The Changing Patterns of Hypertension in Ghana: A Study of Four Rural Communities in the Ga District

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Objective: To determine the prevalence, distribution and risk factors of hypertension among rural residents in Ghana.

Design and Setting: Cross sectional study in four rural communities in the Ga District of Ghana.

Subjects and Methods: All adults aged ≥18 years in four rural communities were asked to participate. The average of two blood pressure readings taken with a mercury sphygmomanometer after 10 minutes of rest was used in the analysis. Hypertension was defined as blood pressure ≥140/90 mm Hg.

Results: 362 subjects with a mean age of 42.4 ± 18.6 years participated in the study. The prevalence of hypertension was 25.4%. Of those with hypertension, only 32.3% (n=30) had prior knowledge of their condition, and less than half of these (n=12) were on treatment. Of those on treatment 16.7% were well controlled (blood pressure ≤140/90 mm Hg). The adjusted odds ratios for developing hypertension for overweight or obesity were 5.8 (95% confidence interval 1.4–24.3) and 6.9 (95% confidence interval 1.7–28.2), respectively. The adjusted odds ratio for hypertension for age groups 45–54, 55–64, and ≥65 years were 31.9 (95% confidence interval 1.88–539.11), 31.8 (95% confidence interval 1.6–624.2), and 58.8 (95% confidence interval 2.9–1168.7), respectively. The adjusted odds ratio for hypertension with respect to smoking, alcohol consumption, job-related physical activity, family history, education, occupation, and diabetes status did not attain statistical significance.

Conclusion: Hypertension is now of public health significance in rural Ga District of Ghana. The high rate of hypertension was associated with low levels of awareness, drug treatment, and blood pressure control. Overweight and obesity are modifiable risk factors for hypertension that can be addressed through lifestyle interventions. Additionally, integrating hypertension care into primary care in rural health facilities may prove beneficial. (*Ethn Dis*. 2006;16:894–899)

Key Words: Africa, Cardiovascular Risk Factors, Community, Hypertension, Prevalence, Rural

Introduction

Hypertension is an important cause of morbidity and mortality worldwide. Its definition is arbitrary and has been defined as the level of blood pressure (BP) at which detection and treatment do more good than harm.[1] The current definition of hypertension is a systolic BP ≥140 mm Hg or diastolic BP ≥90 mm Hg or both.[2]

Hypertension, which was considered to be nonexistent or extremely rare in most African societies, particularly in rural communities, is now emerging as a public health problem in sub-Saharan Africa.[3–5] The rise in prevalence may be a result of rapid changes in diet and physical activity related to urbanization and modernization, which has affected both urban and rural dwellers.[6,7] The prevalence of hypertension in various African communities has varied widely but has generally been higher in urban than in rural communities, with a few exceptions.[5–13] Hypertension has been associated with various factors, including age, sex, family history, alcohol consumption, smoking, obesity, level of education, and occupation, among others.[14–18] In Ghana, few population-based studies on hypertension have been carried out. A blood pressure survey of 20 rural Ghanaian villages in 1973 found a prevalence of 2%–5% and concluded that hypertension was not a significant health problem in rural Ghanaians.[4] In a recent study of two urban communities and one rural community in Ghana, however, hypertension prevalence was 28.4%.[19] The annual health report of the Ga District continues to show hypertension ranking among the top 10 diseases over the past five years, indicating that contrary to what is believed, hypertension does not only occur in urban areas.[20] Hypertension may thus not be rare in rural Ghana as previously noted. This study was carried out to determine the prevalence of hypertension among adults in a rural district of Ghana, to establish the pattern of hypertension distribution, and to evaluate the risk factors associated with high BP.

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Patients and Methods

The Amasaman sub-district is located ≈25 km from Accra, the capital city of Ghana. It has ≈152 communities, with an estimated population 233,884. Four of these stable communities were sampled purposively for participation. The communities, Sarpeiman, Opah, Ayikai Doblo, and Amamoley, had

similar characteristics, typically farming and rural, with electoral registers of 100 to 250 adults aged ≥18 years. All adults aged ≥18 years in the four communities were invited to participate in the study.

Training of Survey Team

To standardize survey measurements and procedures, the research team was trained with specially prepared survey manuals that conformed to recommended noncommunicable disease survey protocols.[21] Before the main study, a field test was carried out to fine tune survey procedures.

Measurement of Blood Pressure

Two nurses with certification in BP measurement (Accurate Blood Pressure Measurement: A Video-Tutored Course - Shared Care, Torrance, Calif, USA) measured the BP of subjects. A quiet area at the survey site was chosen for BP. Blood pressure (BP) was taken from 7 AM–11 AM. The subjects rested quietly for ≥10 minutes and were not permitted to smoke. With the right arm of the subject held at the level of the heart, the maximum inflation level was determined with a mercury sphygmomanometer, using a 15 cm stethoscope and a cuff of appropriate size (a cuff of larger width was used for large arms). The first and fifth Korotkoff sounds were employed for systolic and diastolic pressures, respectively. For sounds that continued to 0 mm Hg, the fourth Korotkoff sound was used for diastolic pressure. Blood pressure was measured to the nearest 2 mm Hg on two occasions at an interval of one minute. The mean of the two measurements was used in analysis. The heart rate was measured during the one-minute interval.

Demographic and Anthropometric Assessment

Demographic data and hypertension status/treatment were subsequently determined with the aid of a structured questionnaire. Anthropometric measurements were performed on subjects in light clothing and without shoes. Weight was measured with a heavy-duty Seca 770 floor digital scale (Seca, Hamburg, Germany) to the nearest .1 kg. Height was measured with a stadiometer to the nearest .1 cm.

Table 1. Characteristics of survey subjects (mean ± standard deviation)

Variable	Female	Male	All
Age (years)	41.6 ± 18.4	44.2 ± 19.2	42.4 ± 18.6
Systolic BP (mm Hg)	128.46 ± 27.6	125.4 ± 20.9	127.5 ± 25.8
Diastolic BP (mm Hg)	73.8 6 ± 14.4	74.5 ± 14.2	74.0 ± 14.3
BMI (kg/m^2)*	23.9 ± 5.4	21.5 ± 2.8	23.2 ± 4.9

* P=.001.
BP=blood pressure; BMI=body mass index.

Ethical Issues

The study was approved by the ethical review committee of the University of Ghana Medical School and complied with the Helsinki Declaration of 1975 (revised in 1983) on human experimentation. Informed consent was obtained from all subjects. The objectives of the survey and survey procedures were explained to all subjects. In addition, prospective subjects were made aware that participation was entirely voluntary and that they had the right to refuse to participate or to withdraw from the survey at anytime. Participants were informed of the results of their BP readings. Subjects found to be hypertensive were counseled and given pre-printed referral letters to attend the nearest health facility for confirmation of hypertension and management.

DATA MANAGEMENT AND ANALYSIS

All data forms were entered with Epi Info version 6 (Centers for Disease Control and Prevention, Atlanta, Ga) and were checked for range and internal consistency. Analysis was conducted by using Stata (StataCorp LP, College Station, Tx) and Microsoft Excel (Microsoft Corp, Redmond, Wash) software packages. Hypertension was defined as BP ≥140/90 mm Hg.[22] Hypertensive subjects were further categorized according to the former World Health Organization criteria of BP ≥160/95, to allow for comparison with previous studies carried out in rural Ga.[4] Body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared and was graded as normal if it was 18.5–24.9 kg/m^2, overweight if 25.0–29.9 kg/m^2, and obese if ≥30.0 kg/m^2.[23]

Statistical tests included the chi-square test for comparison of proportions and Student t test for normally distributed data. Univariate and multiple regression models were used to calculate odds ratios. Results were considered statistically significant if $P<.05$.

RESULTS

The response rate varied from 60% to 80% in the four communities. A total of 362 respondents (out of 363 surveyed), 255 females and 107 males, were used in the analysis. Ages ranged from 18 to 98 and 18 to 99 years for males and females, respectively. The mean characteristics of the study subjects are shown in Table 1. No statistical sex difference was seen with respect to age, systolic, or diastolic pressures. Females had higher BMI than males. Figure 1 shows the mean blood pressure distribution by age and

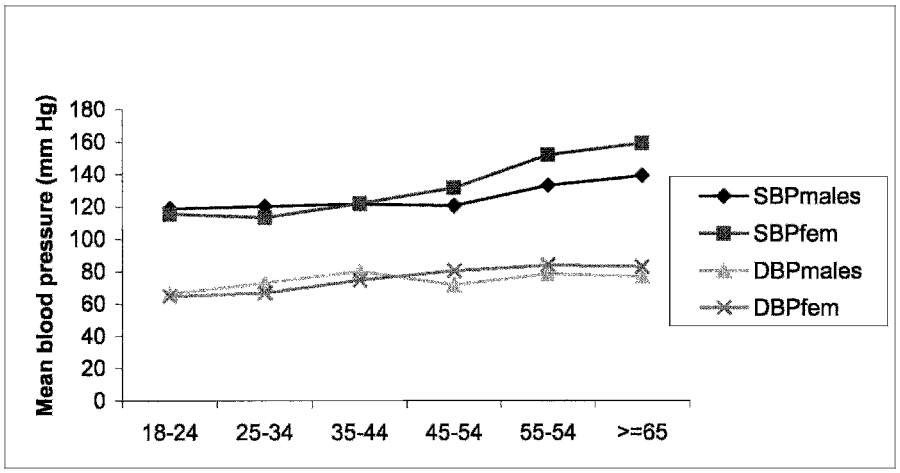

Fig 1. Mean blood pressure distribution by age and sex. SBP=systolic blood pressure; DBP=diastolic blood pressure; fem=females

sex. After the age of 45 years, females had higher blood pressures than males (Figure 1).

Most of the subjects (73.5%) belonged to the Ga-Adangbe ethnic group; Ewes (16.3%) were the second-largest group. Sixty-four percent (64%) of the subjects were married, 41.2% had no formal education, 18.5% had six years of education, 34.3% had completed nine years of education, and the remainder had more than nine years of education. The major occupations were trading (41.9%) and farming (29.8%); 6.9% were artisans.

Prevalence of Hypertension

The prevalence of hypertension, BP ≥140/90 mm Hg and ≥160/95 mm Hg were 25.4% and 15.2%, respectively. Only 30 (32.3%) of the 93 found to be hypertensive were aware they had high blood pressure. Of those aware, only 16.7% had their blood pressure under control (<140/90 mm Hg).

Risk Factors For Hypertension

More than one in five of the patients with hypertension (22.5%) had a first-degree relative with hypertension, compared to 18.5% of the normotensive subjects, though this finding did not attain statistical significance. Table 2 shows distribution of hypertension and the crude and adjusted (for all variables) odds ratio for hypertension (BP ≥140/90 mm Hg) for various variables. The odds for developing hypertension increased with increasing BMI and age. The association between BMI and BP increased further after adjusting for other potential confounders (Table 2). The odds for having hypertension with increasing age decreased slightly after controlling for confounders. Hypertension tended to be higher in participants with diabetes compared to nondiabetic subjects, but this finding was not statistically significant (Table 2).

Sixty percent of respondents admitted to current consumption of alcohol. Current alcohol consumption was, however, not significantly associated with hypertension. Current smoking was relatively low among this population; 9.6% of subjects had ever smoked, while 3.3% were current smokers. Although the odds for having hypertension among smokers was almost three times that of nonsmokers, this finding was not statistically significant (Table 2).

Prevalence of hypertension was higher in those with no education compared to those with some years of education. The odds of having hypertension in those with more than nine years of formal education was, however, almost three times that of those with no education at all, after controlling for potential confounders (Table 2). The odds in the intermediate groups followed no clear trend. The difference was not statistically significant.

Prevalence of hypertension was higher in the farmers (32.7%) than traders (25%) and the other occupation groups, but the odds of having hypertension were almost the same between farmers and traders after controlling for potential confounders (Table 2).

DISCUSSION

Our study shows that hypertension is no longer rare in rural Accra. The prevalence of hypertension was relatively high, but awareness and control were low. Hypertension was associated with obesity, overweight, increasing age, decreasing physical activity, and lack of education. A quarter of subjects studied had hypertension (25.4%). The current rate of hypertension in rural Ga is nearly eight times what it was 30 years ago, and the rate in urban Accra has nearly doubled in that time.[4,24] However, the criteria for hypertension diagnosis and the sampling frame at that time were different from our study. Using the older classification of hypertension (BP ≥160/95 mm Hg) to enable comparison with the previous studies, the prevalence of hypertension in our study population was 15.2%, which is higher than the 4.5% rate reported in a previous study in the same district.[4] The prevalence is, however, comparable to that seen in recent Ghanaian studies that have included both rural and urban areas.[19,25] Studies done in other African countries have stated prevalence in rural areas from 2.6% to 15%.[10–12,15,26,27] Urban areas have generally reported higher prevalence from 6.4% to 41%, although some of the disparity may be due to differences in age of population

Table 2. Distribution (crude and adjusted†) of risk factors for hypertension in the study population

Variable	Number	Hypertension %	Crude OR (95% CI)	Adjusted OR† (95% CI)
Sex				
Male	107	24.1	1.00	
Female	255	25.9	1.10 (.65–1.86)	
Current alcohol use				
No	112	20.7	1.00	1.00
Yes	169	26.8	1.40 (.77–2.54)	.44 (.15–1.29)
Body mass index				
Normal	268	19.4	1.00	1.00
Overweight	57	43.9	3.25 (1.77–5.93)*	5.80 (1.39–24.3)*
Obese	37	40.5	2.83 (1.37–5.83)*	6.86 (1.67–28.2)*
Current smoking				
No	350	34.3	1.00	1.00
Yes	12	24.5	2.81 (.42–23.55)	1.38 (.3–6.47)
Diabetes				
No	299	24.7	1.00	1.00
Yes	4	75.0	9.12 (.83–231.12)	1.38 (.3–6.47)
Contraceptive use				
No	215	8.8	1.00	1.00
Yes	34	29.0	4.21 (1.17–17.98)*	.66 (.10–4.19)
Educational level				
None	148	43.6	1.00	1.00
6 years	67	10.4	.15 (.05–.37)*	.15 (.03–.85)*
9 years	125	13.6	.20 (.10–.39)*	.59 (.10–3.30)
>9 years	22	13.6	.20 (.05–.78)*	2.63 (.09–71.2)
Age group (years)				
<25	67	6.0	1.00	1.00
25–34	89	4.5	.74 (.18–3.08)	1.23 (.05–32.8)
35–44	61	16.4	3.08 (.91–10.4)	3.62 (.18–71.1)
45–54	48	35.4	8.64 (2.68–27.8)*	31.9 (1.88–539.11)*
55–64	39	51.3	16.58 (5.04–54.5)*	31.8 (1.6–624.2)*
≥65	58	63.8	27.75 (8.8–87)*	58.8 (2.9–1168.7)*
Job-related physical activity				
Sedentary	13	69.2	1.00	1.00
Mild activity	84	41.7	.32 (.009–1.11)	.16 (.00–718.8)
Moderate activity	209	19.1	.109 (.03–.37)*	.05 (.00–201.6)
Heavy activity	55	9.1	.04 (.009–.19)*	.029 (.00–162.0)
Occupation				
Farming	107	32.7	1.00	1.00
Trading	152	25.0	.69 (.39–1.18)	1.03 (.49–2.13)
Others	103	19.2	.49 (.26–.92)*	1.24 (.55–2.79)

* $P<.05$.
† Adjusted for all variables shown.
OR=odds ratio; CI=confidence interval.

studied as well as methods used and blood pressure cutoffs.[9,16,18,28]

We saw no significant sex difference in hypertension prevalence in the present study. However, mean systolic and diastolic BP was higher in males than in females up to age 45; thereafter, mean blood pressures became higher in females. This finding agrees with documented evidence in which young and middle-aged male adults are said to have higher mean BP compared to females; the difference narrows later in life, and the pattern may reverse because of hormonal changes in females after menopause.[29]

We saw no significant difference in the prevalence of hypertension in the different communities. This finding was expected since the communities are all typically rural with similar characteristics. The relatively high prevalence of

The prevalence of hypertension was relatively high, but awareness and control were low [in rural Ghana].

hypertension in the rural Ga district since the study in 1973 could be attributed to transformation of rural areas, which could have resulted in a decrease in physical activity from use of automobile transportation and increased mechanization in agriculture. Concomitantly, Ghanaians are adopting lifestyles that they perceive to be desirable or modern, which is changing the types of food consumed both in rural and urban areas.[30]

Only 26% of hypertensives in the study were aware they had high BP. The low levels of awareness may be partly due to poorly developed health services and the relatively low functional literacy rate in rural Ghana. Only 50% of those with previously known hypertension were receiving antihypertensive treatment, and only 16.7% of them had their BP under control. Community hypertension surveys in various parts of the United States have shown that most people with hypertension are either undetected, untreated, or inadequately treated.[31] In many populations, half of the hypertensives are known to have hypertension, half of the known hypertensives are treated, and half of the treated hypertensives are controlled.[32] Low levels of awareness have been described in most studies in Africa.[15,17,19,33] In a recent study from greater Accra, 34% were aware they had high BP, 18% were receiving treatment, and only 4% had their BP controlled.[19] Ghanaian patients often present late with complications of hypertension such as heart failure, stroke, and chronic renal failure.[19] Effective treatment of

hypertension could prevent 250,000 deaths each year in sub-Saharan Africa.[34]

The prevalence of hypertension increased with age, as has been observed in most studies.[16,19,26,35] Hypertension prevalence was 60% among respondents >65 years of age, while it was 6% in those 18–24 years.

Most of the respondents were in jobs that involved physical activity to varying degrees (73%) and also carried out other activities several times a week. The mean BMI of 21.5 ± 2.8 kg/m^2 and 23.9 ± 5.4 kg/m^2 for men and females, respectively, compare to those obtained for men (21.2 and 24.5 kg/m^2, respectively) in rural residents of Accra.[36,37] In fact, overweight and obesity are no longer rare in rural residents[36,37] and may be partly responsible for the high prevalence of hypertension in the Ga District. Hypertension prevalence was significantly higher in those who were overweight and obese as well as those involved in less physical activity. The prevalence of hypertension increased as body mass increased from 18% in those with normal body mass to 100% in respondents with grade 3 overweight. This finding was consistent with available literature since increased fat mass is associated with increased risk of hypertension even in lean populations.[38]

No significant association was observed between hypertension prevalence and alcohol consumption. Epidemiologic data have shown a lower risk of coronary death and ischemic stroke in those who drink the equivalent of one to four standard drinks a day in Western societies. Moderate alcohol intake is believed to have some cardiovascular benefits.[39] Evidence from African studies have been inconclusive; some show an association of regular and moderate alcohol intake with hypertension,[17,24,33] and others show no association.[14] The absence of an association in the present study could possibly be due to lack of accurate ascertainment of alcohol intake. Smoking rates are relatively low in the rural communities studied, which offers a window of opportunity for smoking prevention. Health promotion efforts should be intensified so rural persons do not take up smoking with its attendant health problems.

No significant association was observed between family history of hypertension in a first-degree relative and the subsequent development of hypertension. This conclusion may not be valid, considering the high level of hypertension unawareness detected in this study; subjects are unlikely to be aware of hypertension in other family members. Those with a history of diabetes had an increased risk of being hypertensive, although this association was not statistically significant. Having some degree of formal education carried a lower risk of developing hypertension compared to having no education at all, but having more than nine years of education carried a higher risk compared to no education at all. This finding could be because those with more than nine years of education were, perhaps, relatively wealthier and could afford a more Westernized lifestyle. They probably also had easier access to the mass media, which could have influenced them to change from the indigenous diet which is less fattening to more processed and fatty foods.

The study used standard protocol and had a good response rate. However, the purposive sampling of the four communities could limit generalizability of the findings. Also, not repeating BP measurements on a different day could have led to some overestimation of hypertension prevalence.

CONCLUSION

Contrary to the conclusion from the previous study in the Ga district 30 years ago that hypertension was not a significant health problem, we found that it is now a significant health problem in rural Ghanaians. Screening and control program that use population-based strategies are needed; these programs should involve changes in lifestyle, health promotion, increasing awareness, and detecting individuals at risk of developing hypertension.

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