.2%, p=0.098). Undiagnosed hypertension was highbut similar in both urban (18.5%) and rural (18.4%) settings. Adults aged 40-49, 50-59 and 60 years and above were 3.96, 5.49 and 4.54 times more likely to have hypertension (AOR=3.96, p<0.001), (AOR=5.49, p<0.001) and (AOR=4.54, p<0.001) respectively. Those with tertiary education were 69% less likely to have hypertension (AOR= 0.31, p=0.048). Obese adults were 3.42 time more likely to have hypertension (AOR=3.42, p=0.012). Age and BMI were positively correlated with hypertension (r=0.34, p<0.001) and (r=0.28, p<0.001). **Conclusion:** There is increasing theprevalence of hypertensionamong rural than urban adults due to higher uncontrolled and undiagnosed hypertension among rural adults.Increasing age and obesity are the main contributing factors to hypertension. Periodic screening and creation of awareness could enhance the prevention and control of HPT among rural adults inHohoe Municipality.

Keywords: Diagnosed and Undiagnosed Hypertension, Controlled and Uncontrolled Hypertension, Urbanand Rural adults, Hohoe Municipality, Ghana.

INTRODUCTION

The World Health Organization (WHO) defined hypertension (HPT) as a systolic blood pressure (BP) equal to or above 140 mmHg and/or diastolic BP equal to or above 90mmHg [1]. Hypertension is among the leading causes of non-communicable diseases in developing countries [2]. Most people with hypertension possess a two-fold higher risk of developing coronary artery disease, four times higher risk of congestive heart failure and seven times higher risk of cerebrovascular disease [3]. According to WHO, about 17 million deaths occur worldwide due to cardiovascular diseases (CVDs), of which hypertension accounts for 9.4 million deaths [1,4]. Approximately, 80% of the CVD-related deaths occurred in the developing countries [5]. The global prevalence of HPT 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 [6,7]. The overall prevalence of HPT (including those on medication for high blood pressure) in adults aged 25 years and above was about 40% in 2008 [8]. Both men and women have high rates of BP in the African region with prevalence rates over 40% [1]. A report from rural Nigeria showed the prevalence of hypertension was found to be 37.6% [9].

The prevalence of hypertension in Ghana has increased steadily over the last two decades with more than ten-fold increase in reported new cases of the disease in public facilities, thus, from 49,087 in 1988 to 505,180 in 2007 [10]. A study from Ghana, however, showed the prevalence of HPT to be between 25%-48%, with the prevalence higher in urban populations than in rural populations [11]. Other studies have

***Corresponding author:**
Dr. Elvis Tarkang
Department of Population and Behavioural Sciences, School of Public Health, University of Health and Allied Sciences, Ho, Ghana
Email: ebeyang1[at]yahoo.com

also shown growing trends in HPT in urban communities compared to rural communities [12].

In Africa, the low rates of the awareness, treatment and control of hypertension are major public health concern [13]. The low levels of the above indicators thus imply there will be themajority of populations of hypertensive patients not aware of the increased risk of hypertension-related complications in the years to come. Many studies in Africa have shown that people with hypertension are unaware of their conditions. Many of those who are not aware are not on treatment and many of those treated are not well controlled [14].

In Ghana, studieshave shown that many people living with HPT are not aware of it. For example, HPTprevalence in Accra was 34%. Of this, 15% had been previously diagnosed with HPT while 19% were undiagnosed [15].

Elevated body mass index (BMI) has been identified as the main risk factor of HPT [16]. A cross-sectional study in four rural communities in the Ga District of Ghana showed that risk factors associated with high BP include increasing BMI, salt consumption, a family history of hypertension and excessive alcohol intake [17].

According to the Hohoe Municipal Health Directorate, hypertension is ranked among the top ten diseases in the municipality. It also accounted for one-third of all admissions in 2013. There was also an increase in the number of cases reported for hypertension for outpatients. The number of Hypertensives among outpatients at the Hohoe Municipal Hospital increased from 441 in 2011 to 2713 in 2013 [18].

Thus, determining the awareness and prevalence of hypertension among rural and urban adults is very crucial. This is because it will form the basis for planningfor both primary and secondary preventions of the disease. It is against this background that this study was undertaken to access the prevalence of HPT and Pre-HPT and to determine awareness and prevalence of HPT among urban and rural adults in Hohoe.

MATEREIAL AND METHODS

Study site

The study was carried out in the Hohoe Municipality which is one of the twenty-five administrative municipalities/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 and 7 degrees 15 North. The Municipality is located in the central part of Volta Region with a population of 167,743 peopleof which 48.1% are males and 51.9% are females (2010 population census). Hohoe is the Municipal capital with a population of 63,000 people. The municipality covers an area of 1,403 km.sq. and has been divided into 7 sub-Municipalities namely; Hohoe, Gbi-Rural, Alavanyo, Agumatsa, Likpe, Akpafu/Santrokofi and Lolobi. 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 main economic activity is farming where 55% of the population grow cash crops such as cocoa, maize, cassava, rice, yam and vegetables while trading forms about 25%, livestock rearing 15% and other industrial activities represent 5%. The major ethnic groups in the Municipality are the Ewes, Akpafu/Lolobi, Santrokofi and Likpe. There are 21 health facilities in the Municipality comprising Municipal hospital (1), health centers (14), Reproductive Child Health (RCH) (1) and Community-Based Health Planning and Services (CHPS) compounds (5) [18]. Figure 1 shows the rural and urban communities of Hohoe.

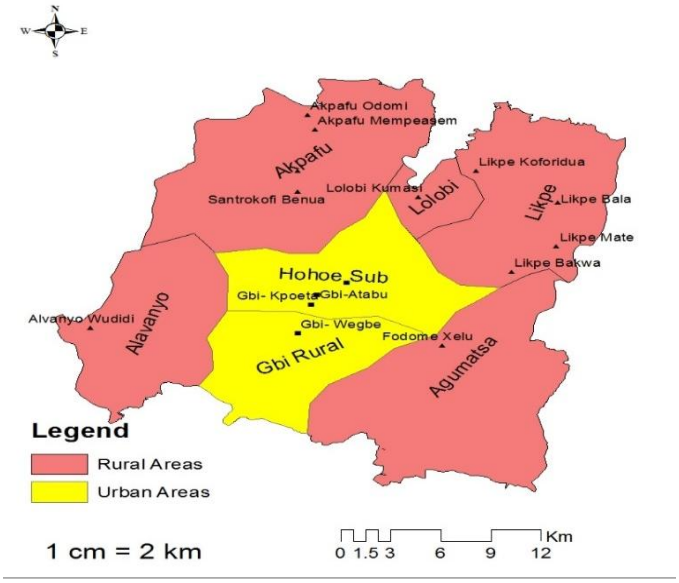

Figure 1: Hohoe map showing rural and urban communities

Study design

This was a cross-sectional study carried out in February 2017 using350 adults with 162 from urban and 188 from rural communities. A pre-tested, semi-structured questionnaire, modified from the WHO STEP wise approach to non-communicable disease risk factor surveillance (STEPS) was used to obtain information on the socio-demographic characteristics and anthropometric indices.

Study Population

The study population consisted of adults from 18 years and above residing in the Hohoe municipalities. Adults who were residing in the Municipality (at least a month), not ill, could speak for themselves, and consented, were sampled for the study. Adults who did not reside in the Hohoe municipality, pregnant women and those who did not agree to participate were excluded.

Sample size determination

The minimum sample size for the study was 350. This was obtained by using Cochlear's formula on sample size calculation (n = 303.76; accounting for 15% non-response rate n = 350).

Sampling method

The WHO 30 Cluster survey was used to randomly select 30 communities. Twelve (12) eligible adults were recruited from each selected community. The names of all the communities were listed to form a sampling frame of clusters. Simple random sampling was used to select the thirty communities from the 2010 population census list of communities in the municipality. The 30 communities were selected using one-stage cluster sampling.

Selection of communities

A cumulative population of theMunicipality was created; the total population was then divided by 30 (the number of clusters needed for the study) to obtain the sample interval (X). A random number (Y) was selected between one and the sample interval from a Cedi note. The community that falls within that number was selected as the first community for the study. The sample interval was then added to the random number (X+Y) to obtain the next community. This procedure was repeated till all the 30 communities were obtained.

Selection of participants

To obtain the number of people to be sampled from each community, the total number of each community was divided by the total number of all the communities and then multiplied by the sample size (N). The center of the community was located and a random direction was chosen by spinning a pen. A random number between 1 and N (sample size) was chosen to represent the house that contained the first household (starting point) to be surveyed. A household (defined as a group of people who live under the same roof and eat together) was eligible if there was an adult in that household at the time of the survey. If there were more than one eligible household in a house, balloting was done to select only one participant.

Data collection procedure

Data was collected using WHO STEPWISE approach for non-communicable disease surveillance (Hypertension) on risk factor assessment with particular emphasis on step 3. **STEP 1** captured information related to nutritional habit, sedentary lifestyle, socio-demographic characteristics, a family history of hypertension and many others with the use of a questionnaire which was administered through face-to-faceinterview. **STEP 2** also captured information on weight, height, blood pressure level and BMI (This was done with the use of equipment such as an electronic weighing scale, tape measure and digital blood pressure monitor) including STEP 1. In **STEP3,** the height of the participants was measured with a Stadiometer (SECA Leicester height measure with a fixed footplate and movable headboard, USA) to the nearest 0.1 centimetre. The weight was measured with a digital weighing scale (BednBath model BB-3018A, UK) with participants dressed in light clothing to the nearest 0.1 kilogram. All the measurements taken were in accordance with the standard anthropometry guidelines. Blood pressure levels of the participants were measured with the aid of (Omron M2 Basic manufacturing, Omron Corporation, Japan) digital blood pressure monitor. The participants were allowed to rest for 10 minutes before their blood pressure was measured. Blood pressure was measured atone-minute intervals for 3 three times, of which the average reading was recorded

Data Collection

A pre-tested, semi-structured questionnaire was used to collect information on the socio-demographic characteristics and awareness of hypertension. Data was collected through one-on-one interview. Arterial blood pressure and anthropometric measurement of height, weight, hip and waist circumference were also measured. Qualified health personnel were trained to assist in the data collection. Data quality control was ensured by calibrating all data collection tools for measurements before use.

Blood Pressure measurement

Arterial blood pressure was measured at rest using a digital sphygmomanometer MOTECH™ ® TrueScan™ (Digital/Automatic Blood Pressure Monitor, Germany). Repeated measurements were taken in triplicate at five-minute intervals, and the averages of the two nearest measurements were recorded to the nearest 1mmHg.

Anthropometric measurements

Weight measurements were taken with an electronic bathroom weighing scale (SecaPersonen wage Clara 803 Medical Scales and Measuring Systems, Hamburg, Germany). Weight was taken with participants wearing light clothing without shoes and values obtained were recorded to the nearest 0.5 kg. Heights of the traders were taken with a Stadiometer while standing upright and recorded to the nearest 0.1 cm. Waist Circumference (WC) and Hip Circumference (HC) were measured to the nearest 0.1 cm 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.

Classification of Hypertension

Hypertension was classified based on recommended cut-offsas follows:

Normal: (Systolic BP <120 and Diastolic BP <80 mmHg);

Pre-hypertension: (Systolic BP = 120-139 and/or Diastolic BP = 80-89 mmHg);

Hypertension- Stage I hypertension: (Systolic BP = 140-159 and/or Diastolic BP = 90-99 mmHg) and Stage II hypertension: (Systolic BP > 160 and/or Diastolic BP > 100 mmHg).

Classification of physical activity

Physical activity was estimated by quantifying activities such as carrying light loads, washing clothes, brisk walking to the farm or to the market, scrubbing the floor and sweeping inside or around the home. Physical activity was re-categorized as ≥3 days in a week and <3 days in a week.

Statistical analysis

Data was entered into Epi Info 7 and analyzed with STATA 14. Body mass index (BMI) was calculated based on WHO criteria 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 standard recommendations. Participantswere classified as hypertensive using BP threshold of 140/90 mmHg. Frequencies and percentages were used to summarize categorical variables (sex, educational background, ethnicity, religion) while means and standard deviations were used for continuous variables (BMI and BP). Chi-square analysis was used to test for the association between HPT and background characteristics. Pearson product moment correlation coefficient was used to determine the direction and strength of therelation between blood pressure (BP) and BMI, BP and WHR. Multivariate Logistic regression was used to determine the strength of association between some independent variables (age, sex, educational level, marital status business location, ever been diagnosed hypertensive) and HPT (dependent variable). The statistical significance was set at p-value < 0.05.

Ethical considerations

Ethical approval for the study was sought from the Ghana Health Service (GHS) Ethical Review Committee (ERC) with an ID number: GHS-ERC 14/03/17. Permission was also sought from the Hohoe Municipal Health Directorate (HMHD) of the GHS. Each respondent was informed prior to the interview that they were under no obligation to take part. They could withdraw at any time and that all answers would be treated with paramount confidentiality. All the eligible adults who agreed to be part of the study signed an informed consent form before being interviewed and blood pressure measured. Persons with high BP were asked to go to the HPT clinic at the Municipal hospital for further investigations and care.

RESULTS

Table 1 summarizes the background characteristics of the respondents. Overall, 350 adult respondents were surveyed. This included 162 from urban and 188 from rural settings. The overall mean age was 40.4±14.5. Mean age of respondents from theurban area was 39.8±14.5 and from rural was 40.9±14.6. The majority 177 (50.6%) of the participants were less than 40 years,of which 87 (53.7%) were from urban and 90 (47.9%) were from rural areas. This was followed by those between 40-49 years with 32 (19.8%) from urban and 31 (16.5%)

from rural areas. Those aged between 50-59 years were 60 (17.1%) with 21 (13.0%) from urban and 39 (20.7%) from rural areas. The rest were above 60 years 50 (14.3%) with 22 (13.6%) from rural and 28 (17.9%)from urban areas. Males who participated in this study were 180 (51.4%) with 81 (50.0%) from urban and 99 (52.7%) from rural areas. A total number of 170 (48.6%) females participated in this study with 81 (50.0%) from urban and 89 (47.3%) from rural areas. Out of the 350 participants, 79 (22.6%) did not have any formal education with, 37 (22.8%) from urban and 42 (22.3%) from rural areas.

Table 1: Background characteristics of the respondents in urban and rural areas

Characteristics	**Location**		
	Urban [N=162] n(%)	**Rural [N=188] n (%)**	**Total N (%)**
Number recruited	162 (46.3%)	188 (53.7%)	350 (100)
Mean Age in years (SD)	39.8 (14.5)	40.9 (14.6)	40.4 (14.5)
Age group (years)			
<40	87 (53.7)	90 (47.9)	177 (50.6)
40-49	32 (19.8)	31 (16.5)	63 (18.0)
50-59	21 (13.0)	39 (20.7)	60 (17.1)
>60	22 (13.6)	28 (17.9)	50 (14.3)
Sex			
Male	81 (50.0)	99 (52.7)	180(51.4)
Female	81 (50.0)	89 (47.3)	170 (48.6)
Educational level			
Never	37 (22.8)	42 (22.3)	79 (22.6)
JHS	63 (38.9)	82 (43.6)	145 (41.4)
SHS	44 (27.2)	51 (27.1)	95 (27.1)
Tertiary	18 (11.1)	13 (6.9)	31 (8.9)
Marital status			
Single	48 (29.6)	52 (27.7)	100 (28.6)
Married	99 (61.1)	117 (62.2)	216 (61.7)
Divorced	8 (4.9)	7 (3.7)	15 (4.3)
Widowed	7 (4.3)	12 (6.4)	19 (5.4)
Occupation			
Unemployed	0 (0.0)	32 (17.0)	32 (9.1)
Farming	13 (8.0)	73 (38.8)	86 (24.9)
Trading	86 (53.1)	15 (8.0)	101 (28.9)
Artisan	48 (29.6)	34 (18.1)	82 (23.4)
Civil servants	15 (9.3)	34 (18.1)	49 (14.0)
Religion			
Christian	136 (84.0)	178 (94.7)	314 (89.7)
Muslim	25 (15.4)	6 (3.2)	31 (8.9)
Traditionalist	1 (0.6)	4 (2.1)	5 (1.43)
Hypertension status			
Normal	124 (76.5)	137 (72.9)	261 (74.6)
Hypertensive	38 (23.5)	51 (27.1)	89 (25.4)
BMI			
Normal	162(62.1)	41 (46.1)	203 (58.0)
Underweight	23 (8.8)	3 (3.3)	26 (7.4)
Overweight	60 (23.0)	29 (32.6)	89 (25.4)
Obese	16 (6.1)	16 (18.0)	32 (9.1)
Salt intake			
Low	33 (20.4)	25 (13.3)	58 (16.6)
High	129 (79.6)	163 (86.7)	192 (83.4)

Family history of hypertension			
No	106 (65.4)	119 (63.3)	225 (64.3)
Yes	56 (34.6)	69 (36.7)	125 (35.7)
Smoking status			
Never smoke	138 (85.2)	172 (91.5)	310 (88.6)
Current smoker	5 (3.1)	6 (3.2)	11 (3.1)
Ex-smoker	19 (11.7)	10 (5.3)	29 (8.3)
Drinking status			
Never drink	91 (56.2)	85 (45.2)	176 (50.3)
Current drinker	52 (32.1)	92 (48.9)	144 (41.1)
Ex-drinker	19 (11.7)	11 (5.9)	30 (8.6)
Exercise per week			
One day	27 (16.7)	14 (7.5)	41 (11.7)
Two days	25 (15.4)	4 (2.1)	29 (8.3)
Three days	22 (13.6)	19 (10.1)	41 (11.7)
Four days	21 (13.0)	32 (17.0)	53 (15.1)
All days	67 (41.4)	119 (63.3)	186 (53.1)
Vegetable intake per week			
One day	9 (5.6)	1 (0.5)	10 (2.9)
Two days	18 (11.1)	10 (5.3)	28 (8.0)
Three days	26 (16.5)	21 (11.2)	47 (13.4)
Four days	109 (67.3)	156 (83.0)	265 (75.7)
HPT			
Normal	124 (76.5)	137 (72.9)	261 (74.6)
Hypertensive	38 (23.5)	51 (27.1)	89 (25.4)
Awareness			
No	119 (73.5)	141 (75.0)	260 (74.3)
Yes	43 (26.5)	47 (25.0)	90 (25.7)

The majority, 145 (41.4%) had JHS level of education with 63 (38.9%) from urban and 82 (43.6%) from rural. This was followed by SHS level of education, 95 (27.1%) with 44 (27.2% from urban and 51 (27.1%) from rural areas. Tertiary education attainment was 31 (5.4%) of which 18 (11.1%) were from urban and 13 (6.9%) from rural areas. The majority 216 (61.7%) of theparticipants were married or cohabiting with their partnersof which 99 (61.1%) were from urban and 117 (62.2%) were from rural areas, followed by those who were singles 100 (28.6%) with 48 (29.6%) from urban and 52 (27.7%) from rural areas. Those who were widowed were 19 (5.4%) with 7 (4.3%) from urban and 12 (6.4%) from rural. The least was those who were divorcedthus, 15 (4.3%) with 8 (4.9%) from urban and 7 (3.7%) from rural settings.

The majority, 101 (28.9%) of the participants were traders with 86 (53.1%) from urban and 15 (8.0%) from rural areas,followed byfarming 86 (24.9%), with 13 (8.0%) from urban and 73 (38.8%) from rural areas. Artisanship were 82 (23.4%) with 48 (29.6%) from urban and 34 (18.1%) from rural areas. Civil servants were 49 (14.0%) with 15 (9.3%) from urban and 34 (18.1%) from rural areas.

Prevalence of Hypertension and awareness of hypertension status

Overall HPT including those who had been diagnosed and were on treatment was 138 (39.4%). At the time of the survey, HPT was 89 (25.4%) of which 38 (42.7%) were from urban and 51 (57.3%) from rural areas (Figure 2). Among the 260 respondents who had never been diagnosed, 48 (18.5%) were hypertensive (Undiagnosed HPT), with 22 (18.5%) from urban and 26 (18.4%) from rural areas (Figure 3). Overall, those had ever been diagnosed with HPT and were aware of their HPT status (Diagnosed HPT) were 41 (45.6%) with 16 (37.2%) from urban and 25 (53.2%) from rural areas (Figure 4).

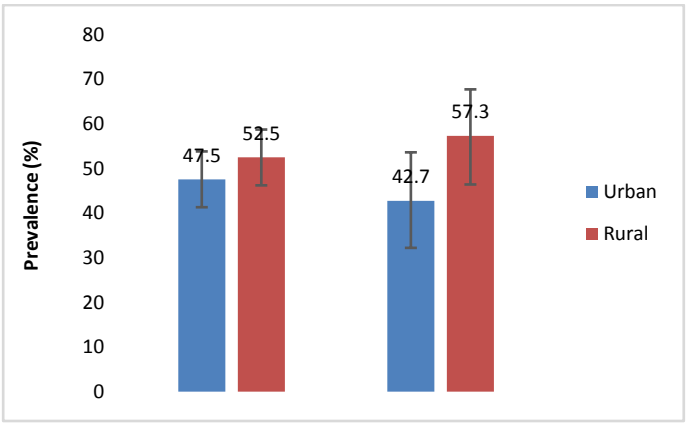

Figure 2: Prevalence of hypertension among rural and urban participants

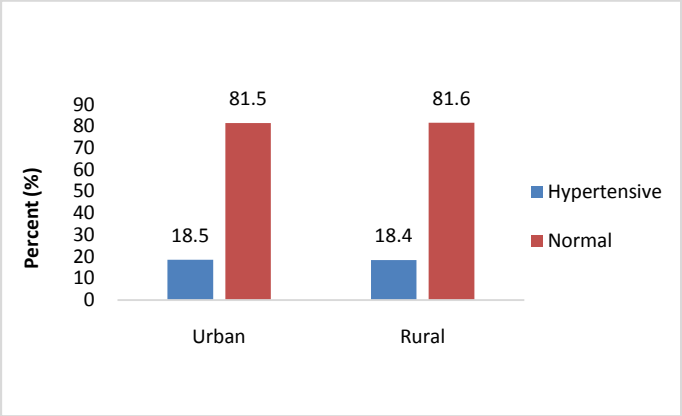

Figure 3: Prevalence of hypertension among adults not aware of their status

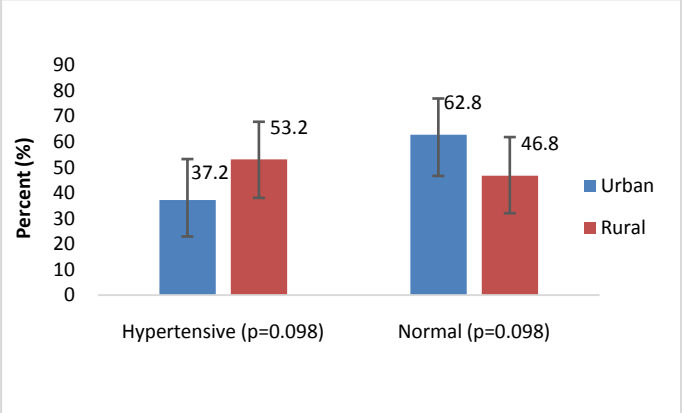

Figure 4: Comparison of Uncontrolled Hypertension among rural and urban adults

Association between background characteristics and Hypertension

Table 2 shows that there was a significant association between age, sex, marital status and HPT (χ^2 =38.45, p<0.001), (χ^2 =4.64, p=0.031) and (χ^2 =23.46, p<0.001 respectively. There was however, no significantly associated between educational level, occupation, religion and HPT (χ^2 =3.18, p=0.364) (χ^2 =9.21, p=0.056) and (χ^2 =1.46, p=0.482).

Association between BMI, life style characteristics and HPT

Table 2 shows that there was a significant association between BMI, a family history of HPT, awareness and HPT (χ^2 =18.18, p<0.001), (χ^2 =4.42, p=0.035)and (χ^2 =25.88, p<0.001), respectively. There was no association between smoking, alcohol consumption, fruit intake, exercise per week, location and HPT (χ^2 =0.82, p=0.663), (χ^2 =0.08, p=0.096), (χ^2 =5.80, p=0.122), (χ^2 =5.83, p=0.212) and (χ^2 =0.62, p=0.432) respectively.

Predictors of Hypertension

Table 2 summarizes some of the predictors of HPT. There was a significant association between increasing age of participants and HPT. Participants who were aged 40-49, 50-49 and 60 years and above were 3.96, 5.49 and 4.54 times more likely to become hypertensive as compared to those aged 18-29 years [AOR=3.96 (95% CI:1.88, 8.36); p<0.001], [AOR=5.49 (95% CI: 2.52, 11.94); p<0.001] and [AOR=4.54 (95% CI: 1.95, 10.54); p<0.001] respectively. Female participants were 1.65 times more likely to become hypertensive however, this was not statistically significant [OR=1.65 (95% CI: 0.87, 3.12); p=0.122]. Even though not statistically significant, participants with JHS and SHS were 0.57 and 0.80 times less likely to become hypertensive as compared to those with no education [AOR=0.57 (95% CI: 0.28, 1.16); p=0.121] and [AOR=0.80 (95% CI: 0.35, 1.79); p=0.589] respectively. However, attaining tertiary education was significantly associated with HPT [AOR=0.31 (95% CI: 0.10, 10.0.99); p=0.048].

Lifestyle, Awareness and the odds of Hypertension

Table 2 shows that respondents who were smoking and ex-smokers were 3.21 and 2.00 timesmore likely to become hypertensive as compared to those who never smoked. However, the difference was not statistically significant [OR= 3.21 (95% CI: 0.74, 12.83); p=0.121] and [OR= 2.00 (95% CI: 0.70, 5.69); 0.192] respectively. Respondents who were aware of their HPT status were 2.31 times more likely to have hypertension as compared to those who were not aware and the difference was statistically significant [OR= 2.31 (95% CI: 1.24, 4.27); p=0.008].

Anthropometric indexes (BMI/WHR) and the odds of Hypertension

Table 2 shows that participants who were underweightwere 0.44 times (66%) less likely to become hypertensive as compared to those who hada normal weight, the difference was however, not statistically significant [OR=0.44 (95% CI: 0.11, 1.75); p=0.250]. Respondents who were overweight were 1.64 times more likely to have HPT as compared to those who hada normal weight but, the difference was not statistically significant [OR= 1.64 (95% CI: 0.87, 3.11); p=0.126]. Respondents who were obese were 3.42 times more likely to become hypertensive as compared to those who hada normal weight [OR= 3.42 (95% CI: 1.32, 8.91); p=0.012].

Correlation between blood pressure,age and body mass index

Pearson product moment correlation coefficient was computed to measure the strength and direction of the relationship between BP and Age, and BP and BMI. There was a statistically significant but weak positive linear relationship between BP and age (r=0.34, p<0.001, α=0.05). There was also a statistically significant positive relationship between BP and BMI (r=0.28, p<0.001, α=0.05). Since all the correlation coefficients computed were positive, the variables (BP and Age, and BP and BMI) were directly related (Table 3).

Table 3: Correlation between blood pressure and age and body mass index

Variable	Hypertension	
	r	p-value
Age	0.34	<0.001
BMI	0.28	<0.001

DISCUSSION

It was found in thecurrent study that there was nostatistically significantassociation between age and HPT.Even though the prevalence of HPT was higher among rural adults than urban areas (p=0.254). The higher rural prevalence is consistent with studies in southern Nigeria which demonstrated a higher prevalence of HPT in rural than urban societies [19]. In theirstudy, they found 44.3% prevalence of HPT in the rural community compared to 27.5% in the urban (p<0.001). This is in contrast with finding reported in Ghana showing a higher prevalence in urban than rural [17].

This increased prevalence of HPT in rural areas as reported in the current study may be attributed to a rise in westernized lifestyle among the rural dwellers. The prevalence of HPT in this study is slightly lower than the 28.4 %reported earlier inHohoe [20]. This may be explained in part by the fact that theprevious Hohoestudy concentrated on traders while thecurrent study considered the general population.

Table 2: Association between risk factors and hypertension

	Hypertension status n (%)					
	Normal N=[261]	**Hypertension [89]**	**Total [350]**	**Chi square (p-Value)**	**COR (95% CI)p-Value**	**AOR (95% CI)p-Value**
Age group (years)						
<40	157 (60.2)	20 (22.5)	177(50.6)			
40-49	40 (15.3)	23 (25.8)	63(18.0)	38.45(<0.001)	4.51(2.26, 9.02)<0.001	3.96 (1.88, 8.36) <0.001
50-59	34 (3.0)	26 (29.2)	60(17.1)		6.00((3.01,11.98)<0.001	5.49 (2.52, 11.94) <0.001
>60	30 (11.5)	20 (22.5)	50(14.3)		5.23(2.52 ,10.89)<0.001	4.54 (1.95, 10.54) <0.001
Sex						
Male	124 (54.8)	37 (41.6)	180(51.4)			
Female	118 (45.2)	52 (58.4)	170(48.6)	4.64(0.031)	1.70 (1.05, 2.78)0.032	1.65 (0.87, 3.12) 0.122
Educational level						
Never	53 (20.3)	26 (20.2)	79(22.6)			
JHS	111(42.5)	34 (38.2)	145(41.4)		0.62 (0.34,1.15) 0.128	0.57 (0.28, 1.16) 0.121
SHS	74 (28.4)	21 (23.6)	95(27.1)	3.18(0.364)	0.58 (0.29,1.14) 0.112	0.80 (0.35, 1.79) 0.589
Tertiary	23 (8.8)	8 (9.0)	31(8.9)		0.71 (0.28,1.80) 0.469	0.31 (0.10, 0.99) 0.048
Marital status						
Single	91 (34.9)	9 (10.1)	100(28.6)			
Married	148 (56.7)	68 (76.4)	216(61.7)	23.46(<0.001)	4.64(0.21,9.76)<0.001	
Divorced	12 (4.6)	3 (3.4)	15(4.3)		2.57(0.59,10.65) 0.206	
Widowed	10 (3.8)	9 (10.1)	19(5.4)		9.1(0.93,28.21) <0.001	
Occupation						
Unemployed	27 (10.3)	5 (5.6)	32(9.1)			
Farming	64 (24.5)	22 (24.7)	86(24.6)		1.86 (0.64,5.41) 0.257	
Trading	66 (25.3)	35 (39.3)	101(28.9)	9.21(0.056)	2.86 (1.01,8.09) 0.047	
Artisan	68 (26.1)	14 (15.7)	82(23.4)		1.11 (0.36,3.39) 0.852	
Civil servants	36 (13.8)	13 (14.6)	49(14.0)		1.95 (0.62,6.13) 0.253	
Religion						
Christian	237 (90.8)	77 (86.5)	314(89.7)			
Muslim	21 (8.0)	10 (11.2)	31(8.9)	1.46(0.482)	1.47 (0.49,6.07)0.346	
Traditionalist	3 (1.2)	2 (2.3)	5(1.4)		2.05 (0.49,2.71) 0.436	
BMI						
Normal	162 (62.1)	41 (46.1)	203 (58.0)			
Underweight	23 (8.8)	3 (3.3)	26 (7.4)		0.52 (0.15, 1.80) 0.299	0.44 (0.11, 1.75) 0.250

Overweight	60 (23.0)	29 (32.6)	89 (25.4)	18.18 (<0.001)	1.91(1.09, 3.34) 0.024	1.64 (0.87, 3.11) 0.126
Obese	16 (6.1)	16 (18.0)	32 (9.1)		3.95 (1.82, 8.56) <0.001	3.42 (1.32, 8.91) 0.012
Family history of hypertension						
No	176 (67.4)	49 (55.1)	225 (64.3)			
Yes	85 (32.6)	40 (44.9)	125 (35.7)	4.42 (0.035)		
Awareness						
No	212 (81.2)	48 (53.9)	260 (74.3)			
Yes	49 (18.8)	41 (46.1)	90 (25.7)	25.88(<0.001)	3.70 (2.20, 6.22) <0.001	2.31 (1.24, 4.27) 0.008
Smoking status						
Never smoke	233 (89.3)	77 (86.5)	310 (88.6)			
Current smoker	7 (2.7)	4 (4.5)	11 (3.1)	0.82 (0.663)	1.73 (0.49, 6.07) 0.392	3.21 (0.74, 12.83) 0.121
Ex-smoker	21 (8.0)	8 (9.0)	29 (8.3)		1.15 (0.49, 2.71) 0.744	2.00 (0.70, 5.69) 0.192
Drinking status						
Never drink	131 (50.2)	45 (50.6)	176 (50.3)			
Current drinker	107 (41.0)	37 (41.6)	144 (41.1)	0.08 (0.0962)	1.01 (0.61, 1.67) 0.979	
Ex-drinker	23 (8.8)	7 (7.9)	30 (8.6)		0.89 (0.36, 2.20) 0.795	
Exercise per week						
One day	30 (11.5)	11 (12.4)	41 (11.7)			
Two days	19 (7.5)	10 (11.2)	29 (8.3)		1.44 (0.51, 4.03)0.492	
Three days	28 (10.7)	13 (14.6)	41 (11.7)	5.83(0.212)	1.27 (0.49, 3.29)0.628	
Four days	36 (13.8)	17 (19.1)	17 (19.1)		1.29 (0.52, 3.17)0.582	
All days	148 (56.7)	38 (42.7)	38 (42.7)		0.70 (0.32, 1.52)0.369	
Location						
Urban	124 47.5)	38 (42.7)	162(46.3)			
Rural	137 (52.5)	51 (57.3)	188(53.7)	0.62(0.432)	1.21 (0.75 ,1.97) 0.432	

Overall undiagnosed and uncontrolled HPT were high among the adults (18.5% vs. 45.6%) respectively. Undiagnosed HPT was similar among urban and rural adults, however, uncontrolled HPT was higher in rural (53.2%) than in urban (37.2%). This could partly explain why HPT is higher among rural than urban adults.

The current study revealed that age, educational level, obesity and awareness were the most important predictors of hypertension in both rural and urban communities. Increasing age has been found to be a single predictor of hypertension [19,21] and is an important cause of morbidity and mortality worldwide.

The findings of thecurrent study showed an overall prevalence of 39.2% HPT cases among adults including those on treatment. At the time of the survey, the prevalence of HPT was 25.4%, with 27.1% in the rural and 23.5% in the urban areas. This also agrees with previous findings, which revealed that the prevalence of HPT ranged from 19% to 48% [11].

A significant association existed between age older than 40 years and having HPT [22]. Thecurrent study also found that in both urban and rural areas, the prevalence of HPT increases with age, with the highest prevalence among the age group of 40-49 in urban (29.8%) and rural (28.7%).

Thecurrent study also found a statistically significant association between HPT and increasing age, attainment of tertiary education, obesity and awareness. Participants aged 40-49, 50-59 and 60 years and above were 3.96, 5.49 and 4.54 times more likely to become hypertensive. This agrees with the findings of a study conducted in China, where theprevalence of hypertension increases with increase in theage group 18-44 years (19.30%), 45-59 years (39.80%), and 60-78 years age group (62.10%) [23].

Those who attained tertiary level of education were 0.31 times less likely to have HPT [OR=0.31 (95% CI: 0.10, 0.99); p=0.048]. This corresponds to a population- based cross-sectional study conductedin Dehui City of Jilin Province in China, where, a lower educational levelwas significantly associated with hypertension [23]. Theselower levels of education could result in less awareness of the risk and protective factors for hypertension, and therefore individuals may be more likely to engage in unhealthy lifestyles such as smoking, high consumption of alcohol, high salt intake and physical inactivity. Other studiesconducted inLiaoning Province of China also showed that higher levels of education produced the lowest risks of blood pressures and was protective against hypertension [24,25].

Thecurrent study also revealed that HPT was significantly higher among those who were obese. This agrees with the results of a study conducted in Benin, which revealed that people who were overweight or obese were at risk to have hypertension as compared to the normal people, which significantly increased the cardiovascular risk compared to those who were not [26]. HPT was found to be significantly higher among those who were aware of their status. Findings from thecurrent study are in contrast with the results obtained from a previous study, which reported no significant association between those who were aware and the disease.

Limitations

The diagnosis of hypertension was based on a mean of three blood pressure measurements at one sitting and this may have affected the overall prevalence of hypertension in this study. The study also identified bias on the part of the respondents as one of the limitations.

CONCLUSION

There is an epidemiologic change in the prevalence of HPT in the rural communities of Ghana.

There is a high prevalence of HPT among adults in this study in both urban and rural settings. Uncontrolled HPT was higher among rural than urban adults. Over a quarter of the adult population were walking about with HPT and were not aware in both urban and rural communities. Prevalence was higher in the rural than the urban area and this could be attributable to higher uncontrolled HPT.

Recommendation

It is therefore recommended that health education should be intensified amongthe rural adult population as a crucial weapon in reducing the prevalence of HPT. It is also essential to provide information about how to control HPT. Large-scale population screening for HPT and pre-HPT is needed and adequate BP control is imperative to mitigate the mortality and morbidity associated with HPT. During screening programmes, information must be provided to alert people to seek timely medical attention as needed to reduce complications associated with HPT. This requires health education in public places and institutions and via the media to curb the impending global epidemic of hypertension.

List of abbreviations

BP-Blood Pressure, VRHD - Volta Regional Health Directorate, mmHg - Millimeters Of Mercury, OPD- Out-Patient Department, NCDS-Non-Communicable Diseases, ISH- International Society of Hypertension, GHS - Ghana Health Service, HBP- High Blood Pressure, PI- Principal Investigator, NIH - National Institute of Health, RCH- Reproductive and Child Health, WHO-World Health Organization, DALYs- Disability-Adjusted Life-Years, BMI- Body Mass Index, CHPS- Community Health Planning and Services, CI-Confidence Interval, WC- Waist Circumference, HC- Hip Circumference, WHR-Waist-Hip Ratio, HMHD-Hohoe Municipal Health Directorate, GHS ERC- Ghana Health Service Ethical Review Committee.

Availability of data and material

Available upon request.

Conflict of interests

The authors declare that they have no competing interests.

Funding

Nill.

Authors' contributions

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

Acknowledgements

We are grateful to the staff of the University of Health and Allied Sciences. We are also grateful to Dr Felix Doe and the staff of the Hohoe Municipal Health Directorate and the Hohoe Municipal Assembly. We would like to thank the interviewers and the adults who participated in the study.

REFERENCES

1. WHO (2013). Raised blood pressure. Global Health Observatory. World Health organization. Geneva, Switzerland. Available at: http://www.int/gho/ncd/risk_factors/
2. WHO Hypertension Fact sheet 2012.
3. Galav A, Bhatanagar R, Meghwal Chandra S, & Jain M. Prevalence of hypertension among rural and urban population in Southern Rajasthan.

National Journal of Community Medicine. 2015; 6(2), 3–7.
4. Lim SS, Vos T, Flaxman AD, Danaei G, Shibuya K, Adair-Rohani H. (2012). Acomparative risk assessment of burden of disease and injury attributable to67 risk factors and risk factor clusters in 21 regions, 1990-2010: a systematicanalysis for the Global Burden of Disease Study 2010. The Lancet. 380(9859):2224–60.
5. Lozano R, Naghavi M, Foreman K, Lim S, Shibuya K, Aboyans. Globaland regional mortality from 235 causes of death for 20 age groups in 1990and 2010: a systematic analysis for the Global Burden of Disease Study2010. The Lancet. 2012; 380(9859):2095–128.
6. Kearney PM, Whelton M, Reynolds K, Muntner P, Whelton PK, He J. Global burden of Hypertension: analysis of worldwide Data. The Lancet. 2005; 365(9455)217-223.
7. Mensah GA., Bakris G. The United Nations high-level meeting addresses Non-communicable diseases, But Where Is Hypertension? The Journal of Clinical Hypertension. 2011; 13(11):787-90.
8. World Health Organization. Global Status Report on Non-communicable diseases, 2010.
9. Isara AR, Okundia PO. The burden of hypertension and diabetes mellitus in rural communities in southern Nigeria. Pan African Medical Journal. 2015; 20. https://doi.org/10.11604/pamj.2015.20.103.5619
10. Centre for Health Information Management. Outpatient morbidity inhealth facilities. Accra, Ghana: Ghana Health Service; 2008.
11. Bosu KW. Epidemic of hypertension in Ghana: a systematic review. BMC Public Health. 2010; 10:418.
12. Awuah RB, Anarfi JK, Agyemang C, Ogedegbe G, Aikins AD-G. (2014). Prevalence, awareness, treatment, and control of Hypertension In urban poor communities in Accra, Ghana. Journal of Hypertension. 2014; 32(6), 1203-1210.
13. de-Graft Aikins A, Unwin N, Agyemang C, Allotey P, et al. Tackling Africa's chronic disease burden: From the local to the global. Global Health. 2010; 6:5. PubMed | Google Scholar.
14. Hendriks ME, Wit FWNM, Roos MTL, Brewster LM, Akande TM, de Beer IH, *et al.* Hypertension in sub-Saharan Africa: cross-sectional surveys in four rural and urban communities. PLoS One. 2012;7 :e32638.
15. Aryeetey R, Ansong J. Overweight and hypertension among college of health sciences employees in Ghana. Afr. J. Food Agric. Nutr. Dev. 2011; 11(6):5444-56.
16. Duah AF, Werts N, Hutton-Rogers L, Amankwa D, Otupiri (2013). Prevalence and Risk Factors for Hypertension in Adansi South, Ghana: A Case for Health Promotion DOI: 10.1177/2158244013515689 sgo.sagepub.com.
17. Addo J, Agyemang C, Smeeth L, de-Graft Aikins A, Edusei AK, Ogedegbe O. A review of population-based studies on hypertension in Ghana. Ghana Medical Journal. 2012 June; 46 (2 Suppl):4-11.
18. Hohoe Municipal Health Directorate Annual Report, 2014.
19. Akpan EE, Ekrikpo UE, Udo AIA, Bassey BE. Prevalence of Hypertension in Akwa Ibom State , South-South Nigeria : Rural versus Urban Communities Study. Int J Hypertens. 2015;1-5.
20. Bani F, Nyavor P, Agbemafle I, Takramah W, Agboli E, Tarkang E, Kweku M. (2017). Prevalence and awareness of hypertension and prehypertension among traders in Hohoe Municipality, Ghana. Journal of Scientific Research and Studies. 2017; 4(1), 22–30.
21. Sola AO, Chinyere OI, Stephen AO, Kayode JA. Hypertension prevalence in an Urban and Rural area of Nigeria. 2013; 4(4), 149-154.
22. Asekun-Olarinmoye E, Akinwusi P, Adebimpe W, Isawuni M, Hassan M, Olowe O, et al. Prevalence of hypertension in the rural adult population of Osun State , southwestern Nigeria. Intern J Gen Med. 2013;6:317–22.
23. Wei Q, Sun J, Huang J, Zhou H, Ding Y, Tao Y, et al. Prevalence of hypertension and associated risk factors in Dehui City of Jilin Province in China. J Hum Hypertens. 2015;(71):64–8.
24. Dong G.H., Sun Z.Q., Zhang X.Z., Li J.J., Zheng L. Q., Li J. (2007). Prevalence, awareness, treatment, and control of Hypertension in rural adults from Liaoning Province, Northeast China. Hypertens Res. 30: 951–958.
25. Wang Y, Chen J, Edwards CL. Education as an important risk factor for the prevalence of hypertension and elevated blood pressure in Chinese men and women. J Hum Hypertens. 2006;898–900.
26. Gbary A. R., Kpozehouen A., Houehanou Y. C., Djrolo F., Amoussou M. P.G., Tchabi Y., Houinato D. S. (2014). Prevalence and risk factors of overweight and obesity: findingsfrom a cross-sectional community-based survey in Benin. Global Epidemic Obesity. doi: 10.7243/2052-5966-2-3. [Available on http://www.hoajonline.com/journals/pdf/2052-5966-2-3.pdf].