# PREVALENCE AND RISK FACTORS OF HYPERTENSION: THE CASE OF THE GHANAIAN MARKET TRADER

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## ABSTRACT

Hypertension is one of the leading Non-Communicable Diseases worldwide and an essential global health problem. The purpose of the study was to ascertain the prevalence and some selected risk factors of hypertension among traders in two markets in Ghana. A descriptive cross-sectional study was conducted using a semi-structured questionnaire. A systematic random sampling was employed in selecting 345 traders for the study. Anthropometric measurements were conducted using the Bioelectrical Impedance Analyzer (BIA) to assess body shape and size and blood pressure readings were taken using a digital sphygmomanometer (OMRON BP monitor). Dietary patterns were established by the use of a food frequency questionnaire. The WHO global physical activity questionnaire was used to assess the physical activity level. Data were analyzed by use of SPSS version 23.0. Pearson's Chi-square test was used to determine the association between

hypertension and hydration status of respondents whilst binary logistic regression model was used to ascertain the association between anthropometric measurements and hypertension. A p-value of <0.05 was considered statistically significant. The overall prevalence of hypertension was 23.5% whilst 31.3% were pre-hypertensive. No significant association existed between physical activity and hypertension. But there was a statistical significance (p=0.000) between the overall anthropometric measurements and hypertension. Hydration status was also statistically significant (p=0.010). Animal foods were eaten occasionally by the participants as evidenced by the low levels of consumption of red meat and processed meat. With regards to the consumption of snacks, fruits were the most consumed. Based on these findings, lifestyle management and appropriate dietary changes are needed to control hypertension as well as interrupt and prevent the progression of pre-hypertension.

**Keywords: Hypertension, Traders, Prevalence, Risk factors, Ghana**

## Background

Worldwide, cardiovascular diseases (CVDs) are the main cause of mortality in adults (Alwan *et al.*, 2010; Unwin and Alberti, 2006) and hypertension is the leading non-communicable disease (NCDs) among both males and females of all races (WHO, 2002). Estimates globally revealed that hypertension is the cause of around 45% of deaths linked to coronary illnesses and 50% of deaths related to stroke (WHO, 2013). While 80% of deaths related to CVD occur in Low- and Middle-Income Countries (LMIC), some countries such as Ghana, Cameroon and South Africa, have risk factors of CVDs risen to epidemic proportions (Bosu, 2010; Seedat, 2007). The global prevalence of hypertension among the adult population is expected to increase from 26% (972 million) in

2000 to 29% (1.56 billion) by 2025 with associated cardiovascular complications (Kearney et al., 2005; Mensah and Bakris, 2011).

According to Bosu (2010), Hypertension is the fifth commonest cause of outpatient illnesses in most regions in Ghana. However, in 2007, hypertension became second to malaria from fourth as the main cause of outpatient illnesses in the Greater Accra Region (Ghana Health Service, 2008). In Ghana, hypertension was the leading determinant of heart and kidney failure (Owusu, 2007) and the hypertension prevalence in mixed populations was greater in urban than in rural communities (Bosu, 2014). Previous population-based studies reported a range of 19-48% in the hypertension prevalence in Ghana (see Addo, Smeeth and Leon, 2008; Bosu, 2010; Burket, 2006; Hill *et al*., 2007) while data retrieved from the Ghana Demographic and Health Survey (GDHS) found the overall hypertension prevalence to be 13.0% (Bosu, 2010; Sanuade, Boatemaa and Kushitor, 2018). But research conducted by Aryeetey and Ansong (2011) revealed that the prevalence of hypertension in Accra alone was 34%, of which 15% had been diagnosed previously and 19% not diagnosed. It has been suggested that awareness of hypertension and its control are important for reducing prevalence, but the level of such awareness have been reported to be low (Addo *et al.*, 2012). In the Ashanti Regional capital, a study that examined factors that were associated with awareness, treatment and control of hypertension found that, 34% knew of their illness, 28% were getting some form of treatment and 6.2% had the condition under control (Agyemang, Bruijnzeels and Owusu-Dabo, 2006).

In Nigeria, a descriptive cross-sectional research by Wordu and Akusu (2018) on adult traders found the hypertension prevalence to be 50.3% for pre-hypertension, stage I hypertension was 18.5% whilst stage II hypertension was 11.1%. Outside Accra, the capital of Ghana, a study conducted among market traders in urban and rural settlements of the Hohoe municipality found

hypertension prevalence to be 36.1%, with rural traders recording 32% whereas urban traders were 36.1% (Kweku *et al.*, 2017). However, in a review of these population-based studies, Addo *et al.* (2012) predicted a rise in the burden of hypertension to be expected in Ghana, unless effective hypertension prevention programmes are drawn.

Hypertension is a preventable disease with many associated etiological factors such as obesity, unhealthy lifestyles including smoking tobacco, excessive consumption of alcohol and lack of physical activity (WHO, 2015). Uncontrolled hypertension may lead to complications such as heart failure, stroke, coronary heart illnesses, peripheral vascular diseases, visual impairment, retinal hemorrhage and kidney impairment (Huang *et al.*, 2013; Lawes *et al.*, 2001; Pistoia *et al.*, 2016; Wu *et al.*, 2013). With the ageing global population, the rise in urbanization, low physical activity, and westernization of dietary intake, it is projected that high blood pressure will continue to advance in prevalence (Adeloye and Basquill, 2014; Zhou *et al.*, 2017).

Hypertension has been related with numerous risk factors, including sex, age, family history, high salt intake, excessive alcohol consumption, tobacco smoking, obesity, inadequate physical activity, unhealthy diet and occupation. The association between the presence of risk factors of hypertension and progress of the disease has been well documented. A number of interventions (see Dickinson *et al.*, 2006; Neter *et al.*, 2003; Xin *et al.*, 2001) and prospective researches (see Awuah *et al.*, 2016; Briasoulis *et al.*, 2012; Gelber *et al.*, 2007; Lelong *et al.*, 2017; Liu *et al.*, 2017) have interrogated these factors. Studies have shown that numerous individuals with hypertension don't know about it.

Trading in markets is one of the most common forms of informal employments in Ghana and they form a substantial portion of the country's working population. These traders often go through a considerable amount of stress. The kind of business being done by these traders influence their

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eating habits and lifestyles. According to Afolabi *et al*. (2004), they eat foods high in salt due to their frequent snacking habits. They have the habit of sitting down most hours of the day which predisposes them to weight gain mainly due to sedentary lifestyle (Afolabi *et al*, 2004). They are also exposed to high extremes of heat over long hours and as such there can be water losses through the skin (perspiration and sweating) which could lead to dehydration (Sawka *et al*., 2005). This study thus sought to ascertain the prevalence of hypertension and also analyse dietary patterns as well as lifestyle risk factors significantly related with hypertension among Ghanaian traders.

## METHODOLOGY

### Study Design

A descriptive cross-sectional study was carried out among 345 traders from two big markets within two municipalities in the Greater Accra Region. Information was obtained on blood pressure, dietary patterns, physical activity levels, anthropometry, self-reported medical history and socio-demographic characteristics.

### Study Population

The study population were traders who were aged 18 years and above and consented to participate. Two big markets from two municipalities were purposively selected for the study and this comprise the Madina and Dome markets. These markets are among the largest markets in the Accra metropolis.

### Sampling

The sample size was calculated using the Cochrane's formula (1989) for cross-sectional studies as follows:

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$$N = \frac{Z^2(P)(1-P)}{d^2}$$

"N" is the sample size, Z is the standard score for the confidence level, P is the population proportion (prevalence) and "d" is the level of statistical significance which is 5% (0.05). The prevalence of adult hypertension in the Greater Accra region of Ghana is 34% by Ayeetey and Ansong, (2011). At 95% confidence level, Z score is 1.96.

$$N = \frac{1.96^2 *(0.34)(1-0.34)}{0.05^2}$$

N = 344.8

N ~ 345

Data collection was successfully carried out on 345 participants, which provides a more reliable estimate of the population.

**Sampling Technique**

Systematic random sampling was employed to recruit 345 participants from the two markets. Data collection was carried out for 6 days (3 days in each market) to obtain the sample size of 345. The first respondent was picked randomly and the subsequent participants at every 4th shop/shed. An average of 50 traders were picked every day from each market.

**Research Instruments**

Data was collected by utilizing a semi-structured questionnaire comprising socio-demographics, behavioral factors, water intake and dietary intake. A food frequency questionnaire was used in assessing dietary practices of respondents. Also, physical measurements involving anthropometric

measurements and BP readings were taken. The dependent variables were systolic and diastolic BP. The independent variables were age, sex, height, weight, alcohol consumption, water intake, physical activity, family history and BMI.

## Recruitment and Training of Research Assistants

Before collection of data, three research assistants who were students of Nutrition and Dietetics-KNUST, and as such familiar with anthropometric measurements and BP readings were recruited and trained. The research objectives, data collection procedures and anthropometric measurements that needed to be taken were explained by the researcher to the assistants so as to familiarize themselves with the study and also how to fill the questionnaire.

## Data Collection Procedure

Prior to data collection, the specific objectives of the research were elaborated to the respondents by the researcher. Only participants who gave approval were recruited to take part in the study. The researcher read out the questionnaire to each participant confidentially, since most of them were not literate. Anthropometric measurements and BP readings were taken by the research assistants.

## Assessment of Physical Activity

The WHO Global Physical Activity Questionnaire was employed in which physical activity levels were assessed by evaluating activities such as brisk walking, carrying light loads, jogging, household activities etc. The amount of time (in minutes) every respondent utilized in moderate to vigorous intensity exercise was ascertained. Physical activity was then classified as low, moderate and high.

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**Assessment of Body Shape and Size**

Anthropometric measurements were assessed for each participant using standard procedures. BMI, body fat, body age, visceral fat was measured using the Bioelectrical Impedance Analyzer (BIA). Standing height measurement was done using a field stadiometer with shoes off to the nearest 0.1cm whilst in an upstanding and a relaxed position and arms hanging freely (UK National Institute for clinical Excellence-NICE, 2007). Weight was measured to the nearest 0.1kg by the use of the BIA. In determining waist circumference to the nearest cm, a metric measuring tape was used by placing it midway between the top of the hip bone and the bottom of the ribs. Hip circumference was likewise measured around the circumference of the hips and widest part of the buttocks. Waist-to-Hip ratio (WHR) is the dimensionless ratio of the waist to that of the hips.

**Dietary Intake Assessment**

A food frequency questionnaire was utilized in assessing the dietary patterns of participants. A food frequency questionnaire that was based on 24 food items was administered in order to establish the dietary practices of the participants. The food items include: whole grain cereals, refined cereals, sweet spreads, dairy products, nuts and seeds, fermented maize products, legumes, fruits; roots, tubers and plantain; eggs, poultry, coffee and tea; palm oil, sodas and juices; red meat, rice and pasta; processed meats, fish, sweat spreads, raw vegetables, vegetable soups, stews and sauces; olive oil, other oils and peanut butter, margarine and cakes and sweets. The variety of foods from the various food group were read out to each respondent and the number of times the foods have been consumed was noted. Participants were to select if they consumed the particular food group daily, weekly or occasionally.

## Assessment of Water Intake

Total water intake was estimated from all foods and drinks expended within the previous 24-hour. Water intake from beverages were grouped as follows; plain water, energy drinks, sugar or artificially sweetened drinks (carbonated or non-carbonated), alcoholic drinks, coffee or tea, fruit and vegetable juices, milk, soymilk (or other diary drinks). Respondents were grouped based on percentiles of total water intake (Armstrong *et al.*, 2012; De Koning *et al.*, 2011; Institute of medicine (US) Food and Nutrition Board, 2005).

Low water intake was defined as intake below the 20th percentile of total water intake (<2.0 L/day), moderate water intake was intake between 20th and 80th percentile (2.0-4.3L/day) and high intake was intake greater than the 80th percentile of total water intake (>4.3L/day). The fluid intake was categorized as i, plain water ii, beverage other than plain water.

## Measurement of Blood Pressure

Blood pressure measurement was taken using a digital sphygmomanometer (OMRON BP monitor) to measure both systolic and diastolic BP. Two measurements were taken when the participants were at rest within 10 minutes intervals and recorded to the nearest $\pm$ 5mmHg (Addo, Smeeth and Leon, 2008) and the mean values were used for data analysis.

## Inclusion and Exclusion Criteria

Adult traders (men and women) above 18 years and willing to partake in the study were included whilst hawkers, pregnant women were excluded from the study.

## Data Processing and Analysis

Data were analyzed with SPSS software version 23.0. Prevalence and risk factors were presented as percentages and frequencies. The association between hypertension and hydration status was tested using Chi-Square. Logistic regression model was used to ascertain the association between BP and anthropometric measurements. At 95% confidence level, a p-value of less than 0.05 was considered to be statistically significant.

## RESULTS

### Part A. Socio-demographic Characteristics

A summary of the characteristics of the respondents is presented in Table 1 below. The parameters examined included age, gender, educational level, marital status, religious affiliation, number of years worked in the market and monthly income. Most of the study participants 98% (338/345) were females whilst a few 2% (7/345) were males. The minimum age was 22 and the maximum age was 75.

**Table 1: Socio-demographic Characteristics of Participants**

| VARIABLES | FREQUENCY | PERCENTAGE |
|---|---|---|
| **AGE (IN YEA RS)** | | |
| 18-29 | 61 | 17.6 |
| 30-39 | 34 | 9.9 |
| 40-49 | 135 | 39.1 |
| 50-59 | 61 | 17.7 |
| 60 and above | 54 | 15.7 |
| **GENDER** | | |
| Male | 7 | 2.0 |
| Female | 338 | 98.0 |
| **MARITAL STATUS** | | |
| Single | 88 | 25.5 |
| Married | 176 | 51.0 |

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| | | |
|---|---|---|
| Separated | 13 | 3.7 |
| Divorced | 34 | 9.9 |
| Widowed/widow | 34 | 9.9 |
| **RELIGION** | | |
| Muslim | 54 | 15.7 |
| Christian | 291 | 84.3 |
| **EDUCATIONAL LEVEL** | | |
| No formal education | 54 | 15.7 |
| Primary | 88 | 25.5 |
| Middle school/JHS | 149 | 43.2 |
| Secondary | 41 | 11.9 |
| Tertiary | 13 | 3.8 |
| **YEARS WORKED** | | |
| Less than 5 | 88 | 25.5 |
| 5-10 | 81 | 23.5 |
| 10-19 | 54 | 15.7 |
| 19-39 | 108 | 31.3 |
| More than 39 | 14 | 4.0 |

**Prevalence of Hypertension among the Traders**

The prevalence of hypertension was determined using the systolic and diastolic BP measurements.

As shown in Figure 1, 23.5% were hypertensive, 31.3% were pre-hypertensive and 45.2% had
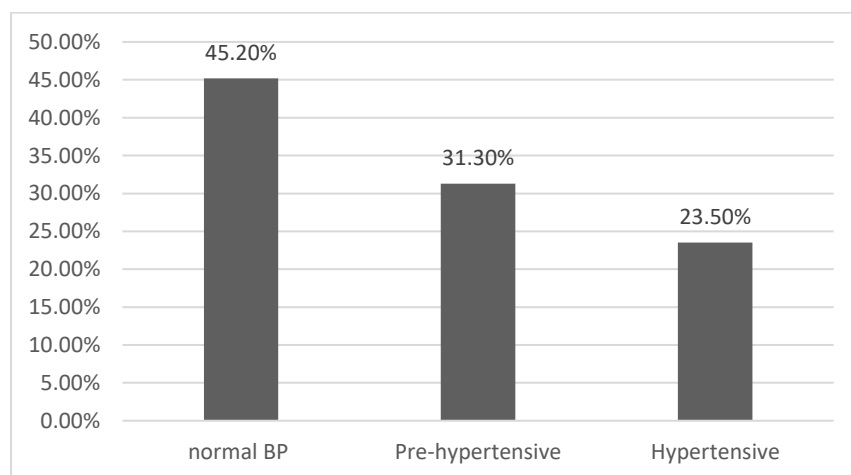
normal BP.



**Figure 1: Hypertensive Status of Participants**

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**Prevalence of Hypertension by Age**

As shown in Figure 2, traders within the age group 50-59 had the highest prevalence (46.15%) of hypertension, followed by 60 years and above with a prevalence rate of 30.77% and then 40-49 years having a prevalence rate of 21.79%.
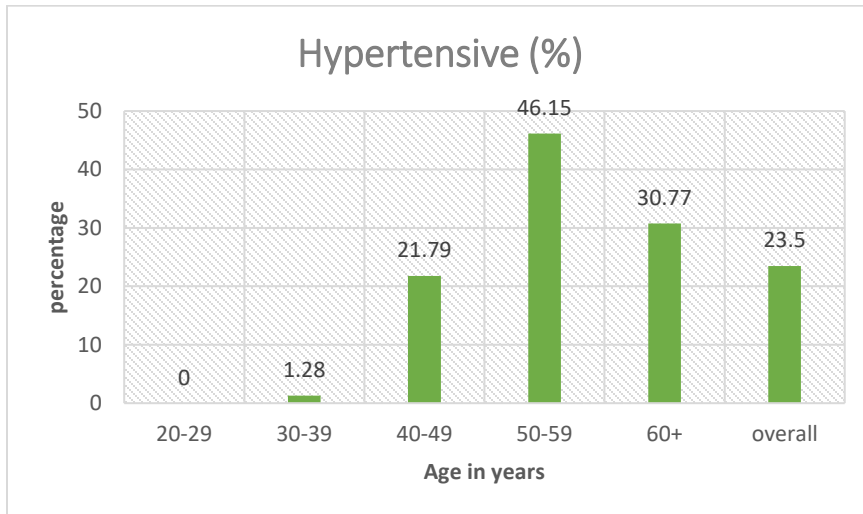


**Figure 2: Prevalence of Hypertension by Age Group**

**Physical Activity Level**

The WHO Global Physical Activity Questionnaire was utilized to assess the level of physical activity of the study population. Physical activity data collected included: type, frequency, duration and intensity of physical activity during work, transportation and leisure time of respondents. The study showed that the majority (66.4%) of the respondents had low levels of physical activity whilst only 10.1% had high levels of physical activity. There was no statistically significant association between hypertension and physical activity levels of respondents,
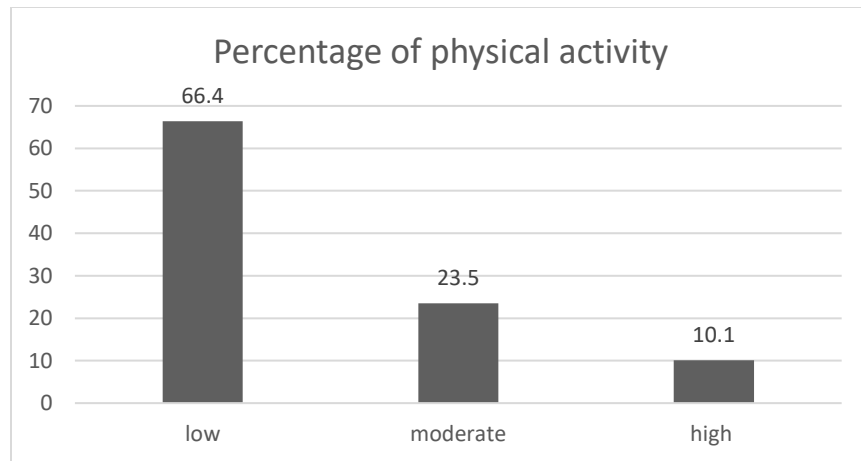
**Figure 3: Physical Activity Level of Respondents**

**Hydration Status of Respondents**

Total water intake that was estimated from all foods and beverages taken within the previous 24-hours found the majority, 54.8% of respondents had moderate water intake (2.0-4.3L/day), while 39.1% had high water intake (>4.3L/day). Only a few, 6.1% had low intake of water (<2.0 L/day). Pearson chi-square analysis showed a significant association between water intake and being hypertensive.

**Table 2: Association of Hypertension and Hydration Status by Chi-square Analysis**

|  | Value | df | Asymp. Sig. (2-sided) |
|---|---|---|---|
| Pearson Chi-Square | 9.192 | 2 | .010 |
| Likelihood Ratio | 15.101 | 2 | .001 |
| Linear-by-Linear Association | 1.443 | 1 | .230 |
| N of Valid Cases | 345 |  |  |

**Table 3: Association of Hypertension and Overall Anthropometric Measurements by Multiple Logistic Regression.**

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| Model | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Regression | 26.041 | 12 | 2.170 | 23.412 | .000 |
| Residual | 26.069 | 278 | .094 | | |
| Total | 52.110 | 290 | | | |

a. Dependent Variable: Hypertensive

b. Predictors: (Constant), Diastolic, Height, Muscle mass, Visceral fat, Body age, Hip, Waist, Systolic, BMI, BMR, Percent body fat, Weight. Binary Logistic Regression showed overall significant association between anthropometric measurements and being hypertensive ($p<0.001$).

**Frequency of Consumption of Different Foods and Water Intake**

The findings showed that only 16.5% of respondents consumed whole grain cereals 4-6 times per week whilst refined cereals had 27.5% intake 4-6 times a week. Fermented maize products were consumed daily by 23.4% of the respondents. Dairy products were consumed occasionally by the majority, 72.5% of participants. Concerning fats and oils, palm oil, which was the most consumed, was taken 4-6 times a week by 27.5% of participants, olive oil intake was 19.7%, 4-6 times a week whilst intake of other oils and peanut butter was by only 3.8% of participants, 4-6 times a week. Margarine was consumed least by only 3.8%, 4-6 times a week. Raw vegetables were consumed 4-6 times a week by only 9.9% of the respondents. Regarding animals and animal products, red meat and processed meat were the least consumed while fish was the most consumed with intake of 29.1% daily by the participants. Cakes and sweets were least consumed by the participants. Only a few, 9.9% of the traders consumed fruits 4-6 times a week.

## DISCUSSION

The aim of the study was to ascertain the risk factors and prevalence of hypertension among market traders in Ghana. A total of 345 traders participated in the research. Majority (98%) were females, 51% were married, 43.2% had middle school/JHS education and about 31% had worked for more than 20 years. The overall prevalence of hypertension was 23.5%, whilst 31.3% were pre-hypertensive. This concurs with the study by Addo, Amoah and Koram (2006) on the changing patterns of hypertension in four rural settlements in the Ga District, who found a quarter of the subjects (25.4%) having hypertension. This also agrees with findings by Bosu (2010), which revealed that the prevalence of hypertension ranged from 19 to 48%.

In this study, hypertension increased with age. This is consistent with studies by Adeloye and Basquill (2014); Sarki *et al*. (2015) and Duda *et al*. (2011) that age is a risk factor for onset of hypertension and uncontrolled hypertension. In a study by Acheampong *et al*. (2019) among adult female population age 25 and above, the hypertension prevalence rose with an increment in age. Women who were 45-65 years and above, were two to five times more likely to be hypertensive than those within the ages of 25-44. Also, in South Africa, a study by Joubert and Bradshaw (2006) reported that the prevalence of hypertension was increased in adults 50 years and over. In the current study, hypertension prevalence was highest in the age group 50-59 years. This is because, increasing age has been found to be a single predictor of hypertension (see Adebayo et al., 2013; Akpan et al., 2015; Sola et al., 2013) and is an important cause of morbidity and mortality worldwide.

Regarding the correlation between the anthropometric measurements and the hypertensive status of the respondents, there was a significant association (p<0.01) between the overall anthropometric measurements and hypertension status. To be specific, hypertension was positively associated with

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hip circumference, weight, height, BMI and visceral fat. The measures of central obesity, significantly waist circumference and waist-to-hip ratio are more accurate in describing the distribution of body fat in comparison with BMI (Huxley *et al*., 2010). Specifically, being obese had a positive association with hypertension in the current study. Many studies have demonstrated the correlation between excess body weight and hypertension. Obesity has been shown to be an independent risk factor for hypertension (Park at al., 2012). According to the American Heart Association (AHA), (2013), it is established that at least 75% of the incidence of hypertension is linked directly to obesity.

From the study, the results showed a very low level of physical activity as most of the traders did not engage in any form of exercise. As a norm, these market traders sit for long hours to sell their products, thus leading to a sedentary lifestyle and this might have influenced the development of hypertension as they age. According to AHA (2013), individuals who have reduced activity are 30% to 50% more at risk of developing hypertension than their active counterparts. A study by Buenza *et al*. (2007) reported that being sedentary was linked with the likelihood of getting hypertension, independent of leisure-time physical activity.

A diet rich in cereals has a high fibre content and as such lowers the risk of developing heart disease. Wyka *et al.* (2012), reported that developing heart illnesses was associated with insufficient intake of vitamin C, calcium and fibre. Animal foods were eaten occasionally by the participants as evidenced by the low levels of consumption of red meat and processed meat. Several experimental investigations have evidenced the progressive increase in systolic blood pressure due to a highly saturated diet in animals (Tamaya-Mori, Uemura and Iguchi, 2002). Since respondents occasionally consumed animal products, may be the reason why the prevalence rate of 23.5% was however lower compared to the prevalence of 34% by Ayeetey and Ansong (2011)

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in the Greater Accra Region. With regards to the consumption of snacks, fruits were the most consumed. Plant-based dietary patterns have been linked with lower systolic blood pressure in observational studies and clinical trials. A study by Acheampong *et al.* (2019) on the predictors of hypertension concluded that, women who did not eat fresh fruit daily were thrice more likely to be hypertensive than those who consumed fresh fruit daily. Also, a meta-analyses of prospective cohort studies have suggested an association between increased fruit and vegetable consumption and a reduced risk of coronary heart disease (Dauchet et al., 2006) and stroke (He, Nowson and MacGregor, 2006). Consumption of adequate quantities of water is associated significantly with a decrease in blood pressure in hot working conditions (Suwondo, 2008). The current study thus recorded a significant association between water intake and hypertension.

## Conclusion

The study set out to identify the predictors and prevalence of hypertension among market traders in two markets in the Greater Accra Region. Prevalence of hypertension was 23.5% and pre-hypertension was 31.3%. Overweight and obesity were both above the national average. Generally, physical activity was low among the study population. Hypertension was positively associated with age, BMI, hip circumference, weight, visceral fat. From the BMI measurements, majority of the respondents were found to be overweight. In conclusion, sociodemographic characteristics and anthropometric measurements were positively associated with an increase in blood pressure. Lifestyle management and appropriate dietary intake are needed to control hypertension as well as interrupt and prevent the progression of pre-hypertension.

## Recommendations

Considering the high prevalence of pre-hypertension, it is recommended that a follow up study be carried out to study the outcome of pre-hypertension among the market traders in Accra. This is because primary prevention of hypertension yields a good opportunity to avoid the continuing costly management of high blood pressure and its complications. Also, policies that aim at motivating modifications in lifestyle by individuals with hypertension should be developed by relevant government institutions. It is recommended that health screening be organized intermittently among the group of workers whose risk factors are high. It is also essential to provide information about how to control hypertension and to develop programmes targeted at health education for groups and individuals at higher risk of developing hypertension. Engaging in the performance of moderate-intensity physical activity to an average of 40 minutes, 3 to 4 days per week is an essential adjunct to other blood pressure-lowering strategies. Also, maintaining a normal BMI through a reduction in fat and total caloric intake as well as a reduction in dietary sodium should be emphasized and disseminated through the appropriate media.

## References

1. Acheampong, K., Nyamari, J., Ganu, D., Appiah S., Pan, X., Kaminga, A. and Liu, A. (2019). Predictors of Hypertension amoung Adult Female Population in Kpone-Katamanso District, Ghana. *International Journal of Hypertension.*

2. Addo, J., Agyemang, C., Smeeth, L., de-Graft Aikins, A., Edusei, A. K., and Ogedegbe, O. (2012). A review of population-based studies on hypertension in Ghana. *Ghana medical journal*, *46*(2 Suppl), 4–11.

3. Addo, J., Amoah, A. G and Koram, K. A. (2006). The Changing Patterns of Hypertension in Ghana: A study of four rural communities in the Ga District. *Ethnicity & Disease,* 16, pp. 894-899

4. Addo, J., Smeeth, L. and Leon, D. A. (2008.) Prevalence, detection, management and control of hypertension in Ghanaian civil servants. *Ethnicity & Disease,* 18(4), pp. 505-511.

5. Adebayo R. A, Balogun M. O, Adedoyin R. A, Obashoro- John O. A, Bisiriyu L. A and Abiodun O. O. (2013). Prevalence of hypertension in three rural communities of Ife north local Government Area of Osun state, South West Nigeria. *International Journal of General Medicine*. 6: 863–868.

6. Adeloye, D. and Basquill, C. (2014). Estimating the prevalence and awareness rates of hypertension in Africa: a systematic analysis. *PLos One,* 9(8), p. e104300.

7. Afolabi, Wasiu., Addo, A. and Sonibare, M. A. (2004). Activity pattern, energy intake and obesity among Nigerian urban market women. International journal of food sciences and nutrition. (55) pp. 85-90.

8. Agyemang, C., Bruijnzeels, M. A., and Owusu-Dabo, E. (2006). Factors associated with hypertension awareness, treatment, and control in Ghana, West Africa. *Journal of human hypertension*, *20*(1), 67–71.

9. Ahmed, S., & Memon, M. (2008). Smoking and its relationship with blood pressure, blood glucose and blood parameters in patients with coronary heart disease. *Pakistan Journal of Physiology*, *4*(1), 5-7.

10. Akpan E. E, Udeme E. Ekrikpo, Aniema I. A. Udo and Bassey Edet Bassey, (2015) "Prevalence of Hypertension in Akwa Ibom State, South-South Nigeria: Rural versus Urban Communities Study", *International Journal of Hypertension*, vol. 2015, Article ID 975819, 5 pages.

11. Alam, N., Soni, G. and Jain, K. (2015). Prevalence and determinants of hypertension in an elderly population of Raipur city, Chhattisgarh.. *International Journal of Research in Medical Sciences,* 3(3), pp. 568-573.

12. American Heart Association. (2013). Heart Disease and Stroke Statistics. *Update At-A-Glance*, Dallas, Texas.

13. Ansong, Joana and Aryeetey, Richmond. (2011). Overweight and hypertension among college of health sciences employees in Ghana. African Journal of Food Agriculture Nutrition and Development. (11), pp. 5444-5456.

14. Appel, J. L. and American Society of Hypertension Writing Group (2009). ASH position paper: Dietary approaches to lower blood pressure. Journal of the American Society of Hypertension, 3(5), pp 321-331.

15. Armstrong, L. E., M. S. Ganio, D. J. Casa, E. C. Lee, B. P. McDermott, J. F. Klau, et al. (2012). Mild dehydration affects mood in healthy young women. J. Nutr. 142:382–388.

16. Beunza, J. J., Martínez-González, M. A., Ebrahim, S., Bes-Rastrollo, M., Núñez, J., Martínez, J. A., & Alonso, A. (2007). Sedentary behaviors and the risk of incident hypertension: the SUN Cohort. *American journal of hypertension*, *20*(11), 1156–1162.

17. Bosu, W. K. (2010). Epidemic of hypertension in Ghana: a systematic review. *BMC Public Health,* Volume 10, p. 418.

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18. Bosu, W., Reilly, S., Aheto, J. and Zucchelli, E. (2019). Hypertension in older adults in Africa: A Systematic review and meta-analysis. *PLoS ONE,* 14(4), p. e0214934.

19. Briasoulis, A., Agarwal, V., & Messerli, F. H. (2012). Alcohol consumption and the risk of hypertension in men and women: a systematic review and meta-analysis. *Journal of clinical hypertension (Greenwich, Conn.)*, *14*(11), 792–798.

20. Burket, B. A. (2006). Blood pressure survey in two communities in the Volta Region, Ghana, West Afica. *Ethnicity & Disease,* Volume 16, pp. 292-294.

21. Cochran, W. (1963). *Sampling Techniques.* 2nd Ed ed. New York: John Wiley and Sons, Inc.

22. Dauchet L, Amouyel P, Hercberg S, Dallongeville J. Fruit and vegetable consumption and risk of coronary heart disease: a meta-analysis of cohort studies. *J Nutr.* 2006; *136*; 2588–2593.

23. de Koning L, Malik VS, Kellogg MD, Rimm EB, Willett WC & Hu FB (2012). Sweetened beverage consumption, incident coronary heart disease, and biomarkers of risk in men. *Circulation* 125 (14), 1735–1741.

24. Diaz, K. M., & Shimbo, D. (2013). Physical activity and the prevention of hypertension. *Current hypertension reports*, *15*(6), 659–668.

25. Dickinson, H. O., Mason, J. M., Nicolson, D. J., Campbell, F., Beyer, F. R., Cook, J. V., Williams, B., & Ford, G. A. (2006). Lifestyle interventions to reduce raised blood pressure: a systematic review of randomized controlled trials. *Journal of hypertension*, *24*(2), 215–233.

26. Duda R. B., Anarfi, J. K., Adanu, R. M., Seffah, J., Darko, R. and Hill, A. G. (2011). The health of the 'older women' in Accra. Ghana: results of the Women's Health Study of Accra.. *Journal of cross-cultural Gerontology,* 26(3), pp. 299-314.

27. Gelber, R. P., Gaziano, J. M., Manson, J. E., Buring, J. E., and Sesso, H. D. (2007). A prospective study of body mass index and the risk of developing hypertension in men. *American journal of hypertension*, *20*(4), 370–377.

28. Ghana Health Service. (2008). Accra: Greater Accra Regional Health Directorate: Annual Report 2007.

29. He FJ, Nowson CA and MacGregor GA. Fruit and vegetable consumption and stroke: meta-analysis of cohort studies. *Lancet.* 2006; *367*: 320–326.

30. Hill, A. G., Darko, R., Seffah, J., Adanu, R. M., Anarfi, J. K. and Duda, R. B. (2007). Health of urban Ghanaian women as identified by the Women's Health Study of Accra. *International Journal of Gynecology and Obstetrics,* 99(2), pp. 150-156.

31. Huang, N., Duggan, K. and Harman, J. (2008). Lifestyle Management of Hypertension. *Australian Prescriber,* 31(6), p. 15.

20

32. Huang, Y., Wang, S. Cai, X., Mai, W., Hu Y., Tang, H. and Xu, D. (2013). Prehypertension and incidence of cardiovascular disease: a meta-analysis. *BMC Medicine,* Volume 11, p. 177.

33. Institute of Medicine. (2005). *Dietary reference intakes: water, potassium, sodium chloride and sulfate.* ed 1 ed. Washington DC: National Academies Press.

34. Joubert J, Bradshaw D. (2006). Population ageing and health challenges in South Africa. Chronic diseases of lifestyle in South Africa: 1995-2005. Cape Town: South African Medical Research Council; 2006. p. 204-19.

35. Kaerney, P. M., Whelton, M., Reynolds K., Muntner, P., Whelton P. K. and He, J. (2005). Global burden of hypertension: analysis of worldwide data. *Lancet,* Volume 365, pp. 217-223.

36. Kweku, M., Bani, F., Axame, W., Owusu, R., Takase, M., Adjuik, M. and Tarkang, E. (2017). rural traders in Hohoe Municipality, Ghana. *Journal of Scientific Research and Studies,* 4(4), pp. 73-85.

37. Lawes, C., Hoorn, S. and Rodgers, A. (2008). Global burden of blood-pressure-related disease 2001. *The Lancet,* 371(9623), pp. 1513-1518.

38. Lelong, H., Blacher, J., Baudry, J., Adriouch, S., Galan, P., Fezeu, L., Hercberg, S., and Kesse-Guyot, E. (2017). Individual and Combined Effects of Dietary Factors on Risk of Incident Hypertension: Prospective Analysis from the NutriNet-Santé Cohort. *Hypertension (Dallas, Tex.: 1979), 70*(4), 712–720.

39. Liu, M., He, Y., Jiang, B., Wang, J., Wu, L., Wang, Y., Zhang, D., Zeng, J. and Yao, Y. (2015). Association Between Family History and Hypertension Amoung Chinese Elderly. *Medicine,* 94(48), pp. 1-6.

40. Mensah G. A, and Bakris G. (2011). The United Nations high-level meeting addresses non-communicable diseases, But Where Is Hypertension? The Journal of Clinical Hypertension, 13(11);787-790

41. Neter, J. E., Stam, B. E., Kok, F. J., Grobbee, D. E., and Geleijnse, J. M. (2003). Influence of weight reduction on blood pressure: a meta-analysis of randomized controlled trials. *Hypertension (Dallas, Tex : 1979), 42*(5), 878–884.

42. Owusu, I., (2007). Causes of heart failure as seen in Kumasi. *Internet J Third World Med,* Volume 5.

43. Pajak, A., Szafraniec K, Kubinova R, Malyutina S, Peasey A, Pikhart H, Nikitin Y, Marmot M, and Bobak M. (2013). Binge Drinking and Blood Pressure: Cross-Sectional Results of the HAPIEE Study. *PLos ONE,* 8(6), p. e65856.

44. Park MH, Falconer C, Viner RM, and Kinra S. (2012). The impact of childhood obesity on morbidity and mortality in adulthood: a systematic review. Obes Rev;13(11):985–1000.

21

45. Pistoia, F., Sacco, S., Degan, D., Tiseo, C., Ornello, R., and Carolei, A. (2016). "Hypertension and stroke: Epidemiological Aspects and Clinical Evaluation,"*High Blood Pressure & Cardiovascular Prevention: the official journal of the Italian Society of Hypertension,* 23(1), p. 9-18.

46. Sanuade O. A, Boatemaa S. and Kushitor M. K (2018) Hypertension prevalence, awareness, treatment and control in Ghanaian population: Evidence from the Ghana demographic and health survey. PLOS ONE 13(11): e0205985.

47. Sarki, A. M., Nduka, C. U. Stranges, S., Kandala, N. B., and Uthman, O. A. (2015). Prevalence of Hypertension in Low-and-Middle Income Countries: A Systematic Review and Meta-Anlysis. *Medicine,* 94(50), p. e1959.

48. Seedat, Y., Ali, A. and Ferdinand, K. (2018). Hypertension and cardiovascular disease in the sub-Saharan African Context. *Annals of Translational Medicine,* 6(15), pp. 297-297.

49. Seedat, Y., Ali, A. and Ferdinand, K. (2018). Hypertension and cardiovascular disease in the sub-Saharan African Context. *Annals of Translational Medicine,* 6(15), pp. 297-297.

50. Sola A. O, Chinyere O. I, Stephen A. O, (2013). Hypertension prevalence in an Urban and Rural area of Nigeria. *J Med Med Sci* 2013; 4:149–54.

51. Steyn, K., Sliwa, K. and Hawken, S. (2005). Risk Factors Associated with Myocardial Infarction in Africa: The INTERHEART Africa Study. *circulation,* Volume 112, pp. 3554-61.

52. Suwondo A Dkk. (2008). Perbedaan Tekanan Darah pada Pekerja yang Terpapar Panas di Industri Sale Pisang Suka Senang Kabupaten Ciamis. *Jurnal Promosi Kesehatan Indonesia* Vol. 3 No.1 Bandung; Indonesia.

53. Tamaya-Mori N, Uemura K, Iguchi A. (2002) Gender differences in the dietary lard-induced increase in blood pressure in rats. Hypertension. 39: 1015–1020.

54. Unwin, N. and Alberti, K. (2006). Chronic non-communicable diseases. *Ann Trop Med Parasitol,* Volume 100, pp. 455-464.

55. Wordu, G and O. M, Akusu. (2018). Dietary Pattern and Prevalence of High Blood Pressure among Adult Traders in Port Harcourt, Nigeria. Asian Journal of Medicine and Health. (11) pp. 1-7.

56. World Health Organisation, (2014). *Global status report on noncommunicable diseases.,* Geneva, Switzerland

57. Wu, S., Huang , Z., and Yang, X. (2013). Cardiovascular events in a prehypertensive Chinese population: four-year follow-up study. *International Journal of Cardiology,* 167(5), pp. 2196-2199.

22

58. Xin, X., He, J., Frontini, M. G., Ogden, L. G., Motsamai, O. I., & Whelton, P. K. (2001). Effects of alcohol reduction on blood pressure: a meta-analysis of randomized controlled trials. *Hypertension (Dallas, Tex.: 1979)*, *38*(5), 1112–1117.

59. Zhou, B., Bentham, J., Di Cesare, M., Bixby, H. (2017). Worldwide trends in blood pressure from 1975 to 2015: a pooled analysis of 1479 populations-based measurement studies with 19.1 million participants.. *Lancet,* 389(10064), pp. 37-55.