Prevalence, awareness, treatment and control of hypertension in urban poor communities in Accra.

Introduction

Hypertension is largely regarded as a major risk factor for cardiovascular diseases with a growing prevalence and poor control particularly in developing countries.[1] It is estimated that by 2030, mortality due to cardiovascular diseases in the adult population will reach 23 million with about 85% of such deaths occurring in low- and middle-income countries.[2] In developing countries, particularly in sub-Saharan Africa, it has been suggested that the prevalence of hypertension is increasing rapidly generally because of increasing longevity and the continuous effect of contributing factors such as an unhealthy diet, obesity and physical inactivity.[3-5] Prevention of hypertension is workable and management can lead to a reduced incidence of preventable complications such as stroke, coronary heart disease and heart failure.[6] In Ghana, renal disease associated with hypertension is a common complication in Accra.[7]

There was more than a ten-fold increase in the number of reported new cases of hypertension in public health facilities in Ghana from 49,087 in 1988 to 505,180 in 2007.[8] Studies on hypertension in Ghana have indicated a crude prevalence between 25% and 48%, using the threshold of 140/90 mmHg with the prevalence higher in urban populations than in rural populations.[9] Evidence also suggests that many Ghanaians living with hypertension are not aware that they have the condition.[10]

In the Greater Accra Region (where the study areas are located), hypertension moved from fourth to become second to malaria as the leading cause of outpatient morbidity in 2007.[11] A study conducted in the capital Accra in 2003, found that the prevalence of hypertension in urban Accra was 28.3% (crude) and 27.3% (age-standardized).[12] However, information on the prevalence, awareness, management and control of hypertension in an urban poor context has not been fully assessed. This study aimed to assess the prevalence, levels of awareness, management, and control of hypertension among the adult population in three urban poor communities in Accra.

Methods and Materials

The urban poor communities the study was conducted in were James Town, Ussher Town and Agbogbloshie. James Town and Ussher Town are sometimes referred to as Ga-Mashie. All three communities are under the Ashiedu-Keteke sub metropolitan assembly which is also under the supervision of the Accra Metropolitan Assembly (A.M.A). The tag of 'urban poor' is based on the classification of communities by socio-economic status by the A.M.A. James Town and Ussher Town are traditional or indigenous communities inhabited mainly by the Ga-Dangme ethnic group with fishing and petty trading being the main economic activities. Agbogbloshie is

largely a heterogeneous or migrant community with most inhabitants engaged in trading activities ranging from food to non-food items with some also working as artisans.

The sample was drawn from 29 enumeration areas (EAs), each with 40 households systematically chosen to make up a total sample size of 1160 households distributed over the three localities. The number of EAs and therefore, households in each locality was proportionate to the population size of that locality. There were five EAs from Agbogbloshie, eight from James Town and sixteen from Ussher Town. The aim of this sampling procedure was to arrive at a survey with 986 households interviewed. Estimates from the Ghana Statistical Service indicated that the non-response rate in the Greater Accra Region is about 15%. As such adding an extra 15% of households to 986 households (which was the aim) led to the figure of 1160. In each household chosen, the head of the household responded to the household questionnaire while every female between the ages of 15 and 49 and every male between the ages of 15 and 59 responded to the individual questionnaire. The data was collected using an interviewer-administered questionnaire.

In total, a representative sample of 974 individuals were eligible to be interviewed for the individual questionnaire out of which 714 individuals had their blood pressure measurements taken. Some respondents did not allow the field personnel to take their blood pressure measurements even though they responded to the individual questionnaire. It has been determined that a sample size of 400 is adequate to detect prevalence of high blood pressure with 5% precision and 95% confidence level.[13]

Blood pressure measurements

Field personnel were given appropriate and adequate training on how to take blood pressure readings. Blood pressure was measured at a single visit. Respondents were made to sit on a chair while they rested their arm on a table. The adjustable chair and table was provided by the field personnel. Respondents' arm circumferences were measured and the appropriate cuff size, either medium or large, was used to take the measurements. [14] At each examination, after a 5-minute rest, blood pressure was measured on the seated participant's right or left arm using an electronic blood pressure (The Microlife® Watch BP ®) monitoring device. Three measurements were taken at 1 to 2 minute(s) intervals. The average of the three readings was then used for analysis. This is in line with the WHO's recommendation of using the average of three blood pressure readings at one visit in risk factor surveys.[15]

Inclusion criteria

Males aged 15-59 and females aged 15-49 (adult population in their reproductive ages) were eligible to answer the individual questionnaire in the survey and by extension had their blood pressure measurements taken Females who were pregnant and those who had given birth in the

last 6 months were excluded from the sample because of issues of pregnancy-induced hypertension.[16, 17]

Ethical Consideration

Ethical approval was sought from the Institutional Review Board (IRB) of the Nogouchi Memorial Institute for Medical Research. Respondents were asked to sign or thumbprint a consent form read to them before the interview and blood pressure measurements proceeded.

Measurements

Socio-demographic details, information on health condition and behaviour, and use of medication was obtained from the interviews conducted with the respondents.[18] Ages of respondents were re-categorized into younger adults (15-24), middle-aged adults (25-34) and older adults (≥35). Educational status referred to the highest level of formal schooling attained by an individual. On this basis, four categories were obtained (no education, basic education; which comprises primary and junior high education, secondary education and tertiary education). Locality referred to the usual residence of respondents which was James Town, Ussher Town or Agbogbloshie.

Physical activity was measured at the household level.[19] It was estimated by quantifying moderate-intensity activities[20] such as carrying light loads, washing clothes, brisk walking, scrubbing floors and sweeping inside or around their home for at least 20 minutes. Physical activity was re-categorized as ≥3 days in a week and <3 days in a week. Alcohol consumption was based on the pattern of consumption; [21] as such consumption of alcohol was reclassified into three categories: regular drinkers, occasional drinkers and non-drinkers. Weight was measured to the nearest 0.1 kg in light clothing. Height was measured without shoes with a measuring tape to the nearest 0.1 cm. Body mass index (BMI) was calculated as weight (kg) divided by standing height (m^2). BMI was then categorized as overweight (25-29.9kg/m^2) and obese (≥30 kg/m^2).

Hypertension was defined as a systolic blood pressure of ≥140 mmHg or a diastolic blood pressure of ≥90 mmHg. Awareness was measured among individuals with hypertension and was based on the respondents' report of a prior diagnosis of hypertension made by a health professional.[22] Treatment of hypertension was considered as the use of antihypertensive medication for lowering high blood pressure among hypertensive subjects.[18, 22] Control of hypertension was defined as the proportion of hypertensive individuals on antihypertensive medication with systolic blood pressure of <140 mmHg and diastolic blood pressure of <90 mmHg.

Statistical analysis

Results were expressed as mean ± standard deviation (for continuous variables) or as percentages. Bivariate comparisons were performed using χ^2 test for categorical variables. Multivariate analysis was performed using logistic regression and results were expressed as odds ratios with 95% confidence intervals (CIs).[23] All statistical analyses were performed using SPSS 19.0 for Windows (SPSS, Inc., an IBM Company © Copyright 2010).

Results

Characteristics of the respondents

Among the 714 respondents included in the analysis, 329 were men (46.1%) and 385 were women (53.9%). Of the 329 men, 119 (36.2%) were in James Town, 160 (48.6%) in Ussher Town and 50 (15.2%) in Agbogbloshie. Out of the 385 women who participated in the study, 123 (31.9%) were in James Town, 191 (49.6%) in Ussher Town and 71 (18.4%) in Agbogbloshie. The mean age was 31.1 years (range 15–59 years). Of the three communities, Agbogbloshie had the highest proportion of residents with no formal education (41.0%) while Ussher Town had the highest proportion of residents with higher or tertiary education (58.8%) with a p-value of <0.001. With regards to BMI, 21.7% of respondents were overweight and 17.1% were obese. More women (88.5%) than men (11.5%) were obese (p<0.001).The characteristics of the study population are presented in Table 1.

Systolic and diastolic blood pressure values

Systolic and diastolic blood pressures were higher in men than in women (p<0.001 for systolic and p=0.007 for diastolic). Systolic and diastolic blood pressures also increased progressively with age in men and in women (p<0.001 for systolic and p<0.001 for diastolic). However, no clear pattern was observed by educational level.

Table 1. Characteristics of respondents by sex

Characteristic	**All (*n*=714)**	**Men (*n*=329)**	**Women (*n*=385)**
Mean age (years)	31.1 (±10.6)	31.5 (±11.6)	30.6 (±9.6)
Systolic blood pressure (mmHg)	121.6 (±.16.6)	124.4 (±15.9)	119.4 (±16.7)
Diastolic blood pressure (mmHg)	76.5 (±11.9)	77.5 (±12.2)	75.4 (±11.5)
Body mass index (kg/m^2)	25.0 (±6.8)	22.8 (±3.9)	26.9 (±8.1)
Age groups			
Younger adults (15-24)	240 (33.6%)	110 (45.8%)	130 (54.2%)
Middle-aged adults (25-34)	222 (31.1%)	104 (46.8%)	118 (53.2%)
Older adults (≥35)	252 (35.3%)	115 (45.6%)	137 (54.4%)
Highest Level of Education			
No education	39 (5.5%)	10 (25.6%)	29 (74.4%)

Primary education	141 (19.7%)	37 (26.2%)	104 (73.8%)
Junior secondary school (JHS)	315 (44.1%)	147 (46.7%)	168 (53.3%)
Senior secondary school (SHS)	185 (25.9%)	107 (57.8%)	78 (42.2%)
Tertiary	34 (4.8%)	28 (82.4%)	6 (17.6%)
Locality of residence			
James Town	242 (33.9%)	50 (41.3%)	71 (58.7%)
Ussher Town	351 (49.2%)	119 (49.2%)	123 (50.8%)
Agbogbloshie	121 (16.9%)	160 (45.6%)	191 (54.4%)
Ethnicity			
Ga-Dangme	419 (58.7%)	78 (41.5%)	110 (58.5%)
Akan	188 (26.3%)	211 (50.4%)	208 (49.6%)
Ewe	35 (4.9%)	13 (37.1%)	22 (62.9%)
Northern ethnic groups	72 (10.1%)	27 (37.5%)	45 (62.5%)
Physical activity			
≥3 days in a week	202 (28.3%)	66 (32.7%)	136 (67.3%)
<3 days in a week	512 (71.7%)	263 (51.4%)	249 (48.6%)
Alcohol consumption			
Non-drinkers	261 (36.6%)	108 (41.4%)	153 (58.6%)
Occasional drinkers	327 (45.8%)	144 (44.0%)	183 (56.0%)
Regular drinkers	126 (17.6%)	77 (61.1%)	49 (38.9%)

Values are Mean ± SD or *n* (%)

Prevalence, awareness, treatment and control of hypertension

The overall prevalence of hypertension was 28.3% (women 25.6% and men 31.0%) (Table 2). The prevalence of hypertension increased with age in both men and women in all three localities (Figure 2). Apart from the middle-aged adults (25-34years), men had a higher prevalence of hypertension than women in the other age categories. Among the ethnic groups, Akans had the highest prevalence (30.9%). Respondents with secondary education had the highest prevalence than the other categories of education and this was statistically significant (p=0.018).The prevalence of hypertension was higher among overweight and obese respondents (31.0% and 30.3% respectively) than in respondents with normal weight (27.2%) even though the difference was not statistically significant (p=0.661).

Among respondents who had hypertension, 7.4% were aware of their condition; meaning they had been diagnosed by a health professional. About 4% of hypertensive subjects were on antihypertensive medication while 3.5% of hypertensive respondents on treatment had their blood pressure controlled below 140/90 mmHg. The level of awareness and treatment was lower in males than in females (p=0.035 and p=0.085 respectively). Among individuals on treatment, the level of control was higher among females compared with males.

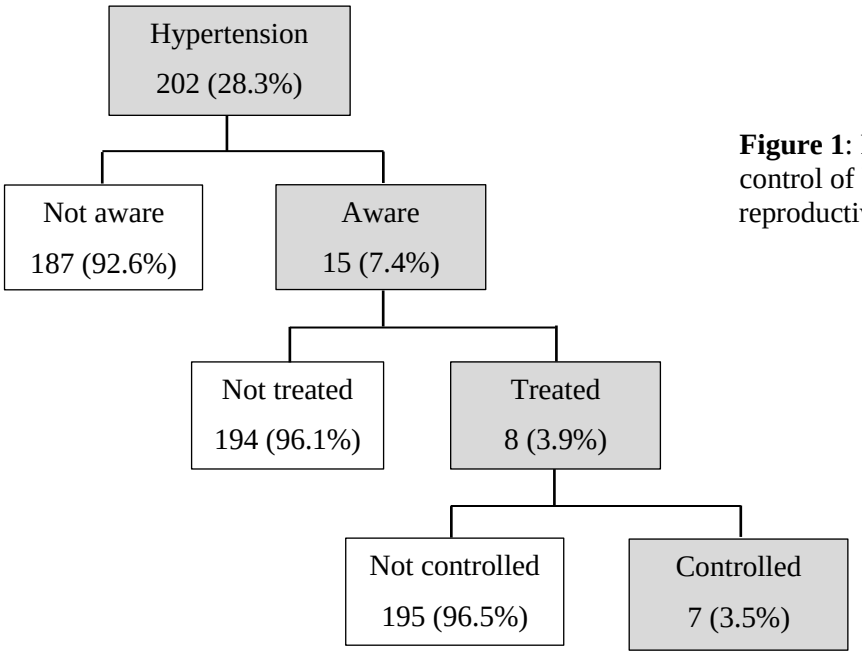


Figure 1: Prevalence, awareness, treatment, and control of hypertension among adults in their reproductive ages in urban poor areas in Accra.

Table 2. Prevalence of hypertension by some demographic characteristics of the study participants

	All (*n*=714)	**Men (*n*=329)**	**Women (*n*=385)**
Hypertension	202 (28.3%)	104 (31.0%)	98 (25.6%)
Awareness among hypertensives	15 (7.4%)	3 (3.1%)	12 (11.9%)
Treatment among hypertensives	8 (3.9%)	1 (1.3%)	7 (6.5%)
Control among treated hypertensives	7 (3.5%)	2 (2.1%)	5 (5.0%)

Values are *n* (%)

Factors related to hypertension prevalence.

The factors related to the prevalence of hypertension in urban poor communities in Accra were assessed separately for each sex using logistic regression analysis. The factors related to awareness, treatment and control of hypertension were not analyzed due to the small proportions of respondents in these categories (7.4%, 3.9% and 3.5% respectively).

After adjusting for age, locality, education and ethnicity, alcohol consumption and BMI had a positive association with the prevalence of hypertension in both men and women. Physical activity had an inverse relationship with the prevalence of hypertension in both men and women such that respondents who had <3 days in a week of physical activity were more likely to have hypertension. The results are summarized in Table 3.

Table 3. Factors related to hypertension prevalence.

	All		Men		Women	
	Odds ratio (95% CI)	*P*	Odds ratio (95% CI)	*P*	Odds ratio (95% CI)	*P*
Alcohol consumption						
Regular drinkers *(ref.)*	1 (ref.)		1 (ref.)		1 (ref.)	
Occasional drinkers	0.7 (0.5 – 1.0)	*	0.6 (0.3–1.0)	*	0.9 (0.5–1.5)	
Non-drinkers	0.9 (0.6 – 1.5)		1.0 (0.4–1.8)		0.9 (0.4–2.0)	
BMI						
Underweight *(ref.)*	1 (ref.)		1 (ref.)		1 (ref.)	
Normal	1.1 (0.6 – 2.3)		0.6 (0.3–1.5)		3.2 (0.7–14.4)	
Overweight	1.3 (0.6 – 2.8)		1.5 (0.6–4.3)		2.4 (0.5–11.6)	
Obese	1.4 (0.6 – 3.1)		1.6 (0.4–6.5)		2.8 (0.6–13.2)	
Physical activity						
≥3 days / week *(ref.)*	1 (ref.)		1 (ref.)		1 (ref.)	
<3 days / week	1.3 (0.9–1.9)		2.5 (1.2–5.0)	**	1.1 (0.6–1.7)	
Locality	0.6 (0.5–0.8)	***	0.6 (0.4–0.9)	**	0.7 (0.5–0.9)	**
Education	1.3 (1.1–1.6)	**	1.3 (1.0–1.7)	**	1.4 (1.0–1.8)	**
Ethnicity	0.9 (0.8–1.1)		0.5 (0.4–0.8)	***	1.2 (0.9–1.6)	
Age	1.0 (1.0–1.1)	**	1.0 (1.0–1.1)		1.0 (1.0–1.1)	***

Results are expressed as odds ratio and 95% confidence interval adjusted for locality, education, ethnicity and age. *P< 0.05; **P< 0.01 and ***P< 0.001. *ref.*, reference group.

Figure 2. Prevalence of hypertension by age-group among adults in their reproductive ages in Accra.

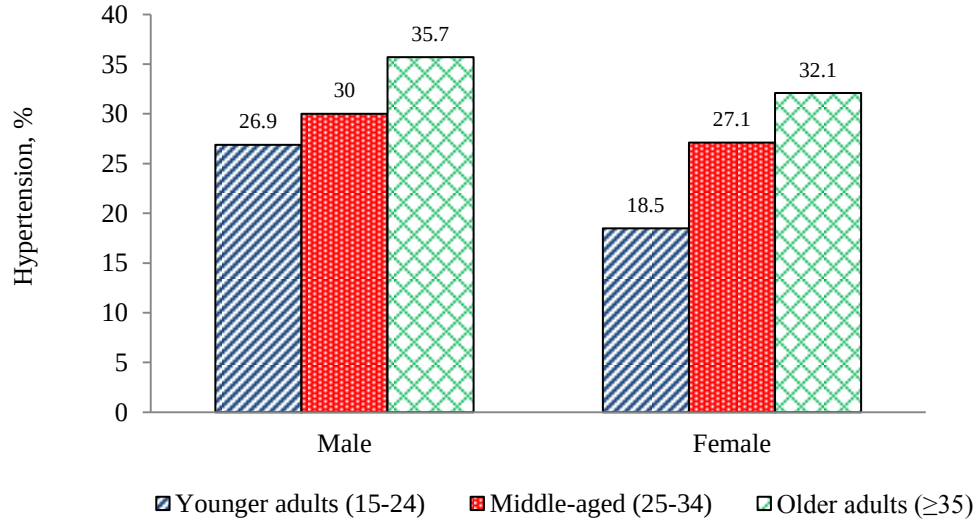
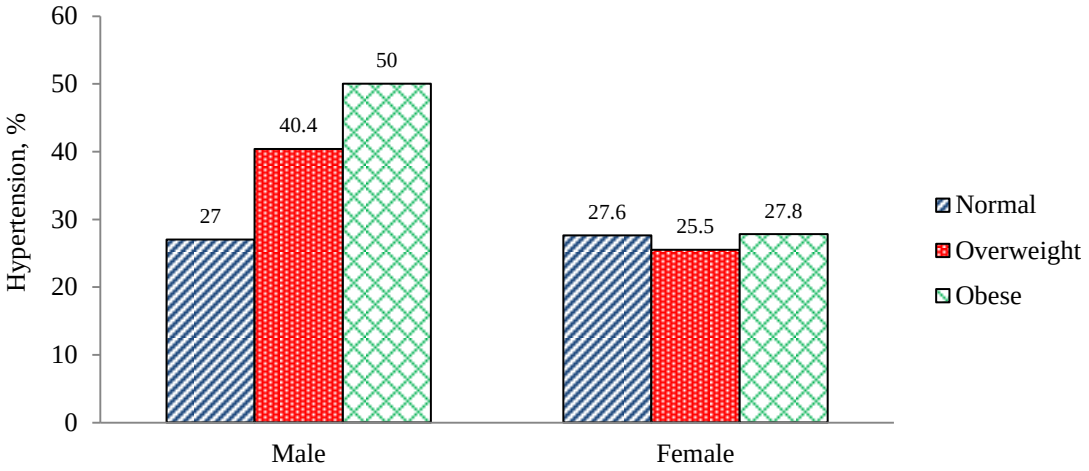


Figure 3. Prevalence of hypertension by BMI status among adults in their reproductive ages in Accra.



Discussion

There are a number of studies on the detection, management, control and distribution of hypertension among the adult population in Ghana and some West African countries.[10, 12, 24–30] In all of these studies, the prevalence of hypertension has been consistently higher particularly in urban areas. Additionally, such studies have shown evidence of low levels of awareness or detection and corresponding low rates of treatment and control. There is therefore an urgent need for pragmatic strategies to tackle this serious threat to the health of the people in urban (poor) settings.[10]

Prevalence of hypertension

The overall prevalence of hypertension in this study was 28.3% and remarkably the same as the prevalence of 28.3% found in another study in Accra[12] and similar to the prevalence of 28.7% found in Kumasi.[10] In the study in Accra however, hypertension was more common in women than men. The prevalence of hypertension in our study was higher than ones found in some West African countries. For example a study in Nigeria found a prevalence of 21.1% among urban men and women.[32] Another study in Sierra Leone found a prevalence of hypertension to be 25.2% (crude) and 19.6%. (age-adjusted).[33] On the other hand, the prevalence rate in this study was much lower compared with other parts of sub-Saharan African countries[34–35] For example in urban Namibia, the prevalence of hypertension was 38.0%.[36] The prevalence in this study was also much lower compared to Ghanaians living in the Netherlands[18] as well as African Caribbean's in the United Kingdom[37] and Africa descent populations in the United States of America.[38] In Ghana, within a 15 year period (from 1972 to 1987) a number of studies were carried out in the Greater Accra region as part of a research into the health burden of

cardiovascular diseases. The prevalence of hypertension which was defined as ≥160/95 mm Hg, was found to be between 8% to 13% in the city.[10, 25, 31]

The prevalence of hypertension found in this study, therefore indicates that the condition persists and is increasing in prevalence despite efforts over the years to reduce it. The reason for this persistent or increasing rate of hypertension among residents living in urban poor communities in Accra is uncertain. It has however been suggested that environmental factors could explain this phenomenon.[39] Additionally, it has also been found that BMI is one of the most essential factors to explain the prevalence of hypertension in African communities.[30] Cultural, traditional and socio-economic factors may also be at play[40] and these factors may explain the lifestyles or way of living of residents in the three communities that predispose them to developing hypertension overtime.

Conclusion

The very low levels of awareness, treatment and control despite the high prevalence of hypertension should be a matter of concern to stakeholders in the health sector. Urgent medical assistance, which should be comprehensive in nature, is advocated for implementation in the communities. The human resource needed to implement such plans should be given adequate training. Considering the scarcity of resources in many developing countries including Ghana, activities aimed at preventing, managing and controlling hypertension have to compete with many other pressing economic, social and health needs. This would therefore mean that important measures be taken by political administrations and health authorities to reduce risks of hypertension and for that matter other cardiovascular diseases and optimize health outcomes in general. This could be achieved by implementing cost-effective measures such as promotion of physical activity, reduction of alcohol consumption and advocacy for maintaining normal and healthy body sizes.

References

1. Kearney P.M., Whelton M., Reynolds K., Whelton P.K., He J. Worldwide prevalence of hypertension: a systematic review. *J Hypertens*. 2004; 22:11–19.

2. Mathers CD, Loncar D. Projections of global mortality and burden of disease from 2002 to 2030. *PLoS Med*. 2006; 3:e442.

3. Seedat Y.K. Recommendations for hypertension in sub-Saharan Africa. *Cardiovasc J S Afr*. 2004; 15:157–158.

4. Singh R.B., Suh I.L., Singh V.P., Chaithiraphan S., Laothavorn P., Sy R.G., et al. Hypertension and stroke in Asia: prevalence, control and strategies in developing countries for prevention. *J Hum Hypertens*. 2000; 14:749-763.

5. Yusuf S., Reddy S., Ounpuu S., Anand S. Global burden of cardiovascular diseases: part I: general considerations, the epidemiologic transition, risk factors, and impact of urbanization *Circulation*. 2001; 104:2746-2753.

6. Damasceno A., Azevedo A., Silva-Matos C., Prista A., Diogo D., Lunet N. Hypertension prevalence, awareness, treatment, and control in Mozambique. Urban/rural gap during epidemiological transition. *Hypertension*. 2009; 54:77-83.

7. Mate-Kole M.O., Affram R.K. Presentation and clinical course of end-stage renal failure in Ghana. A preliminary prospective study. *Ghana Med. J*.1990; 24:164–168.

8. Centre for Health Information Management: Outpatient morbidity in health facilities, Ghana. Accra: Ghana Health Service 2008.

9. Bosu W.K. Epidemic of hypertension in Ghana: a systematic review. *BMC Public Health*. 2010; 10:418.

10. Cappuccio F.P., Micah F.B., Emmett L., Kerry S.M., Antwi S., Martin-Peprah R. et al. Prevalence, detection, management, and control of hypertension in Ashanti, West Africa. *Hypertension*. 2004; 43:1017–1022.

11. Greater Accra Regional Health Directorate: Annual Report 2007.Accra: *Ghana Health Service* 2008.

12. Amoah AGB. Hypertension in Ghana: a cross-sectional community prevalence study in Greater Accra. *Ethn Dis.* 2003; 13:310–315.

13. Addo J., Smeeth L., Leon D.A. Hypertension in Sub-Saharan Africa: A Systematic Review. *Hypertension*. 2007; 50:1012-1018.

14. Chobanian A.V., Bakris J.L., Black H.R., Cushman W.C., Green L.A., Izzo J.L., et al. Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure: The JNC 7 report. *The Journal of the American Medical Association.* 2003; 289(9), 2560.

15. World Health Organization (2008). WHO STEPS Surveillance Manual. Geneva: WHO.

16. Magee L.A. Diagnosis, Evaluation, and Management of the Hypertensive Disorders of Pregnancy. *JOGC*. 2008; Vol. 30 (3), 206.

17. Siddiqui Q, Anam M. and Mahmood, K.T. Management of Pregnancy Induced Hypertension. *Journal of Pharmaceutical Science and Technology*. 2010; 2 (12), 421-426.

18. Agyeman C., Nicolaou M., Boateng L., Dijkshoorn, van de Born B-J., and Stronks K. Prevalence, awareness, treatment and control of hypertension among Ghanaian population in Amsterdam, the Netherlands: the GHAIA study. *European Journal of Preventive Cardiology* 2012; 0(00) 1-9.

19. Salmon J., Owen N., Bauman A., Schmitz M.K.H, and Booth M. Leisure-Time, Occupational, and Household Physical Activity among Professional, Skilled, and Less-Skilled Workers and Homemakers. *Preventive Medicine*. 2000; 30,191–199.

20. Pescatello L.S, Franklin B.A, Fagard R., Farqular W.B, Kelley G.A, Ray C.A. American College of Sports Medicine position stand. Exercise and hypertension. *Med Sci Sports Exerc*. 2004; 36: 533-553.

21. Puddey, I.B., Rakic, V., Dimmitt, S.B., Beilin, L.J. Influence of pattern of drinking on cardiovascular disease and cardiovascular risk factors: A review. *Addiction.* 1999: 94(5):649–663.

22. Burt V.L. et al. Trends in the prevalence, awareness, treatment and control of hypertension in the adult US population. Data from the health examination surveys, 1960 to 1991.*Hypertension.* 1995; 26: 60–69.

23. Danon-Hersch N., Marques-Vidal P., Bovet P., et al. Prevalence, awareness, treatment and control of high blood pressure in a Swiss city general population: the CoLaus study. *European Journal of Cardiovascular Prevention and Rehabilitation.* 2009; 16:66–72.

24. Agyeman C. Rural and urban differences in blood pressure and hypertension in Ghana, West Africa. *Public Health*. 2004. 6:525–533.

25. Pobee J.O.M. Community-based high blood pressure programs in sub-Saharan Africa. *Ethn Dis*.1993;3:S38–S45.

26. Bosu W.K. Epidemic of hypertension in Ghana: a systematic review. *BMC Public Health*. 2010; 10:418

27. Akinkugbe O.O. The Nigerian hypertension programme. *J Hum Hypertens*. 1996;10:S43–S46.

28. Lisk D.R., McEwen E.K. The significance and trend of hypertension related deaths in urban Sierra Leonean Africans. *J Hum Hypertens*. 1996;10: 215–218.

29. van der Sande M.A.B, Milligan P.J.M., Walraven G.E.L., Dolmans W.M.V., Newport M., Nyan O.A., Banya W.A.S, Thien T.H., Ward R., McAdam K.P.W.J. Geographical variation in prevalence of hypertension within The Gambia. *J Hum Hypertens*.2001;15:733–739.

30. Cooper R., Rotimi C., Ataman S., McGee D., Osotmehin B., Kadiri S., Muna W., Kingue S., Fraser H., Forrester T., Bennett F., Wilks R. The prevalence of hypertension in seven populations of West African origin. *Am J Public Health*.1997; 87:160–168.

31. Pobee J.O., Larbi E.B., Dodu S.R., Pisa Z., Strasser T. Is systemic hyper-tension a problem in Ghana? *Trop Doct.*1979;9:89–92.

32. Ekwunife, O., Udeogaranya, P. and Nwatu, I. (2010) Prevalence, awareness, treatment and control of hypertension in a Nigerian population. *Health*, 2010; 2, 731-735.

33. Meehan K.A., Bankoski A.J., Tejan E., Ansumana R., Bangura U., Stenger D.A., Jacobsen K.H. Hypertension in Bo, Sierra Leone. *Ethn Dis.* 2011,21(2):237-42.

34. Goma F.M., Nzala S.H., Babaniyi O., Songolo P., Zyaambo C., Rudatsikira E., Siziya S., Muula A.S. Prevalence of hypertension and its correlates in Lusaka urban district of Zambia: a population based survey. *International Archives of Medicine*, 2011; 4:34.

35. Jenson A., Omar A.L., Omar M.A., Rishad A.S., Khoshnood K.. Assessment of hypertension control in a district of Mombasa, Kenya. *Global Public Health.* 2011;6(3):293-306.

36. Hendriks M.E., Wit F.W.N.M., Roos M.T.L., Brewster L.M., Akande T.M., et al. Hypertension in Sub-Saharan Africa: Cross-Sectional Surveys in Four Rural and Urban Communities. *PLoS ONE*, 2012 7(3): e32638.

37. Agyemang C., Bhopal R. Is the blood pressure of people from African origin adults in the UK higher or lower than that in European origin white people? A review of cross-sectional data. *J Hum Hypertens*, 2003;17: 523–534

38. Cooper R.S., Wolf-Maier K., Luke A., Adeyemo A., Banegas J.R., Forrester T. et al. An international comparative study of blood pressure in populations of European vs. African descent. *BMC Med*, 2005; 3: 2.

39. Agyeman C., Addo J., Bhopal R., et al. Cardiovascular diseases, diabetes and established risk factors among populations of sub-Saharan African descent in Europe: a literature review. *Global Health*, 2009; 5:7.

40. Agyemang C., Bhopal R., Bruijnzeels M. Negro, black, black African, African Caribbean, African American or what? Labelling African origin populations in the health arena in the 21st century. *J Epidemiol Community Health*, 2005; 59: 1014–1018.