Journal of Advances in Medicine and Medical Research

33(17): 202-213, 2021; Article no.JAMMR.70075
ISSN: 2456-8899
(Past name: British Journal of Medicine and Medical Research, Past ISSN: 2231-0614, NLM ID: 101570965)

Prevalence, Awareness and Risk Factors of Hypertension among Public Sector Workers Aged 40 Years and above in the Tamale Metropolis of Ghana

Mishio Bawa Elijah[1], Mensah-Onumah Deborah[1], Julius Tieroyaare Dongdem[2] and Cletus Adiyaga Wezena[1,3*]

[1]Department of Physiology and Biophysics, School of Medicine, University for Development Studies, Tamale, Ghana.
[2]Department of Biochemistry and Molecular Medicine, School of Medicine, University for Development Studies, Tamale, Ghana.
[3]Department of Microbiology, School of Biosciences, Nyankpala, Ghana.

Authors' contributions

This work was carried out in collaboration among all authors. Authors MBE, MOD and CAW conceptualized and designed the study. Authors MBE and MOD designed and administered the study questionnaire, performed physical measurements, blood pressure readings, statistical analysis and wrote the first draft of this manuscript under the supervision of authors CAW and JTD. Authors CAW and JTD completed the final manuscript. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JAMMR/2021/v33i1731045
Editor(s):
(1) Dr. Emin Umit Bagriacik, Gazi University, Turkey.
Reviewers:
(1) Domenico Ferro, University La Sapienza Rome, Italy.
(2) Luis A. Camputaro, Buenos Aires University, Argentina.
(3) Cecilia Villa Etchegoyen, Universidad de Buenos Aires, Argentina.
Complete Peer review History: https://www.sdiarticle4.com/review-history/70075

Original Research Article

Received 01 May 2021
Accepted 02 July 2021
Published 09 August 2021

ABSTRACT

Aim: To determine the prevalence, awareness and risk factors associated with hypertension among adults.
Study Design: Cross-sectional study.
Place and Duration of Study: Tamale Metropolis from January to March 2020.
Methodology: 200 adults (101 men and 99 females) aged 40 years and above were recruited. Socio-demographic characteristics, anthropometric and blood pressure data of participants

**Corresponding author: E-mail: cletus.adiyaga@gmail.com , cletuswezena@edu.uds.gh, cletusadiyaga@gmail.com;*

collected through face-to-face administered questionnaire and physical measurements were analyzed for prevalence, knowledge and awareness of hypertension. Binary and multivariate logistic regression was used to estimate the odds of association of risk factors with hypertension.

Results: Overall age-standardized prevalence of hypertension was 46.00% (49.50% in males, 42.42% in females). The prevalence of both systolic and diastolic hypertension was higher in males than in females. 49.10% of hypertensive participants were unaware of their status at the time of this study and 83.3% of the hypertensive participants who were aware of their status were diagnosed incidentally. Multivariate logistic regression analysis revealed a significant positive association of being male [AOR = 2.39, (95% CI: 1.08–5.30)], aged between 50 – 65 years [AOR = 2.03, (95% CI: 1.03–4.01)], and being obese [AOR = 3.64, (95% CI: 1.43–9.29)] with hypertension. Being widowed [AOR = 0.06, (95% CI: 0.01–0.66)] was negatively associated with hypertension. Only obesity [AOR = 2.81, (95% CI: 1.29–6.14)] was independently associated with hypertension.

Conclusion: Hypertension affects one in every two adults aged 40 years and above in the Tamale Metropolis of Ghana. Awareness of adult hypertension status in the Metropolis is very low with the most diagnoses of the disease occurring accidentally. Obesity, advancing age, being male and being widowed are risk factors associated with hypertension. The study suggests workplace BP screening and a scale-up of awareness campaigns in the Metropolis to curb the incidence of the disease and control associated risk factors.

Keywords: Hypertension; obesity; blood pressure.

ABBREVIATIONS

BP : Blood pressure
SBP : Systolic blood pressure
DBP : Diastolic blood pressure
GHO : Global Health Observatory
WHO : World Health Organization
DALY: Disability-adjusted life year
OPD : Out-patient department
BMI : Body mass index

1. INTRODUCTION

Hypertension is chronically elevated blood pressure (BP) that is associated with a risk of heart failure, hemorrhagic stroke, hypertensive kidney and brain disease, and premature death, especially in adults [1–5]. Defined as persistent systolic blood pressure (SBP) ≥ 140 mmHg and /or persistent diastolic blood pressure (DBP) ≥ 90 mmHg and/or taking an anti-hypertensive drug, this disease is a major risk factor for mortality and disability worldwide [2,3,5,6]. Hypertension is largely asymptomatic (silent) [2,7] therefore, a large number of hypertension cases go undetected making it difficult to control the disease thereby exposing patients to a high risk of complications [1]. However, in severe and chronic cases, symptoms such as chest pain, confusion, ear buzzing, irregular heartbeat, headache, changes in vision, nosebleed, tiredness, stroke, and sudden death may occur [3]. Once regarded as a disease of affluent societies, an epidemiological shift, partly due to urbanization, has ensured that hypertension is currently a heavy global health burden and an important emerging public health problem in developing countries of the world [2–4,8–11]. In 2014, the prevalence of hypertension was estimated to be 22% in the world's adult population [3,5]. The Global Health Observatory (GHO) of the World Health Organization (WHO) in 2016 estimated that high blood pressure causes 7.5 million deaths annually, representing 12.5% of deaths across the globe [3,7]. The annual impact of hypertension was then estimated to be as high as 57 million disability-adjusted life years (DALYs) or 3.7% of global DALYs [3,9]. Hypertension is also estimated to be responsible for 45% and 51% of global deaths due to heart disease and stroke respectively [3]. Unexpectedly, across the WHO regions, Africa has the highest prevalence of high blood pressure with more than 40% of the adult population suffering the condition [3,4,8]. Hypertension is thus a major non-communicable disease in most countries in Africa [4]. Even though it is challenging to compare the prevalence of hypertension across sub-Saharan Africa due to scarcity and heterogeneity of studies against the background of different localities, it is estimated that over 74 million people (highest in any region of the world) are hypertensive in the region with prevalence ranging from 15.9% to 39.6% [4,8,12,13]. In Ghana, some population surveys, though limited, have revealed that the prevalence of hypertension, in recent years, is also on the increase [10,14]. The number of new cases of hypertension that were reported in the Outpatient

Departments (OPDs) of public health facilities increased ten-fold from 49,087 in 1988 to 500,180 in 2007 [10]. The rise in the prevalence of hypertension in Ghana and other low- and middle-income countries has been attributed to urbanization, increased standard of living coupled with the corresponding changes in lifestyle [10,14]. In Ghana, a bulging middle-class is visible. The better standard of living that comes with a middle-class status has led to the increased prevalence of lifestyle factors such as obesity, lack of exercise, harmful use of alcohol, smoking, poor diet, excessive salt intake, and increased Body Mass Index (BMI) [11,12,14]. These lifestyle factors are strongly suggested as risk factors of the incidence of hypertension, even though nonmodifiable factors such as age, race, sex, genetic composition, and family history are also strongly implicated [11,12,14]. Besides these human factors, Ghana's weak health care system, characterized by a shortage of qualified health personnel, logistics, and equipment is inadequate in creating awareness about hypertension and promoting testing/diagnosis and management of the disease in the general population [10,14]. The effects of a pluralistic health care environment in Ghana, in which orthodox methods intermingle with traditional and faith-based methods of managing cases of hypertension and related conditions such as stroke, should also be emphasized [14]. These factors together reflect in the increased burden of hypertension in terms of increased mortality and morbidity across the country, especially among adults above the age of 40 years living in urban areas of the country [14]. The present study determined the prevalence and awareness of hypertension among adults aged 40 years and above and working in the public sector of the Tamale Metropolis of Ghana, and assessed the risk factors associated with disease. Information from this study will facilitate the compilation of a more recent and comprehensive national database on hypertension. The data will essentially enable the development of stronger national and regional policies that will focus more attention to the condition and help establish more effective programs for its treatment and management in the Metropolis and beyond.

2. MATERIALS AND METHODS

2.1 Study Area

The study was conducted in the Tamale Metropolis, the rapidly expanding cosmopolitan capital of the Northern Region of Ghana. The metropolis is one of twenty-six administrative and political districts of the Northern Region. Regarded as one of the fastest-growing cities in West Africa and a hotspot for investment in the sub-region, the metropolis is also the third-largest city in Ghana, covering a total area of 750 km^2 [15]. Geographically, the metropolis is located 600 km north of Accra, the capital city of Ghana [16]. It is the most populous town in northern Ghana with an estimated population of about 400,000 inhabitants in 2017. The metropolis is made up of both urban and rural communities. Around 80.0% of the population dwells in the urban localities [17].

2.2 Study Population

The study population consisted of males and females aged 40 and above. Participants within the age group were recruited from various institutions within the Metropolis including Senior High Schools, Tertiary Institutions, churches, the Regional Educational Office and Tamale Metropolitan Assembly.

2.2.1 Inclusion criteria

Participants were recruited only if they were 40 years and above, working in the public sector of Ghana and residing in the study area.

2.3 Study Design and Procedures

We conducted a cross-sectional survey of adults in the Tamale Metropolis from January to March 2020. The scope of this study was limited to the administration of questionnaire, blood pressure and anthropometric measurements.

2.3.1 Sample Size Determination and Sampling Technique

The sample size of the study was calculated using Cochran's formula:

$$n = \frac{Z^2(P)(1-P)}{E^2}$$

The overall prevalence of hypertension (P) in the Ghana population was estimated as 27% [18]. Assuming a margin of error (E) set at 5% (0.05) and assuming a confidence level (Z) of 95% with a standard value set at 1.96, a minimum final sample size (n) of approximately 302 participants was calculated for the general population. However, public sector workers make up only about 7% of the population of the Metropolis and

therefore a sample size of 200 participants is in line and would cater for the effects of non-responding participants. Convenience sampling was used to select participants from the study institutions. These places were within reach and the sample population was easily obtainable. However, the number of participants per sampling station was limited to up to 15 persons.

2.3.2 Variables

The main outcome variable was the hypertension status of participants. However, hypertension predictor variables that were also assessed for each participant included socio-demographic features, behavioral characteristics, and biological risk factors. These included age, sex, education, marital status, employment, religion, physical activity, smoking tobacco, obesity and alcohol consumption.

2.3.3 Definition of Predictor Variables

Physical activity was categorized under none, moderate or high. Participants were categorized as none if they performed no extra organized physical activities apart from normal movements at home and work. Moderate physically activity was defined as a daily engagement in moderate-intensity physical exercises such as brisk walks, or bicycle rides for up to 21 min, vigorous exercises such as jogging and skipping for up to 15 min or an equivalent engagement in a combination of moderate and vigorous exercise. High physical activity was defined as a daily engagement in at least 1 h moderate-intensity physical exercise or at least 30 min vigorous exercise. Smoking was defined in this study as having one or more cigarettes per day, whiles non-smoking was defined as not ever taking a cigarette or having stopped smoking. Alcohol consumption was categorized under drinking and not drinking. Drinking was defined as consumption of alcoholic beer, spirits, or wine daily. Not drinking was defined as abstinence from alcohol.

2.4 Data Collection

2.4.1 Socio-demographic characteristics

Data on socio-demographic characteristics and research variables was collected using questionnaire that was designed as described by Shukuri et al. [3]. The questionnaire was first pre-tested and after the necessary adjustments, the questionnaire was administered either directly to participants to complete themselves or was filled by research staff after face-to-face interviews with participants. The questionnaire displayed three sections: section A assessed participants' socio-demographic characteristics such as age, gender, religion, marital status, level of education, and monthly income; section B assessed participants' knowledge on hypertension and risk factors of the disorder; while section C assessed the socio-cultural characteristics of the participants.

2.4.2 Anthropometric Measurements

2.4.2.1 Blood pressure

Blood pressure measurements were taken in triplicates using two Omron M4 digital monitors as described by Shukuri et. al. [3]. Briefly, participants were advised not to exercise nor take in alcohol, caffeine, or smoke 30 min before the start of BP measurements. Before the measurements, participants were allowed to rest for 30 min with their legs uncrossed for 30 min. The left upper arm on which the BP was monitored was positioned at the same level as the heart during this time. The three measurements were taken 5 min apart and recorded while the participant remained at a sitting position. The mean of the last two BP measurements was calculated to determine the BP of each participant. In this study, blood pressure levels were categorized according to British Hypertension Society guidelines [19]. Optimal BP was defined as SBP < 120 mmHg and/or DBP < 80 mmHg. Normal BP was defined as SBP < 130 mmHg and/or DBP < 85 mmHg. High-normal or prehypertension was defined as SBP of 130 – 139 mmHg and/or DBP of 85 - 89 mmHg. Hypertension was defined as above (SBP ≥ 140 mmHg and /or DBP ≥ 90 mmHg and/or taking an anti-hypertensive drug) [19]. Hypertension awareness in this study described the participant's indication of their prior diagnosis of hypertension by a health professional while hypertension treatment described the applicant's indication of their current use of medication to lower high blood pressure.

2.4.2.2 Determination of Body Mass Index

Bodyweight and height for the determination of Body Mass Index (BMI) were measured using standard techniques [2,3]. The weight of participants was measured to the nearest 0.1 kg using two calibrated Beautural digital scales (1byone Products Inc. USA). Participants wore minimum clothing and were barefooted when

their weight was taken. The height of barefooted participants was measured to the nearest 0.1 cm using a calibrated rigid meter rule. Height measurements were done from heel to the top of the head while the participants stood upright with hands on the sides.

BMI was calculated using the formula:

$$\text{BMI} = \frac{\text{Weight (kg)}}{\text{Height}^2(\text{m}^2)}$$

Following the calculation of BMI, participants were categorized according to WHO guidelines [2] into underweight (BMI < 18.5), normal (BMI ≥ 18.5 but ≤ 24.9), overweight (BMI ≥ 25.0 but ≤ 29.9), or obese (BMI ≥ 30.0) [2].

2.5 Quality Control

To ensure quality, the questionnaire was pre-evaluated by experienced researchers of the School of Medicine and Health Sciences, UDS, to assess its clarity and consistency. The questionnaire was then pre-tested on the staff of a school outside the study area to further check its word clarity and feasibility in terms of the average time needed to complete one questionnaire form. Participants also had access to the link of the questionnaire on google forms for the convenience of computer literates. The quality of the data collection process was further strengthened by using research staff who were well trained in explaining the importance of the present study and in standard interviewing skills. Staff were given 6 hr of training on participant engagement techniques, the informed consenting process, administration of the questionnaire, data entry processes, and best practices in taking height and weight readings with minimal error. In addition, the project supervisor cross-checked the data entry process on daily basis by meeting with the research staff.

2.6 Data Analysis

Number codes were assigned to responses for easy data entry and analysis. Data management and analysis were conducted using Epi Info version 7, CDC, USA. Descriptive statistics such as the frequencies, means, and standard deviation were generated using cross-tabulations. The Chi-square test was used to determine the association between variables with a *P*-value of less than 0.05 considered significant.

3. RESULTS AND DISCUSSION

3.1 Results

3.1.1 Socio-demographic characteristics

Socio-demographic characteristics of the study participants are presented in Table 1. 200 participants ranging in age from 40 to 65 years and above were recruited for the study. Out of this number 101 (50.5%) were males while 99 (49.5%) were females. The majority of the participants (107; 53.50%) were in the 40 - 49 age group. The overall mean age of participants was 52.2 years (SD±9.3) while the mean ages of male and female participants were 50.00 years (SD±7.4) and 54.5 years (SD±10.5) respectively. Regarding the marital status of participants, the majority of participants (151;75.50%) were married while 23 (11.50%) were never married before. The rest of the participants were either divorced/separated or widowed. Education-wise, the majority of participants (169; 84.5%) were educated at least to the basic level with only 31 (15.50%) having no formal education. More than half of the participants (137; 68.50%) were educated to the tertiary level. Whereas 105 (52.50%) of participants were Muslims, the remaining 95 (47.50%) were Christians.

3.1.2 Risk factors of hypertension

Results from the analysis of biological and behavioral characteristics of participants that potentially puts them at risk of developing hypertension are shown in Table 2. The BMI analysis showed that 127 (63.50%) of respondents are either overweight or obese. Across the gender groupings, more than half of males (57; 56.44 %) and almost three-quarters (3/4) of females (70; 70.71%) were either overweight or obese. The prevalence of obesity was generally high among the participants, (43; 21.50%). However, obesity was much higher (31; 31.31%) among females compared to males (12; 11.88%). The overall average BMI value was 26.88 kg/m^2 (SD±5.04) which is in the range of overweight. Concerning the physical activity of participants, more than half of participants (106; 53.00%) did not perform physical exercise. Physical activity was particularly low among females as more than half (59; 59.60%), did not exercise. Relating to alcohol consumption and smoking, the majority of participants, 154 (77.00%) and 189 (94.50%) respectively, abstained from these substances. However, unlike smoking, a significant number of males and females, 22 (24.40%) and 24 (21.80%)

respectively, consumed alcoholic beverages. Among participants who consumed alcohol, majority 24 (53.33%) were women. 40 (88.88%) out of the 45 participants who consumed alcohol, are Christians. On analysis of how sedentary participants are on daily basis, close to a quarter (45; 22.50%) revealed that they sat for more than 5 hr daily.

3.1.3 Prevalence of hypertension

Table 3 presents the distribution of blood pressure in the study population. The overall age-standardized prevalence of hypertension was 46.00% (95% CI: 41.20 – 49.30), with 92 of the 200 participants having either systolic hypertension, diastolic hypertension, or both. The prevalence of hypertension in males and females was 49.50% (95% CI: 39.40 – 59.64) and 42.42% (95% CI: 32.55 – 52.77) respectively. The prevalence of systolic hypertension in the study population was 38.00% (95% CI: 32.4 – 41.1). The prevalence of diastolic hypertension was 33.50% (95% CI: 30.3 – 48.7). Participants with both systolic and diastolic hypertension were 51 (25.5% [95% CI: 21.0 – 29.1]). The prevalence of both systolic and diastolic hypertension in males was higher than in females. More than half (52; 56.52%) of hypertensive participants were unaware of their status at the time of this study. Among the participants (40; 43.48%) who were aware of their hypertension status, 36 (90%) participants were taking various forms of hypertension medication. Only 14 participants (38.89%) of hypertensive participants under medication had their BPs controlled to normal levels. The mean systolic BP was 135.00 mmHg (SD±21.00) while the mean diastolic BP was 86.00 mmHg (SD±12.4). Most of the hypertensive participants (45; 83.3%), who were aware of their status were diagnosed incidentally when they visited a health facility with a different illness. Only 9 (4.5%) of participants who knew their hypertension status were diagnosed upon routine medical check-ups. 40 (46.51%) out of 86 participants who indicated a family history of hypertension were also hypertensive.

3.1.4 Knowledge about hypertension

The majority of participants (183; 91.5% [95% CI: 94.3 – 87.6]), were aware of hypertension as a disease and 165 (82.5% [95% CI: 78.5 – 84.3]) participants understood the condition to also mean high blood pressure. 25 (12.5%) participants were unaware of hypertension as high blood pressure. More than half (106; 53.0%) of participants erroneously indicated that hypertension is curable. 154 (77.0%) participants rightly indicated that a diet that includes fruits and vegetables daily helps to control blood pressure. The majority, 147(73.5%) and 140 (70.0%), of participants, rightly indicated that excessive alcohol intake and smoking (tobacco use) respectively increase the risk of developing hypertension. With regards to medication, more than half (139; 69.5%) of participants rightly indicated that hypertension can be managed and controlled with orthodox medicine while 32 (16%), of participants, indicated that regular physical activity can help control the disease. 33 (16.5%) of participants also indicated that herbal medicine has the potential to treat hypertension.

Table 1. Socio-demographic characteristics of the study population (N = 200)

Variable	Men n (%)	Female n (%)	Total n (%)
Age group (Years)			
40 - 49	63 (62.28)	44 (44.44)	107 (53.50)
50 - 65	35 (34.65)	37 (37.37)	72 (36.00)
66 and above	3 (2.97)	18 (18.18)	21 (10.50)
Marital status			
Never married	6 (5.94)	17 (17.17)	23 (11.50)
Married	88 (87.13)	63 (63.64)	151 (75.50)
Divorced/separated	3 (2.97)	6 (6.06)	9 (4.50)
Widowed	4 (3.96)	13 (13.13)	17 (8.50)
Level of education			
None	2 (1.98)	29 (29.29)	31 (15.50)
Basic	7 (6.93)	11 (11.11)	18 (9.00)
Secondary	5 (4.95)	9 (9.09)	14 (7.00)
Tertiary	87 (86.14)	50 (50.51)	137 (68.50)
Religion			
Christian	34 (33.66)	61 (61.62)	95 (47.50)
Muslim	67 (66.34)	38 (38.38)	105 (52.50)

n = number

Table 2. Prevalence of predictors of hypertension in the study population

Predictor	Men n (%)	Female n (%)	Total n (%)
BMI			
Underweight	0 (0.0)	1 (1.01)	1 (0.50)
Normal	44 (43.56)	28 (28.28)	72 (36.00)
Overweight	45 (44.55)	39 (39.39)	84 (42.00)
Obese	12 (11.88)	31 (31.31)	43 (21.50)
Physical activity			
High	5 (4.95)	2 (2.02)	7 (3.50)
Moderate	49 (48.51)	38 (38.38)	87 (43.50)
None	47 (46.53)	59 (59.60)	106 (53.00)
Alcohol consumption			
Drinking	22 (24.4)	24 (21.8)	46 (23.0)
Not drinking	68 (75.6)	86 (78.2)	154 (77.0)
Sitting at work for > 5 hr			
Yes	21 (20.79)	24 (24.24)	45 (22.50)
No	80 (79.21)	75 (75.76)	155 (77.50)
Smoking			
Yes	8 (7.92)	3 (3.03)	11 (5.50)
No	93 (92.08)	96 (96.97)	189 (94.50)

n = number

Table 3. Blood pressure distribution in the study population by sex

Blood pressure (BP)	Men n (%)	Female n (%)	Total n (%)
Systolic BP			
Optimal BP	22 (21.78)	26 (26.26)	48 (24.00)
Normal BP	26 (25.74)	20 (20.20)	46 (23.00)
Prehypertension	9 (8.92)	21 (21.21)	30 (15.00)
Hypertension	44 (43.56)	32 (32.32)	76 (38.00)
Diastolic BP			
Optimal BP	30 (29.70)	42 (42.42)	72 (36.00)
Normal BP	16 (15.84)	13 (13.13)	29 (14.50)
Prehypertension	18 (17.83)	14 (14.14)	32 (16.00)
Hypertension	37 (36.63)	30 (30.30)	67 (33.50)

n = number

3.1.5 Risk factor association with hypertension

Table 4 presents the association of potential risk factors with hypertension. In our logistic regression crude odds analysis, only obesity and being widowed were significantly associated with hypertension. While obesity showed a positive association with hypertension, being widowed showed a negative association with the disease. Following multivariate logistic regression analysis after adjusting for possible confounders, being male, older age, being widowed and obesity were significantly associated with hypertension. However, whereas gender, older age, and obesity showed a positive association with hypertension, being widowed showed a negative association. The risk of getting hypertension increased with advancing age. Participants in the 50 – 65-year group were two times [AOR = 2.03, (95% CI: 1.03–4.01)] more likely to develop hypertension compared to participants in the 40 – 49 years age bracket. Participants who were 66 years and above were almost two and half times [AOR = 2.45, (95% CI: 0.73-8.18)] more at risk of hypertension compared to those in the 40 – 49 years age bracket, even though this association was not statistically significant. The results also pointed to an almost two and half times [AOR = 2.39, (95% CI: 1.08–5.30)] more risk of male participants being hypertensive compared to the female counterparts. Obesity was strongly associated with developing hypertension in the study population. Obese participants had an almost four-fold risk [AOR = 3.64, (95% CI: 1.43–9.29)] of developing hypertension compared to participants who had a normal Body Mass Index. Participants who are overweight also had a higher risk [AOR = 1.54, (95% CI: 0.76-3.11)] of being hypertensive

Table 4. Predictor association with hypertension

Predictor	Number	Hypertension n (%)		Crude Odds Ratio		Adjusted Odds Ratio		
		Positive	Negative	COR	95% CI	AOR	95% CI	*P*-value
Sex								
Male	101	50 (49.50)	51 (50.50)	1.33	0.76-2-32	2.39	1.08-5.30	.03*
Female	99	42 (42.42)	57 (57.58)	1		1		
Age group (years)								
40 - 49	107	43 (40.19)	64 (59.81)	1		1		
50 - 65	72	39 (54.17)	33 (45.83)	1.76	0.96-3.22	2.03	1.03-4.01	.04*
66 and above	21	10 (47.62)	11 (52.38)	1.35	0.53-3.46	2.45	0.73-8.18	.15
Marital Status								
Never married	23	10 (43.48)	13 (56.52)	0.22	0.04-1.30	0.27	0.026-2.56	.26
Married	151	80 (52.98)	71 (47.02)	0.25	0.05-1.26	0.18	0.02-1.39	.1
Divorced/separated	9	7 (77.78)	2 (22.22)	1	1	1		
Widowed	17	4 (23.53)	13 (76.47)	0.09	0.01-0.61	0.06	0.01-0.66	.02*
Level of education								
None	31	13 (41.94)	18 (58.06)	1.44	0.43-4.85	3.82	0.71-20.71	.12
Basic	18	6 (33.33)	12 (66.67)	1		1		
Secondary	14	8 (57.14)	6 (42.86)	2.67	0.63-11.28	3.26	0.55-19.24	.19
Tertiary	137	65 (47.45)	72 (52.55)	1.81	0.64-5.09	3.06	0.76-12.29	.12
Religion								
Christian	95	47 (49.47)	48 (50.53)	1		1		
Muslem	105	45 (42.86)	60 (57.14)	0.77	0.44-1.34	0.8	0.40-1.60	.53
BMI								
Underweight	1	0 (0.00)	1 (100.00)	0.00	0.00-> 1.0E12	0	0.00-> 1.0E12	.97
Normal	72	27 (37.50)	45 (62.50)	1		1		
Overweight	84	38 (45.24)	46 (54.76)	1.38	0.72 - 2.62	1.54	0.76-3.11	.23
Obese	43	27 (62.79)	16 (37.21)	2.81	1.29 - 6.14	3.64	1.43-9.29	.002**
Physical activity								
High	7	1 (14.29)	6 (85.71)	1		1		
Moderate	87	38 (43.68)	49 (56.32)	4.65	0.54-40.27	3.12	0.31-31.38	.33
None	106	53 (50.00)	53 (50.00)	5.99	0.69-51.51	4.92	0.49-49.70	.18
Sitting > 5 hr								
Yes	75	37 (49.33	38 (50.67)	1.24	0.70-2.20	1.23	0.64-2.35	.45
No	125	55 (44.00)	70 (56.00)	1		1		

compared to participants with normal Body Max Index even though this result was not statistically significant. Marital status in the present study suggests an inverse association to hypertension. Widowed participants had an almost one-fold chance [AOR = 0.06, (95% CI: 0.76-3.11)] of being protected from hypertension as divorced or separated participants. In the logistic regression analysis, level of education, religion, family history and level of income did not show a significant association with hypertension in the present study.

3.2 Discussion

Hypertension is reported to be more prevalent among older adults than younger age groups (1). The present study aimed to determine the awareness and prevalence of hypertension in adults aged 40 years and above and working in the public sector of the Tamale Metropolis of Ghana. Our study revealed that approximately one in every two older adults surveyed are hypertensive, reporting an age-standardized prevalence of 46.00% (CI: 41.20 – 49.30). This finding is consistent with findings of a recent cross-sectional study by Calys-Tagoe and colleagues who, using data from Global Study on Aging and Adult Health (SAGE) wave 2, reported a prevalence of 50.7% (CI: 48.30 – 53.20) among adults aged 50 years and above in Ghana (20). The relatively lower prevalence reported in this study compared to the latter study could be due to the lower ages of 40 – 49 years included in our study. Our results are also in congruence with a similar study in Hohoe Municipality in Ghana which reported a prevalence of 39.4%, having surveyed a population with participants less than 40 years of age [21]. Reviewed cross-sectional studies across Africa put the prevalence of hypertension among older adults 35 years and above to be between 29.4% and 57.0% [2,22].

More than half of hypertensive adults 40 years and above were unaware of their status at the time of this study. The very low level of awareness of hypertension status is consistent with results from many studies in Africa [23]. Results from this study also reveal that more than four out of five (83%) of adults who are aware of their disease were diagnosed when they visited the hospital with a different illness. The results also suggest that current medications for treating hypertension in the Tamale Metropolis of Ghana may not be producing expected results as more than half of patients under medication still had abnormal BPs. Our finding points to and emphasizes the implications of low awareness of hypertension status to the health of adults because of the confirmed association of unmanaged hypertension to serious health problems such as stroke, cardiovascular diseases and sudden death [24,25]. The majority of strokes, heart problems, and sudden death occur in persons with undiagnosed and therefore unmanaged high blood pressure [25]. Our findings further stress the need for employers as well as public health institutions to create opportunities for regular and convenient monitoring of blood pressures of employers and the general adult population to control hypertension and mitigate its adverse outcomes.

Our results, in congruence to other studies [1–3,10], also confirmed the advancing age of adults to be significantly associated with hypertension. Adults in the 50 – 65 years age bracket are twice more likely to be hypertensive than younger ages, while those above 66 years are two and half times more at risk. The statistical insignificance of the risk of adults 66 years and above to hypertension may be due to the low number of male participants in this age bracket enrolled in the present study. Our results, in agreement with previous studies [1,7], revealed hypertension to be more prevalent in males than females. Males are almost two and half times more likely to develop hypertension than females in this study. Presumably, the very low number of three male participants as against 18 females in the 66 years and above age bracket would affect the overall significance of prevalence of hypertension in this group.

Marital status, BMI, level of education, and physical activity are associated with hypertension [2,5,26,27]. Concerning marital status, our results surprisingly show a protective association between this variable and hypertension. Widowhood in particular confers significant protection against hypertension in our study. However, several studies [2,28], including a study in Burkina Faso [2], reported being widowed poses two times more risk of being hypertensive compared to being married. The observed disparity may be explained by socio-cultural differences between the studies' different populations. BMI is one variable that is strongly associated with hypertension and many studies globally. Our results revealed that obese adults have more than 3 and a half risk of being hypertensive compared with adults with normal

BMI. Our results, though with higher odds, [AOR = 3.64, (95% CI: 1.43-9.29)] are in agreement with similar studies conducted in Kenya among adults between the ages of 35 and 64 years with odds of 2.4 for obese adults in comparison with adults with normal BMI [2]. A plausible explanation for the higher prevalence of obesity in females compared to males may be the fact that they are comparably less active and more sedentary as revealed in our study. Level of education and physical activity, though associated with the development of hypertension, were statistically insignificant.

4. LIMITATIONS

The study was conducted mainly in public work institutions which reduced our chances of recruiting participants above the retirement age of 60 years and above. This limitation may have affected calculations of prevalence of hypertension as well as our analysis of trends and associations of variables. Our study is also subject to bias because data on the lifestyles of respondents was self-reported rather than observed with the possibility of respondents overstating, understating, or holding back information necessary for the study. This situation could affect the analysis and output of the study.

5. CONCLUSION

Hypertension remains a major public health problem affecting close to one in two adults in the Tamale Metropolis of Ghana. Sex, age, and BMI are important risk factors associated with the disease. Even though there is adequate general knowledge about the disease, awareness of the disease among the adult population, which is most at risk of hypertension, is sadly very low with dire consequences. Improved health education on the need for regular blood pressure monitoring among adults together with sensitization on the risk factors is necessary to curb hypertension and mitigate the dangers that the disease poses.

CONSENT AND ETHICAL APPROVAL

Ethical approval for the study was obtained from the Tamale Teaching Hospital Institutional Review Committee, Tamale, Ghana. Permission was acquired from the administration of the institutions whose staff participated in the study using a UDS official introductory letter. The letter clearly outlined the purpose of the study. Opinion leaders were also duly informed about the study in nonformal areas of the study. In all instances, the participants involved were also informed about the study and its purpose. Verbal informed consent was sought after which signed consent (or thump print) was obtained from each participant before enrollment. All participants were given the option of opting out at any point during the interview or answering the questionnaire if they so desired. Participants were assured of confidentiality on their voluntary responses and no question revealed their identity.

Verbal and signed (or thump print) consents were obtained from all participant.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Mac Stone CD, SW. The Influence of age, sex and other risk factors on hypertension. Education. 2003;1–9.
2. Olack B, Wabwire-Mangen F, Smeeth L, Montgomery JM, Kiwanuka N, Breiman RF. Risk factors of hypertension among adults aged 35-64 years living in an urban slum Nairobi, Kenya. BMC Public Health [Internet]. 2015;15(1):1–9. Available:http://dx.doi.org/10.1186/s12889-015-2610-8
3. Shukuri A, Tewelde T, Shaweno T. Prevalence of old age hypertension and associated factors among older adults in rural Ethiopia. Integr Blood Press Control. 2019;12:23–31.
4. Princewel F, Cumber SN, Kimbi JA, Nkfusai CN, Keka EI, Viyoff VZ, et al. Prevalence and risk factors associated with hypertension among adults in a rural setting: The case of Ombe, Cameroon. Pan Afr Med J. 2019;34:1–9.
5. Wang J, Sun W, Wells GA, Li Z, Li T, Wu J, et al. Differences in prevalence of hypertension and associated risk factors in urban and rural residents of the Northeastern region of the people's republic of China: A cross-sectional study. PLoS One. 2018;13(4):1–14.
6. Booth JN, Li J, Zhang L, Chen L, Muntner P, Egan B. Trends in Prehypertension and Hypertension Risk Factors in US Adults 1999-2012. Hypertension. 2017 ;70(2):275–84.

7. Shen Y, Chang C, Zhang J, Jiang Y, Ni B, Wang Y. Prevalence and risk factors associated with hypertension and prehypertension in a working population at high altitude in China: A cross-sectional study. Environ Health Prev Med. 2017;22(1).
8. Jobe M, Agbla SC, Prentice AM, Hennig BJ. High blood pressure and associated risk factors as indicator of preclinical hypertension in rural West Africa: A focus on children and adolescents in The Gambia. Med (United States). 2017;96(13).
9. Rahman M, Zaman MM, Islam JY, Chowdhury J, Ahsan HN, Rahman R, et al. Prevalence, treatment patterns, and risk factors of hypertension and pre-hypertension among Bangladeshi adults. J Hum Hypertens [Internet]. 2018;32(5):334–48.
   Available:http://dx.doi.org/10.1038/s41371-017-0018-x
10. Bosu WK. Epidemic of hypertension in Ghana: A systematic review. BMC Public Health. 2010;10.
11. Nyarko SH, Osei E, Komesuor J, Ananga MK. Prevalence and predictors of hypertension history among ghanaian men. Ghana J Geogr. 2017;9(3):50–63.
12. Dosoo DK, Nyame S, Enuameh Y, Ayetey H, Danwonno H, Twumasi M, et al. Prevalence of hypertension in the middle belt of Ghana: A community-based screening study. Int J Hypertens. 2019.
13. Amoah AGB. Hypertension in Ghana: A cross-sectional community prevalence study in Greater Accra. Ethn Dis. 2003;13(3):310–5.
14. Sanuade OA, Boatemaa S, Kushitor MK. Hypertension prevalence, awareness, treatment and control in Ghanaian population: Evidence from the Ghana demographic and health survey. PLoS One. 2018;13(11):1–18.
15. Narrative AP. 2015 Urban and peri-urban agriculture in tamale; 2015.
16. Ghana Statistical Service (GSS). 2010 Population & housing census national analytical report. Ghana Stat Serv. 2013;1–91.
17. Fuseini I, Yaro JA, Yiran GAB. City profile: Tamale, Ghana. Cities. 2017;60:64–74.
18. Bosu WK, Bosu DK. Prevalence, awareness and control of hypertension in Ghana: A systematic review and meta-analysis [Internet]. Vol. 16, PLoS ONE. 2021.
   Available:http://dx.doi.org/10.1371/journal.pone.0248137
19. Williams B, Poulter NR, Brown MJ, Davis M, Mcinnes GT, Potter JF, et al. Blood pressure assessment: Overview, indications, contraindications. Bmj. 2004 ;328(7440):634–40.
20. Calys-Tagoe B, Nuertey BD, Tetteh J, Yawson AE. Individual awareness and treatment effectiveness of hypertension among older adults in Ghana: Evidence from the world health organization study of global ageing and adult health wave 2. Pan Afr Med J. 2020;37(264):1–16.
21. Incoom S, Adjuik M, Takramah W, Axame WK, Owusu R, Parbey PA, et al. The Frequency of Hypertension and Pre-hypertension Among Adults in the Hohoe Municipality of Ghana. J Prev Med Healthc. 2017;1(3): 1–9.
22. Abegunde KA, Owoaje ET. Health problems and associated risk factors in selected urban and rural elderly population groups of South - West Nigeria. 2013;12(2).
23. Demisse AG, Greffie ES, Abebe SM, Bulti AB, Alemu S, Abebe B, et al. High burden of hypertension across the age groups among residents of Gondar city in Ethiopia: A population based cross sectional study. BMC Public Health. 2017; 17(1):1–9.
24. Saadeh AM, Jones J V. Predictors of sudden cardiac death in never previously treated patients with essential hypertension: Long-term follow-up. J Hum Hypertens. 2001;15(10):677–80.
25. Verdecchia P, Angeli F, Cavallini C, Aita A, Turturiello D, De Fano M, et al. Sudden cardiac death in hypertensive patients. Hypertension. 2019;73(5):1071–8.
26. Thawornchaisit P, De Looze F, Reid CM, Seubsman SA, Sleigh AC, Chokhanapitak J, et al. Health risk factors and the incidence of hypertension: 4-Year prospective findings from a national cohort of 60 569 Thai Open University students. BMJ Open. 2013;3(6):1–10.
27. Ramezankhani A, Azizi F, Hadaegh F. Associations of marital status with diabetes, hypertension, cardiovascular disease and all-cause mortality: A long

term follow-up study. PLoS One. 2019;14(4):1–15.

28. Perkins JM, Lee H young, James KS, Oh J, Krishna A, Heo J, et al. Marital status, widowhood duration, gender and health outcomes: a cross-sectional study among older adults in India. BMC Public Health [Internet]. 2016;16(1): 1–12. Available:http://dx.doi.org/10.1186/s12889-016-3682-9

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle4.com/review-history/70075