Prevalence, Detection, Management, and Control of Hypertension in Ashanti, West Africa

Francesco P. Cappuccio, Frank B. Micah, Lynsey Emmett, Sally M. Kerry, Samson Antwi, Ruby Martin-Peprah, Richard O. Phillips, Jacob Plange-Rhule, John B. Eastwood

Abstract—Hypertension and stroke are important threats to the health of adults in sub-Saharan Africa. Nevertheless, detection of hypertension is haphazard and stroke prevention targets are currently unattainable. Prevalence, detection, management, and control of hypertension were assessed in 1013 men (n = 385) and women (n = 628), both aged 55 [SD 11] years, living in 12 villages in Ashanti, Ghana. Five hundred thirty two lived in semi-urban and 481 in rural villages. The participants underwent measurements of height, weight, and blood pressure (BP) and answered a detailed questionnaire. Hypertension was defined as BP ≥140 and/or ≥90 mm Hg or being on drug therapy. Women were heavier than men. Participants in semi-urban areas were heavier and had higher BP (129/76 [26/14] versus 121/72 [25/13] mm Hg; P < 0.001 for both) than in rural areas. Prevalence of hypertension was 28.7% overall and comparable in men and women, but higher in semi-urban villages (32.9% [95% CI 28.9 to 37.1] versus 24.1% [20.4 to 28.2]), and increased with age. Detection rate was lower in men than women (13.9% versus 27.3%; P = 0.007). Treatment and control rates were low in both groups (7.8% and 4.4% versus 13.6% and 1.7%). Detection, treatment, and control rates were higher in semi-urban (25.7%, 14.3%, and 3.4%) than in rural villages (16.4%, 6.9%, and 1.7%). Hypertension is common in adults in central Ghana, particularly in urban areas. Detection rates are suboptimal in both men and women, especially in rural areas. Adequate treatment of high BP is at a very low level. There is an urgent need for preventive strategies on hypertension control in Ghana. (Hypertension. 2004;43:1017-1022.)

Key Words: blacks ■ epidemiology ■ hypertension, detection and control ■ population

Worldwide, hypertension is common1 and now regarded as a major public health problem.2 In a recent study, the prevalence of hypertension was found to be 28% in North America and 44% in western Europe.3 Until recently, hypertension was thought to be rare in rural Africa; on the other hand, hypertension and its complications, including stroke, heart failure, and renal failure, have been reported in blacks all over the world. Hypertension is now being widely reported in Africa and is the most common cause of cardiovascular disease on the continent.4 It is also a major factor in the high mortality of adults in sub-Saharan Africa.5 In Ghana, hypertensive renal disease is a common complication in both Kumasi and Accra.7–8

In Ghana, earlier studies revealed a hypertension prevalence of 4.5% among rural dwellers and of 8% to 13% in the town.9 This was part of an evaluation of the health burden of cardiovascular diseases in Accra and was to form the basis for setting up a hypertension control program. More recently, the prevalence of hypertension in urban Accra was found to be 28.3% (crude) and 27.3% (age-standardized).10 Hypertension is becoming more common as urbanization increases, and this has been shown in several studies in Africa.11

A number of studies of urban African populations have shown a positive correlation between blood pressure, age, and gender. The prevalence of hypertension in Accra was much higher in men than in women aged <40 years but similar above that age.9 On the other hand, in a recent study prevalence was higher in women than in men.10

In the developed world, the detection, treatment, and control of hypertension have been characterized by the “rule of halves,”12 although recent evidence suggests that there has been a general improvement.13 However, in much of sub-Saharan Africa, due to scarce resources and inadequate healthcare provision, detection, treatment, and control are very poor.9,10,14

The aim of our study was to assess the prevalence, detection, management, and control of hypertension among men and women living in rural and semi-urban villages in the Ashanti Region of Ghana, West Africa.15 It was part of a community-based study of the prevention of hypertension and stroke in the same region.
Methods

All procedures were carried out according to a study protocol approved by the Local Ethics Committee in London as well as the Committee on Human Research Publication and Ethics, School of Medical Sciences, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana. Twelve villages (6 semi-urban and 6 rural) that had little day-to-day contact with each other in the Ejisu-Juaben and Kumasi Districts of the Ashanti Region of Ghana were selected in consultation with the local health workers.15 Following agreement with the chiefs and elders in each of the villages, a team of fieldworkers carried out a population census between January and March 200115 to create an age-and-sex register for the villages. Full details are reported elsewhere.15 In brief, a total of 16 965 individuals (6597 rural and 10 368 semi-urban) from 1460 households (750 rural and 710 semi-urban) were seen. The 12 villages had an average population (all ages) of 1414 per village (532 were from semi-urban and 481 from rural villages). Men and women were of comparable age (55 [SD 11] versus 55 [SD 11] years) as were semi-urban and rural participants. Men were heavier but shorter than women and, therefore, had a higher BMI (21.6 [4.6] versus 20.2 [3.1] kg/m²; P<0.001). Both systolic and diastolic BPs were higher in men than in women but not systolic BP, was higher in men than in women (126/76 [24/14] versus 125/74 [27/14] mm Hg; P=0.45/0.01). Both systolic and diastolic BPs were higher in the semi-urban participants (Table 1). These differences were confirmed after adjustment for the confounding effects of age, gender, and BMI (systolic BP difference: 5.1 mm Hg [1.9 to 8.3]; diastolic BP difference: 2.1 mm Hg [0.4 to 3.8]).

Results

Characteristics of the Study Population

There were 1013 participants in the study (385 men and 628 women)(5th–95th percentile of aged 40 to 75 years); of these 532 were from semi-urban and 481 from rural villages. Men and women were of comparable age (55 [SD 11] versus 55 [SD 11] years) as were semi-urban and rural participants. Men were heavier but shorter than women and, therefore, had a higher BMI (21.6 [4.6] versus 20.2 [3.1] kg/m²; P<0.001). Both systolic and diastolic BPs were higher in men than in women (126/76 [24/14] versus 125/74 [27/14] mm Hg; P=0.45/0.01). Both systolic and diastolic BPs were higher in the semi-urban participants (Table 1). These differences were confirmed after adjustment for the confounding effects of age, gender, and BMI (systolic BP difference: 5.1 mm Hg [1.9 to 8.3]; diastolic BP difference: 2.1 mm Hg [0.4 to 3.8]).

Prevalence of Hypertension

There were 291 hypertensives (115 men and 176 women, 116 rural and 175 semi-urban) giving an overall prevalence of

<table>
<thead>
<tr>
<th>Variables</th>
<th>All (n=1013)</th>
<th>Rural (n=481)</th>
<th>Semi-urban (n=532)</th>
<th>Men (n=385)</th>
<th>Women (n=628)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (y)</td>
<td>54.7 (11.3)</td>
<td>54.5 (11.2)</td>
<td>54.9 (11.4)</td>
<td>54.6 (10.9)</td>
<td>54.8 (11.5)</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>160.4 (8.5)</td>
<td>160.6 (8.6)</td>
<td>160.3 (8.5)</td>
<td>166.6 (7.0)</td>
<td>156.6 (7.0)</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>54.3 (11.2)</td>
<td>51.1 (9.5)</td>
<td>57.2 (11.9)</td>
<td>56.3 (9.8)</td>
<td>53.0 (11.9)</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>21.1 (4.2)</td>
<td>19.8 (3.2)</td>
<td>22.3 (4.6)</td>
<td>20.2 (3.1)</td>
<td>21.1 (4.6)</td>
</tr>
<tr>
<td>Systolic BP (mm Hg)</td>
<td>125.5 (26.1)</td>
<td>121.5 (25.1)</td>
<td>129.2 (26.4)</td>
<td>126.3 (24.4)</td>
<td>125.1 (27.0)</td>
</tr>
<tr>
<td>Diastolic BP (mm Hg)</td>
<td>74.4 (13.6)</td>
<td>72.3 (13.2)</td>
<td>76.2 (13.8)</td>
<td>75.8 (13.7)</td>
<td>73.5 (13.5)</td>
</tr>
<tr>
<td>Pulse Rate (bpm)</td>
<td>74.2 (12.0)</td>
<td>74.4 (12.2)</td>
<td>74.0 (11.9)</td>
<td>71.3 (11.4)</td>
<td>75.9 (12.1)</td>
</tr>
</tbody>
</table>

Results are mean (SD).

*Blood pressure ≥140 and/or ≥90 mm Hg, or being on antihypertensive medication.

†P<0.001 vs rural; ‡P=0.002; §P<0.001 vs men.

Height was measured without shoes, using a wooden platform and a height rule, to the nearest 0.5 cm. Weight was measured to the nearest 0.5 kg with manual Seca 761 scales (Vogel & Halke, Germany) after the participants had removed their outer garments and footwear. Body mass index (BMI) was calculated as weight (kg) divided by height (m²). Blood pressure (BP) and pulse rate were measured after the participant had been sitting upright for at least 5 minutes with an automatic machine (OMRON HEM705CP sphygmomanometer; Omron Matsusaka Co Ltd, Japan). The appropriate cuff size (13×23 cm or 16×30 cm) was used. Three readings were taken 1 minute apart. The first was discarded, and the mean of the last 2 readings were used in the analysis. Participants were also asked whether they were on regular antihypertensive drug therapy. Hypertension was defined as a systolic BP ≥140 mm Hg and/or a diastolic BP ≥90 mm Hg or being on drug therapy for hypertension.

Locality and gender differences in blood pressure were compared using a 2-sample t test. Exact confidence intervals for prevalence rates were computed using a binomial distribution, and gender and locality differences compared using a χ² test.
hypertension of 28.7% (95% CI 26.0 to 31.6). Hypertension prevalence was comparable in men and women (29.9% [25.3 to 34.7] versus 28.0% [24.5 to 31.7]). Hypertension was more prevalent in semi-urban than rural villagers (32.9% [28.9 to 36.9] versus 24.1% [20.4 to 28.2]; \( P = 0.002 \)). The prevalence rate increased with age in both men and women (Figure 2, top), and in both rural and semi-urban participants (Figure 2, bottom).

**Detection, Management, and Control of Hypertension**

Overall 22.0% (64/291) were aware of being hypertensive, 11.3% (33/291) were on antihypertensive treatment but only 2.8% of the total (8/291) had their blood pressure adequately controlled (ie, \(< 140/90 \text{mm Hg}\)). The detection rate was lower in men than in women (odds ratio [OR] = 0.43 [0.23 to 0.80]) (Figure 3, top). Both men and women had very low treatment and control rates (Figure 3, top). Semi-urban participants had higher detection, treatment, and control rates than rural participants (Figure 3, bottom).

**Discussion**

There have been a number of surveys of blood pressure distribution, and of the prevalence, detection, management, and control of hypertension in West Africa.\(^4\)\(^-\)\(^10\),\(^16\)\(^-\)\(^31\) Data have been published from Nigeria, Ghana, Cameroon, the Gambia, Sierra Leone, Liberia, and Senegal. All these studies have shown a high (and rising) prevalence of hypertension generally, and a consistently higher prevalence in urban than in rural areas (Table 3). They have also shown low rates of detection and correspondingly low rates of treatment and control. Clearly, therefore, there is a pressing need for robust strategies to deal with this serious threat to the health of the people of sub-Saharan Africa.\(^9\)\(^-\)\(^10\),\(^16\)\(^-\)\(^31\)

In Ghana, studies were carried out in Greater Accra from 1972 to 1987 as part of an investigation into the health burden of cardiovascular diseases. The prevalence of hypertension (BP \(\geq 160/95 \text{mm Hg}\)) was found to be 4.5% in the rural areas and 8% to 13% in the city itself. Among the urban dwellers, 24% knew they were hypertensive and 7.2% were on some form of treatment, though only half were being treated adequately.\(^4\),\(^9\),\(^28\) More recently, in Accra, Amoah found overall crude and age-standardized prevalence rates of hypertension (BP \(\geq 140/90 \text{mm Hg}\)) to be 28.3% and 27.3%, respectively.\(^10\) Hypertension was more common in women than men. Overall, only 34% were aware that their blood pressure was high and 22.2% were taking antihypertensive medication, but only 6.2% had optimal blood pressure control.\(^10\)

Our present study is unique in several ways. First, it is the first report in Ghana of blood pressure in a population outside

**TABLE 2. Blood Pressure by Age Group, Locality, and Gender**

<table>
<thead>
<tr>
<th>Age Group (y)</th>
<th>n</th>
<th>Systolic BP (mm Hg)</th>
<th>Diastolic BP (mm Hg)</th>
<th>n</th>
<th>Systolic BP (mm Hg)</th>
<th>Diastolic BP (mm Hg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural (n=481)</td>
<td></td>
<td></td>
<td></td>
<td>Semi-urban (n=532)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;45</td>
<td>91</td>
<td>109.2 (16.0)</td>
<td>67.8 (11.3)</td>
<td>106</td>
<td>117.1 (19.7)</td>
<td>73.0 (13.6)</td>
</tr>
<tr>
<td>45–54</td>
<td>170</td>
<td>122.4 (24.7)</td>
<td>74.1 (13.1)</td>
<td>190</td>
<td>124.4 (23.9)</td>
<td>76.0 (13.7)</td>
</tr>
<tr>
<td>55–64</td>
<td>121</td>
<td>123.4 (25.0)</td>
<td>73.3 (12.8)</td>
<td>107</td>
<td>137.1 (27.4)</td>
<td>79.7 (14.4)</td>
</tr>
<tr>
<td>65 and over</td>
<td>99</td>
<td>129.0 (29.0)</td>
<td>72.2 (14.4)</td>
<td>129</td>
<td>139.7 (28.1)</td>
<td>76.3 (13.0)</td>
</tr>
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</table>

\( P \) for linear regression:

<table>
<thead>
<tr>
<th>Rural (n=481)</th>
<th></th>
<th>0.103</th>
<th></th>
<th>Semi-urban (n=532)</th>
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<th>0.022</th>
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<tr>
<td>Men (n=385)</td>
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<td>Women (n=628)</td>
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<td></td>
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<tr>
<td>&lt;45</td>
<td>77</td>
<td>120.9 (18.6)</td>
<td>75.1 (13.9)</td>
<td>120</td>
<td>108.7 (16.8)</td>
<td>67.7 (11.3)</td>
</tr>
<tr>
<td>45–54</td>
<td>130</td>
<td>124.6 (22.2)</td>
<td>76.6 (13.6)</td>
<td>230</td>
<td>122.8 (25.4)</td>
<td>74.3 (13.3)</td>
</tr>
<tr>
<td>55–64</td>
<td>94</td>
<td>130.0 (25.5)</td>
<td>77.3 (14.4)</td>
<td>134</td>
<td>129.7 (28.1)</td>
<td>75.6 (13.6)</td>
</tr>
<tr>
<td>65 and over</td>
<td>84</td>
<td>130.0 (30.0)</td>
<td>73.4 (12.9)</td>
<td>144</td>
<td>138.1 (28.0)</td>
<td>75.2 (14.2)</td>
</tr>
</tbody>
</table>

\( P \) for linear regression:

| Rural (n=481) |    | 0.856 |                      | Semi-urban (n=532) |    | 0.001 | 0.001 |

Results are mean (SD).
the Greater Accra area. The present survey was carried out in
the area around Kumasi, the second largest city in Ghana,
where hitherto data on the prevalence of hypertension has
been lacking. A report from the Teaching hospital, however,
suggested that hypertension was a common cause of morbid-
ity and mortality. Second, stratified random samples of the
12 villages were studied. The part of Ghana this encompassed
was a large area of approximately 960 km², so it is possible
that our findings could be taken as representative of other
villages in Ashanti and in Ghana as a whole. Third, the
present study compares rural with semi-urban villages (in-
stead of large urban communities). In the present study
“rural” refers to villages lacking any real infrastructure; they
had no main water supply or sewage and often lacked
electricity. These villages were up to 40 km from Kumasi. In
contrast, most of the “semi-urban” villages had main water
and all had electricity; they were within 15 km of Kumasi. This
last characteristic is important because none of the
villages we studied could be regarded as fully urbanized,
unlike the study of the Greater Accra region mentioned
above. However, there were significant differences in blood
pressure, body weight, and prevalence of hypertension be-
tween the two settings, indicating that a limited move toward
urbanization can lead to important alterations in cardiovas-
cular risk factors.

Prevalence of Hypertension

The overall prevalence of hypertension in our study was high
at 28.7% and remarkably similar to the prevalence of 28.3%
found in Accra. These values are much higher than the
14.5% found in Nigeria and 16.9% in Cameroon, but lower
than the value of 32.6% for blacks in the United States. Hypertension was more common in the semi-urban areas
compared with the rural areas. This is similar to other reports
from West Africa, with the exception of Nigeria where rural
and urban prevalences have been found to be similar. As
mentioned earlier, comparisons between studies are fraught
with difficulty as the definitions and characteristics of rural
and urban settings can differ substantially between studies.
Furthermore, the participants in our study were relatively
lean, unlike many studies of African populations. We
found that the prevalence of hypertension was higher in men
than women, whereas in Accra the reverse was found. In
general, no clear pattern of association between hypertension
and gender has emerged. In the International Study of
Hypertension in Blacks, for example, there was a higher
prevalence of hypertension in men than women in Nigeria
and urban Cameroon, but in rural Cameroon the prevalence
was higher in women. In our study, prevalence rates showed
a consistent increase with age in men and women in both rural
and semi-urban villages.
Detection, Management, and Control of High Blood Pressure

A number of past studies of hypertension in the developed world have reported low rates of detection, treatment, and control. More recently, however, rates have much improved and are well above the “rule of halves.” Studies from Africa and other developing countries have shown very low rates. In our study, the overall detection rate was 22%, and rates of treatment and control were 11.3% and 2.8%, respectively. These figures are very low compared with rates reported from Accra and elsewhere.9–10,23 Detection rate was lower in men than in women, yet taking care not to induce too great a population difference. Care was also taken to make sure that the villages chosen had little day-to-day contact with each other and used different markets. This was important because the study involved a community-based trial of health promotion.15 Selection of participants in each village was by stratified random sampling following a population census. Stratification was by age and gender so that the total sample selected would represent the overall population structure and to ensure that the age and gender of the participants in the villages would be similar. The response rate to the invitation for screening was estimated at 53%. This is a low response rate, and it was due to a number of factors. The survey was carried out in 2 main sessions each involving 6 villages. The second set of villages was surveyed more than 1 year after the census, and, by the time of the second visit, a number of individuals had migrated from the villages; some of the older inhabitants had died. Further, the main study (not reported here) involved blood sampling. This was viewed with a high degree of suspicion by some of the inhabitants, particularly at a time when HIV/AIDS awareness was a government priority. Some people may have been unable to attend the data collection center due to work commitments, particularly those working in the city. Finally, this study was part of an intervention study that was to span 6 months. Although the participants were unaware of the specific objectives of the study at the time of the baseline assessment, selected participants who showed no commitment to finishing the project were not enrolled. Notwithstanding-

Potential Limitations of Our Study

In a study such as we have described, biases can potentially arise in 3 main ways: from the method used to select the villages, from the methods used to select participants, and from different response rates. The villages were selected so that there were 6 rural villages and another 6 close to Kumasi, where.9

where.9


<table>
<thead>
<tr>
<th>First Author (Year of Publication)</th>
<th>Country</th>
<th>Population Type</th>
<th>Age Group</th>
<th>Prevalence of Hypertension* (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>45–49</td>
<td>Men 14.4, Women 39.4</td>
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<td></td>
<td>50–54</td>
<td>Men 23.3, Women 33.6</td>
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<td></td>
<td></td>
<td>55–59</td>
<td>Men 20.5, Women 29.0</td>
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<td></td>
<td></td>
<td>60–64</td>
<td>Men 44.6, Women 41.6</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>65–69</td>
<td>Men 27.6, Women 39.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>70+</td>
<td>Men 45.0, Women 39.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>45–49</td>
<td>Men 16, Women 36</td>
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<td>50–54</td>
<td>Men 18, Women 34</td>
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<td></td>
<td>55+</td>
<td>Men 20, Women 50</td>
</tr>
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<td></td>
<td>25+</td>
<td>Men 14.2, Women 16.3†</td>
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<td></td>
<td></td>
<td>25+</td>
<td>Men 22.8, Women 16.0†</td>
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<td></td>
<td>Urban</td>
<td>Men 23.8, Women 18.7</td>
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<td>Rural</td>
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<td></td>
<td></td>
<td>55+</td>
<td>Men 54.0, Women 61.0</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Urban</td>
<td>Men 46.6, Women 52.3</td>
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<td></td>
<td></td>
<td>55+</td>
<td>Men 77.8, Women 69.0</td>
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<td>Amoah10 (2003)</td>
<td>Ghana</td>
<td>Urban</td>
<td>25+</td>
<td>Men 27.6, Women 29.5†</td>
</tr>
</tbody>
</table>

*Hypertension defined as SBP ≥140 and/or DBP ≥90 mm Hg or being on drug therapy.
†Age-adjusted.
ing these shortcomings, and in view of the external consistency of our data with those of similar studies,10 our results may well be representative of the Ashanti Region of Ghana as a whole and be reasonably used to formulate local health policy, at least for the age groups studied.

**Perspectives**

Hypertension is common in West Africa and must be regarded as a major public health issue. Our study has shown a high prevalence hypertension, even in rural areas, but worrisome low rates of detection, treatment, and control. Clearly, the government of Ghana will have high blood pressure on its health agenda. It will need to formulate a national control program as well as national guidelines for the detection and management of hypertension. Other measures such as a reduction in salt intake,33 which is currently recommended by the World Health Organization,4 should also be promoted, while low-cost drug treatment is being implemented.11

**Acknowledgments**

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**References**

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