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Prevalence and awareness of Hypertension among urban and rural Adults in the Keta Municipality, Ghana

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Abstract

Background: With the changing trends in the epidemiology of hypertension (HPT), recent studies have shown an increasing prevalence of HPT in rural than urban communities. This study examined the prevalence of HPT and its awareness among urban and ruraladults in Keta Municipality. **Method:** A population-based cross-sectional study involving 264 adults (18-65 years). Face-to-face interview using semi-structured questionnaire was used to collect information. Blood pressure and anthropometric measurements were taken following standard procedures. Differences in means were determined using t-test. Associations between independent categorical variables and HPT were determined using Chi-square and multivariable logistic regression model. The correlation coefficient was computed to determine the strength and direction of the relationship between anthropometric indices and hypertension. **Results:** At the time of the survey, HPT prevalence was 146 (55.3%). Out of this, 49 (43%) were from urban and 65 (57.0%) from rural areas. Diagnosed HPT was 49 (30.1%), of which the majority, 32 (65.3%) were from urban and 17 (34.7%) from rural areas. Of the 32 Hypertensives from the urban areas, 20 (62.5%) were uncontrolled. Of the 17 Hypertensives among the rural adults, 12 (70.6%) were uncontrolled. Undiagnosed HPT was 114 (53.0%), with 19 (49.0%) among urban and 65 (56.5%) among rural adult population. Females were 0.29 times less likely to have HPT as compared to males (AOR=0.29, p=0.007]. Thosewith JHS, SHS and tertiary education were 0.48, 0.25 and 0.29 times less likely to have HPT (AOR=0.48, p=0.043), (AOR=0.25, p=0.004) and (AOR=0.29, p=0.031) respectively. Those with a family history of HPT were 2.46 times more likely to have HPT (AOR=2.46, p=0.003). Adults with moderate and high-risk WHR were 2.58 and 2.61 times more likely to have HPT [AOR=2.58, p=0.039] and [AOR=2.61, p=0.032] respectively. There was a positive linear relationship between age and BMI in both urban and rural settings and HPT. **Conclusion:** The prevalence of HPT is very high among adults in the Keta Municipality.Rural adults are more affected than urban, probably due to higher awareness and control of HPT among the urban population.Creation of awareness on HPT and its management are needed to enhance the prevention and control among rural adults.

Keywords: Hypertension, Diagnosed, Undiagnosed, Controlled, Uncontrolled, Urban, Rural, Keta 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 the burden of non-communicable diseases in the developing countries and it was seento be non-existent in most African societies. 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 [2,3]. 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. Both men and women have high rates of BP in the African region, with prevalence rates of over 40% [1]. Although there has been a slight decline in the average global prevalence of hypertension, there is an increasing trend inthe middle and low-income countries with two-thirds living in the developing countries [4].

Reports have shown ahigh prevalence of hypertension among women (29.5%) compared to men (27.6%) in Ghana [5]. Aside sex differences, the prevalence of hypertension is highly influenced by residential status. Currently, hypertension prevalence is high in rural communities than urban countries. Studies have shown that some lifestyles and dietary changes are increasingly affecting rural areas in parts of Sub-Saharan Africa (SSA) [6]. Rural areas in Tanzania and Uganda were found to have ahigh prevalence of

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hypertension. Among them, only 6% of individuals with hypertension in each country had it under control [6].

Multiple factors including modifiable and non-modifiable have been demonstrated to be associated with hypertension development. The prevalence of hypertension among adult females was 8.7% compared to 7.3% in males in Nigeria [7]. However, theprevalence of hypertension in South Africa among men was 4.1% compared to 2.8% in females [8]. Studies have found family history to be associated with hypertension in both urban and rural areas [9]. In addition, thelevel of education was among the three factors influencing thedevelopment of hypertension in Rukungiri District in Uganda [10].

The world Health Organization defines obesity as a condition characterized by excess accumulation of body fat to an extent that, health may be adversely affected. This metabolic risk factor (obesity) is one of therisk factors of non-communicable diseases including hypertension.Being obese was found to be one of the risk factors of hypertension in Burkina Faso [11] and Africa as a whole [12,13].

Reports from rural Thailand indicated high BP amongadults to be27% with 15% being hypertensive and 12% being pre-hypertensive [14]. In rural Nigeria, the prevalence of hypertensionwas found to be 37.6% [15]. Hypertension in Ghana was found to be one of the top three killer diseases with a high prevalence rate of 30-40% and alsothe major cause of heart failure [16,17]. A survey of 20 rural Ghanaian villages in 1973 found the prevalence of 2%–5% and concluded that HPT was not a significant health problem in rural Ghana [18]. A recent study in rural Ghana indicated the prevalence of HPT to be 35% [19]. The prevalence of HPT in Ghana as at 2010 was between 25% and 48%, with ahigher rate in urban populations than in rural [20]. Another study has shown a growing trend of HPT in urban communities compared to rural communities [21].

Early detection and treatment of hypertension are vital. Low rates of awareness, treatment and control of hypertension in Africa are major public health concerns [22]. In the United State of America, 75.7% of people living with hypertension are aware of their status, 65.1% of the 75.7% were under management, and 36.78% had it under control [23]. In Cameroon, awareness of HPT was 32.5% with only 59.6% of them on treatment [24]. In South Africa, people with hypertension are unaware of their condition. However, those aware are not on any form of treatment and the majority of those on treatment are not well controlled [25]. Studies have shown that awareness of HPT is low [14]. In Ghana, reports have shown that many Ghanaians living with HPT are not aware of it. In Accra, HPT prevalence was 34% and 15% had been previously diagnosed with HPT, while 19% were undiagnosed [26]. In all, increase in awareness, treatment and control rates of hypertension will have a huge and significant impact on Cardio Vascular Diseases (CVD) in Africa [27].

Elevated body mass index (BMI) has been identified as the main risk factor of HPT [28]. A recent study in Ghana found that over a third of the study population was either overweight or obese [22]. 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, increased salt consumption, a family history of hypertension and excessive alcohol intake [29]. The current study was set out to access the prevalence of HPT and to determine awareness and predictors of HPT among urban and rural adult populationin Keta Municipality.

MATERIALS AND METHODS

Study site

Keta Municipality is one of the twenty-five (25) administrative districts/municipalities in the Volta Region of Ghana with a total population of 162,942 people projected from the 2010 census. It is located in the south-eastern part of the Volta estuary, between longitude 0°30E and 1°05E. The Municipality shares common borders with Akatsi South District to the North, the Gulf of Guinea to the South, South Tongu District to the West and Ketu South District to the East. The administrative capital of the municipality is Keta. It has a total land area of about 1,086 km^2, out of which about a third is covered with water bodies (362 km^2). Among the water bodies, the Keta lagoon is the largest. The lagoon is about 1.2km wide and 32 km long and is a designated wetland area. The remaining land area of 724 km^2 creates a situation of severe constraint on access to land for development in the Municipality. The Volta River passes through the western part of the Municipality at Galo-Sota and Anyanui before finally emptying itself into the sea at the estuary in Ada. There are six sub-municipalities namely; Keta, Tegbi, Anloga, Anyanui, Shime and Anyako. The municipality has one main ethnic group, the Anlo-Ewes, and is endowed with 28 health facilities including 2 Hospitals, 12 health centres, 5 private clinics, 3 private maternity facilities and 6 functional CHPS zones.

Study population

The study population comprised adults aged 18-64 years residing in the municipality. Those who consent to participate were included in the study. Adults not residing in the municipality, seriously ill or did not consent to participate were excluded from the study.

Study design

The study was a cross-sectional,carried out in February 2017 using 264 adults in Keta Municipality. Face-to-face interviews using pre-tested, semi-structured questionnaires, modified from the WHO STEP-wise approach to non-communicable disease risk factor surveillance (STEPS) were used to obtain information on the socio-demographic characteristics and anthropometric indices. The information collected include awareness of HPT status. There was ameasurement of anthropometric indices (weight, height, waist and hip circumference). Blood pressure was also measured.

Sample size determination

The required sample size was determined using a sample size calculation formula [30]. Z score of 1.96 at 95% confidence level, the margin of error of 5% and proportion of 30% were entered into the formula to determine a minimum sample size of 216. A non-response rate of 5% was applied to the minimum sample size, which was increased to 264 adults.

Sampling method

Multi-stage sampling method was used. The six sub-municipalities were stratified into two groups; urban and rural. Two urban and two rural communities were randomly selected from each sub-municipality. The names of the communities were written on pieces of paper and folded, then grouped into corresponding strata and shaken to ensure they mixed well. Using the lottery method, three persons were blinded and they randomly selected one community from each stratum. Individual units were interviewed in the selected communities. Eleven (11) participants were selected from each community making a sample size of 264. For each community, households were randomly selected. Within each study community, the central point was located. Standing at that location, the field worker spun a pointed object. The angle the object took determined the direction to follow. The field worker entered the first house facing him from which a respondent was sampled. If there were more than one eligible respondent in a house, one respondent was randomly recruited. Upon exit from a house, the house whose entrance directly faced the one being exited from was the next compound visited. Thus, the serpentine movement approach

aided field workers to identify subsequent houses. Thus, this procedure was repeated until the sample size required was obtained.

Data collection procedure

Community entry was done before data collection. 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 diabetes and hypertension and many others with the use of a questionnaire. **STEP 2** also captured information on weight, height, blood pressure level and BMI (This was done with the use of equipment such as electronic weighing scale, tape measure and digital blood pressure monitor) including STEP 1. In **STEP3** the height of the participants were taken with a Stadiometre (SECA Leicester height measure with a fixed footplate and movable headboard, USA) to the nearest 0.1 centimetre. Weight was measured with a digital weighing scale (Bedn Bath model BB-3018A, UK) with participants dressed in light clothing to the nearest 0.1 kilogram. All measurements taken were in accordance with the standard anthropometry guidelines. Blood pressure levels of participants were measured with the aid of (Omron M2 Basic manufacturing, Omron Corporation, Japan) digital blood pressure monitor. 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 about 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 minutes interval, and the averages of the two nearest measurements were recorded to the nearest 1 mmHg.

Anthropometric measurements

Weight measurements were taken with an electronic bathroom weighing scales (Seca Personen 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 Stadiometre while standing upright 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 14.1. 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 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 statusbusiness 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 14/03/2017. Permission was also sought from the Keta Municipal Health Directorate (HMHD) of the GHS. Each participant 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 traders who agreed to be part of the study signed an informed consent form before being interviewed and blood sampleswere taken. 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 participants. In all, 264 participants were surveyed. This included 132 urban and 132 rural dwellers. Most participants were above 60 years thus, 96 (36.4%). Sixty-six (25.0%) were less than 40 years, 57 (21.6%) were between 50-59 years, and 45(17.0%) were between 40-49 years. The majority of the participants were females 192 (72.7%). Of the 264 participants, 73 (27.6%) did not have any formal education. The highest level of education attained by most participants was Junior High School (JHS)/Middle school 89 (33.7%), followed by primary school 45(17.1%). Only 35 (12.3%) of the participants had Senior High School (SHS) and 22 (8.3%) had a tertiary level education.

Most participants 150 (56.8%) were married followed by those who were widowed 55 (20.8%), single 33 (12.0%) and the least were divorced 26 (9.8%). The majority 207 (78.4%) of the participants were self-employed, followed by the unemployed 25(9.5%), retired 15 (6.7%) and civil servants 17 (6.4%).

Table 1 shows that occupation and physical activity were significantly associated with HPT (χ^2 =10.89, p=0.012) and (χ^2 =12.58, p=0.006)

respectively. There was no significant association between age, sex, educational level, marital status and HPT (χ^2 =1.74, p=0.627), (χ^2 =3.74, p=0.053), (χ^2 =6.64, p=0.156) and(χ^2 =0.44, p=0.931) respectively.There was also no significant association between BMI, WHR (men), WHR (women), WHR alland HPT (χ^2 =5.56, p=0.135), (χ^2 =1.53, p=0.466), (χ^2 =4.74, p=0.094) and (χ^2 =4.46, p=0.108) respectively.

Table 1: Background characteristics of Respondents

	Location				
	Urban N=[132]	**Rural N=[132]**	**Total [264]**	**Chi Square (χ^2)**	**p-Value**
Mean age (in years)					
Age group (years)					
<40	35 (26.5)	31 (23.5)	66 (25.0)		
40-49	23 (17.4)	22 (16.7)	45 (17.0)	1.74	0.627
50-59	31 (23.5)	26 (19.7)	57 (21.6)		
>60	43 (32.6)	53 (40.1)	96 (36.4)		
Sex					
Male	29 (22.0)	43 (32.6)	72 (27.3)		
Female	103 (78.0)	89 (67.4)	192 (72.7)	3.74	0.053
Educational level					
No education	38 (28.8)	358 (26.5)	73 (27.6)		
Primary	23 (17.4)	22 (16.7)	45 (17.1)		
JHS	41 (31.1)	48 (36.4)	89 (33.7)	6.64	0.156
SHS	14 (10.6)	21 (15.9)	35 (12.3)		
Tertiary	16 (12.2)	6 (4.5)	22 (8.3)		
Occupation					
Unemployed	16 (12.1)	9 (6.8)	25 (9.5)		
Civil servants	14 (10.6)	3 (2.3)	17 (6.4)	10.89	0.012
Self employed	94 (71.2)	113 (85.6)	207 (78.4)		
Retired	8 (6.1)	7 (5.3)	15 (6.7)		
Marital status					
Single	18 (13.6)	15 (11.4)	33 (12.5)		
Married	75 (56.8)	75 (56.8)	150 (56.8)		
Divorced	12 (9.1)	14 (10.6)	26 (9.8)	0.44	0.931
Widowed	27 (20.5)	28 (21.2)	55 (20.8)		
BMI					
Underweight	5 (3.8)	2 (1.5)	7 (2.7)		
Normal	42 (31.8)	59 (44.7)	101 (38.3)		
Overweight	41 (31.1)	32 (24.2)	73 (27.6)	5.56	0.135
Obese	44 (33.3)	39 (29.6)	83 (31.4)		
WHR men					
Low risk	25 (86.2)	34 (79.1)	59 (81.9)		
Moderate risk	4 (13.8)	7 (16.3)	11 (15.3)	1.53	0.466
High risk	0 (0.0)	2 (4.6)	2 (2.8)		
WHR women					
Low risk	11 (10.7)	13 (14.6)	24 (12.5)		
Moderate risk	31 (30.1)	15 (16.9)	46 (24.0)	4.74	0.094
High risk	61 (59.2)	61 (68.5)	122 (63.5)		
WHR all					
Low risk	36 (27.3)	47 (35.6)	83 (31.4)		
Moderate risk	35 (26.5)	22 (16.7)	57 (21.6)		
High risk	61 (46.2)	63 (47.7)	124 (47.0)	4.46	0.108
Physical exercise per week					
No physical exercise	106 (80.3)	102 (77.3)	208 (78.8)		

1 day	8 (6.1)	0 (0.0)	8 (3.0)	12.58	0.006
2-3 days	8 (6.1)	8 (6.1)	16 (6.1)		
More than 3 days	10 (7.6)	22 (16.7)	32 (12.1)		
Family History of Hypertension					
No	74 (56.1)	74 (56.1)	148 (56.1)		
Yes	58 (43.9)	58 (43.9)	116 (48.9)	0.00	1.00
Awareness of Hypertension					
No	100 (75.8)	115 (87.1)	215 (81.4)		
Yes	32 (24.2)	17 (12.9)	49 (18.6)	5.64	0.018

Anthropometric indices of the respondents

Table 1 shows that underweight was 2.7%, with 3.8% from urban and 1.5% from rural areas. Overweight was higher among urban than rural participants (31.1%) and (24.2% respectively. Obesity was also higher among urban (33.3%) than rural (29.6%) participants but the difference was not significant. The prevalence of high-risk WHR for all participants was similar in both urban and rural participants (46.2% vs. 47.7%) respectively (p=108) (Figure 3).The prevalence of high-risk WHR for male participants was 0.0% in urban and 4.6% among rural participants (p=0.466). The prevalence of high-risk WHR for women was higher among rural than urban participants (68.5% vs. 59.2%) (p=094).

Prevalence of Hypertension and awareness of hypertension status

Overall HPT including those who had been diagnosed and were on treatment was 163 (61.7%). At the time of the survey, HPT was 146 (55.3%), with 69 (47.3%) from urban and 77 (52.7%) from rural communities (Figure 1). Of the 146 Hypertension cases, those who hadnever been diagnosed (Undiagnosed HPT) were 114 (78.1%), (Figure 1) of which 49 (43.0%) were from urban and 65 (57.0%) were from rural communities.

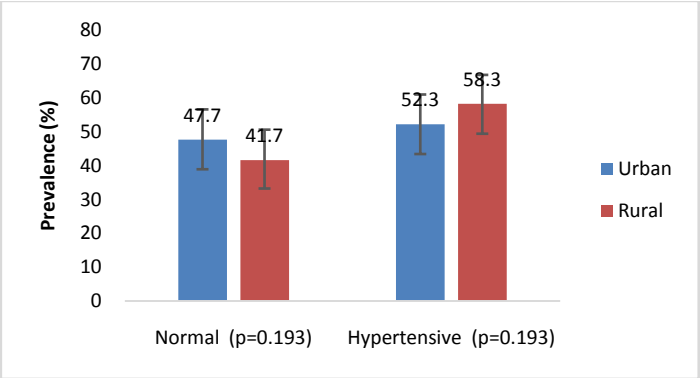

Figure 1: Prevalence of hypertension among rural and urban participants

In all, 215 respondents were not aware or had never been diagnosed (Undiagnosed HPT), with 100 from urban and 115 from rural areas. Out of the 100 respondents from urban areas, 49 (49.0%) were hypertensive, while of the 115 from rural areas 65 (56.5%) were hypertensive. Even though undiagnosed HPT was higher among the rural than among the urban adults, the difference was not statistically significant (p=0.167) (Figure 2).

Of the 32 who had HPT from urban areas, 20 (62.5%) were not able to control their BP. Out of the 17 respondents from rural areas who were hypertensive, 12 (70.6%) could not control their BP. Even though uncontrolled hypertension was higher among rural adults than urban the difference was not statistically significant (p=0.405) as shown in figure 3.

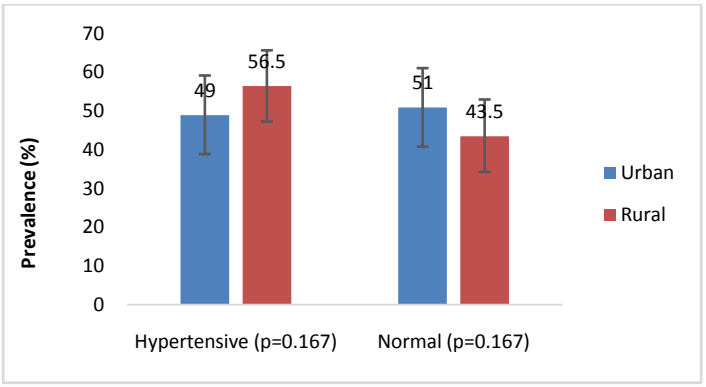

Figure 2: Prevalence of hypertension among adults who were not aware of their status

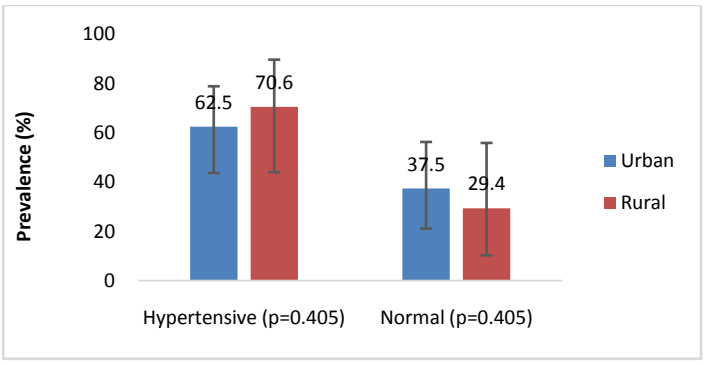

Figure 3: Comparison of uncontrolled hypertension among urban and rural adults

Predictors of Hypertension

Table 2 summarizes some of the predictors of HPT. Females were 0.29 times less likely to have HPT as compared to males and this was statistically significant [AOR=0.29 (95% CI: 0.12, 0.71); p=0.007].There was no significant association between increasing age and HPT among older participants as compared to the younger age group. Participants who were aged 40-49, and 60 years and above were 1.60 and 1.05 times more likely to become hypertensive as compared to those aged less than 40 years [AOR=1.60 (95% CI:67, 3.82); p=0.282] and [AOR=1.05 (95% CI: 0.49, 2.22), p=0.901] respectively. Those aged between 50-49 years were 0.93 times less likely to become hypertensive [AOR=0.93 (95% CI: 0.41, 2.08); p=0.863].

Even though not statistically significant, participants with primary level educational were 0.52 times less likely to become hypertensive as compared to those with no education [AOR=0.52 (95% CI:0.22, 1.17); p=0.225]. Those with JHS,SHS and tertiary education were 0.48, 0.25 and 0.29 times less likely to have HPT and these were statistically significant [AOR=0.48 (95% CI: 0.23, 0.99); p=0.043], [AOR=0.25 (95% CI: 0.09, 0.64); p=0.004] and [AOR=0.29 (95% CI: 0.09, 0.89); p=0.031] respectively.

Table 2: Association between risk factors and hypertension

	Hypertension n (%)					
	Normal [N=118] n (%)	**Hypertensive [N=146] n (%)**	**Total [N=264] N (%)**	**Chi-square (p-value)**	**COR(95% CI)p-value**	**AOR (95% CI)p-value**
Age group						
< 40 years	39 (33.1)	27 (18.5)	66 (25.0)			
40-49 years	16 (13.5)	29 (19.9)	45 (17.0)	8.54(0.036)	2.61(1.19, 5.73) 0.016	1.61 (0.68, 3.82) 0.281
50-59 years	26 (22.0)	31 (21.2)	57 (21.6)		1.2 7(0.84, 3.52) 0.137	0.93 (0.42, 2.09) 0.870
60+ years	37 (31.4)	59 (40.4)	96 (36.4)		2.30 (1.21, 4.37) 0.011	1.03 (0.49, 2.17) 0.945
Sex						
Male	30 (25.4)	42 (28.8)	72 (27.3)			
Female	88 (74.6)	104 (71.2)	192 (72.7)	0.36 (0.544)	0.84 (0.49, 1.460) 0.544	0.29 (0.12, 0.71) 0.007
Level of education						
Never	20 (16.9)	53 (36.3)	73 (27.6)			
Primary	21 (17.8)	24 (16.4)	45 (17.1)		0.43 (0.19, 0.94) 0.034	0.51 (0.23, 1.17) 0.113
JHS	42 (35.6)	47 (32.2)	89 (33.7)	15.64(0.004)	0.42 (0.21, 0.81) 0.011	0.48 (0.23, 0.99) 0.043
SHS	22 (18.6)	13 (8.9)	35 (12.3)		0.22 (0.09, 0.52) 0.001	0.25 (0.09, 0.64) 0.004
Tertiary	13 (11.0)	9 (6.2)	22 (8.3)		0.26 (0.10, 0.70) 0.008	0.29 (0.09, 0.89) 0.031
Occupation						
Unemployed	11 (9.3)	14 (9.6)	25 (9.5)			
Civil servants	9 (7.6)	8 (5.5)	17 (6.4)	2.49(0.478)	0.69 (0.20, 2.40) 0.570	
Self employed	94(79.7)	113 (77.4)	207 (78.4)		0.94 (0.40, 2.18) 0.894	
Retired	4 (3.4)	11 (7.5)	15 (5.7)		2.16 (0.53, 8.67) 0.277	
Marital status						
Single	22 (18.6)	11 (7.5)	33 (12.5)			
Married	64 (54.2)	86 (58.9)	150 (56.8)		2.68 (1.23, 5.94) 0.015	
Divorced	14 (11.9)	12 (8.2)	26 (9.9)	10.76(0.013)	1.71 (0.59, 4.93) 0.318	
Widow	18 (15.3)	37 (25.3)	55 (20.8)		4.11 (1.64,10.29) 0.003	
Religious affiliation						
Christian	95 (80.5)	111 (76.0)	206 (78.0)			
Muslim	4 (3.4)	4 (2.7)	8 (3.0)	1.17(0.558)	0.85 (0.21, 3.51) 0.829	
Traditional	19 (16.0)	31 (21.2)	50 (18.9)		1.39 (0.74, 2.63) 0.301	
Location						
Urban	63 (53.4)	69 (47.3)	132 (50.0)			

Rural	55 (46.6)	77 (52.7)	132 (50.0)	0.98(0.322)	1.28 (0.78, 2.01) 0.322	1.26 (0.73, 2.16) 0.401
Physical activity per week						
No physical activity	96 (81.4)	112 (76.7)	208 (78.8)			
1 day	3 (2.5)	5 (3.4)	8 (3.0)		1.43 (0.33, 6.13) 0.631	
2-3 days	2 (1.7)	14 (9.6)	16 (6.1)	7.97 (0.047)	6.0 (1.33, 27.06) 0.020	
More than 3 days	17 (14.4)	15 (10.3)	32 (12.1)		0.76 (0.35, 1.59) 0.463	
Family history of HPT						
No	82 (69.5)	66 (45.2)	148 (56.1)			
Yes	36 (30.5)	80 (54.8)	116 (43.9)	15.63(<0.001)	2.76 (1.66, 4.59) <0.001	2.46 (1.36, 4.45) 0.003
BMI						
Underweight	1 (0.9)	6 (4.1)	7 (2.7)			
Normal	54 (45.8)	47 (32.2)	101 (38.3)		0.14 (0.02, 1.25) 0.079	
Overweight	29 (24.6)	44 (30.1)	73 (27.6)	6.95(0.073)	0.25 (0.03, 2.21) 0.214	
Obese	34 (28.8)	49 (33.6)	83 (31.4)		0.24 (0.02, 2.09) 0.196	
WHR						
Low risk	43 (36.4)	40 (27.4)	83 (31.4)			
Moderate risk	25 (21.2)	32 (21.9)	57 (21.6)	2.67 (0.263)	1.38 (0.69, 2.71) 0.356	2.58 (1.05, 6.35) 0.039
High risk	50 (42.4)	74 (50.7)	124 (47.0)		1.59 (0.91, 2.78) 0.104	2.61 (1.09, 6.26) 0.032
Awareness of Hypertension						
No	101 (85.6)	114 (78.1)	215 (81.4)			
Yes	17 (14.4)	32 (21.9)	49 (18.6)	2.44 (0.119)	1.67 (0.87, 3.18) 0.21	

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

Table 2 shows that adults with moderate and high risk WHR were 2.58 and 2.61 times more likely to have HPT as compared to those with low risk [AOR=2.58 (95% CI: 1.05, 6.35); p=0.039] and [AOR=261 (95% CI: 1.09,6.26); p=0.032] respectively.

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 and Age, BP and BMI, and BP and WHR. Table 3 shows a statistically significant but weak positive linear relationship between BP and Age ($r=0.13$, $p<0.041$, $\alpha=0.05$). There was no statistically significant relation between BP and BMI ($r=0.07$, $p=0.2303$, $\alpha=0.05$) and between BP and Waist to Hip Ratio (WHR), ($r=-0.04$, $p=0.49$, $\alpha=0.05$). The correlation coefficients computed which were positive include the variables (BP and Age, and BP and BMI), and were directly related. However,BP and WHR wasnot directly related (Table 3).

Table 3: Correlation between blood pressure and anthropometric indices

Variable	Hypertension			
	Urban		Rural	
	R	p-value	r	p-value
Age	0.13	0.040	0.13	0.040
BMI	0.15	0.082	0.00	0.981
WHR	0.19	0.030	-0.08	0.342

DISCUSSION

It was found in this study that even though not statistically significant, there was a higher prevalence of Hypertension among rural than in urban areas (52.7 vs. 47.3; p=0.193). The higher rural prevalence is consistent with studies in southern Nigeria, which demonstrated a higher prevalence of HPT in rural than urban societies [31]. In thestudy, the authors found a 44.3% prevalence of HPT in the rural society compared to 27.5% in urban ($p<0.001$). This is in contrast with other reportsfrom Ghana, which showed ahigher prevalence in urban than rural [29]. This increased prevalence of HPT in rural areas may be attributed to a rise in westernized lifestyle among the rural dwellers. Thesefindings contradict others, which revealed that the prevalence of HPT ranged from 19% to 48% [20]. This is an indication that the prevalence of HPT in some areas in Ghana has exceeded the range.

In the current study, overall undiagnosed and uncontrolled HPT were high among rural adults than urban.Thiscould partly explain why HPT was higher among rural than urban adults.

Thecurrent study also revealed that sex, educational level,a family history of HPT, moderate and high-risk WHR were the most important predictors of hypertension in both rural and urban areas.

Females were 71% less likely to have HPT. This is contrary to findings from a study conducted in Kenya. The study found hypertension to be significantly higher among females in the age strata of 34-44 years (p=0.008) and 55-64 years(p=0.001) as compared to males [32].

Those with JHS, SHS and tertiary educational levels were 52%, 75% and 71% less likely to have HPT. This was found to be contrary to what was found in China [33]. It was found that subjects with low and intermediate levels of education had 33% (OR=1.33 95%; CI: 1.23, 1.48) and 22% (OR= 1.22; 95% CI: 1.12, 1.32) higher risk of hypertension respectively as compared to those with high-leveleducation. Our findings corresponded to those ofother authors, who reported higher education to be a protective factor against hypertension [34,35].

Thecurrent study revealed that adults with afamily history of HPT were 2.46 times more likely to have HPT. Results from this study corroborate what was found by others [34]. Their study found out that both rural and urban adults who had a family history of hypertension were 1.18 and 1.24 times more likely to be hypertensive.

It was also found in the current study that those with moderate and high-risk WHR were 2.58 and 2.61 times more likely to have HPT. This finding is in agreement with those of others, who found an elevated waist-hip ratio increased the likelihood of hypertension by 1.3 times (OR 1.3; 95% CI: 0.8, 2.0) [32].

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 in Ghana.

The overall prevalence of hypertension in thecurrent study was very high (61.7%). There is ahigh prevalence of HPT among adults in both urban and rural settings. Undiagnosed HPT was higher among rural than urban adults. Eight out of 10 adults with HPT were walking about and were not aware in both urban and rural communities.The prevalence was higher in the rural than urban areas and this could be attributable to higher undiagnosed HPT.

Recommendations

It is therefore recommended that health education should be intensified among the rural population as a crucial weapon in reducing the prevalence of 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 - Millimetres 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, KMHD-Keta Municipal Health Directorate, GHS ERC- Ghana Health Service Ethical Review Committee.

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 and FB conceived the study, MK, WT, MA, WKA and RO did the data analysis and wrote the methods section. 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.

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REFERENCES

1. WHO. Raised blood pressure. Global Health Observatory. 2013; World Health organization. Geneva, Switzerland. Available at: http://www.int/gho/ncd/risk_factors/
2. 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.
3. 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);787-790.
4. Malekzadeh MM., Etemadi A, Kamangar F, Khademi H, Golozar A, Islami F, … Malekzadeh R. Prevalence, awareness and risk factors of hypertension in a large cohort of Iranian adult population: Journal of Hypertension. 2013;31(7), 1364–1371. https://doi.org/10.1097/HJH.0b013e3283613053.
5. Amoah AG. Hypertension in Ghana: a cross-sectional community prevalence study in greater Accra. Ethnic Distribution; 13:310–315.20.Ga District Health Year Report. 2003
6. Kavishe B, Biraro S, Baisley K, Vanobberghen F, Kapiga S, Munderi P, … Grosskurth H. High prevalence of hypertension and of risk factors for non-communicable diseases (NCDs): a population-based cross-sectional survey of NCDS and HIV infection in Northwestern Tanzania and Southern Uganda. BMC Medicine. 2015;13(1). https://doi.org/10.1186/s12916-015-0357-9.
7. Ajayi IO, Soyannwo MAO, Asinobi AO, Afolabi NB, Ayede AI, Bamgboye EA. Blood pressure pattern and hypertension related risk factors in an urban community in Southwest Nigeria: The Mokola hypertension initiative project, Ibadan, Nigeria. Journal of Public Health and Epidemiology. 2017;9(4), 51–64.
8. Ejike CECC, Ugwu CE, Ezeanyika LUS. Variations in the prevalence of point (pre)hypertension in a Nigerian school-going adolescent population living in a semi-urban and an urban area. BMC Pediatr. 2010; 10:13.
9. Soubeiga JK, Millogo T, Bicaba BW, Doulougou B, Kouanda S. Prevalence and factors associated with hypertension in Burkina Faso: a countrywide cross-sectional study. BMC Public Health.2017;17(1).
10. Wamala JF, Karyabakabo Z, Ndungutse D, Guwatudde D. Prevalence factors associated with hypertension in Rukungiri district, Uganda-a community-based study. African Health Sciences.2009;9(3).
11. Doulougou B (2014). Hypertension in the adult population of Kaya health and demographic surveillance system in Burkina Faso: prevalence and associated factors. Int J Trop Dis Health.2014; 4:94–110.
12. 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.
13. De Ramirez SS, Enquobahrie DA, Nyadzi G, Mjungu D, Magombo F, Ramirez M, et al. Prevalence and correlates of hypertension: a cross-sectional study among rural populations in sub-Saharan Africa. J Hum Hypertens. 2010; 24:786–95.
14. Myo NA. Thaworn L, Janthila S Nongluk P, Suchart K. Assessing awareness and knowledge of hypertension in an at-risk population in the Karen ethnic rural community, Thasongyang, Thailand. International Journal of General Medicine. 2010; Dovepress 2012:5
15. Isara AR, Okundia PO. The burden of hypertension and diabetes mellitus in rural communities in southern Nigeria. Pan African Medical Journal. 2015;20.
16. Owusu-sekyere E, Ebenezer B, Linda O. Spatial Modeling of Hypertension Disease in the Kumasi Metropolitan Area of Ghana. 20133(4):132-140.
17. Owusu IK, Adu-boakye Y. Prevalence and Aetiology of Heart Failure in Patients Seen at a Teaching Hospital in Ghana. 2013;1(5):1-4.
18. Pobee JO, Larbi EB, Belcher DW, Wurapa FK, Dodu SR. Blood pressure distribution in a rural Ghanaian population. Transactions of the Royal Society of Tropical Medicine & Hygiene. 1977;71:66–72.
19. Cook-Huynh M, Ansong D, Steckelberg RC, Boakye I., Seligman K, Appiah L. Amuasi J. H. Prevalence of hypertension and diabetes mellitus in adults from a rural community in Ghana. Ethnicity & Disease. 2012;22(3):347–352.
20. Bosu KW. Epidemic of hypertension in Ghana: a systematic review. BMC Public Health. 2010; 10:418.
21. Awuah RB, Anarfi JK, Agyemang C, Ogedegbe G, Aikins AD-G. Prevalence, awareness, treatment, and control of Hypertension In urban poor communities in Accra, Ghana. Journal of Hypertension. 2014; 32(6), 1203-1210.
22. 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.
23. Leung. (2007). Hypertension Among United States Adults 1999 – 2004. https://doi.org/10.1161/01.HYP.0000252676.46043.18.
24. Dzudie A, Kengne AP, Muna WF, Ba H, Menanga A, Kouam Kouam C et al. Prevalence, awareness, treatment and control of hypertension in a self-selected sub-Saharan African urban population: a cross-sectional study. BMJ Open. 2012;2(4). pii: e001217.
25. Van de Vijver S, Oti S, Addo J, de Graft-Aikins A, Agyemang C. Review of community-based interventions for prevention of cardiovascular diseases in low- and middle-income countries. Ethn Health. 2012; 17(6):651-76.
26. Aryeetey R., Ansong J. Overweight and hypertension among college of health sciences employees in Ghana. Afr. J. Food Agric. Nutr. Dev. 2011; 11(6):5444-5456.
27. Whelton PK, Beevers DG, Sonkodi S. Strategies for improvement of awareness, treatment and control of hypertension: Results of a panel discussion. J Hum Hypertens.2004; 18(8):563-5. PubMed | Google Scholar.
28. Duah AF, Werts N, Hutton-Rogers L, Amankwa D, Otupiri E. Prevalence and risk factors for hypertension in Adansi South, Ghana. Sage J 2013;Vol.3.4 2158244013515689
29. 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.
30. Degu G, Tessema F. (2005). Biostatistics for Health Science Students: lecture note series. The Carter Center 9EPHTI), Addis Ababa
31. 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;2015.
32. Joshi MD, Ayah R, Njau EK, Wanjiru R, Kayima JK, Njeru EK, et al. Prevalence of hypertension and associated cardiovascular risk factors in an urban slum in Nairobi , Kenya : A population-based survey. 2014;1–10.
33. 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.
34. 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.
35. Dong GH, Sun ZQ, Zhang XZ, Li JJ, Zheng LQ, Li J. Prevalence, awareness, treatment, and control of Hypertension in rural adults from Liaoning Province, Northeast China. Hypertens Res. 2007;30: 951–958.