MASTERS THESIS

PREVALENCE OF HYPERTENSION AND ITS DETERMINANTS IN AN ETHIOPIAN ADULT POPULATION

by

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ABSTRACT

A community based cross sectional survey was conducted from October 15/1991 to December 31st 1991, to measure the prevalence of hypertension and its determinants in Wonchi Awraja.

From 9 urban kebeles and 184 rural kebeles in the Awraja 24 kebeles were selected by multistage sampling from which a total of 2,745 individuals who are 15 years old or above were included in the study.

Relevant measurements of-blood pressure, pulse rate count, body weight, height, waist girth, and hip girth of the study subjects were taken and a pretested questionnaire was filled to assess some of the other determinants of hypertension.

It was found that the prevalence of hypertension in the Awraja is 8.3%. The urban population has a higher prevalence of hypertension 11.8%, than that of the rural population, 7.5%, ($P<0.05$).

Prevalence of hypertension is closely related to age and body build as measured by body mass index [weight in kgs/ (ht in m)^2]. Prevalence of hypertension increases with advancing age. Persons with body mass index $\geq$ 25 kg/m^2 have a statistically significantly higher prevalence of hypertension.

No significant difference in prevalence of hypertension is observed by occupation and by differences in smoking, chat chewing, ethnic group, and salt consumption.

INTRODUCTION

Epidemiologic surveys have demonstrated a continuous distribution of arterial pressure levels within the population, and any point separating "normal" from "elevated" is therefore arbitrary. Absolute blood pressure levels vary with sex, age, race,and numerous other factors. The higher the arterial pressure, systolic or diastolic, the greater the cardiovascular morbidity and mortality. This has been found to be true in all countries studied, in all age groups, and in both sexes (1) .

Stephen Hales had measured the blood pressure of a horse by arterial cannulation in the early 18th century. However, it was not until Riva Rocci invented his indirect mercury sphygmomanometer and then Korotkov described the sounds heard over the brachial artery during sphygmomanometry in 1905 that blood pressure measurements became well established (2).

It is believed that cardiovascular diseases are now becoming prominent as a public health problem in developing countries as well as in industrialized ones. With progressive overall socioeconomic development,as infection and malnutrition are steadily overcome in the developing world, an increase in the toll of cardiovascular diseases is likely to follow . Hypertension is the most common of the cardiovascular diseases and affects most of the populations in the world.Hypertension and associated disorders constitute some 60% of all cardiovascular diseases seen in adults in most developing countries (2,3). Hypertension is a very common

condition and is an important public health problem in all countries of the world. Although it is virtually symptomless,it is an important contributing cause of cerebrovascular, heart and renal disease.

Elevated blood pressure is one of the commonest and most potent precursors for coronary heart disease, stroke and congestive heart failure, which make up the bulk of the lethal cardiovascular diseases (1).

In the Framingham study it was shown that compared to normotensive subjects, hypertensive persons develop a marked excess of the major cardiovascular diseases. In the age group 45 to 74 years they develop more than twice as much premature occlusive peripheral arterial disease, almost three times as much coronary disease, five times as much congestive failure, and about eight times the incidence of the cerebrovascular diseases. About two-thirds of victims of the major cardiovascular diseases have some degree of hypertension, one third have definite hypertension, and only a third are entirely normotensive (4).

An analysis of 150 CVA patients in Tikur Anbessa Hospital has shown that the single most important risk factor for CVA is hypertension, which accounts for 50% of admissions for non embolic ischemic vascular disease (5).

Despite generally poor data, it appears that the cardio vascular diseases are becoming more common in the developing world including Ethiopia . If this is true, it is important to develop strategies to prevent the increment in prevalence of CVD that has

been seen in more industrialized countries. If the prevalence of hypertension increases in developing countries before they are able to control infection and malnutrition it can be more devastating. So one can't wait until the higher priority problems of infection and malnutrition are controlled.

Before developing strategies of control the first step is to determine the prevalence of the disease and to examine current levels of risk factors among the communities. This study presents the prevalence of hypertension and the current level of some of its determinants in Wonchi Awraja.

At present the literature on the prevalence of hypertension in Ethiopia is scanty, and community based studies on the problem are rather few. Thus the present study can serve in developing the literature on the subject, and it can also be used as a base line data against which future trends in the disease and the level of its risk factors can be assessed.

This study is a community based cross sectional survey of the prevalence of hypertension and its determinants in Wonchi Awraja, which is one of the twelve Awrajas in western Shoa Administrative Region, located in central Ethiopia. The majority (91.7%) of the population in the Awraja live in rural areas, while the remaining 8.3% live in urban area.

LITERATURE REVIEW

A large proportion of the adult population in many parts of the world have blood pressure ranges associated with an excess morbidity and mortality, regardless of what cut-off values are used in definition. WHO estimates that 8 to 18% of adults have pressures above 160 mm Hg (21.3 K Pa) systolic and/or 95mm.Hg (12.7 KPa) diastolic (1).

It is mostly in developing countries that communities with out hypertension have been described (1,6,7,8). Several features are common of such communities; the blood pressure does not rise significantly with age and the prevalence of hypertension is low or non existent. These communities are often isolated, usually small and diminishing in size; and frequently nomadic. Generally they do not form complex social structures. Individuals in these communities tend to have a low body size, do not show the 'common' increase in body size in middle age and are accustomed to high physical activity. Dietary salt intake as measured by a dietary history or a timed urinary sodium excretion, is low. In general serum lipids are low, although groups within a community may have plasma lipid levels similar to those in western societies with out significant elevation of their blood pressure. These communities constitute a minute part of the developing world and none of the features observed among them are typical of the rest of the their country. When these communities become settled, or members migrate

to urban societies, they begin to manifest a rise of their blood pressures with age and an increasing prevalence of hypertension.

Hypertensive disease is a mass public health problem in the United States.It is one of the most important, if not the most important affliction producing premature sickness, disability, and death in the adult population. A sound current estimate is that 20 to 25 million Americans have hypertension (9).

Numerous cross sectional studies from Africa and the developing world, show that the prevalence of hypertension in adults (ie. over 15 years of age) varies from 1% to over 18%. This wide variation in reported prevalence is due principally to differences in the rate of rise of blood pressure with age; although methodological differences, including differences in cut-off points for hypertension and variations in the age structures of study populations also contribute (10).

In 1968, Parry noted that 16% of patients with cardiac diseases at the tuberculosis centre in Addis Ababa were hypertensive. He also reported blood pressure readings taken from 4,379 out patients at the tuberculosis centre in Addis Ababa. In this study hypertension as defined by the World Health Organization was found in 5.1% of men and 4.6% of women (11).

In 1973, Lester studied arterial blood pressure readings from 2,103 medical outpatients in an Addis Ababa clinic and she found almost 12% of the population were hypertensive by the W.H.O. criterion of 160/95 (12). Both of the above studies by Parry and Leister (11,12), were based on surveys on blood pressure levels of

Ethiopian ambulatory patients attending health care facilities in Addis Ababa. Hence they were not necessarily representative of the community at large. In 1986, a survey of blood pressure and body mass index was carried out in 8 rural farming Ethiopian communities in north western Ethiopia. The prevalence of hypertension in this population was low (1.8%). Although it was done at a time when the area was stricken by drought, this remains the main source of reference on blood pressure patterns of rural populations in Ethiopia. In this study further studies were recommended to elucidate the pattern of blood pressure and the factors that influence it (13).

In 1990 a cross-sectional, descriptive survey was undertaken in two settlement areas located in Dembia Awaja; lowland communities situated southwest of Gonder town, again by Zein et al and they found that the prevalence of hypertension in children was 4.3 % and in adults 2.7 % (14).

In 1983, Teklu Bayu noted that 13% of men and 5% of women among urban bank employees in Ethiopia were hypertensive (15).

In 1987, a total of 482 Ethiopian immigrants in Israel, mean age 41 $\pm$ 16 years were examined a few weeks after their arrival in Israel, and only four hypertensive (1%) were recorded (16). But these were malnourished immigrants from drought stricken area and are likely not to be representative.

A comparison of major risk factors for cardiovascular disease was caried out in two groups, Ethiopian immigrants and Israeli industrial employees, in a sample of 387 male Ethiopians, aged 20-

49 years, examined in 1987, who had immigrated to Israel three to four years previously, and a sample of 2,747 male Israeli industrial employees in the same age group examined in 1985-7.In this study it was found that the prevalence of hypertension was 11.6% and 13.0% for Ethiopians and other Israelis respectively (17). But this may not be representative of Ethiopian communities as these measurements are taken three to four years after arrival.

In the comparison of Ethiopian immigrants and Israeli industrial employees blood pressure patterns with age were similar and increased with age in both groups (17).

Shaper (6) noted that in three nomadic pastoral tribes in Northern Kenya, no increase in blood pressure with increasing age was recorded. However,studies elsewhere (1,3,8,16,18) as well as those from previous studies in Ethiopia (11,12,13,14) lend support to the view that, at present most tropical and developing communities show the same pressure age pattern as is found in the advanced countries (1,8,17,18,19,20) ie. blood pressure increases with advancing age.

Zein (13) noted that blood pressures are higher in young men than in women until middle age, when older women tend to have higher pressures. This pattern of blood pressure among men and women was similar to the observations in developed countries (1) as well as in others in Ethiopia (11,12).

DaneshPajooh (20) has also noted that hypertension was found to be associated with sex,being more prevalent in women than in men in all age groups. It is possible that a higher prevalence of

hypertension in women is secondary to body build because more women were over weight in this study group.

In most countries, urban-rural differences exist; with higher pressures and higher prevalence of hypertension in urban than in rural communities (1,10,11,12,13,20).

DaneshPajooh (20) compared the prevalence of hypertension in rural and urban area in Iran and found the prevalence in the mountain villages was 5.6% while in the Pahlavi city it was 29.7%. This considerable difference in the prevalence of hypertension was found in these two groups belonging to the same ethnicity and living less than 100 km apart. He also noted that the prevalence of hypertension in the city and its low prevalence in mountain villages may be explained by differences in diet, especially differences in salt intake, differences in physical activity of the people in the two areas, differences of factors related to modernization (noise, crowding, work conditions, etc), protective cultural condition in isolated mountain villages, or a combination of all these as well as other factors.

In contrast to the above observations, Buyamba et al (21) compared blood pressure and prevalence of hypertension in rural and urban Zaire and found on average both systolic and diastolic pressure were higher in rural than in urban Bantu. They explained some of this unusual difference by aging of the rural population, which was probably a consequence of exodus of teenagers and young adults from the village to cities and the return of retired people from cities to the village,and could account at least partly for

the difference in blood pressure between the two populations since both blood pressure and age were positively correlated. However,at a given age,in most circumstances,blood pressure was higher in the rural area,and after correcting for age in multiple regression analysis blood pressure difference between rural and urban Bantu remained significant.

Occupational factors would also appear to affect blood pressure levels. An example is a study from Nigeria, in which rural clerks have higher pressures than rural labourers in the same community; even though these clerks have lower pressures than clerks in the urban community (10).

In the hypertension study conducted in Nepal (22) prevalence of hypertension was observed to be higher amongst the subjects whose salt intake is higher than 5g/day compared to those whose salt intake is lower than that. The study has shown a statistically significant positive correlation between salt intake and the prevalence of hypertension in the rural Kathmundu area. In the mountain region no statistical testing was possible as there were no hypertensive cases in the low-salt intake group. In urban old Kathmundu and the Teraiplains, although there is a higher prevalence in the high salt intake group, the difference was not found to be statistically significant. In these two areas, only 16.2 and 13.7%, respectively, of the population were in the low-salt intake group. The inability to demonstrate a statistically significant positive correlation in these two areas might be due to the small number of hypertension cases observed among the people

with low salt intake. Perhaps a larger sample size from these two areas would have shown a statistically significant difference.

Although the role of cigarette smoking in the causation of hypertension remains controversial, the immediate effect of smoking 1-2 cigarettes in a healthy volunteer or a hypertensive person is a rise of systolic blood pressure (SBP) and the diastolic blood pressure (DBP) (23).

In a large multi centre study of 918 hypertensive patients in India, 28% of the subjects were found to be smokers (23).

In the comparison of Ethiopian immigrants and Israel industrial employees only 6.7% of Ethiopians were smokers as compared to 41.1% among the other Israelis.(17).

Obesity is a recognized risk factor for development of essential hypertension, as is weight gain during adult life (24,25).

In the comparison of Ethiopian immigrants and Israeli industrial employees there were no cases of over weight (Quetelet's index above 2.8)in the immigrants, as compared with 20.7% over weight among the other Israelis (17).

Recently, several studies have reported that excess abdominal fat, expressed as an increased ratio of waist to hip circumference, is independently associated with higher levels of blood pressure (26).

Direct continuous recording of blood pressure by means of intra arterial puncture has provided valuable information and has emphasized the lability of arterial pressure both in normal and in

clearly hypertensive subjects through out a 24 hour period (1). Such blood pressure measurements are, however, not practicable for general clinical or epidemiological use.

Blood pressure measurements with a mercury sphygmomanometer should be made by an observer who has been suitably instructed and shown to have normal hearing (1). If appropriately trained, nurses are as good at it as physicians (27).

Mercury sphygmomanometers are recommended since they are more reliable than the aneroid type instruments (i.e. with a pointer). However, mercury instruments may also be faulty, and must be kept in good working order(1,27).

The dimensions of the cuff are very important, the standard cuff is 12.5 cm wide and sufficiently long to surround the upper arm. Cuffs of different width are required for measurements in children and obese adults (1,27).

Blood pressure measurement should take place in a pleasant and reassuring atmosphere, room temperature should be around 21 degree centigrade, since low environmental temperature causes an elevation of blood pressure and excessive heat provokes tachycardia (1,27).

Measurement of arterial pressure with the patient in the siting position is the most practical method. Measurement of arterial pressure with the patient in the lying position and again after he has been standing for 1-5 minutes may give useful clinical information about the hypertensive patient, particularly when under treatment. It is also valuable to record the heart rate at the same

time as the blood pressure measurement: this is particularly important during treatment with certain drugs (1,27).

Because height is a linear measurement and weight reflects a three dimensional measurement of body volume, numerous ratios of weight to height^2, height^3, etc. have been suggested over the past 100 years. Recently, (as a revival of Quetelet's index) the body mass index W/H^2 (Bray 1978) has been suggested (28), and is being used in most studies.

The major predictor of subsequent blood pressure level is the current blood pressure level. The association of the current with future levels of blood pressure in individuals within low, normotensive , and higher blood pressure ranges has been called tracking, ie. individuals tend to retain their relative rank order position vis-a-vis their age, race and sex peers with the passage of time. The association of casual blood pressure measurement of adults with measurements 10 to 20 years later has been reported, with coefficients of correlation as an index of tracking in the range of 0.6 to 0.7 (5).

Contrary to what might be expected, comparison of biennial casual pressures in the Framingham cohort revealed that casual office blood pressures are reasonably characteristic of persons from one examination to the next. In fact, they correlate surprisingly well, even 18 years apart. More to the point, prospective epidemiologic data at Framingham have consistently revealed that risk of cardiovascular events is strikingly related to casually determined office pressures. The fact that blood

pressure measurement is a casual reading does not reduce its ability to predict those at high risk (4).

Froom et al (29) by comparing exercise testing and casual blood pressure in a longitudinal study concludes that a single casual BP had the best combination of maximal sensitivity and positive predictive value (PPV).

OBJECTIVES

General Objective

To generate baseline data on hypertension in the Awraja which can be used in the planning of future health services and assessing future trends of hypertension in the Awraja.

Specific Objectives

1. To determine the prevalence of hypertension in the Awraja.
2. To determine the prevalence of some of the determinants of hypertension in the Awraja. A secondary objective is to see their association with the disease in the Awraja.
3. To find out the awareness of the hypertensive in the Awraja that they have the disease.
4. To find out how many of those who are aware that they have the disease get antihypertensive medication.

MATERIALS AND METHODS

Study Design

The study is a community based cross sectional survey of the prevalence of hypertension and its determinants in Wonchi Awraja.

The Study Area

Wonchi Awraja is one of the 12 Awrajas in Western Shoa Administrative Region, which is located in central Ethiopia, west of Addis Ababa. The Awraja has a population of 327,184. The majority (91.7%),of the population live in rural areas. 82% of the population are Oromos, 13% Gurage and 5% Amhara.

The Awraja is administratively and geographically divided in to 9 urban Kebeles and 184 rural Kebeles .

Source Population

Wonchi Awraja population who are 15 years old and above.

Study Population

Sample from the source population.

Sample Size Calculation

Sample size calculation is made using the following assumptions.

1. Prevalence of hypertension in the population 1.8%.
2. Maximum discrepancy between sample and population prevalence of hypertension $\pm$0.5%.

3. Degree of certainty that the discrepancy is with in these limits 95%.

The 95% certainty and the "±" for the discrepancy indicates 5 percent in two tails of the normal distribution, namely , Z = ± 1.96. The discrepancy of ± 0.5 percent between the sample and population prevalence gives 100p - 100 II = 0.5 (where P = sample prevalence and II is population prevalence), the critical ratio then yields.

$$1.96 = \frac{0.5}{100\sqrt{\Pi(1-\Pi)/n}}$$

Solving for n yields

$n = (196/0.5)^2\ 0.018\ (1 - 0.018)$

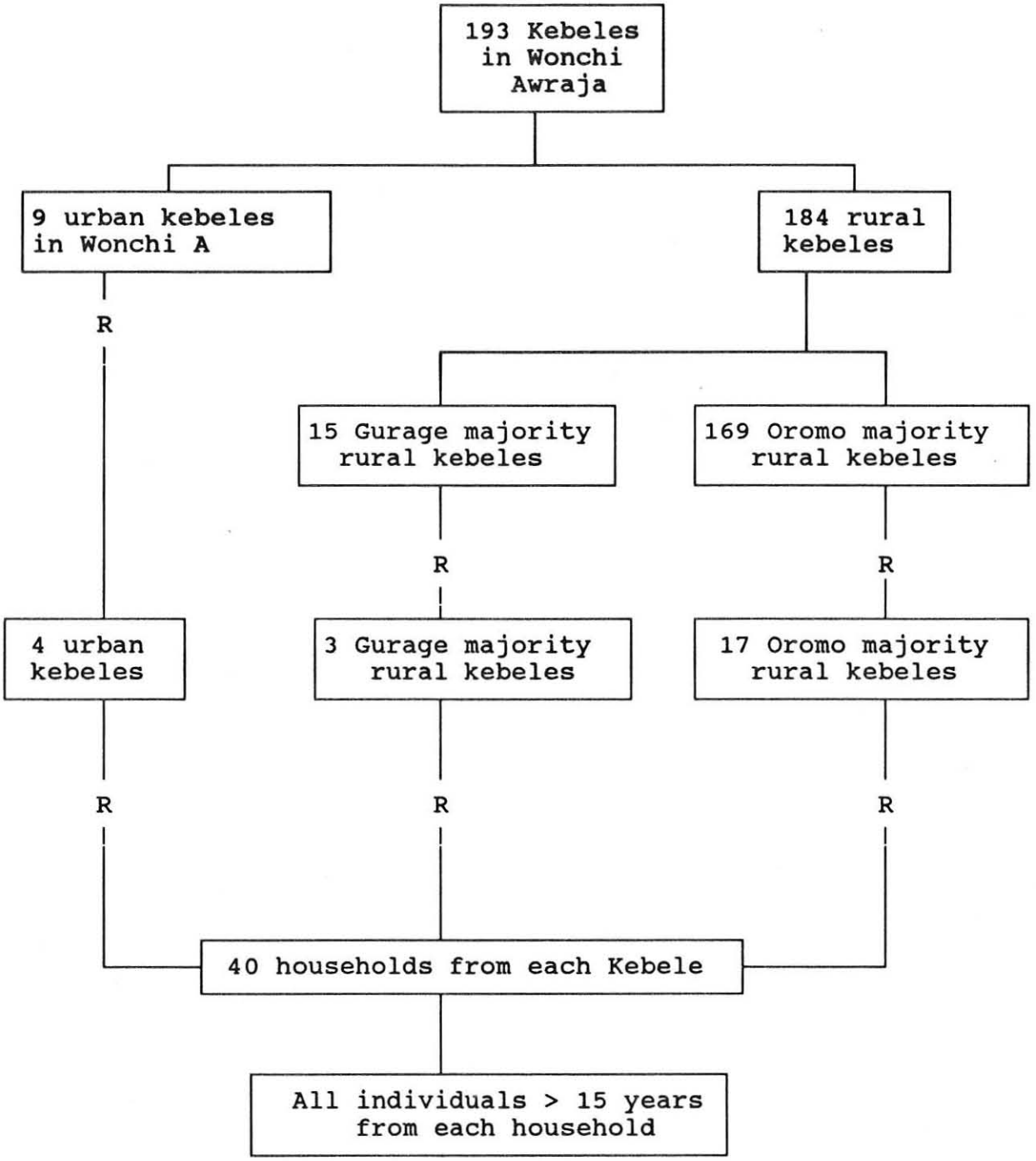
$= 2,716$

Therefore with the above assumptions about 2,700 individuals are required for the study. This assumes that the subjects are chosen by simple random sampling. A cluster sampling technique was used in this case which would decrease the precision.

4.6. Sampling Procedure

The primary aim of this study is to determine the prevalence of hypertension and its determinants. As a secondary aim, though the power may be low, in order to see the association of the determinants like ethnicity, living place (urban Vs rural) with the hypertension, the sample is made to include kebeles from the urban associations, the few peasant associations with majority Gurage, and the rest of the peasant associations with majority Oromos.

24 kebeles were studied which were chosen randomly after stratification to include urban kebeles, Gurage majority rural kebeles, and Oromo majority rural kebeles. From each kebele 40 households were chosen using systematic sampling,the first house being chosen at random. From each household all those who are 15 years old and above were included in the study. Assuming an average of three persons with age $\geq$ 15 per household, about 120 individuals were studied from each kebele (fig. 1).



Total = 24 kebeles
= 24 x 40 = 960 households
= 2,745 individuals

Figure 1 - Sampling Frame

MEASUREMENT

Measurements of blood pressure, height, weight, waist circumference, hip circumference, and pulse count were made house to house for all those included in the study. Associated factors were also looked for by filling a pretested questionnaire.

A single, casual blood pressure reading was recommended for epidemiological studies by the WHO expert committee in 1978, with subjects at rest in the sitting position for 5 minutes was taken in the right arm with the use of a mercury sphygmomanometer of an average cuff size (12 x 22cm). All readings was taken to the nearest 5mm. Hg. by a trained observer. Systolic pressure was taken as the pressure at which the ear distinguishes the first arterial sound, and the point at which the last arterial sound disappears (korotkof phase 5) was taken as the diastolic pressure. Pulse count was taken at the same time, counted by the same observer.

Height was recorded to the nearest centimetre using a metallic tape and girth of waist and hips were recorded to the nearest centimetre using a plastic tape. Weight was recorded to the nearest kilogram using a bathroom scale in light clothing after participants have removed their shoes (if any) and heavy garments. Horizontal circumferences (waist and hip girth) were measured on subjects in the standing position, waist girth at a level midway between lower rib margin and the iliac crest, and hip girth as the

widest circumference over the greater trochanter. The body mass index (weight (kg) divided by squared height (m^2) was used as a measure of relative body weight. Abdominal obesity was estimated by calculating the ratio of waist girth to hip girth.

In order to determine the daily salt consumption of a house hold, the interviewers took with them samples of 5, 10, 20, 50 and 100g of salt packed separately in polyethylene bags so that it was clearly visible with out being opened. They showed these packets to house wives and enquired which of the packets of salt is usually used per day for cooking purposes in the household. Once the packet is identified and the number of members in the household is known the amount of salt consumed by every member of the eligible population was approximated by making certain assumptions for the age variation. These arbitrary assumptions were:

1. Children of 0-2 years consumed zero units;
2. Children of 2-12 years consumed half a unit ;
3. persons aged 12 years and above consumed one unit.

Participants were also asked if they put salt in their coffee.

Information on other determinants was also obtained using a pretested questionnaire. The questionnaire which is found in Appendix I includes information on socio demographic characteristics like ethnicity, educational status, and occupation. It also includes information on behavioral characteristics which include smoking and chat chewing.

Subjects found to be hypertensive in this study were informed about their blood pressure and referred to the nearest health

institution for follow up. For those participants with very high blood pressure who required immediate attention, transportation service to the health centre was given.

Definition

In this study, hypertension is defined as systolic blood pressure ≥ 160 mm. Hg. and/or a diastolic blood pressure ≥95 mm Hg.

Data Collection and Management

Training was given to the four interviewers and the project coordinator for 3 days by the principal investigator. Piloting was done to test the questionnaires and other feasibility issues and accordingly minor amendments were made.

All the data were collected by two teams of interviewers, each team consisted of two persons - a health assistant and a student who had completed 12th grade. Both interviewers were from the area and speak the local languages.

Measurements of BP, pulse, weight, height, waist girth and hip girth were taken by the health assistants while the interview from the other questionnaire was done by the students.

Preceding data collection in each kebele, discussion with the CHA's (if available), peace and stability committees and informal leaders (usually the elderly) was made about the study and their consent was secured. They were also asked to cooperate during the study and to assign about two persons to go from house to house with the interviewers. All the kebeles studied were happy about the study and cooperative.

A random check of blood pressure measurements was carried out by the principal investigator in three randomly chosen kebeles by taking blood pressure measurements of the study subjects just after the health assistant took the blood pressure measurement, and the findings were similar. Periodic check up of the weight scale was also made against standard weight and weight scales were satisfactorily accurate ($\leq$ 1kg difference).

The interviewers were supervised by the principal investigator at least once in every kebele.

Data Processing and Analysis

Data processing and analysis was performed using a computer of the Department of the Community Health, Medical Faculty, Addis Ababa University. Data entry was carried out, using Epi Info program written for this purpose (30).

After computer input was completed, a 10% check of all the questionnaires in the completed computer information was carried out by the investigator

The analysis was done using EPI Info program , which is capable of producing frequency distributions, cross tabulations, and tests of associations, rate ratios, 95% confidence intervals and chi square statistic for linear trend.The SAS program (31) was additionally used for multiple linear regression.

Univariate statistics were computed to assess demographic, behavioral and body build characteristics of the study population. Tables were also prepared for cross tabulations between systolic and diastolic blood pressure and the demographic, behavioral, and body build characteristics of the study population .

Finally graphs were made using the Harvard Graphics Program (32).

RESULTS

During the study period a total of 2,745 individuals were studied. The prevalence of hypertension in the Awraja is 8.3%. The prevalence of hypertension in males is 9.2% while in females it is 7.4%. It is 11.8% in urban and 7.5% in rural populations of the Awraja.

Socio demographic characteristics of the study population

Age and sex distribution of the study population is described in table 1.

Sex and residence (rural-urban) composition of the study population are described in table 2. The ethnic composition,educational status,and occupation of the study population are depicted in figures 2,3,and 4 respectively. The behavioral characteristics -smoking,chat chewing and salt consumption are described in tables 3,4 and 5 respectively.

Table 1. Age and Sex distribution of the study population

Age group	Male	Female	Total	Percentage
15 - 19	258	332	590	21.5%
20 - 29	253	316	569	20.7%
30 - 39	219	276	495	18.0%
40 - 49	178	258	436	15.9%
50 - 59	167	179	346	12.6%
≥ 60	195	114	309	11.3%
Total	1270	1475	2745	100.0%

Table 2. Sex and residence (rural-urban) composition of the study population.

Characteristics		No of individuals studied	% of the study population
Sex	- Male	1,270	46.3%
	- Female	1,475	53.7%
			100 %
Resid.	- Rural	2,254	82.1 %
	- Urban	491	17.9 %
			100 %

Figure 2 - Ethnic composition of the study population

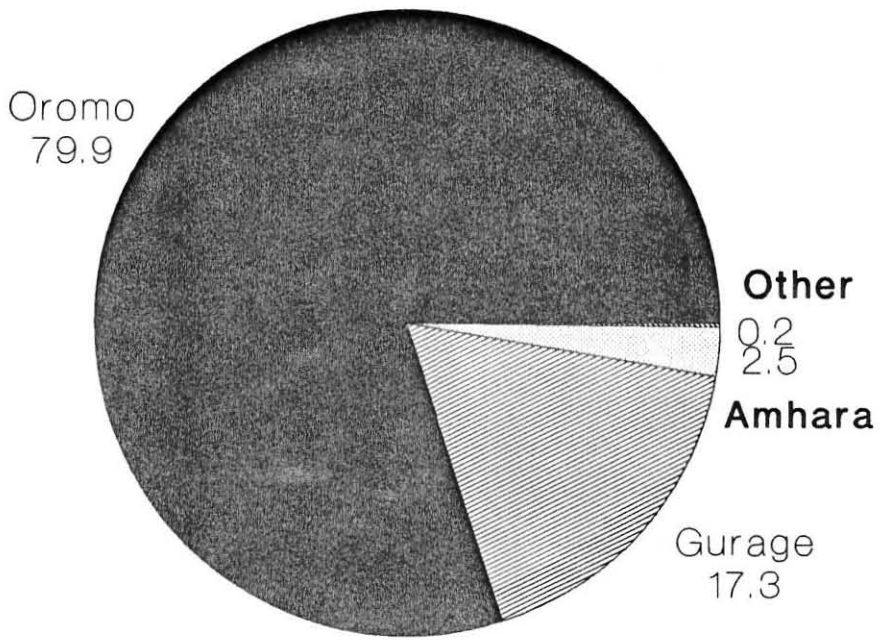


Figure 3- Educational Status of the study population

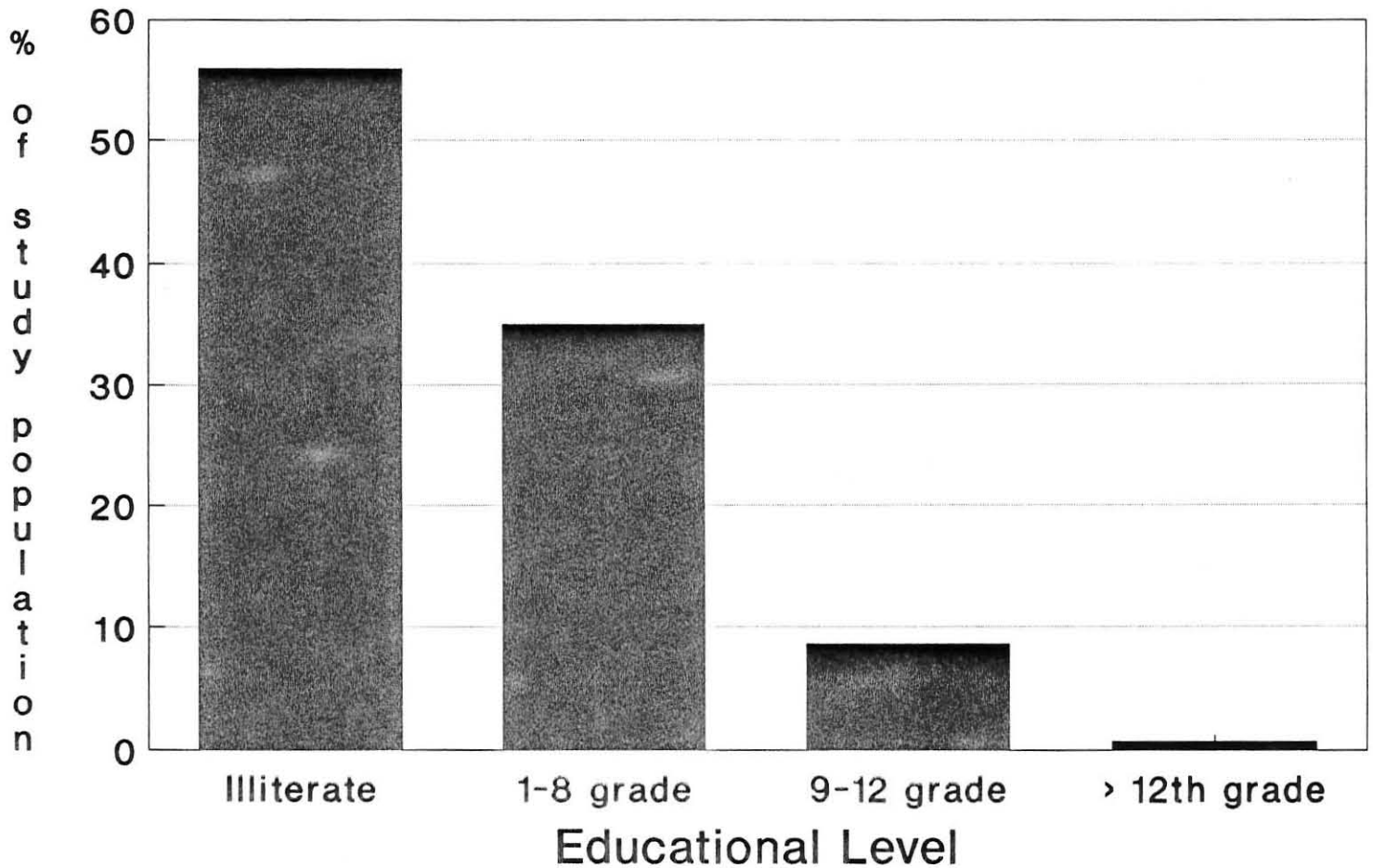


Figure4 - Occupation of the study population

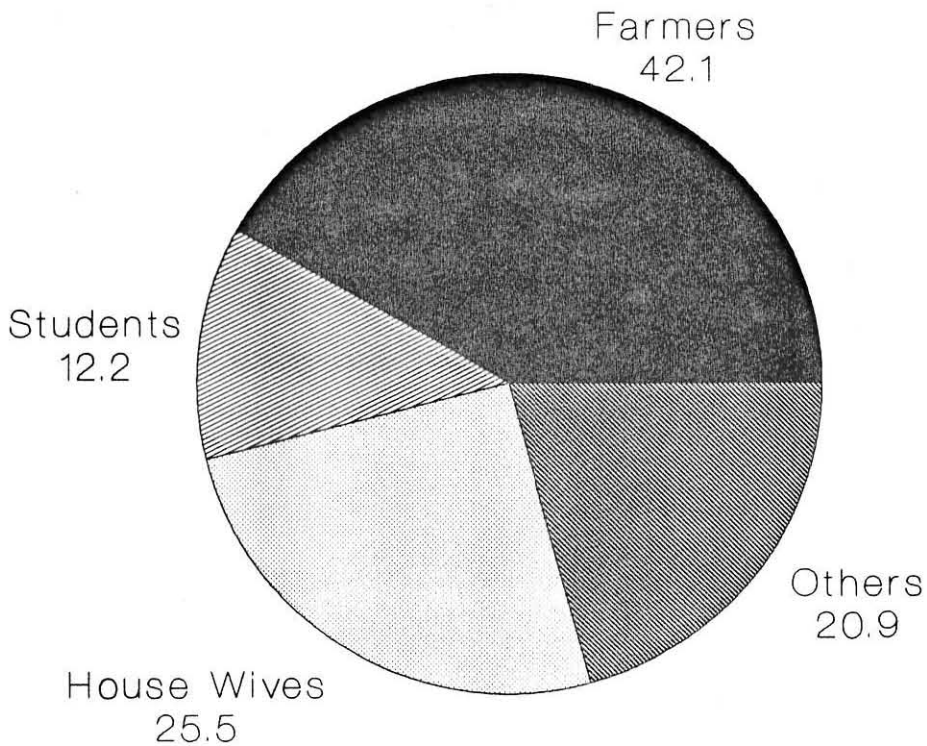


Table 3. Prevalence, duration and frequency of smoking in the study population

Characteristic		No of individuals Studied	% from the study Population
Smoking	- Smokers	139	5.1 %
	- Non Smokers	2,604	94.9 %
			100 %
Duration	- ≥ 10	90	64.7 %
of smoking	- 5-9	20	14.4 %
in years	- 1-4	26	18.7 %
	- < 1	3	2.2 %
			100 %
NO of	- ≥ 20	22	15.8 %
cigarettes	- 10-19	43	30.9 %
per day	- 1-9	67	48.2 %
	- < 1	7	5.0 %
			100 %

Table 4. Prevalence, frequency and price of chat chewing in the study population

Characteristic		No of individuals Studied	% from the study Population
Chat	- Chewers	451	16.4 %
	- Non Chewers	2,292	83.5 %
			100 %
Freq. of Chewing per week	- Daily	171	37.9 %
	- 4-6 days	40	8.9 %
	- 2-3 days	44	9.7 %
	- 1 day	128	28.4 %
	- < 1 day	68	15.1 %
			100 %
Chat Price- In cents per session	- ≤ 50	225	49.9 %
	- 51-100	175	38.8 %
	-101-200	32	7.1 %
	-201-300	10	2.2 %
	- > 300	9	2.0 %
			100 %

Table 5. Salt consumption in the study population

Characteristic		No of individuals Studied	% from the study Population
Salt in	- Put	2,484	90.5 %
Coffee	- Don't Put	259	9.4 %
			100 %
No of	- < 1	44	1.8 %
Cups of	- 1-3	195	7.9 %
Coffee	- 4-6	567	22.8 %
Per day	- 7-9	656	26.4 %
	- ≥ 10	1,022	41.1 %
			100 %
Salt cons.-	< 15	497	18.1 %
gm/day	- ≥ 15	2,248	81.9 %
			100 %

Body build characteristics of the study population

Mean weight of our study population is 50 kgs.(s.d. 8.59), and the mean height is 162 cms (s.d. 9.77).

As a measure of relative body weight, the body mass index (weight (kg) divided by squared height (m2) was calculated and grouped using a class interval of 5. The number of individuals and the percentage in each group is presented in figure 5.

The mean body mass index in our study population is 18 kg/m2 .

Mean waist girth circumference in our study population is 69 cms and mean hip circumference is 78 cms.

Abdominal obesity was estimated by calculating the ratio of waist girth to hip girth.The mean ratio of waist girth to hip girth is 0.88.

Mean Blood Pressure

Mean systolic BP and mean diastolic BP of different groups and the p-value of each group are presented in table 6.

The uniformity of the mean diastolic BP is noted as seen in table 6, but this could be because the measurements are taken to the nearest 5mm Hg, and the range of diastolic BP is narrower than that of the systolic.

Figure 5 - Body Mass Index (BMI) of the study population

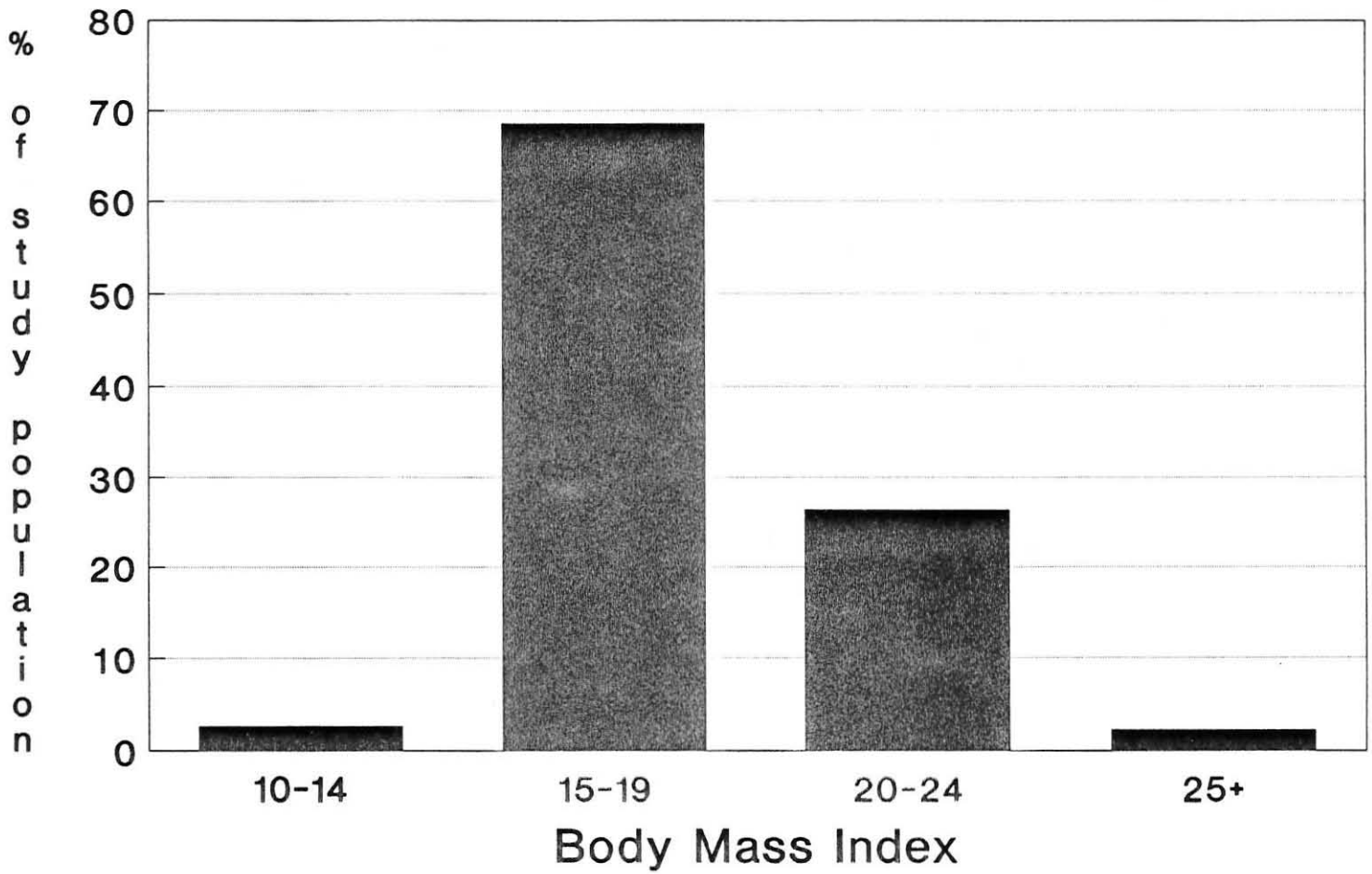


Table 6. Mean BP systolic and diastolic.

Group		means sys.BP.	Mean diast.BP.
sex	male	118	80
	female	117	79
	p	0.02	0.01
Ethen.	Oromo	117	80
	Gurage	118	80
	Amhara	120	80
	others	117	79
	p	0.52	0.99
Educa.	Illiterate	118	80
	Literacy camp.& gr.1	119	79
	≥ grade 2	117	79
	P	0.10	0.05
Smoking	Smokers	118	80
	Non smokers	118	80
	P	0.73	54
Chat	Chewers	119	80
	Non chewers	117	79
	P	0.00	0.07
Occupa.	Farmers	117	80
	Merchants	125	84
	Office workers	119	80
	Students	115	77
	House wives	118	79
	Others	119	79
	P	0.00	0.00
Salt in coffee	Put	117	80
	Don't put	120	80
	P	0.00	0.50
Reside.	Rural	117	79
	Urban	121	81
	P	0.00	0.00

Prevalence of Hypertension by Age

The number of hypertensive and non hypertensive were compared for each group using a 2x2 table. The 15-19 age interval was taken as a reference group to determine p-value, odds ratio (OR) and 95% confidence limits for the odds ratio of each group as compared with prevalence in the age interval 15-19 age group.

As seen in table 7, the age variation of the prevalence of hypertension is significant ($P<0.05$). Prevalence of hypertension increases with increasing age.

Table 7. Prevalence of hypertension by age.

Age Group	No.of Indiv. Studied	No.of Hyper tens.	Preva.of Hypert.	P-value	OR	95% conf. Limit for OR
15-19	590	20	3.4%	-	-	-
20-29	569	37	6.5%	0.01	1.98	1.10 - 3.59
30-39	495	43	8.7%	0.00	2.71	1.53 - 4.85
40-49	436	40	9.2%	0.00	2.88	1.61 - 5.19
50-59	346	48	14.2%	0.00	4.70	2.67 - 8.35
>60	309	38	12.3%	0.00	4.00	2.21 - 7.27

P-value 0.00

Prevalence of Hypertension by Sex and Residency

The number of hypertensive and non hypertensive in both sexes were compared. By taking the male group as a reference group P-Value, odds ratio and 95% confidence limits for the odds ratio were calculated.

As seen in table 8 there is no statistically significant difference in the prevalence of hypertension between male and female.

The Rural Urban difference of the hypertensive and non hypertensive were also compared and by taking the rural population as a reference group, the P-Value, odds ratio and 95% confidence limits of the urban population were determined.

As seen in table 8 there is statistically significant ($P<0.05$) rural- urban difference in prevalence of hypertension.

Table 8. Prevalence of Hypertension by Sex and Residency

Characteristic		No.of Indiv. Studied	No of hyper tensives	Preva lence	P-value	OR	95% conf. limits for OR
Sex	- Male	1270	117	9.2 %	-	-	-
	-Female	1475	110	7.4 %	0.09	0.79	0.60 - 1.05
Resid.	-Rural	2254	169	7.5 %	-	-	-
	-Urban	491	58	11.8 %	0.00	1.65	1.19 - 2.29

Figure 6 - Prevalence of hypertension by age and sex

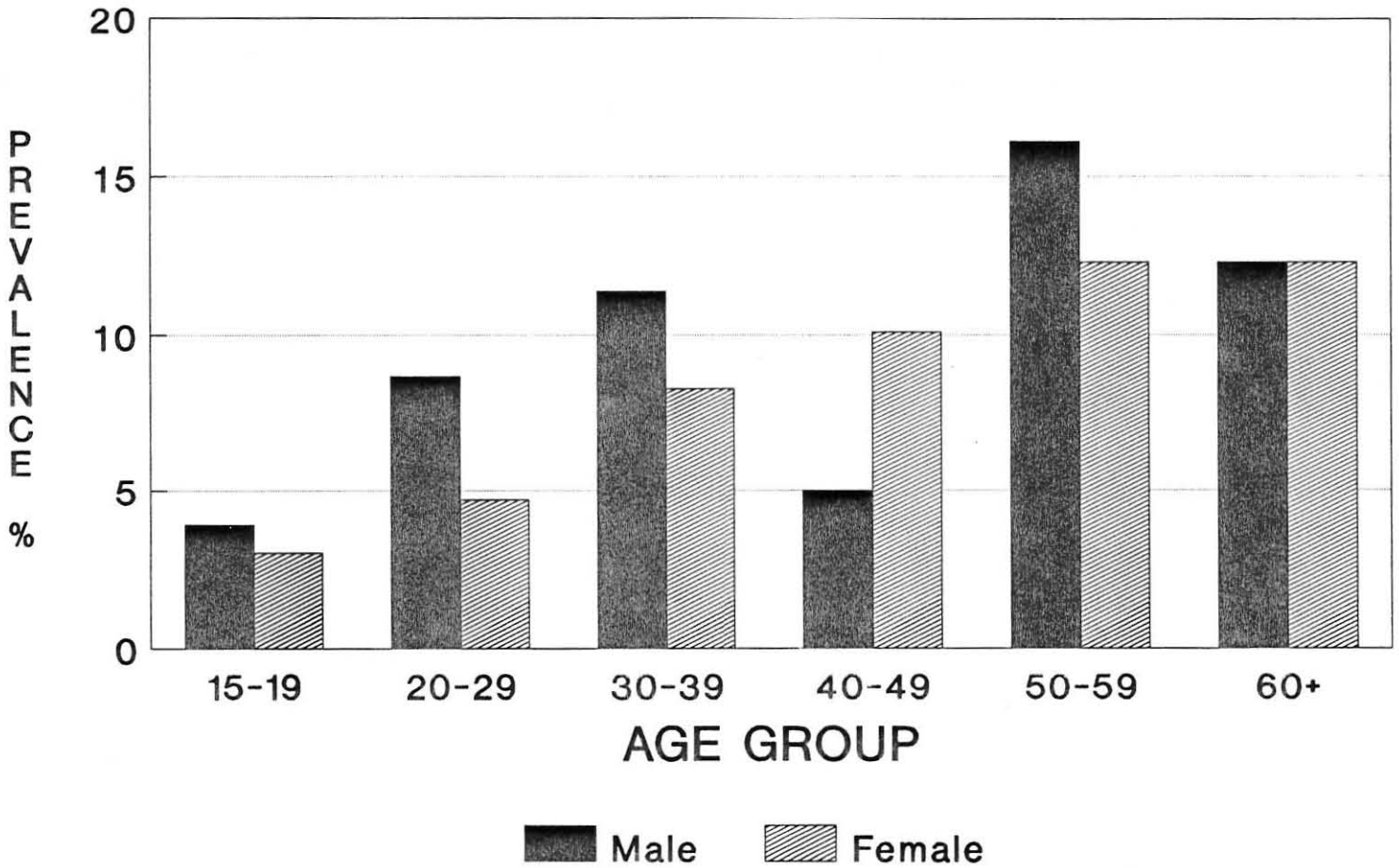


Figure 7 - Prevalence of hypertension by age and residency

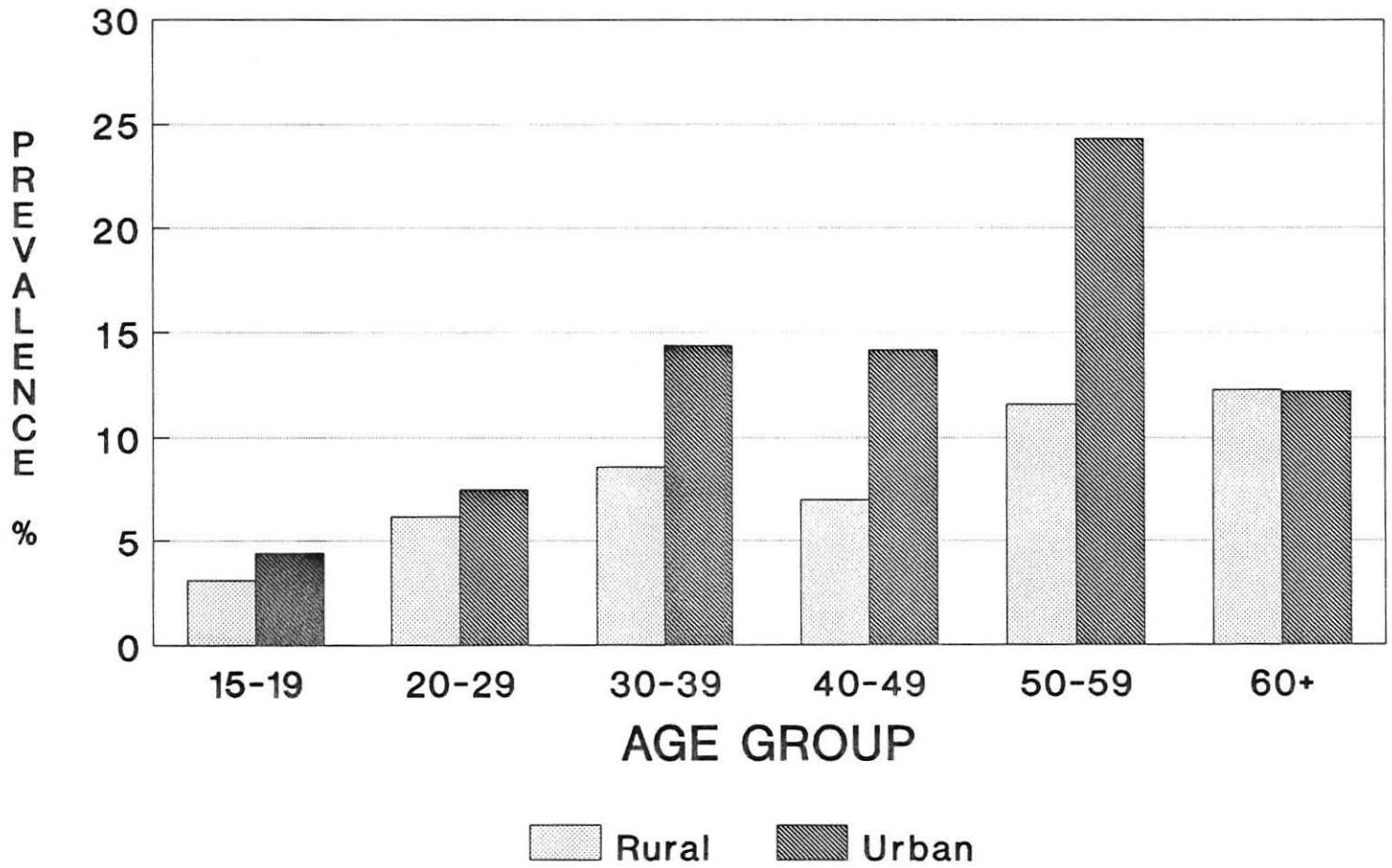


Table 9. Prevalence of hypertension by age, sex and residency.

Age group	Male	Female	Rural	Urban
15-19	10 (3.9%)	10 (3.0%)	15 (3.1%)	5 (4.4%)
20-29	22 (8.7%)	15 (4.7%)	29 (6.2%)	8 (7.5%)
30-39	25 (11.4%)	23 (8.3%)	35 (8.6%)	13 (14.4%)
40-49	9 (5.0%)	26 (10.1%)	26 (7.0%)	9 (14.2%)
50-59	27 (16.1%)	22 (12.3%)	32 (11.6%)	17 (24.3%)
>60	24 (12.3%)	14 (12.3%)	32 (12.3%)	6 (12.2%)
Total	117 (9.2%)	110 (7.4%)	169 (7.5%)	58 (11.8%)

Prevalence of Hypertension by Ethnicity

The number of hypertensive and non hypertensive in each ethnic group were compared. Taking the Oromos as a reference group P-Value odds ratio and the 95% confidence limit for the odds ratio for each of the rest of the ethnic groups as compared to the Oromos is determined.

As seen in table 10, no statistically significant ethnic difference is observed in the prevalence of hypertension.

Prevalence of Hypertension by Educational Status

Educational status of the study population was grouped in four groups namely, illiterate, 1-8th grade, 9-12th grade and above 12th grade.

The numbers of hypertensive and non hypertensive in each group were compared. Taking the illiterate group as a reference group the P-Value, odd ratio, and 95% limits for the odds ratio for each group as compared to the illiterates are determined.

As seen in table 11 no statistically significant difference in prevalence of hypertension is observed by educational status.

Prevalence of Hypertension by Occupation

The number of hypertensive and non hypertensive in each of the occupational groups as seen in table 11 are compared. Taking farmers as a reference group P-Value, odds ratio and 95% confidence limits for each the rest groups as compared to the farmers are determined.

As seen in table 12 there is no statistically significant difference in prevalence of hypertension by most occupations.

When compared to farmers, students have a statistically significantly ($P<0.05$) less prevalence of hypertension than farmers.

Table 10. Prevalence of Hypertension by Ethnicity

Ethnicity	No of hyper tensives	No.of indiv Studied	Preva lence
-Oromo	184	2192	8.4%
-Gurage	34	475	7.2%
-Amhara	8	69	11.6%
-Others	1	6	16.6%

P.value = 0.50

Table 11. Prevalence of Hypertension by Educational Status

Education	No of hyper tensives	No.of Indivi. Studied	Preva lence
-Illitr.	132	1534	8.6%
- 1-8	69	960	8.5%
-9-12	24	237	10.1%
- >12	2	19	10.5%

P-value = 0.86

Table 12. Prevalence of hypertension by occupation

Occupation	No of hyper tensives	No. of indiv. Studied	Preva lence	P-value	OR	95% confi. limits for OR
Farmers	112	1157	9.7%	-	-	-
Merchants	2	31	6.4%	0.55	0.64	0.10 - 2.82
Off.workers	3	24	12.5%	0.64	1.33	0.31 - 4.80
Students	17	334	5.1%	0.01	0.50	0.29 - 0.87
House wives	58	701	8.3%	0.31	0.84	0.60 - 1.19
Others	35	498	7.0%	0.08	0.71	0.47 - 1.06
P-value	0.10					

Prevalence of Hypertension by Associated Behaviours.

The behaviours which are included in this section include smoking, chat chewing and salt consumption.

Smoking

Taking smokers as a reference group P-Value, odds ratio and 95% confidence limits of the odds ratio of non smokers as compared to smokers is determined. As seen in table 12 there is no statistically significant difference in prevalence of hypertension between smokers and non smokers.

The smokers group were further classified by the duration of smoking in years and by the number of cigarettes smoked per day. Again no statistically significant difference is observed among the smokers by the duration of smoking or by the number of cigarettes they smoke per day.

Chat Chewing

Taking chat chewers as a reference group, P-Value, odds ratio and 95% confidence limit for the odds ratio are determined and no significant difference in prevalence of hypertension is observed among chat chewers and non chewers.

The chat chewers group were further classified by number of chewing days per weeks and by the amount of money spent for chat per session (as a measure of the amount of chat chewed per session).

No statistically significant difference in prevalence of hypertension was observed among the chewers by either frequency of chewing or amount of money spent for chat per session.

Table 13. Prevalence of hypertension by smoking

Behaviour		No of hyper tensives	No. of indiv. Studied	preva lence	P-value	OR	95% confi. limits for OR
-Smokers		14	139	10.0%	-	-	-
-Non Smok.		213	2604	8.2%	0.43	0.80	0.44 - 1.47
Durat.	-≥ 10	11	90	11.7%	-	-	-
Of Smok. in years	-5-9	1	20	5.0%	0.37	0.40	0.02 - 3.32
	-1-4	2	26	7.7%	0.56	0.63	0.06 - 3.20
P-value	0.60						
No of cig./day	-≥ 20	4	22	18.2%	-	-	-
	-10-19	1	43	2.3%	0.07	0.11	0.00 - 1.22
	-1-9	9	67	13.0%	0.58	2.25	0.50 -10.76

P-value 0.08

Table 14. prevalence of hypertension by chat chewing

Behaviour	No of hyper tensives	No. of indivi. Studied	Preva lence	P-value	OR	95% confi. limits for OR
Chat chewers	47	451	10.4%	-	-	-
Non Chewers	180	2292	7.8%	0.07	1.37	0.96 - 1.94
Freq.of chewing -daily	18	171	10.2%	-	-	-
/week -4-6 days	3	40	7.5%	0.61	0.72	0.16 - 2.77
-2-3 days	4	44	9.0%	0.83	0.88	0.24 - 2.99
-1 day	13	128	10.1%	0.99	1.00	0.44 - 2.55
-<1 day	12	68	17.6%	0.11	1.89	0.80 - 4.46
P-value 0.41						
Chat Price.-≤ 50 in cents	25	225	11.1%	-	-	-
- 51-100	19	175	10.9%	0.93	0.97	0.49 - 1.91
- 101-200	4	32	12.5%	0.82	1.14	0.31 - 3.81
- 201-300	1	10	10.0%	0.91	0.89	0.02 - 6.91
P-value 0.99						

Salt consumption

Salt in coffee . Number of hypertensive and non hypertensive among those who put salt in coffee and those who don't put are compared.

Taking those who put salt in coffee as a reference group those who don't put salt in coffee, have statistically significantly ($P<0.05$) higher prevalence of hypertension than those who do put salt in their coffee.

Those who put salt in their coffee are further divided by the number of cups they drink per day. Among those who put salt in their coffee no statistically significant difference in prevalence of hypertension is observed by the amount of cups of coffee they drink per day.

Total salt consumption. With regard to the amount of salt consumed per day, the study population is grouped in to those who consume < 15 gm/ day and those who consume ≥ 15 gm/day. No statistically significant difference is observed in prevalence of hypertension between those who consume < 15 gm/day and those who consume ≥ 15 gm/day.

Table 15. Prevalence of hypertension by salt consumption

Behaviour	No of hyper tensives	No. of indiv. Studied	Preva lence	P-value	OR	95% confi. limits for OR
Salt in coffee						
Put	199	2484	8.0%	-	-	-
Don't Put	38	259	14.7%	0.00	1.97	1.33 - 2.91
NO of Cups/ day - 1-3	19	195	8.4%	-	-	-
- 4-6	47	567	7.9%	0.78	0.93	0.52 - 1.68
- 7-9	59	656	8.6%	0.94	1.02	0.58 - 1.82
P-value = 0.97						
Total salt cons						
<15 gm./day	40	497	8.0%	-	-	-
≥15 gm./d	187	2248	8.3%	0.84	1.04	0.72 - 1.50

Prevalence of hypertension by body build

As a measure of relative body weight, body mass index [weight in kg/ (height in M)^2] was calculated and the study population was grouped in to four groups as seen in table 16. A statistically significant difference in prevalence of hypertension is observed in different body mass index groups. As body mass index increases prevalence of hypertension increases. Taking the 10-14 BMI group as a reference group, the 15-19 and the 20-24 BMI group have no statistically significant difference of prevalence of hypertension from the 10-14 group, but those with BMI of $\geq$ 25 have statistically significant ($P<0.05$) higher prevalence of hypertension.

Body mass index remains significant in a multiple linear regression even when other variables (age and residency) are controlled.

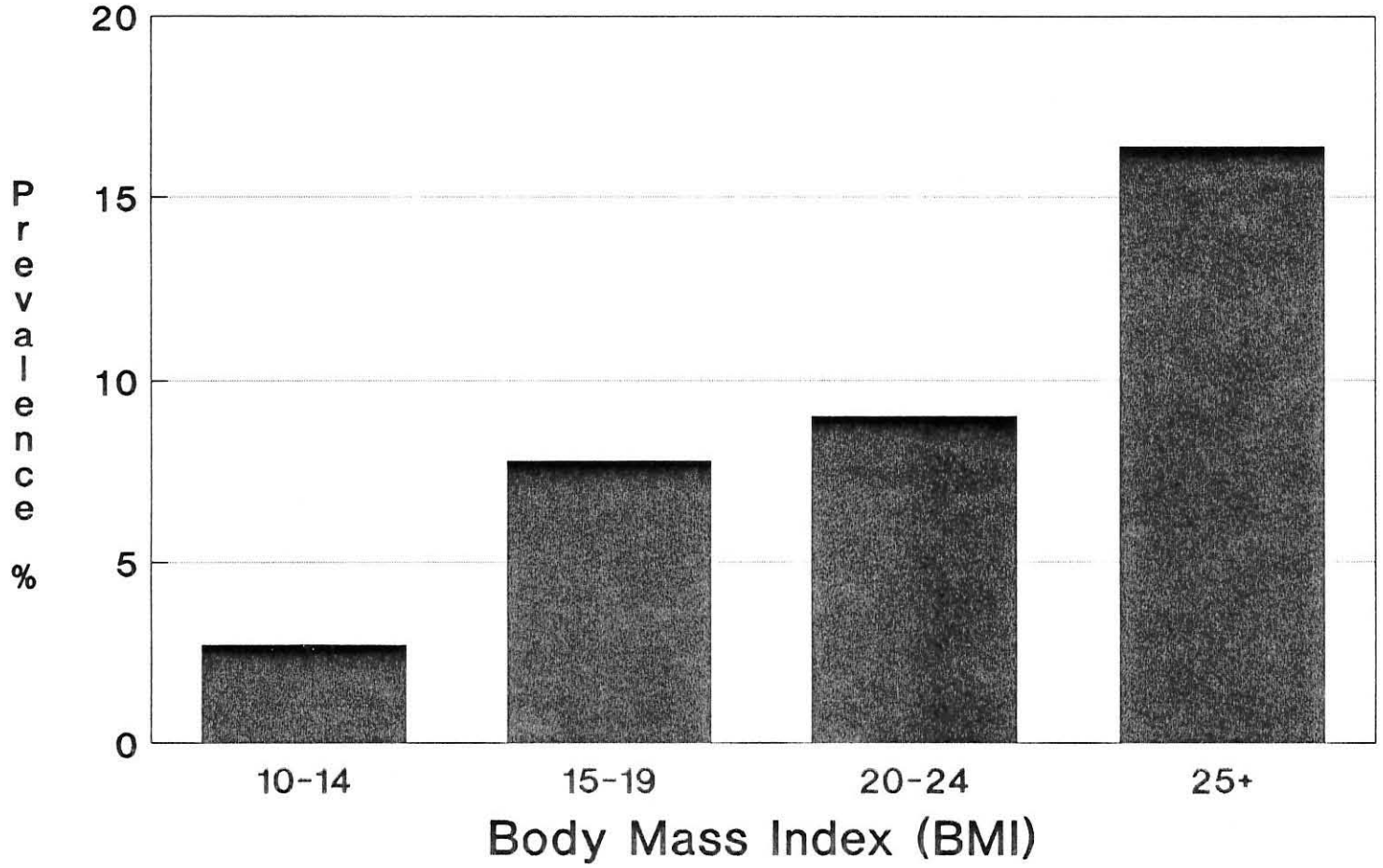
As a measure of abdominal obesity the ratio of waist girth to hip girth circumference is calculated. The mean ratio of waist girth to hip girth is 0.88 . In a multiple linear regression the ratio of waist girth to hip girth didn't come out as a significant factor.

Table 16. Prevalence of hypertension by body build

Measure of body built		No of hyper tensives	No. of indiv. Studied	Preva lence	P-value	OR	95% confi. limits for OR
Body Mass index	10-14	2	73	2.7%	-	-	-
	15-19	148	1883	7.8%	0.10	3.03	0.72 - 18.02
	20-24	65	725	9.0%	0.06	3.50	0.82 - 21.09
	≥ 25	10	61	16.4%	0.00	6.96	1.34 - 48.20

P-value =0.02

Figure 8 - Prevalence of hypertension by Body Mass Index (BMI)



Number of individuals who put salt in their coffee and those who don't put are compared for rural and urban population. By taking the rural population as a standard population the p-value odds ratio and 95% confidence limit for the urban population are determined. As seen in table 17 putting salt in coffee is significantly lower in the urban population.

The rural and urban population was compared for different body mass index groups. By taking the body mass index interval 10-14 group as a reference group, p-value, odds ratio and 95% confidence limits for the odds ratio of the remaining groups were determined.

As seen in table 18 as compared to the BMI interval 10-14 group, the BMI interval 15-19 group have no significant difference, but the BMI interval 20-24 group and the BMI interval $\geq$ 25 group live significantly less in rural areas.

Students and farmers are compared by age grouping in to <30 age group and $\geq$30 age group. By taking the age group <30 as a reference group p-value, odds ratio and 95% confidence limits for the odds ratio are determined. As seen in table 19 the age group $\geq$30 are significantly less in students.

Multiple Linear regression of all the variables was done on systolic and diastolic blood pressure and the findings of the significant variables are presented in table 20 for systolic and in table 21 for diastolic blood pressure.

Table 17. Prevalence of salt putting in coffee in urban and rural population.

	Put salt in coffee	Don't put salt in coffee	P-Value	OR	95 %con
Rural	2,101 (87.0%)	93 (35.9%)	-	-	-
Urban	323 (13.0%)	166 (64.1%)	0.00	0.08	0.06-0.11
Total	2,484 (100%)	259 (100%)			

Table 18. Prevalence of different body mass index groups in rural and urban population.

Body Mass index	Rural	Urban	P -Value	OR	95% conf.limit
10-14	66 (90.4%)	7 (9.6%)	-	-	-
15-19	1643 (87.2%)	240 (12.8%)	0.43	0.73	0.30-1.66
20-24	521 (71.9%)	204 (28.1%)	0.00	0.27	0.11-0.62
$\geq$ 25	23 (37.7%)	38 (62.3%)	0.00	0.06	0.02-0.18
Total	2,203 (81.8%)	489 (18.2%)			

P = 0.00

Table 19. Age grouping of students and farmers

Age group	Students	Farmers	P-Value	OR	95% conf.
< 30	308 (92.2%)	940 (41.7%)	-	-	-
≥ 30	26 (7.8%)	1314 (58.2%)	0.00	0.06	0.04-0.09
Total	334 (100%)	2254 (100%)			

Table 20. Significance of variables by multiple linear regression for systolic blood pressure.

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEPT	1	97.410556	2.25928945	43.116	0.0000
AGE	1	0.123655	0.01666803	7.419	0.0001
SEX	1	-1.629522	0.59483552	2.739	0.0062
BMI	1	0.739768	0.10596653	6.981	0.0001
RESIDENCE	1	2.818467	0.81732747	3.448	0.0006
OCCUPATION	1	0.109317	0.15509839	0.705	0.4810
SALT IN COFFEE	1	0.541553	0.99120130	0.546	0.5849

Table 21. Significance of variables by multiple linear regression for diastolic blood pressure.

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEPT	1	67.051262	1.72995124	38.759	0.0001
AGE	1	0.060541	0.01276281	4.744	0.0001
SEX	1	-0.825269	0.45546906	1.812	0.0701
BMI	1	0.613131	0.08113919	7.557	0.0001
RESIDENCE	1	0.409056	0.62583246	2.251	0.0244
OCCUPATION	1	-0.250044	0.11875975	2.105	0.0353
SALT IN COFFEE	1	-0.709183	0.75896867	0.934	0.3502

Awareness and medication

Among the 227 persons with hypertension in the Awraja only 6(2.6%) are aware that they have the disease. 5 (83%) of those who are aware of their disease have taken antihypertensive medication for some time. Only 1 (16.6%) of those who took medication take it regularly as advised or prescribed by their health worker and visit their health worker regularly. No person who is aware of his hypertension was found to be non hypertensive during the study time.

DISCUSSION

The prevalence of hypertension in this study, 8.3%, is high in comparison with the rural prevalence rate of 1.8% in North Western Ethiopia (13). This could be because the latter was done at a time when the area was stricken by drought, or hypertension between the two communities. The present prevalence was also higher than the 2.7% prevalence in adults of two settlement villages in lowland areas which was also done in Gonder region (14), but this two settlement villages are likely to be different from our study population. It is less than most of the urban prevalence rates (4.6%-13%) in Ethiopia (11,12,13) but it is consistent with the WHO estimation of prevalence of hypertension in most parts of the world 8%-16% (1).

82.1% of our study population live in rural areas and the remaining 17.9% of our study population live in urban areas. When this urban rural composition of the study population is compared to urban rural composition of the whole Awraja according to the records from the Western Shoa plan committee office, which is 91.7% rural and 8.3% urban, the urban population is over represented in this study.

53.7% of the study population are female and the rest 46.3% are male. This gives a female to male ratio of 1.16 which is not very far from the planning committee estimate, 1.05 female to male ratio in the Awraja.

The majority of our study population, 79.9%, are ethnically Oromos, 17.3% are Gurages, 2.5% Amhara and the rest 0.3% are from other ethnic groups. This ethnic composition of our study population is again not far from the planning committee estimation of ethnic composition of the Awraja which is 82% Oromo, 13% Gurage, 4% Amhara and < 1 % others.

In general the prevalence of hypertension increases with advancing age (table 7). This finding is consistent with the view that blood pressure increases with advancing age which is found in this study as well as from previous studies in Ethiopia (11,12,13), and studies in other countries (1,3,8,16,18) .

As seen in table 8 prevalence of hypertension in both residencies rural and urban and in both sexes increases with advancing age.

Mean systolic and diastolic BP which are 118 and 117 systolic in male and female respectively and 80 and 79 diastolic in male and female respectively are higher in male for both systolic and diastolic ($P<0.05$).

However one should be cautious when interpreting this significance as our measurement error of blood pressure is 2.5 (ie BP measurements in this study are recorded to the nearest 5 mm hg).

Prevalence of hypertension in male 9.2% is higher than the prevalence of hypertension in females 7.4% But this is not statistically significant. No significant difference in prevalence of hypertension was detected among male and female in North West Ethiopia (13,14).

Blood pressures are higher in men until the age of 39, but in the age interval 40-49 it is higher in females. No difference is observed in the prevalence of hypertension between male and female above the age of 60. The pattern of blood pressure in developed countries with higher blood pressures in young men than in women until middle age, but older women tend to have higher pressures (1), though not exactly is generally a fitting description of blood pressure differences between the sexes observed in the present study, as well as in others in Ethiopia (11,12,13).

Mean blood pressure both systolic and diastolic 121 and 81 respectively are higher in urban than in rural population which are 117 and 79 systolic and diastolic respectively.

The prevalence of hypertension is also higher 11.8% in urban as compared to 7.5% in rural population (P = 0.00).

This urban rural difference in blood pressure and prevalence of hypertension have been recognised by several investigators (1,10,20,21).

In this study no significant difference in prevalence of hypertension is observed by ethnic group. There are no studies who have tried to see the difference in prevalence of hypertension among different ethnic groups in Ethiopia .

No significant difference in prevalence of hypertension is observed by educational status.

There is significant difference in mean systolic and diastolic blood pressure among different occupations with higher systolic and diastolic blood pressure 125 and 84 respectively for merchants and

lower mean systolic and diastolic blood pressure (115 and 77 respectively) for students.

Over all there is no significant difference in the prevalence of hypertension by occupation, except that students have lower prevalence of hypertension table 11. As the majority 92.3% of the students are < 30 years old as compared to 41.7 % of the farmers (table 18) and as it becomes insignificant when age is controlled, the difference in the prevalence of hypertension is most likely due to their age rather than the occupation.

The prevalence of smoking in our study population is 5.1% . This is comparable to the 6.7% prevalence of Ethiopian immigrant in Israel but low in comparison to the prevalence in developed countries (16).

No significant difference in prevalence of hypertension or mean systolic or diastolic blood pressure is observed among smokers and non smokers.

The prevalence of chat chewing in our study population is 16.4% which is fairly high prevalence.

Chat chewers have higher mean systolic blood pressure 119 than non chewers with a mean systolic blood pressure of 117. There is no significant difference in mean diastolic pressure among chewers and non chewers.

No difference in prevalence of hypertension is observed among chat chewers and non chewers .

Though there is no data for comparison on the prevalence of salt putting in coffee habit in other places of the country,as the

majority 90.5% of our study population, put salt in their coffee, the prevalence of salt putting habit in the study population is very high.

The mean systolic blood pressure for those who don't put salt in their coffee is higher (120) than those who do put salt in their coffee (117).

Those who put salt in coffee have significantly less prevalence of hypertension (8.0%), as compared to those who don't put salt in coffee (14.0%) (table 14). Among those who put salt in coffee there is no significant difference in prevalence of hypertension by the number of cups of coffee they drink per day.

In table 16 it is shown that the majority of those who put salt in coffee live in rural areas,and when residence is controlled the difference becomes insignificant, hence the difference in prevalence of hypertension among those who put and don't put salt in coffee might be explained by their rural urban distribution difference rather than by the habit it self.

Daily salt consumption of the majority 81.9% of our study population is $\geq$ 15 gm, which is a high amount (1, 22).

No difference in mean systolic or diastolic blood pressure or in prevalence of hypertension is observed among those whose daily salt consumption is <15 and $\geq$ 15 gms.

As a result of low mean body weight 50.24 kgs, the mean BMI our study population is low 18.49 kg/m^2. This mean BMI is similar to the finding in North western Shoa (13), but much lower than in developed countries (3,17,24, 25,27).

Only 2.2% of our study population have BMI $\geq$ 25 kg/m^2 indicating the rarity of obesity in this population. This is again similar to the percentage of persons with greater than 0.26 kg/cm^2 (1.7%) in North Western Ethiopia (13). As seen in table 15, significant difference in prevalence of hypertension is observed by difference in BMI. Those who have BMI $\geq$ 25 kg/m^2 have significantly higher prevalence 16.4%, as compared to those who have body mass index 10-14 (2.7%).

Our data suggest that having BMI $\geq$ 25 is a significant risk factor in the development of hypertension. This is also the conclusion of other studies including an Ethiopian study (13), and elsewhere (17,24,25).

CONCLUSIONS AND RECOMMENDATIONS

7.1. Conclusions

In this study the prevalence of Hypertension in the Awraja is not low. Prevalence of hypertension increases with advancing age. It also increases as BMI increases, with a much higher prevalence for those with BMI $\geq$ 25.The prevalence of hypertension is also higher in urban as compared to the rural population of the Awraja.

The percentage of the hypertensives who are aware that they have the disease is very low. Among those who take antihypertensive medication, the percentage of taking the medication regularly is again very low.

Recommendations

These above findings lead to the following recommendations.

1. The Ministry of Health and health workers should be aware that, the prevalence of hypertension is not low and many hypertensives are unaware of their disease, hence they should plan effective ways of detecting and treating hypertension. However,there is no point of detecting unless one is able to treat the detected cases, hence the Ministry of Health has to look for ways of improving the currently prevailing shortage of antihypertensive drugs.
2. Because the condition is symptomless, many individuals are unaware that their blood pressure is high, hence its detection is the responsibility of health workers. Therefore health workers should take the blood pressure of every patient they

come in contact with, and should not wait until patients complain of their Blood pressure.

3. Health workers should teach hypertensive patients, on the need for long term treatment as well as the importance of regular daily medication. Health workers should also teach obese individuals that they are at higher risk to develop higher blood pressures, hence should recommend a decrease of weight.
4. Further research on Hypertension should be encouraged. Research on the causes of noncompliance, and ways of improving them are required. Effectiveness and efficacy research for the detection and treatment of hypertension are also recommended.

REFERENCES

1. WHO Technical Report Series. Arterial Hypertension.1978;628.

2. Pedol H. Hypertension, in Miller D.L. and Farmer R.DT. Epidemiology of diseases. Blackwell Scientific Publications Boston Melbrne,1982; 122-145.

3. WHO Technical Report Series.Prevention in childhood and youth of adult cardiovascular diseases : time for action.1990;792.

4. Gordon, T. and Kannel.W.B. An epidemiological investigation of cardiovascular disease. The Framingham study.US DHEW,1971;1-27.

5. Abebe, M., and Tekle Haimanot. Cerebrovascular Accidents in Ethiopia.Ethiop. Med. J,1990; 28 .

6. Shaper, A.G. Blood Pressure studies in East Africa. In Jeremiah Stamler. The Epidemiology of Hypertension. USA, 1967; 139 -154.

7. Shaper,AG.Communities without hypertension, in cardiovascular diseases in the tropics. British Medical Association, London, 1974; 77-83.

8. Kenneth, J.R. The Yi migrant study: population exposures influencing blood pressure patterns. Epidemiology. 1991;2,283-87.

9. Stampler et al. Hypertension the problem and the challenge (source not obtained).

10. Ikeme.A.C. Hypertension studies in developing countries. In clin.and exper. hyper:theory and practice.1989.

11. Parry, EHO. Ethiopian cardiovascular studies, III The Casual Blood Pressure in Ethiopian Highlanders in Addis Ababa. East Afr. Med. H, 1969; 46, 246 - 251.

12. Lester, FT. Blood Pressure Levels in Ethiopian out Patients Ethiop. Med. J. 1973; 11, 145 - 154.

13. Zein Ahmed Zein and Mekonnen Assefa, Blood Pressure Levels and hypertension in rural Ethiopian Communities. Ethiop. Med. J, 1973; 24, 169 - 178.

14. Zein Ahmed Zein,Tekleberhan Berhe, Teshome Asefa and Yared Fantaye. Blood Pressure distribution and hypertension in two rural communities of Gonder Region, Ethiopia. Etiop. J. Health Dev,1991; 5,(1)35-42.

15. Bayu Teklu. 1983. Hypertension amongst bank employees in urban

Ethiopia. Ethiop. med. J,1983; 21, 217-221.

16. Ethud Grossman,Aaron Knecht, Talma Rosenthal, Biblothica Cardiologica. Switzerland,1983; 42, 93-96.

17. Manfred S. Green. etal. Blood pressure and serum cholesterol among male Ethiopian immigrants compared to other Israelis. J. of Epid and comm. Health, 1991; 45, 281-286.

18. Akinkugbe,OO. High blood pressure in the African. Churchill Livingstone, Edinburgh and London, 1972; 14-26.

19. Jiang He. Effect of migration on blood pressure: The Yi people study. Epidemiology. 1991; 2,2,88-97.

20. Daneshpajooh. M. Comparison of the prevalence of hypertension in the rural and urban Areas of Guilan Province, Northern Iran. In Y. yamarietal. prophylactic Approach to Hypertensive Disease. Raven press. New york, 1979.

21. Buyamba. J.R.M. Comparison of blood pressure and prevalence of Hypertension in Rural and Urban Zaire. Biblthca cardiol.1987; 42, 80-87.

22. Mrigendra R.P. Hypertension in Nepal; Biblthca cardiol. 1987; 42, 68-76.

23. M paul Anand, Ds Bakhle, Samyuktha Ajay. 1990. Smoking and Hypertension: Indian scenario. J. Assoc physicians India 38(4), 283-284.

24. Gordon T. , Kannel. W.B. Obesity and cardiovascular defects: The Framinghum study. Clinics in Endocrinology Andmetabolism.1976; 5 (2), 367-375.

25. Selby J V.et al. Precursors of Essential Hypertension. The role of body fat distribution pattern. Ame. J. of Epid. 1989; 129-(1), 43-52.

26. Bernaard Marti. Body fat distribution in the Finnish population. Environmental determinants and predictive power for cardiovascular risk factor levels, in J. of Epid. and comm. Health. 1991; 45, 131-137.

27. Gross,F pisa,Z. Strasser T. and Zanchetti, A. Management of arterial Hypertension. WHO, Geneva.1984

28. Derrick B. Jelliffe and E.F. Patrice Jelliffe. Community nutritional assessment with special reference to assessment with special reference to less technically developed countries. Oxford University press,1989; 342.

29. Paul Froom et al. Exercise Testing and Subsequent Casual Blood Pressure Measurements. Biblthca cardiol. 1987; 42, 139-143.

30. Andrew G. Dean, EPI Info, versions, USD, stone mountaion, Georgia, 1990.

31. SAS/STAT. users guide, car, NC, USA, 1990.

32. Harverd Grapics, users guide USD, 1990.

APPENDIXES

QUESTIONNAIRE

1. Name of head house hold _____

2. Name of Interviewee _____

3. Ethnic group
   1. ____ Oromo
   2. ____ Gurage
   3. ____ Amhara
   4. ____ Others

4. Education
   1. ____ Illiterate
   2. ____ Literacy campaign or grade 1 level
   3. ____ for ≥ grade 2, school grade completed _____

5. Do you smoke cigarettes
   1. ____ Yes
   2. ____ No
   3. If, no go to Q. 7 .

- If yes for how long have you been smoking?
   1. ____ ≥ 10 years
   2. ____ 5 - 9 years
   3. ____ 1 - 4 years
   4. ____ < 1 years

6. How many cigarettes do you smoke per day?
   1. ____ ≥ 20
   2. ____ 10 - 19
   3. ____ 1 - 9
   4. ____ < 1

7. Do you chew chat
   1. ____ Yes
   2. ____ No
   3. If No go to Q. 8.

- If yes, how often?
   1. ____ Daily
   2. ____ 4 - 6 days/week
   3. ____ 2 - 3 days/week
   4. ____ Once per week
   5. ____ Less than once per week
      (=Once in more than a week)

- Estimated price per session per individual _____

8. Occupation
   1. ____ Farmer
   2. ____ Merchant
   3. ____ Office workers
   4. ____ Student
   5. ____ Housewife
   6. ____ Other specify _____

9. Do you put salt in your coffee ?
   1. ____ Yes
   2. ____ No
   3. ____ Don't drink coffee
   4. ____ If No go to Q.10.

- If yes - how many cups of coffee do you drink per day ?
   1. ____ < 1 cup 2. ____ 1 - 3 cup 3. ____ 4 - 6 cups
   4. ____ 7 - 9 cups 5. ≥ 10 cups

10. Do you have any known family history of health problems ?
   1. Yes 2. No
   If yes- 1.Hypertension
   2. Diabetes
   3. Other specify _____

11. Do you have any known health problem ?
   1. Yes 2. No
   If yes- what ?
   1.Hypertension
   2.Diabetes
   3.Other specify_____

12. Answer this question if the answer to question 11 is yes -hypertension.
   Do you take anti hypertension medication?
   1. Yes 2. No
   If yes - Do you take medication regularly ?
   1. Yes 2. No
   If not regularly why not_____

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*Name of head of household*_____

Instruction:-1. *Ask the housewife or the one who prepares the food, which packet of salt best represents the amount of salt used in the household per day, and circle the answer.*

1. 5gm. 2. 10gm. 3. 20gm. 4. 50gm. 5. 100gm. 6. More than 100gm.

2. *Fill the names, age and sex of all the persons living in the household but do the measurements, only for those who are 15 years and older.*

Ser No.	List of Names of People living in the Household	Age	Sex	B.P. in mm.Hg .	Pulse Count	Weight in kg .	Height in cms	Waist Girth in cms	Hip Girth in cms.
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									

10. አሸቦጳን / ሶንጳን / ?

1. ኤየን
2. ሳከ
3. ቡና ህንጹጉ ዯ ሻብንሣ ኤየን ታኤ ጉያ ተከኒ ሲኒ ማታ ጳገጹ ?

1. <1 3. 4 – 6 5. ≥10
2. 1 – 3 4. 7 – 9

11. ፍራ ኬሴን ኬሣ ናምኒ ራክ ጳኽጣ ቱሩ ታቡ ጀራ ?

1. ኤየን 2. ሳከ ዯ ሻብንሣ ኤየን ታኤ

1. ሻጋ ባይና / ዝምም ብዛት /
2. ጰኽጣ ምኤፍቱ / ስኲር /
3. ከምቢራ /ጳጣጹ/ _____

12. ኤሳን ጳኽጣ ቱሩ ታበሩ

1. ኤየን
2. ሳከ ዯ ሻብንሣ /
   1. ሻጋ ባይና / ዓደም ብዛት /
   2. ጳኽጣ ምኤፍቱ / ዓስኲር በሽታ /
   3. ሰምቢራ ዯታኤ ጳጣጹ _____

13. ኤከቱሣ 12 ሩ ሻብንሣ ኤየን ሻጋ ባይነ ዯታኤ ጀዋ /ሽርፓ/ ሻጋ ባይና ሩደቱ ?

1. ኤየን
2. ሳከ ዯ ሻብንሣ ሳከ ሻጹግ
   ግለሪ ? _____
   _____
   _____

ቤተሰብ _____

1. ኩታ ከሣ ጅርተኒ _____

2. ማታ አስ መና _____

3. ማታ ናማ ጋራ ተሙ _____

4. ጉሣ /ለቡማ/

1. አርጮ
2. ጉራጌ
3. አማራ
4. ጉሣ ሐምቢራ

5. ታራሚሣ / ቦራሚሠ/

1. ህገቅራኔ / ...../
2. መሠረተ ትምህርተ ሆካኹ በልበሳ ተክ ካንታራኡ /ካንበረቴ/
3. በልበሳ ለማ ሆካኹ በልበሳ ለማ አል ካንተራኡ /ከንበረቴ/ ኢሸሠ _____

6. ትንበ / ቤጋራ / ሕ.....

1. ኤየን 2. ክሎ የ ሻጊንሠ ኡየን ታኡ ወጋ ጣታ ታኮ ?

1/ ≥10
2/ 5 – 9
3/ 1 – 4
4/ < 1

7. ጉያ ተክት ቦጋራ ጣታ ቦሙ ?

1/ ≥ 20
2/ 10 – 19
3. 1 – 9
4. < 1

8. ሺጣ ለጣት / ሊንተምቱ ? 1. ኤየን

ሰኪ የ ሻጠንሠ ኡየን ታኮ

1. ጉያቲ
2. ተርጣኒቲ 4—5
3. ተርጣኒቲ 2—3
4. ተርጣኒቲ 1
5. ተርጣኒቲ <1 ናማ ተክ የር ጣቲ / ሺማ / ቀመስቱ ሆሬ ሰማጭ ቦርጎሺሠ ? _____

9. ሆቺ / ጀለጋ /

1. ገበረ / ...../
2. ነጋዳ
3. ሆቺ መና ...ራሠ
4. በረታ
5. ሰጋ መና
6. ክሮቢራ / ጥን አኡ አሰቢ/

ወይ ኮታ ኪዛ ፳ር ተን ____________________

ወይ አቢ ወና ____________________

አበሣ / ቀ፲ልዛ/ ወዎሪያ

1. ሐደ ወና ሆቢኰ ናባ ፀንፓታ ፎ፲ተ ንዩት አፓበ/ በገና/ ሀመም ኛተፈ ናታት /ባበስት/ :

   1. 5 ገሬም   4. 50 ገሬም

   2. 10 ገሬም   5. 100 ገሬም

   3. 20 ገሬም   6. 1000 ገሬም

2. ናባ ዓና ከና ኪቢት አርገሙ ሁገዓባ ባታበኚዐጋበኚ [illegible] [illegible] /ያታ/ ከተቢ
   አበበዳ [illegible] 5 ከንታአኒፍ [illegible]

ለከፍሁ	ወይ ነቃታ	ወጋ	ያታ	ዲ.ዓ	/ገፊ.በ/	አሰፍና በኪገ	በ.	ወሻ ወዲ ንዬና በሲ.ዓ	በሩ በሌ.ና

DECLARATION

I, the undersigned declare this thesis is my original work and has not been presented for a degree in this or any other university and that all sources of materials used for this thesis have been duly acknowledged.

Name Mismay G. Hiwot

Signature

Place Addis Ababa

Date of submission March 31st, 1992

This thesis has been submitted for examination with my approval as University Advisor.

Dr. Joyce Pickering

Advisor