BLOOD PRESSURE DISTRIBUTION AND HYPERTENSION IN TWO RURAL COMMUNITIES OF GONDAR REGION, ETHIOPIA.

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ABSTRACT: The purpose of this study was to document the distribution of blood pressures and the prevalence of hypertension in two rural communities located in the northwestern Gondar Region of Ethiopia. Based upon a systematic random sampling, 226 households (724 persons) were selected. Mean systolic and diastolic blood pressures (SBP and DBP) were calculated separately for male and female children (5 -15 years) and adults. Among male and female children the mean SBP's were 110.0 +/- 9.5 and 113.4 =/- 10.0, while the mean DBP's were 73.8 +/- 8.2 and 73.8 +/- 7.9, respectively. The difference in mean SBP's was statistically significant ($p<0.05$). Among adult males and females the mean SBP was 118 +/- 13.3 and 114.0 +/- 14.5, while the mean DDP was 73.5 +/- 8.2 and 72.7 +/- 9.2 respectively. The difference in mean SBP's was statistically significant ($p<0.05$). Blood pressure was found to rise with age. The prevalence of hypertension in children was 4.3% and in adults 2.7%. Prevalence rates were not significantly different in females and males.

INTRODUCTION

Blood pressure distributions among Ethiopian populations have not been extensively studied. The few studies conducted in Ethiopia have concentrated on the detection of hypertension (1). It has been reported that Ethiopian highlanders have a higher average blood pressure than lowlanders (2). Research done in several isolated and primitive communities in Chile, New Guinea, the Easter Islands, and among rural African and Asian populations have found little or no increase of systolic or diastolic blood pressure with increasing age in adults (3). This is in contrast to industrialized societies and underdeveloped populations assimilated into western lifestyles and diets, in whom increasing blood pressure with age is well documented (2). One study conducted in rural Ethiopian communities has found that blood pressure rises with age (4).

The aims of this study are to determine the blood pressure distribution and prevalence of hypertension within two typical rural communities located in the northwestern Gondar Region of Ethiopia (Wawa and Tsehay Egir Cherkos).

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METHODS

Study Design: A cross-sectional, descriptive survey was undertaken in April 1990, in two settlement areas located in Dembia Awraja; lowland communities situated southwest of Gondar town. The total population of the two settlement areas (Wawa and Tsehay Egir Cherkos) is 4430 (5-8). The population is typical of rural farming communities in northwestern Ethiopia, whose economy is subsistence agriculture. Cereals and legumes are the staple diet, but beef and mutton are also eaten occasionally.

Population: All residents of the two communities were eligible for entry into the study. Households were enumerated and then study subjects selected on the basis of a 1:4 systematic random sampling of households. All members of

Table 1. Mean systolic (SBP) and diastolic (DBP) blood pressures by sex among children and adults

	SBP		DBP	
Children	Mean +/-1SD	(95% CI)	Mean +/-1SD	(95% CI)
male	110.0 +/-9.5	(108.5,111.5)	73.8+/-8.2	(75.2, 75.1)
female	113.4+/10.0	(111.6,115.2)	73.8 +/-7.9	(72.4,75.2)
Adults				
male	118.1+/-13.3	(116.3, 119.9)	73.5+/.8.2	(72.4, 74.6)
female	114.0 +/-14.5	(112.2, 115.8)	72.7+/-9.2	(71.5,73.9)

the household were entered into the study.Of 243 selected households, 226 were surveyed. The age-sex breakdown was as follows: children, 153 males and 125 females; adults, 360 males and 364 females.

Measurement: An aneroid sphygmomanometer (cuff size 12cm x 15cm) for adults and a mercury sphygmomanometer (cuff size 8 x 15cm) for children were used to measure blood pressure.

Measurements were made on the right arm. This was done after the arm had been comfortably supported in semi-flexion. The cuff was applied firmly to the arm and then quickly inflated to 20-30 mm Hg above the pressure at which the radial pulse was no longer audible. The stethoscope was applied to the arm overlying the point at which the brachial pulse had been palpable. Cuff pressure was allowed to fall and the point at which the audible pulse beat occurred was taken as the systolic blood pressure and the Kortkoff sound V as the diastolic blood pressure. The measurement was taken twice in a one minute interval and the average value was recorded.

The WHO definition of hypertension was used to identify hypertensive above the age of 15 years. For those 30 to 64 years, a systolic blood pressure of 160 mm Hg or above and a diastolic blood pressure of 95 mm Hg or above were used as cut off points. For subjects between the ages of 16 and 29 years, the cut-off values were 150 mm Hg systolic and 90 mm Hg diastolic. For those 65 years and above, the cut-off values were 165 mm Hg systolic and 95 mm Hg diastolic (9). For children 15 years and under hypertension was defined as 2 SD greater than the mean systolic or diastolic estimate derived from the study population (10).

Prior to the survey, piloting was conducted in ten households in order to standardize measurement procedures and reduce inter- observer bias.

RESULTS

Sex specific frequency distribution curves for systolic and diastolic blood pressures among children and adults are summarized in figures 1 through 4. Figures 1 and 3 illustrate lower but generally symmetrical systolic distribution curves among females.

The diastolic blood pressure distribution among adult males (figure 4) is bimodal with modal values in the ranges of 70-74 and 80-84 mm Hg. The frequency distribution curve for adult females is symmetrical with a modal value in the 70-74 mm Hg range.

Table 1 summarizes the mean systolic and diastolic blood pressures for adults and children by sex. Standard deviation and 95% confidence intervals are included for each estimate. The male-female differences in mean systolic blood pressure for children and adults is significant ($p<.05$). Figures 5 and 6 summarize the change in mean systolic and diastolic blood pressures with increasing age in children and adults. There is no significant change in BP with increasing age among children. For adult males and females there is a trend towards increased diastolic and systolic blood pressure with increasing age.

The overall prevalence of hypertension was found to be 3.3%. The prevalence rate in children was 4.3%. Among adults 2.7% had hypertension. The prevalence rates in adult females and males were 2.9% and 2.4%, respectively. This difference is not statistically significant.

Although systematic random sampling was used through out, X^2 goodness of fit test revealed that data did not come from a normally distributed population.

DISCUSSION

This study suggests that, as in other rural populations within developing countries, mean systolic and diastolic blood pressures are lower than those found in industrialized societies(4,11). These findings are also lower than those reported in surveys of urban Ethiopian populations (12,13).

We have found that adult mean systolic blood pressure is higher in males than females, whereas the diastolic blood pressure is almost the same. Conversely, among children the mean systolic blood pressure was higher among females than males, while the mean diastolic blood pressure was essentially identical.

These results are not free of potential sources of bias. Non-differential information bias could be due to stress imposed upon subjects not accustomed to modern medicine home visitors and the unfamiliar blood pressure apparatus (BP cuff). Blood pressure was measured in adults before children in order to minimize this effect in the latter.

Previous studies in less developed communities throughout the world show that blood pressure does not rise with progression in age (14). Two studies done in Ethiopians (14) claim that this situation holds true among Ethiopians as well. Our results indicate that blood pressure increases with progression in age. This result is in accordance with other previous studies conducted in Ethiopia (4,11-13) and in developed countries. Nevertheless, stress, concurrent pathology, and high salt intake could be important sources of distortion which this study does not control for.

The overall prevalence of hypertension in the world is reported to range between 8 and 18% (2). In this survey the results are much lower, at 3.3%. This may be explained, in part, by the relative absence of several important risk factors for hypertension in the population studied. These include the relative absence of obesity, smoking, and a high dietary caloric/cholesterol intake. This finding indicates that hypertension may not be a great public health problem in rural Ethiopia at the present time.

In the pediatric age group, hypertensive children accounted for 4.3% of the population. This prevalence is greater than that of the adults. The higher prevalence could have been caused by secondary hypertension due to glomerulonephritis, which is common in the region. A urine examination was not included and it is therefore not possible to objectively estimate the potential influence of renal disease. Although an adjustment in cuff size was made for children, this may not have been adequate and could account for a spuriously high estimate in both mean blood pressures and the proportion with hypertension.

Statistical test using X^2 goodness test revealed that our sample was not taken from a normally distributed population. This may be due to differential rates of migration or infant mortality.

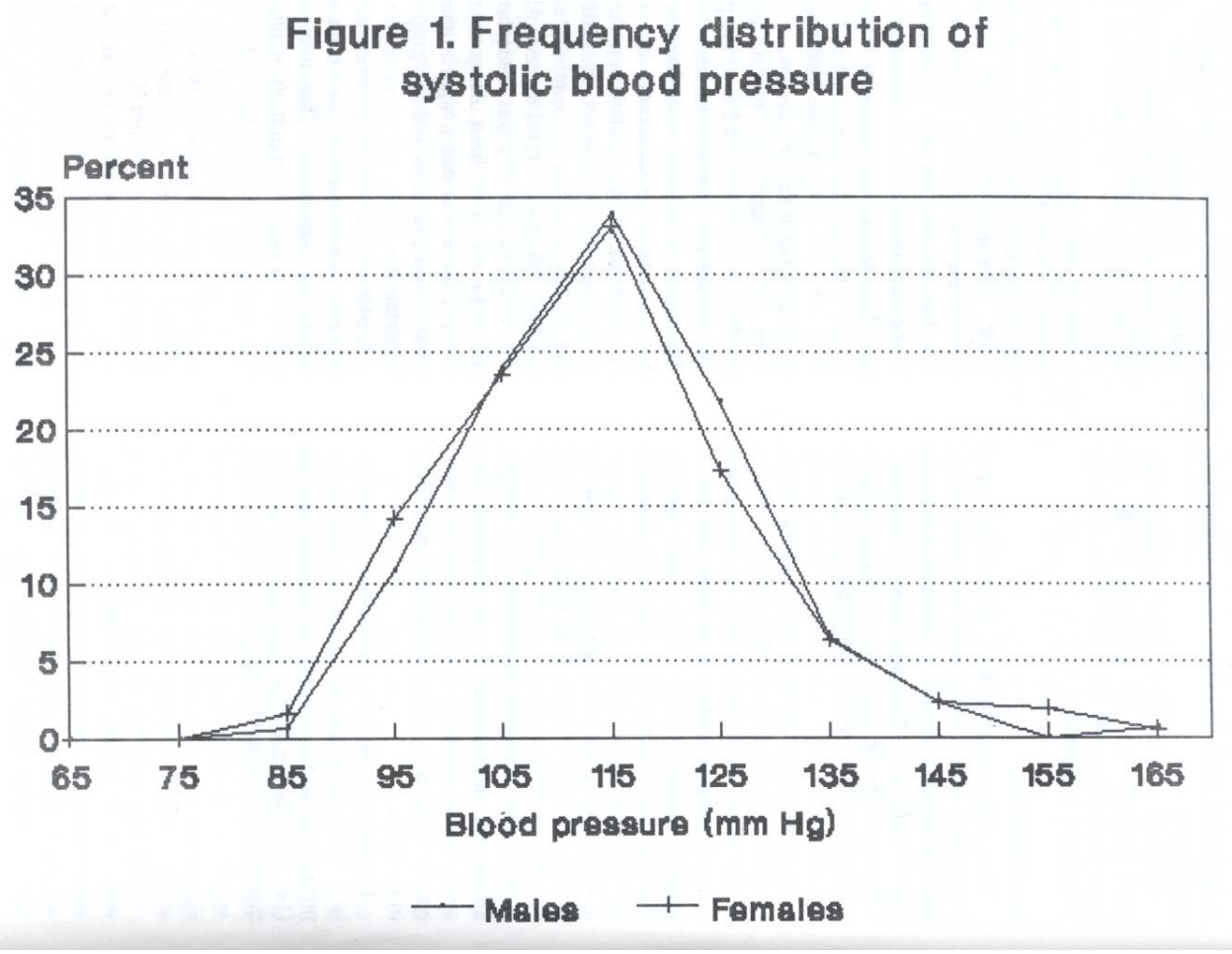


Figure 2. Frequency distribution of diastolic blood pressure

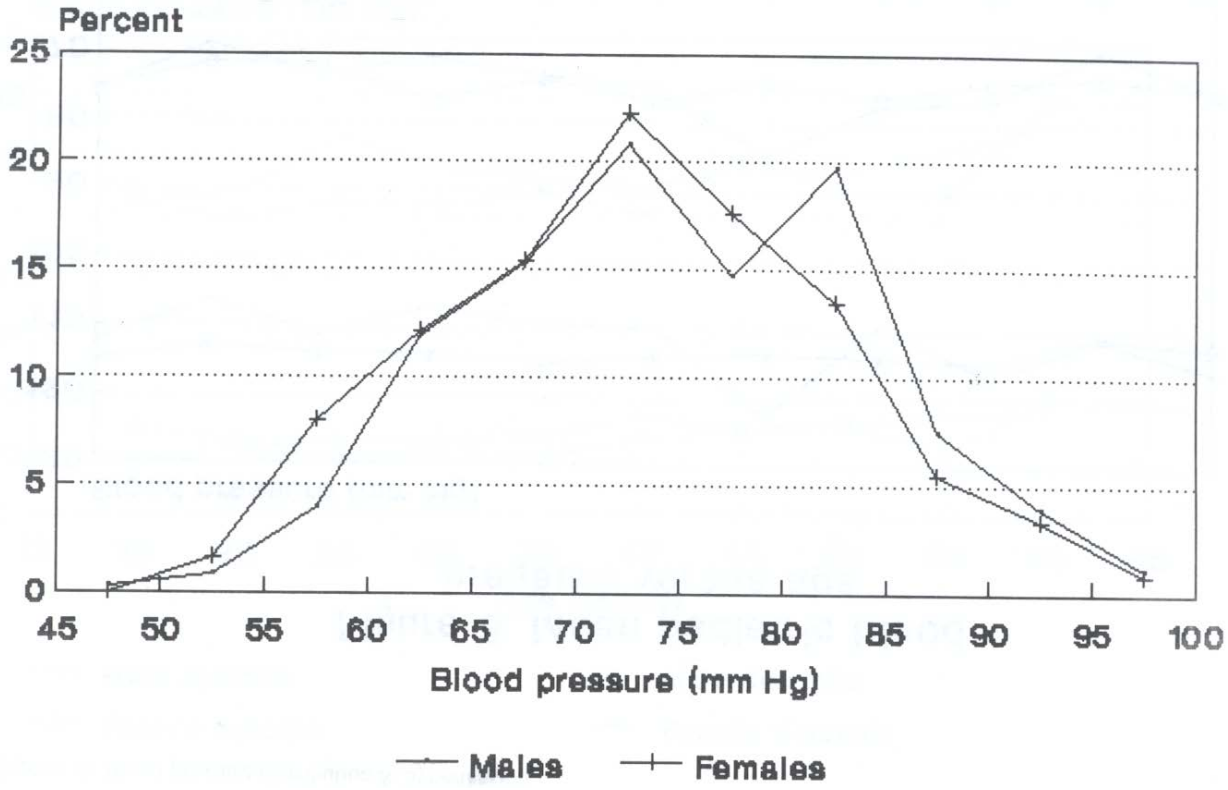


Figure 3. Mean pediatric blood pressure versus age

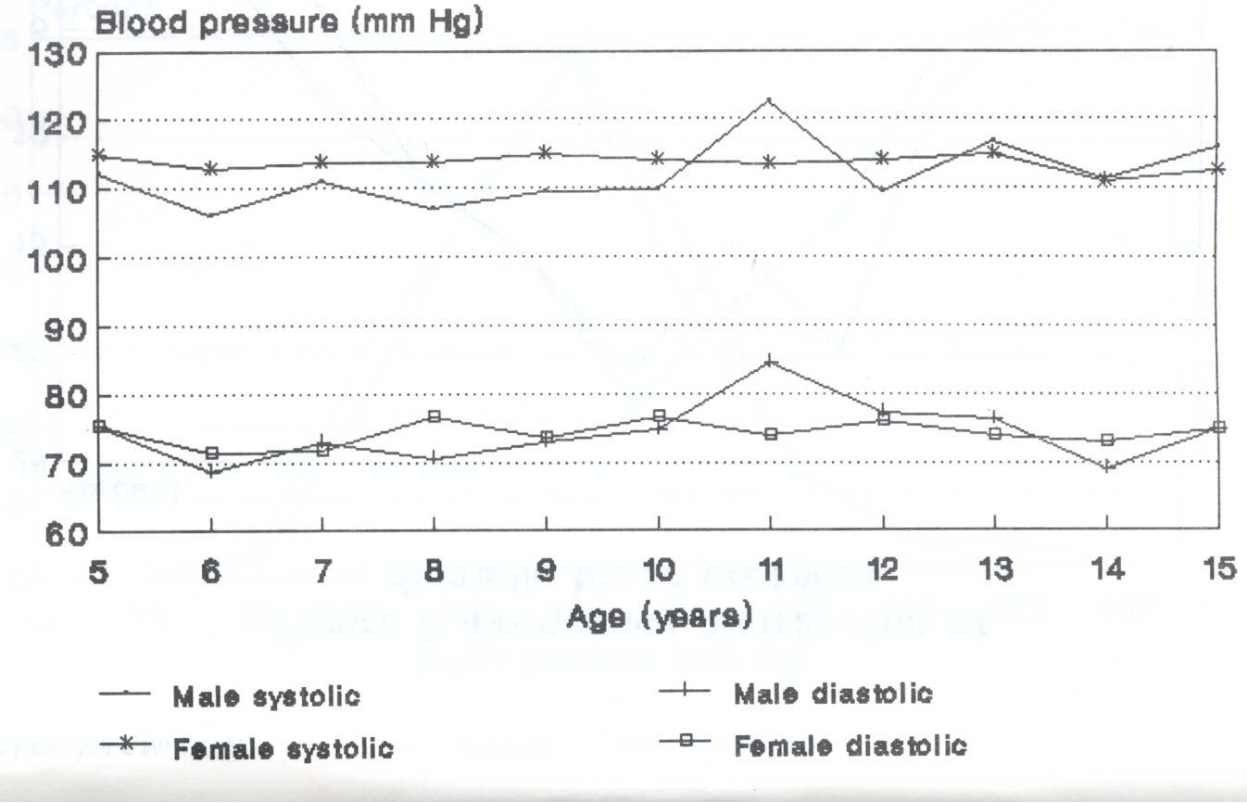
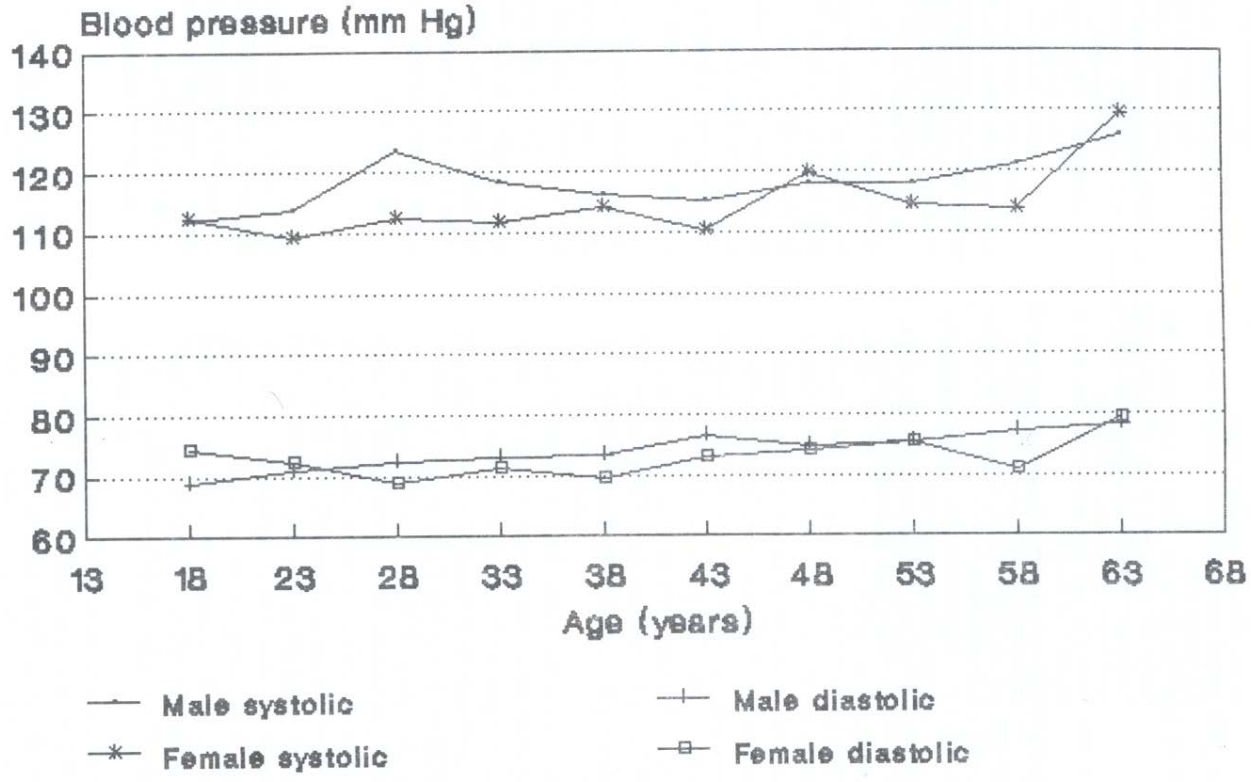


Figure 4. Mean adult blood pressure versus age



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