"A CROSS SECTIONAL STUDY TO KNOW THE PREVALENCE OF HYPERTENSION AMONG RURAL ADULTS"

By

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Dissertation

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Under the Guidance of

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DECLARATION

I hereby declare that this dissertation entitled **"A CROSS SECTIONAL STUDY TO KNOW THE PREVALENCE OF HYPERTENSION AMONG RURAL ADULTS"** is a bona fide and genuine research work carried out by me under the guidance of **Dr. (Mrs). PADMAJA R. WALVEKAR. M.D.,** Professor, Department of Community Medicine, Jawaharlal Nehru Medical College, Nehru Nagar, Belgaum-590010.

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LIST OF ABBREVIATIONS USED

BMI	–	Body Mass Index
BP	–	Blood Pressure
CVD	–	Cardiovascular Disease
CVE	–	Cardiovascular Events
DASH	–	Dietary Approach to Stop Hypertension
DBP	–	Diastolic Blood Pressure
ECG	–	Electrocardiogram
FAO	–	Food and Agriculture Organization
IHD	–	Ischemic Heart Disease
JNC	–	Joint National Committee
LAD	–	Left Atrial Dilatation
LBBB	–	Left Bundle Branch Block
LVH	–	Left Ventricular Hypertrophy
NHANES	–	National Health Examination Survey
NCHS	–	National Centre for Health Statistics
PHC	–	Primary Health Centre
RBBB	–	Right Bundle Branch Block
SBP	–	Systolic Blood Pressure
SES	–	Socio Economic Status
UK	–	United Kingdom
USA	–	United States of America
WC	–	Waist Circumference
WHO	–	World Health Organization
WHR	–	Waist Hip Ratio

ABSTRACT

Background and objectives

Most of the developing countries including India are undergoing epidemiological transition. Complications of hypertension are some of the leading causes of mortality in low- and middle-income countries. Many studies showed an increasing trend in the prevalence and also the risk factors associated with hypertension in India. Hence the present study, to know the prevalence of hypertension among rural adults aged between 30 years to 60 years and to determine the risk factors associated with hypertension.

Methodology

A cross sectional study, conducted from January 2010 to December 2010 among all rural adults aged between 30 years to 60 years residing in subcentre Agasaga, under PHC, Handignur, Belgaum. Total 1472 participants were included in study.

After written informed consent, data regarding socio demographic variables, personal information such as diet history, habits, exercise and family history of hypertension were collected. Anthropometric measurements, general physical examination and systemic examination were carried out. ECG, fundoscopy and urine examination for protein were carried out among hypertensives. Statistical analysis was done using chi square test and regression analysis. P value less than 0.05 was considered significant.

Results

Prevalence of hypertension was 27.7%. 30.8% in men and 24.3% in women. Prevalence of hypertension increased as age advanced in both males and females. Hypertension was associated with sedentary service (41.5%), high literacy status (42.9%), consumption of extra salt (59.8%) and extra fat (61.1%), smoking (47.2%), consuming smokeless tobacco (36.7%), alcohol (40.4%), family history of hypertension (51.7%) and obesity (61.8%). Among hypertensives 65.7% were diagnosed during survey and among known cases of hypertension 88.6% were on treatment. Cardiac involvement was 36.3% among hypertensives, 38.7% had retinal involvement and 6.4% showed presence of albumin in urine.

Conclusion and interpretation

Prevalence of hypertension was 27.7%. Modifiable risk factors were physical inactivity, extra salt and fat consumption, tobacco and alcohol consumption. Among hypertensives majority were diagnosed during survey (61.8%). Among known hypertensives only half were taking regular treatment. Cardiac involvement was present in 36.3% and retinal involvement in 38.7%.

Key words

Hypertension; Prevalence; Rural

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Chapter 1

Introduction

INTRODUCTION

Most of the developing countries including India are undergoing epidemiological transition. Infectious and nutritional diseases are receding among adults while non communicable diseases are becoming increasingly common as the cause of morbidity and mortality. Demographic projections indicates a major increase in cardiovascular disease mortality in India due to increase in life expectancy and change in the age structure of the growing population.[1]

Non-communicable or chronic diseases are diseases of long duration and generally slow in progression such as heart disease, stroke, cancer, chronic respiratory diseases, hypertension and diabetes. These diseases are the leading cause of mortality in the world, representing 63% of all deaths. Out of the 36 million people who died from chronic diseases in 2008, nine million were under 60 and ninety per cent of these premature deaths occurred in low- and middle-income countries.[2]

Hypertension is Iceberg disease and follows the rule of Halves.[3] In general population only about half of those who are aware of hypertension are being treated and only about half of those treated were considered adequately treated.[4]

Raised blood pressure is a major risk factor for coronary heart diseases and ischemic as well as hemorrhagic stroke. Blood pressure levels have been shown to be positively and progressively related to the risk for stroke and coronary heart disease. In some age groups, the risk of cardiovascular disease doubles for each incremental increase of 20/10 mmHg of blood pressure, starting

as low as 115/75 mmHg. In addition to coronary heart diseases and stroke, complications of raised blood pressure include heart failure, peripheral vascular disease, renal impairment, retinal hemorrhage and visual impairment.[2]

The prevalence of raised blood pressure is similar across all income groups, though it is generally lowest in high-income populations. Worldwide, raised blood pressure is estimated to cause 7.5 million deaths, about 12.8% of the total of all annual deaths. This accounts for 57 million DALYs or 3.7% of total DALYs. Globally, the overall prevalence of raised blood pressure in adults aged 25 and over was around 40% in 2008. The proportion of the world's population with high blood pressure, or uncontrolled hypertension, fell modestly between 1980 and 2008. However, because of population growth and ageing, the number of people with hypertension rose from 600 million in 1980 to nearly 1 billion in 2008.[5]

A recent meta-analysis has noted a rising trend in the prevalence of hypertension in India over the last three decades. In one study prevalence of hypertension increased from 8% to 24% in males and 6% to 17% in females. There is a general increase in the risk factor hypertension and other non communicable diseases in India.[1]

An epidemiological shift in the prevalence of hypertension in developing countries as compared to developed countries has been observed. Dramatic change in lifestyle from traditional to modern have lead to physical inactivity due to technological advances, rising affluences has modified the dietary pattern, characterized by increase consumption of diet rich in fat, sugar and calories.

Further increase in the population growth at the current rate above 2% each year and the technological advances have shrunken the employment opportunity among the young generation, leading to stress and hypertension in young person, including students and laborers.[6]

As the prevalence of hypertension varies in different geographical areas and also the risk factors for hypertension vary among different population, depending upon biological as well as environmental factors. Many studies have shown that, the risk of hypertension increases above the age of 30 years and also lifestyle modification has an effect on the risk factors of hypertension.

The knowledge about prevalence and the risk factors associated with hypertension will help in carrying out the interventions like - to detect the undiagnosed cases of hypertension, to advise treatment after diagnosis and also to reduce the risk factors associated with hypertension among the population. Hence the present study has been undertaken among rural adults aged between 30 to 60 years.

Chapter 2

Objectives

OBJECTIVES

1. To know the prevalence of hypertension among rural adults aged between 30 years to 60 years.

2. To determine the risk factors associated with hypertension.

Chapter 3

Review of Literature

REVIEW OF LITERATURE

HISTORICAL REVIEW OF HYPERTENSION

Reverend Stephen Hales who is considered as the Father of sphygmomanometery, at Cambridge (1773) during his course in theology initially experimented on pressure, resistance, flow and his experiment on horse could determine blood pressure.[7]

Poiseuille who was a physician and a physicist introduced the mercury manometer which was connected to a cannula that was inserted directly into an artery. In 1881 Samuel Von Basch further advanced blood pressure measurements with the use of an inflatable rubber bag with water. In 1889 Potaine substituted air for water and used a rubber bulb for compression of the pulse. Scipione Riva – Rocci, in 1896 reported a noninvasive method of obtaining blood pressure that led to our current technique.[7]

In 1905 Nicolai Korotkoff further advanced Riva – Rocci ideas, he was first to observe the sounds made by a constriction of the artery. Korotkoff found that, there were characteristic sounds at certain point in the inflation and deflation of the cuff. These sounds later known as Korotkoff sounds and were caused by the abnormal passage of blood through the artery, corresponding to the systolic and diastolic blood pressure.[8]

Now, 1970s onwards, blood pressure can be monitored continually by sensors worn on the patient's thumb, inflatable cuffs are coupled to a servomechanism which maintains suitable cuff pressure. Strain gauges,

photocells and semiconductors are coming into use in the recording of blood pressure.[7]

SIGNIFICANCE OF BLOOD PRESSURE AND HYPERTENSION

Sir George Peckering in mid 20th century formulated a concept that, blood pressure in a population is distributed continuously as a bell shaped curve with no real separation between normotension and hypertension.[3] Hypertension is one of the most common worldwide disease afflicting humans. Hypertension is emerging as a major public health problem in developing as well as developed countries. Because of the changing life styles, the environment, industrialization, and urbanization the prevalence of hypertension is increasing constantly. Hypertension is an important public health challenge because of the associated morbidity and mortality and the cost to society.[9]

The WHO report 1998 states that, considering the prevalence of any disease, hypertension ranks fourth in the world. Pooled epidemiological studies show the average prevalence of hypertension in India is 25% in Urban and 10% in rural population. Hypertension is a significant public health problem in urban and rural areas of India. It is directly responsible for 57% of all stroke deaths and 42% of coronary heart disease deaths in India. It is also a leading cause of blindness, renal failure and congestive heart failure.[9,10] By the year 2020, non-communicable diseases such as cardiovascular diseases (CVD) will be the major causes of morbidity and mortality in developing countries, accounting for almost four times as many deaths as from communicable diseases. This shift potentially

coincides with socio-economic changes and the 'nutrition transition' associated with poverty alleviation.[11]

Over the past several decades, extensive research, widespread patient education, and a concerted effort on the part of health care professionals have led to decreased mortality and morbidity rates from the multiple organ damage arising from years of untreated hypertension. Field-based studies on the prevalence of hypertension are still scarce and more fields based are required to highlight problem of hypertension.[9]

DEFINITION AND CLASSIFICATION

Defining abnormally high blood pressure is extremely difficult and arbitrary. Furthermore, the relationship between systemic arterial pressure and morbidity appears to be quantitative rather than qualitative. A level for high BP must be agreed upon in clinical practice for screening patients with hypertension and for instituting diagnostic evaluation and initiating therapy. Because the risk to an individual patient may correlate with the severity of hypertension, a classification system is essential for making decisions about aggressiveness of treatment or therapeutic interventions.[12,13]

Based on recommendations of the Seventh Report of the Joint National Committee of Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC VII), the classification of BP (expressed in mm Hg) for adults aged 18 years or older is as follows.[14]

- Normal - Systolic lower than 120, diastolic lower than 80 mm Hg.

- Prehypertension - Systolic 120-139, diastolic 80-90
- Stage 1 - Systolic 140-159, diastolic 90-99
- Stage 2 - Systolic equal to or more than 160, diastolic equal to or more than 100

The classification above is based on the average of 2 or more readings taken at each of 2 or more visits after initial screening.

Prehypertension, a new category designated in the JNC VII report, and is at risk for progression to hypertension and that lifestyle modifications are important preventive strategies.[14]

From another perspective, hypertension may be categorized as either essential or secondary. Essential hypertension is diagnosed in the absence of an identifiable secondary cause. Approximately 95% of the 50 million American adults with hypertension have essential hypertension, while secondary hypertension accounts for fewer than 5% of the cases.[14]

Especially severe cases of hypertension may be further categorized. Severe hypertension is defined by a blood pressure above 180/110 without symptoms. Hypertensive urgency is defined as a BP above 180/110 with mild end organ effects, such as headache and dyspnea. Hypertensive emergency is a BP of 220/140 or greater with life-threatening end-organ dysfunction.[15]

PREVALENCE OF HYPERTENSION

A 2005 survey in the United States found that, in the population aged 20 years or older, an estimated 41.9 million men and 27.8 million women had prehypertension, 12.8 million men and 12.2 million women had stage 1 hypertension, and 4.1 million men and 6.9 million women had stage 2 hypertension. In many countries, 50% of the population older than 60 years had hypertension. The prevalence dramatically increases in patients older than 60 years.[16]

National surveys indicated the prevalence of hypertension in many countries was high as or higher than that identified in the United States. A recent estimate suggested that, approximately 1 billion adults had hypertension (333 million in economically developed and 639 million in economically developing, countries), with the highest prevalence being noted in Eastern Europe and the Latin American/Caribbean region. Temporal trends in age-specific and age-adjusted prevalence of hypertension indicate that, there had been a progressive increase in the prevalence of age-specific and age-adjusted hypertension in China. This trend could be probably representative of a broader tendency for a progressive rise in the prevalence of hypertension in economically developing countries. Given that more than 80% of the world's population lives in economically developing nations, it is very likely that the worldwide burden of illness due to hypertension will continue to escalate unless measures are taken to blunt the expected increase in the prevalence of hypertension.[16,17]

According to data from the National Health Examination Surveys (NHANES), the age-adjusted prevalence of hypertension varied from 18-32%. The National Center for Health Statistic Surveys (NCHS) reported the awareness for hypertension increased from 53% over 1960-1962 to 89% over 1988-1991. The percentage of patients engaged in hypertension treatment increased from 35% to 79% during this period.[18]

Overall, approximately 20% of the world's adults were estimated to have hypertension, when hypertension was defined as BP in excess of 140/90 mm Hg. Worldwide, approximately 1 billion people have hypertension, contributing to more than 7.1 million deaths per year.[19]

National health surveys in various countries showed that, a high prevalence of poor control of hypertension. These studies reported that, prevalence of hypertension was 22% in Canada, of which 16% among it was controlled; the prevalence was 26.3% in Egypt, of which 8% among it was controlled; out of 13.6% in China only 3% among it was controlled.[20]

Indian scenario

Wasir HS et al. reported 3% prevalence of hypertension (criteria $\geq$ 160/95) in Delhi.[21] During 1984-87 Gopinath and Chadha et al. reported the prevalence of hypertension in Delhi (criteria: >=160/90) to be 11% among males and 12% among females in the urban areas and 4% and 3% respectively in rural areas.[22,23] Another two studies carried out in rural areas of Haryana (1994-95)

demonstrated 4.5% prevalence of hypertension (JNC V criteria) while urban areas of Delhi had a higher prevalence of 45% during 1996-97.[1,24]

In the ICMR study 1994 involving 5537 individuals (3050 urban residents and 2487 rural residents), 25% and 29% prevalence of hypertension was found among males and females respectively in urban Delhi and 13% and 10% in rural Haryana.[25]

Further, Gupta R from Jaipur, through three serial epidemiological studies (Criteria ≥ 140/90 mm of Hg) carried out during 1994, 2001 and 2003 demonstrated rising prevalence of hypertension (30%, 36%, and 51% respectively among males and 34%, 38% and 51% among females).[26,27,28]

The prevalence of hypertension in rural Indian population showed that, there has been a steady increase over time. Prevalence increased from 0.5% in Bombay (1959), 2.0% in Delhi (1959), 3.6% in Haryana (1978), 5.4% in Delhi (1983), 5.6% in Rajasthan (1984), 3.4% in Maharasthtra (1993), 7.1% in Rajasthan (1994) and 3.6% in Haryana (1998) (x^2 for trend = 2.75, $P = 0.097$).[29]

A cross sectional study conducted at rural area of Wardha among individuals aged 18 years and above to find out the relationship between obesity and hypertension revealed that, overall prevalence of hypertension was 20.9% and more in men compared to women. Prevalence of overweight was 5.1% and 5.2% among men and women respectively.[30]

A cross sectional study conducted in rural population of Maharashtra in the year 2005 showed that, the prevalence of hypertension among adult aged 30 years and above was 18.5%. Among men it was 19.7% and among women 17%. Increased intake of saturated fat, salt and use of tobacco were found to be important risk factors.[31]

According to a cross sectional study conducted to know the prevalence and determinants of hypertension in rural north India in the year 1999, prevalence of hypertension was 4.5%, prevalence among female was 5.8% and male was 3.0% with probability value less than 0.05, which was statistically significant. In 73.3% hypertension was detected for the first time during the survey. 15.8% knew that they are hypertensive and were put on treatment but discontinued. 3.5% knew that they were hypertensive but were not put on treatment and only 7% were on regular treatment.[1]

RISK FACTORS FOR ESSENTIAL HYPERTENSION

Age

A progressive rise in BP with increasing age is observed.[29] Age-related hypertension appears to be predominantly systolic rather than diastolic. The SBP rises into the eighth or ninth decade, whereas the DBP remains constant or declines after age 40 years.[32]

The third NHANES survey reported that, the prevalence of hypertension grows significantly with increasing age in all sex and race group. The age-specific prevalence was 3.3% in white men (aged 18-29 y), this rate increased to

13.2% in the group aged 30-39 years. The prevalence further increased to 22% in the group aged 40-49 years, to 37.5% in the group aged 50-59 years, and to 51% in the group aged 60-74 years .In another study, the incidence of hypertension appeared to increase approximately 5% for each 10-year interval of age.[33]

From south India, Kutty VR carried out hypertension prevalence study (criteria: >=160/95 mm of Hg) in rural Kerala during 1991 in the 20 plus age group and the prevalence was found to be 18%. Later studies in Kerala (Criteria: JNC VI) reported 37% prevalence of hypertension among 30-64 age group in 1998 and 55% among 40-60 age group during 2000. A higher prevalence of 69% and 55% was recorded among elderly populations aged sixty and above in the urban and rural areas respectively during 2000.[34,35]

Sex

Early in life there is little evidence of a difference in blood pressure between the sexes. However at the adolescence, men display a higher average level. Various epidemiological studies have shown difference in prevalence of hypertension in adult, among male display higher level than female. Sedentary life, increased central obesity and post menopause in female after the age of 50 years have contributed in increased prevalence of hypertension as compared to male.[36]

A case control study conducted in rural area of Jammu and Kashmir in the year 1999 among adults aged between 18-60 years showed that, overall

prevalence of hypertension was 8.3%. It was 10.08% in males and 6.34% in females.[37]

Study on prevalence of hypertension from eastern Indian population by Hazarika et al. in 2002, reported 61% prevalence (criteria = JNC VI) among men and women aged thirty and above in Assam.[38]

Physical activity

Physical activity has a proven countermeasure for the development of various chronic diseases in adults including hypertension. Preliminary evidence suggested that, increased aerobic based physical activity can reduce systolic blood pressure and significantly restore endothelial function. The benefit of physical activity occurs gradually during a period of months.[39,40]

A study conducted By Agrawal et al. in rural community of India found a strong association between physical inactivity and hypertension (OR=37.9; CI= 18.5 – 78.9; $p< 0.001$).[31] A study among un-industrialized rural population of north India showed similar results with $p < 0.01$.[1] Study conducted by Mandal et al. in urban community of India showed that, the prevalence of hypertension was 39.8% in those who exercise compared to17.2% in those who did not (p=2.872). This shows there is no association between exercise and hypertension.[41]

Dubey VD carried out one of the earliest study in India (1954), documented 4% prevalence of hypertension (criteria > 160/95) amongst industrial workers doing heavy work in Khanpur.[42]

Socio economic status

Blood pressure is not correlated with socioeconomic factors, and differences between urban and rural areas have varied, sometimes even taking opposite directions.[43]

Few studies were carried out comparing different socio economic groups. The initial study from urban Chennai, Mohan et al. reported 8.4% prevalence of hypertension among men and women aged 20 years and above, and belonging to the low socio economic group.[44] Similarly, the middle socio economic group had a higher prevalence (15%) during 1996-97. A study conducted in the urban areas of Chennai during 2000 (age group ≥ 40 years) reported a higher prevalence of hypertension (54%) among low income group and 40% prevalence among high-income group.[45] Misra et al. reported 12% prevalence of hypertension among slum dwellers of Delhi belonging to poor socioeconomic status.[46]

A community based descriptive study was conducted to know the socio-demographic determinants of hypertension in rural area of Andra Pradesh among ≥ 40 years age group showed 16.5% prevalence of hypertension. The difference of prevalence in hypertension among study participants belonging to different SES was statistically significant.[47]

Family history and type of family

Family history of high blood pressure means someone in family had high blood pressure before the age of 60 years. Having one or more close family

members with high blood pressure means two times the risk of having it. A strong family history means three or more relative are hypertensive.

Family studies have shown that, the children of two normotensive parents have three percent possibility of having hypertension, whereas this possibility would become 45% in children with both parents hypertensive. Hypertension was more prevalent in person with family history.[3]

Extra salt intake

A WHO technical report and the FAO recommended the consumption of less than 5 g sodium chloride (or 2 g sodium) per day as a population nutrient intake goal. Salt sensitivity is defined as the tendency for blood pressure to fall during salt reduction and rise during salt repletion or supplementation.[48]

Many epidemiological studies have demonstrated that high salt intake was associated with an increased risk of high blood pressure. In the Inter Salt Study, the association between blood pressure and salt intake was studied in 52 communities with a wide range of salt intake. This study showed a positive relationship between salt intake and blood pressure.[48]

The efficacy of reduced sodium intake in lowering blood pressure has already been established. In a Cochrane systematic review by He & MacGregor in 2004 showed that, a modest reduction in salt intake for duration of 4 weeks or more was found to have a significant reduction in mean blood pressure of about 4.97 mmHg (systolic) and 2.74 mmHg (diastolic) in those with elevated blood

pressure. In individuals with normal blood pressure the mean reduction in blood pressure was 2.03 mmHg (systolic) and 0.99 mmHg (diastolic).[49]

Meta-analysis by Hooper et al. in 2004 reviewed the results of three trials in normotensive people, five trials in those with untreated hypertension, and three trials in people being treated for hypertension were included, with follow-up from six months to seven years. This study showed that, systolic and diastolic blood pressures were reduced (systolic by 1.1 mmHg and diastolic by 0.6 mmHg) at 13–60 months, as was urinary 24-h sodium excretion. Degree of reduction in sodium intake and change in blood pressure were not related.[48]

Indian studies showed mixed response for association between extra salt consumption and hypertension. Some studies showed positive association[41,50] and some negative.[6,31]

Diet

Dietary factors such as protein, carbohydrates, saturated fat and fiber intake have also been implicated in the etiology of hypertension. Cross sectional population studies have suggested that, a vegetarian diet decreases the prevalence of hypertension. Among vegetarians fall of 5 to 6 mm Hg systolic and 2 to 3 mm Hg diastolic was observed by Rouse et al. in omnivorous normotensive subjects.[51] A Randomized cross over study by Margetts and coworker in 58 subjects showed that, the beneficial effect of a vegetarian diet in reducing SBP in untreated subject with mild hypertension. A fall in systolic blood pressure up to 5 mm Hg occurred during a six week vegetarian diet, with corresponding rise on resuming meat diet. The diastolic blood pressure fell by an average of 3 mm

Hg.[52] Studies in India showed no significant effect in vegetarian and non vegetarian diet.[53]

Habits

Tobacco

Tobacco consumption continues to grow in India at 2–3% per annum, and by 2020 it is predicted that it will account for 13% of all deaths in India. Only 20% of total tobacco consumption is in the form of cigarettes .A common alternative to traditional cigarettes is the bidi, a hand-rolled filter less tobacco cigarette. Tobacco is also used in the hookah, as pan masala or guthka (a chewing tobacco containing areca nut), as chutta (a clump of tobacco smoked with the lighted end inside the mouth), and mishri (a powdered tobacco rubbed on the gums as toothpaste). Bidis account for the largest proportion of tobacco consumption in India, at about 40%.[54]

Smoking a cigarette or bidi or smokeless tobacco consumption acutely elevates the blood pressure and this effect may be prolonged for 2 hours. In western countries epidemiological studies have shown that, the smoker's blood pressure tends to be lower than of non-smokers. California Tobacco Control Program has shown that, a decrease in per-capita consumption of cigarettes resulted in reduction in deaths from all forms of heart diseases including hypertension. This showed smoking is important in hypertension pathogenesis and hypertension-related cardiovascular deaths.[55]

A study conducted in Jaipur by Rajeev Gupta et al. in Indian showed that, predominantly bidi-smoking population's mean systolic blood pressure was significantly greater in both urban and rural subjects ($p<0.01$). In predominantly tobacco-chewing urban females, the prevalence of hypertension was 53.7% as compared to 28.9% in non-users ($p <0.001$). Multivariate logistic regression showed that smoking or tobacco use was independently associated with hypertension in both males and female.[56]

Many other epidemiological studies from other parts of India have shown a significant correlation of smoking or tobacco use with hypertension prevalence. A recent case-control study from Bangalore also showed that, smoking was an independent risk factor for hypertension (odds ratio 2.25, $p=0.014$). In an experimental study, acute use of pan-masala (an indigenous concoction of lime, areca nut, catechu, etc.) has been shown to significantly increase blood pressure.[57]

A community based cross sectional study conducted in rural Haryana in north India among male population above 15 years showed that, 26.6%, 21%, 33% and 19.4% of participants were non user of tobacco, exclusive Smokeless tobacco users, exclusive smoker of tobacco and both smoker and smokeless tobacco user. No statistically significant difference was seen in prevalence of any risk factors among exclusive smokeless tobacco users and non user population. Prevalence of systolic hypertension was higher in exclusive smokeless tobacco consumers as compared to non users and this difference was not statistically significant. The prevalence of diastolic hypertension was found to be

significantly higher in exclusive smokeless tobacco users as compared to non users of tobacco.[58]

Cross-sectional data from 3 years (1994 to 1996) of the annual Health Survey for England was analyzed to know the association between smoking and blood pressure showed that, Overall, age adjusted BPs did not differ importantly among never, past, and current smokers, although in men, a small significant difference was observed in mean SBP between never smokers (139.9 mm Hg) and current smokers (140.7 mm Hg) ($P = 0.05$), and heavy smokers (141.4 mm Hg) ($P = 0.05$).[59]

Alcohol

In case of alcohol-hypertension relation, a major obstacle to establishing a more definitive association had been the difficulty of differentiating the effects of alcohol from other life-style components. Alcohol intake in higher quantity is associated with an increased risk of high blood pressure. Alcohol consumption raises systolic pressure more than the diastolic.[60]

Study conducted in US by Fuchs et al. in white and black men and women showed that, in unadjusted analysis, consumption of low to moderate amounts of alcohol appeared to provide protection in white men and women and in black women, but low to moderate consumption was associated with an increased risk of hypertension in black men. This pattern of association with low to moderate alcohol consumption persisted after adjustment for several risk factors for hypertension but was formally significant only in black men. In the 3 race-gender strata in which it was possible to study the effect of a higher consumption of

alcohol compared with nondrinking, there was an increased risk of hypertension in both univariate and multivariate analyses.[61]

Campbell et al. conducted A MEDLINE search for the period 1966–1996 with the terms ethyl alcohol and hypertension. Studies have almost uniformly demonstrated a positive association between levels of alcohol consumption and blood pressure in both men and women. However, many of the studies found that, for people who consumed alcohol at low levels, blood pressure was no different from or was slighter lower than for those who abstained from alcohol use. High levels of alcohol consumption were a strong predictor of the development of high blood pressure in both men and women in most of the cohort studies.[62]

Indian studies showed that, positive association between prevalence of hypertension and alcohol usage.[41,50] Some studies have shown there is no association.[6,63] These studies have failed to assess scientifically the duration, quantity and regularity of alcohol consumption in normotensive and hypertensive study participants.

Body mass index

The relation between BMI and the percentage of body fat depends on age and sex, and differs across ethnic groups. It depends on environmental factors, such as the amount of physical activity, as well as physiological factors. Many studies had shown Asian populations have a high percentage of body fat at a low BMI and risk of having cardiovascular disease or diabetes is high at lower BMIs. Data from China indicate that, the prevalence of hypertension, diabetes,

dyslipidaemia, and clustering of risk factors all increased with increasing BMIs even at indices below the cut-off point for overweight that is less than 25 kg/m^2. For many Asian populations, additional trigger points for public health action were suggested as- less than 18·5 kg/m^2 underweight; 18·5–23 kg/m^2 increasing but acceptable risk; 23–27·5 kg/m^2 increased risk; and 27·5 kg/m^2 or higher high risk.[64]

Stamler et al. in 1978 and Elliot et al. in 1989 stated that, there is linear relationship between BMI and blood pressure. Inoue in 1997 reported there is two fold increase in the risk of hypertension for those with BMI ≥25 (Kg/m^2) compared to those with BMI of 22 (Kg/m^2). Many studies in India had also shown the positive relationship with increasing BMI, hypertension and cardiovascular diseases.[65] Many Indian studies have shown increase in prevalence of hypertension as BMI > 25kg/m^2.[1,30,31,41]

Waist circumference and Waist hip ratio

Waist circumference is a convenient and simple measure which is unrelated to height and correlates closely with BMI. The ratio of waist to hip circumference is an approximate index of intra-abdominal fat mass and total body fat. Changes in waist circumference reflect changes in risk factors for cardiovascular diseases and other forms of chronic diseases. Waist circumference is highly sensitive and specific measure of central obesity. The cut off value for risk is 102 cms. for adult males and 88 cms. for adult females. Waist circumference has been recommended as a simple and practical measure for

identifying overweight and obese patients. Waist circumference has proven to be useful predictor of various CVD risk factors in adults.[66]

Sanya et al. observed that, WHR correlated significantly with systolic and diastolic blood pressures. Canoy et al. in 2004 observed that waist and hip circumferences were positively related to systolic and diastolic blood pressures in male and female participants.[66] However, hip circumference was not independently correlated with blood pressure.[65]

Dowling and Pi-Sunyer in 1993, Nesto in 2003 study showed that an increase in BMI above 25kg/m^2 and WHR more than 0.9 correlates with hypertension in both male and female participants. Indian studies showed similar results.[30,31,53]

Stress

A great number of the researchers have adopted a relationship between stress and blood pressure. In fact, the natural reaction of the cardiovascular response to the stress is the increase in heart rate caused by over sympathetic activity. Stress starts while the emotional, environmental and physical needs of the individual compete with one and other and exceed the ability of the individual.[67] Most of the studies on blood pressure and catecholamine levels in young people revealed significantly higher noradrenalin level in hypertensive than in normotensive. This supports the contention that, over activity of sympathetic nervous system has an important part to play in the pathogenesis of hypertension. In meta-analyses of prevalence of hypertension by Gupta, speculated that among the urban population exposed to the stress, the rates of

hypertension had been doubled more than in the last 30 years.[68] In a study on a relationship between self perceived stress and blood pressure showed an inverse relation.[69]

COMPLICATIONS OF HYPERTENSION

Hypertension is the largest risk factor for cardiovascular diseases, growing in prevalence and poorly controlled virtually everywhere. Prevention is possible, although rarely achieved and treatment can lead to a reduced incidence of complications, including stroke, coronary heart disease, heart failure, and kidney disease. By 2030, 23 million cardiovascular deaths are projected, with 85% occurring in low- and middle-income countries.[43]

Classification of hypertension by extent of Organ damage.[70]

Stage	Complication to organs
Stage I	No objective signs of organic changes
Stage II	At least one of the following signs of organ involvement ✓ Left ventricular hypertrophy (X-ray, electrocardiography, echocardiography) ✓ Generalized and focal narrowing of the retinal arteries ✓ Proteinuria and/or slight elevation of plasma creatinine concentration (1.2-2.0 mg/dl) ✓ Ultrasound or radiological evidence of atherosclerotic plaque (carotid arteries, aorta, iliac and femoral arteries)
Stage III	Both symptoms and signs have appeared as a result of organ damage. These include: ✓ Heart: angina pectoris, myocardial infarction, heart failure. ✓ Brain: transient ischaemic attack, stroke, hypertensive encephalopathy ✓ Optic fundi: retinal haemorrhages and exudates with or without papilloedema ✓ Kidney: plasma creatinine concentration above 2.0 mg/dl, renal failure ✓ Vessels: dissecting aneurysm, symptomatic arterial occlusive disease

Mortality, morbidity, and disability attributable to the major non-communicable diseases account for about 60% of all deaths and 47% of the global burden of disease; these rates are expected to rise.

LIFESTYLE MODIFICATIONS

JNC VII recommendations to lower BP and decrease cardiovascular disease risk include the following,[14]

- Lose weight if overweight. This can be accomplished with the DASH[71] (Dietary Approaches to Stop Hypertension) diet, which is rich in fruits and vegetables and encourages the use of fat-free or low-fat milk and milk products.
- Limit alcohol intake to no more than 1 oz (30 mL) of ethanol per day in men (ie, 24 oz [720 mL] of beer, 10 oz [300 mL] of wine, 2 oz [60 mL] of 100-proof whiskey) or 0.5 (15 mL) of ethanol per day for women and people of lighter weight.
- Increase aerobic activity (30-45 min most days of the week).
- Reduce sodium intake to no more than 100 mmol /d (2.4 g sodium or 6 g sodium chloride).
- Maintain adequate intake of dietary potassium (approximately 90 mmol/d).
- Maintain adequate intake of dietary calcium and magnesium for general health.
- Stop smoking and reduce intake of dietary saturated fat and cholesterol for overall cardiovascular health.

The AHA-ASA guidelines recommend regular blood pressure screening, lifestyle modification, and drug therapy. A lower risk of stroke and cardiovascular events are seen when systolic blood pressure levels are < 140 mm Hg and diastolic blood pressure < 90 mm Hg. In patients with hypertension with diabetes or renal disease, the blood pressure goal is < 130/80 mm Hg.[72]

Chapter 4

Methodology

METHODOLOGY

The present study was conducted in the sub centre, Agasaga under Primary Health Center (PHC), Handignur which is a rural field practice area of department of community medicine, Jawaharlal Nehru Medical College, Belgaum. The Handignur PHC has four sub-centers catering to 16 villages, having total population of 26,057. The sub centre is situated at a distance of 10 Kms. from Belgaum towards North West (Figure 1).

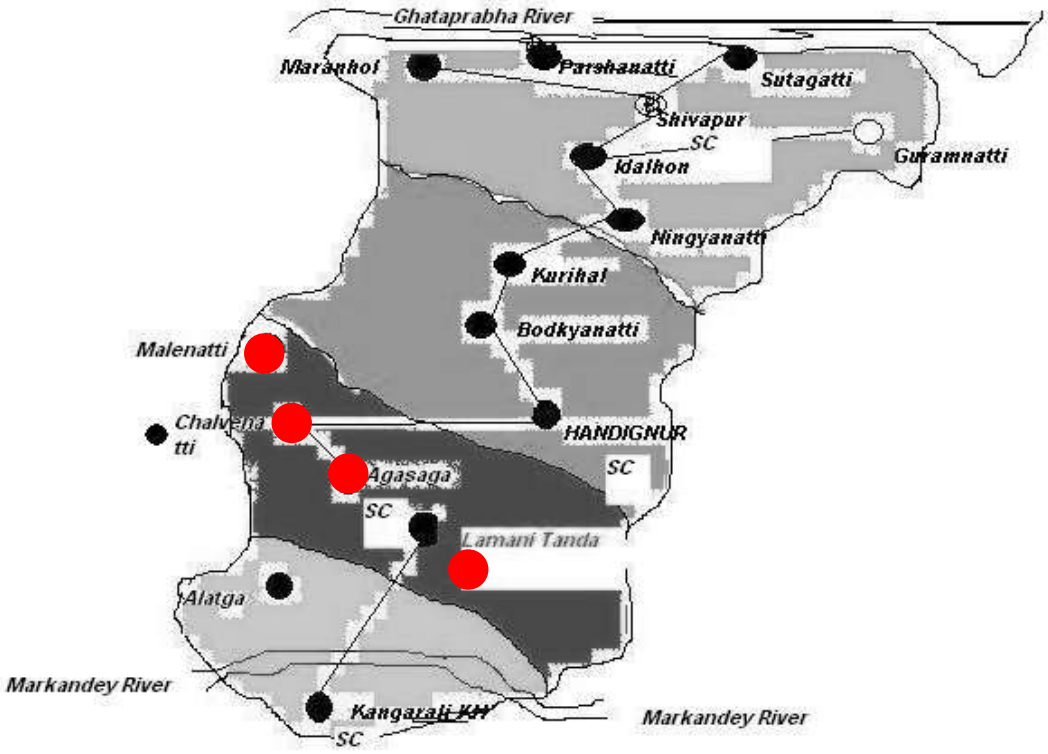


Figure1. Map of Handiganur Primary Health Centre

Design

The study design was community based cross-sectional study.

Duration

This one year study was conducted from January 2010 to December 2010.

Participants

All adults aged between 30 years to 60 years residing in sub centre Agasaga of primary health centre, Handignur, which is a rural field practice area of Department of Community Medicine, Jawaharlal Nehru Medical College, Belgaum.

Selection criteria

Inclusion

- Adults aged between 30 years to 60 years.
- Permanent residents of the study area and who were staying in that area for more than one year.

Exclusion

- Migrants and nomad population.

Sample size

All the adults aged between 30 years to 60 years were selected for the study. A total of 1536 participants were identified for the study, as per the inclusion criteria. Of them, 1472 consented for the study.

Sampling procedure

Primary Health Centre Handignur has four sub-centres, which includes Kangrali, Agasaga, Handignur and Shivapur and caters 16 villages covering 26,057 population. The sub-centre Agasaga include four villages Lamani Tanda (53 households covering 151 population), Agasaga (509 households covering 2894 population), Cheluvinatti (242 households covering 1133 population) and Malenatti (118 households covering 608 population).

The population of Agasaga sub centre was 4,786. Voter list was obtained from grampanchayat office of Agasaga, to identify all the adults aged between 30 years to 60 years and those who fulfilled the inclusion criteria were included in the study. 734 out of 792 participants from Agasaga, 418 out of 419 participants from Cheluvinatti, 242 out of 247 participants from Malenatti and 78 participants from Lamani Tanda participated in the study.

Ethical Clearance

The study was approved from Institutional Ethics Committee for Human Subject's Research, Jawaharlal Nehru Medical College, Belgaum.

Informed consent

Based on the selection criteria, the study participants were selected and written informed consent (Annexure I) was obtained from all the participants, before collecting the data.

Procedure

A pilot study was conducted using a predesigned questionnaire and required modifications were made in the questionnaire.

Data was collected from the participants through interview. Data regarding socio demographic variables like place of residence, age, sex, education status, marital status, socio-economic status, type of work and type of family were collected. Personal information such as diet history, habits and other information about exercise and family history of hypertension were also collected.

Anthropometric measurements, general physical examination and systemic examination were carried out and findings were recorded.

Known cases of hypertension and newly diagnosed hypertensive participants were subjected to undergo investigations like electrocardiography (ECG), fundoscopy and urine for protein to detect effect of hypertension on the target organs.

Instruments used for data collection

The instruments included in the study were, stethoscope, mercury sphygmomanometer with standard adult cuff, weighing machine and a measuring tape. All the instruments were standardized by checking the reading obtained by these, against those obtained from standard instruments.

Statistical analysis

The data was tabulated and master chart was prepared (Annexure III). Data collected in the questionnaire was coded and entered in Microsoft excel sheet. Data was analysed and expressed in terms of rates, ratios and percentages. Statistical analysis was done using Chi Square test to find out the association between risk factors and hypertension. A probability value (p value) of less than 0.05 was considered as significant. Odds ratio was calculated to know the strength of association between hypertension and the risk factors. Univariate and multivariate logistic regression analysis was done to know the significant risk factors associated with hypertension.

Definition of study variables

Age: Age was recorded to the nearest completed year as per information given by the study subjects.

Religion: The subject's religion was noted and was grouped as "Hindu", "Muslim", "Christian" and "Others" (Jain, Boudh, and Parsi etc).

Type of family[3]

Nuclear family: Married couples, along with their dependent children living in the same house.

Joint family: Many married couples and their children who are living in the same household. All males in the family are blood relatives and all females of the family are related to them either by marriage or blood relation.

Three generation family: Married couple with married children and their kids (three generations) related to each other by direct descent and living together.

Broken family: One where, the couple have separated, or where death of one of the spouse has occurred.

Socioeconomic status: Information of total monthly income of the family in rupees was obtained as well as the family size. Per capita monthly income in rupees was calculated, and then the family was classified using modified B. G. Prasad's classification.[73]

Modified B. G. Prasad's Classification

Socioeconomic class	Prasad's classification (1961) per capita income in Rs/ month[73]	Modified Prasad's classification in the study period (2010) Per capita income in Rs/month[74]
I	100 & above	4100 and above
II	50 to 99	2050 to 4099
III	30 to 49	1230 to 2049
IV	15 to 29	615 to 1229
V	below 15	below 615

Average Consumer Price Index for the year 2010 = 841[74]

Modification was done with the aid of Correction Factor (C.F), which was obtained as below:

$$\text{C. F.} = \frac{\text{Average Consumer Price Index for study period}}{100} \text{ X } 4.93$$

$$C.F. = \frac{841}{100} \times 4.93$$

$$= 41.46 \approx 41$$

Educational status: The subjects were asked about their educational qualifications and were grouped into following categories.

Illiterate: A person above 7 years, who could not read and write with understanding in any language as per 2001 census.

Primary: A person who had studied till or less than seventh standard.

High School: A person who had studied from eighth to tenth standard.

Pre university/ Diploma: A person who had studied upto pre university collegiate education and/or studied diploma.

Graduate and post graduate: A person who had studied upto graduation or post graduation.

Type of work:

Sedentary work*:* Sedentary work involves lifting no more than 10 pounds at a time and occasionally lifting or carrying articles like docket files, ledgers, and small tools. Sedentary job is defined as one which involves sitting, a certain amount of walking and standing is often necessary in carrying out job duties. Jobs are sedentary if walking and standing are required occasionally and other sedentary criteria are met. Example: Teacher, tailor, barber, priest, executive,

peon, retired personnel, shoe maker, housewife, maid, nurse, doctor, clerk, shopkeeper, manager, goldsmith etc.[75 & 76]

Medium work: Medium work involves lifting no more than 50 pounds at a time with frequent lifting or carrying of objects weighing up to 25 pounds. If someone can do medium work, we determine that he or she can also do sedentary and light work. Example: Potter, basket maker, carpenter, mason, electrician, fitter, turner, driver, welder, fisherman, coolie, site supervisor, post man etc.[75 & 76]

Heavy work: Heavy work involves lifting no more than 100 pounds at a time with frequent lifting or carrying of objects weighing up to 50 pounds. If someone can do heavy work, we determine that he or she can also do medium, light, and sedentary work. Example: Stone cutter, blacksmith, mine worker, wood cutter, farm labourer, army soldier etc.[75 & 76]

Food habit: Interpretation was made as "vegetarian diet" and "mixed diet" (those who were consuming vegetarian and non vegetarian food).

Smoking: For the assessment of history of smoking, period of recall was considered for the past one year.

Smokers: Subjects those who had smoked in the past or smoking at present were considered as "smokers".

Present smoker: The person who smoked beedis or cigarettes for the last one year.

Past smoker: The person who smoked beedis or cigarettes earlier but left smoking for the last one year.

Non Smokers: Subjects who had never smoked in any form of tobacco (Cigarettes/Beedi) were considered as "non smokers".

Smokeless tobacco use and other habits

- Each participant was asked about the habit other than smoking,
  - ✓ Gutka
  - ✓ Plane tobacco
  - ✓ Others (beetle squid, applying tobacco to tooth etc.)

Alcohol Consumption: For the assessment of history of alcohol consumption period of recall was considered for the past one year.

Alcoholics: Subjects those who had consumed any alcoholic drinks either in the past or consuming at present were categorized as "alcoholics".

Present alcoholic: The person who consumed alcohol for the last one year.

Past alcoholic: The person who consumed alcohol earlier but left consuming alcohol for the last one year.

Non Alcoholics: Subjects who had never consumed alcohol were considered and kept in the category of "non alcoholics".

Height*:* The subject was asked to stand straight without footwear, with heels, buttocks and back straight and arms hanging by side. The height was measured

from head to heal. The coinciding reading was measured to the nearest 0.1 cm using a metallic measuring tape.[77]

Weight: Body weight was measured without any foot wear and with minimal clothing to the nearest 0.1 kilogram using a standard portable adult weighing machine, which was standardized periodically during the study. The scale was adjusted to zero before each session and weight was recorded in kilograms.[77]

Calculation of Body Mass Index (BMI): As per the revised guidelines recommended by WHO, persons with BMI values of less than 18.5 were classified as "Underweight", 18.5 to 22.9 were classified as "Normal weight", 23 to 29.99 were classified as "pre-obese" and above 30 were classified as "Obese".[65] Body mass index was calculated as;

$$\text{BMI} = \frac{\text{Weight in Kgs}}{(\text{Height in Meter})^2}$$

Waist circumference: The measurement was made at the approximate midpoint between the lower margin of the last palpable rib and the top of the iliac crest and the subject stands with arms at the sides, feet positioned close together, and weight evenly distributed across the feet.[66]

Hip Circumference: It is the maximum circumference in the horizontal plane measured over the buttocks.[66]

Waist hip ratio: The ratio of waist circumference to the hip circumference less than 0.85 in females and less than 0.90 in male was considered normal.[66]

Blood pressure measurement: During the course of interview, two measurements of blood pressure of each study participant were measured using mercury sphygmomanometer, first by palpatory method followed by auscultatory method as per JNC VII guidelines. Both blood pressure measurements were obtained after the subject had rested for at least five minutes in a seated position. The first blood pressure measurement was recorded after obtaining sociodemographic information from study subject, while second was recorded after clinical examination. All blood pressure measurements were made on left arm of each subject, using a cuff of appropriate size. The sphygmomanometer was kept at the level of the heart. The average of two SBP and DBP reading in mm Hg were noted to describe the blood pressure of the participant.[14]

Categorization of subjects by blood pressure levels: The subjects were divided into "Normotensives" or "Hypertensives" on the basis of their blood pressure levels and "prehypertensives" were included as normotenives.

Normotensives: Systolic blood pressure less than 120 mm Hg and Diastolic blood pressure less than 80 mm Hg.

Hypertensives: Systolic blood pressure 140 mm Hg or above Diastolic blood pressure 90 mm Hg or above.

Prehypertensives: Systolic blood pressure (BP) in the range of 120 to 139 mm Hg or diastolic blood pressure 80 to 89 mmHg.[14]

Salt intake

The participant was asked about consumption of extra salt in the form of extra salt in the plate, use of picke or papad and use of processed foods like potato chips, etc. The participants who consumed them were considered as extra salt consumer. Salt added in cooking and invisible salt in food and vegetable was not taken into consideration.[6 & 63]

Extra fat consumption

The participants consuming extra fat in the form of oil and taking ghee, butter in the plate. Invisible fat in food grains and vegetable was not taken into consideration.

Sphygmomanometer

A mercury sphygmomanometer (manufacturer Disha company, model JG0400238, India) used for measurement of blood pressure. The Adult arm cuff was used which covered 80% of arm circumference of the participant. Machine was calibrated once a month to provide appropriate reading

Urine analysis

Urine reagent strip (company; Cogent, product name; Orinasys GP, product code 21US103-60, India) was used to analyse urine for presence of protein (albumin) and sugar. The reagent strip consisted of plastic strip affixed with separate reagent area for detection of protein (albumin) and sugar. Urine reacts with specific reagent area on the strip to produce a standardized range of

visible colour change within one to two minutes. By comparing the colour produced with colour standard, the quantity of protein (albumin) and sugar was noted. Detection limit for albumin was 7.5 to 15 mg/L and for glucose 50 to 100mg/dl.

Electrocardiography

A single basic channel electronic electrocardiography machine (Company BPL, product code 6108P) was used for recording ECG. The participant was asked to lie down and relax. One electrode is attached to each limb and 6 chest leads are attached in their position. The machine was calibrated with 1mV signal. Three or four complexes of 12 leads ECG was recorded and interpreted as normal and abnormal.[78]

Fundoscopy

The fundus was examined using direct ophthalmoscope (Company Heine Beta model no 200 S). The grading of hypertensive retinopathy was done as per Keith and Wegner (1939) classification of hypertensive retinopathy.

Keith and Wegner (1939) classification of hypertensive retinopathy[79]

Grades	Findings
Grade I	Mild generalized arteriolar attenuation, particularly of small braches, with broadening of the arteriolar light reflex and vein concealment.
Grade II	Marked generalized narrowing and focal attenuation of arterioles associated with deflection of veins at arteriovenous crossing.
Grade III	Grade II changes plus copper wiring of arterioles, banking of veins distal to arterio-venous crossing, tapering of veins on either side of the crossings and right angle deflection of veins. Flame shaped hemorrhages, cotton wool spots and hard exudates are also present.
Grade IV	All changes of grade III plus silver wiring of arterioles and papilloedema.

Chapter 5

Results

RESULTS

This one year community based cross-sectional study was conducted in 2010, in sub centre, Agasaga under Primary Health Center (PHC), Handignur which is a rural field practice area of department of community medicine, Jawaharlal Nehru Medical College, Belgaum. The Handignur PHC has four sub-centers catering to 16 villages, having total population of 26,057. The sub centre is situated at a distance of 10 Kms. from Belgaum towards North West. The sub-centre Agasaga include four villages Lamani Tanda (53 households covering 151 population), Agasaga (509 households covering 2894 population), Cheluvinatti (242 households covering 1133 population) and Malenatti (118 households covering 608 population).

Most of the population can fluently speak and understand Kannada and Marathi languages. Many people are involved in agriculture and related activities for their living. The educational facilities are available in the villages upto higher primary school. The Anganwadi Workers, Health Assistants, Trained Dais, Private Practitioners, Medical Officer of PHC Handignur and postgraduates of Community Medicine Department, Jawaharlal Nehru Medical College, Belgaum provide health care facilities

Results section is divided into three parts

I. Profile of study participants

II. Comparison of profile of normotensives and hypertensives

III. Profile of hypertensives

I. PROFILE OF STUDY PARTICIPANTS

Table 1. Age wise distribution of the study participants (n=1472)

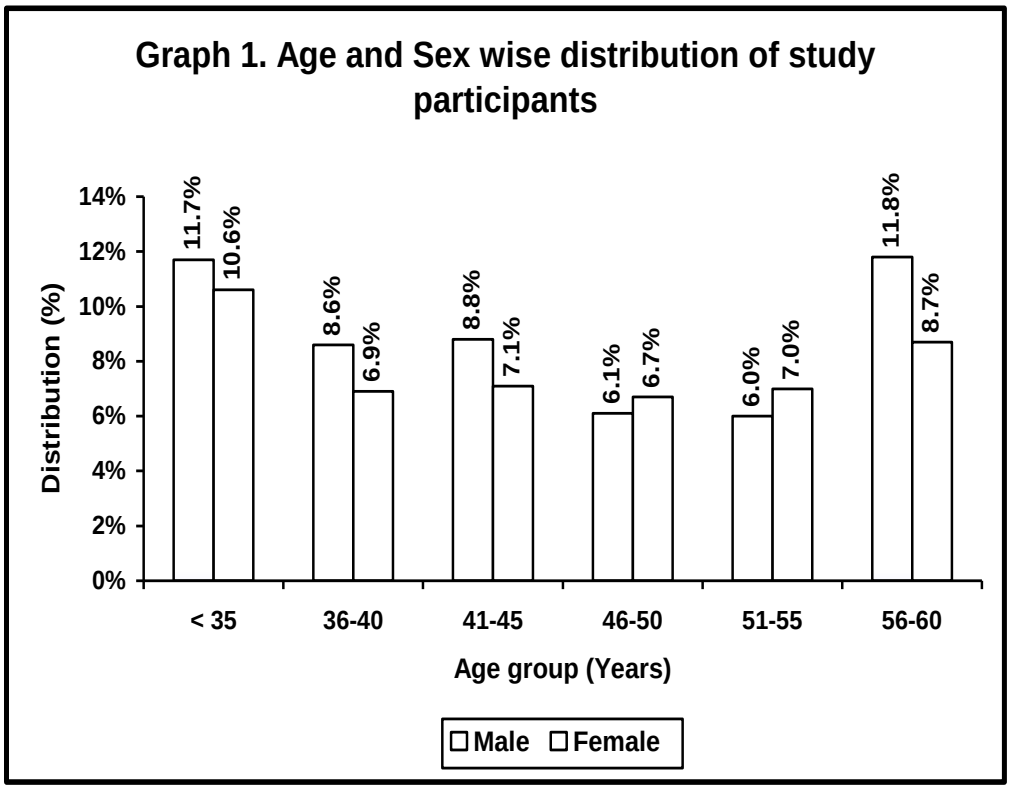
Age (Years)	Number	Percentage
≤ 35	328	22.30
36 – 40	228	15.50
41 – 45	234	15.90
46 – 50	188	12.80
51 – 55	192	13.00
56 – 60	302	20.50
Total	**1472**	**100**

328 (22.30%) participants were below the age of 35 years, 228 (15.50%) between 36 to 40 years, 234 (15.90%) between 41 to 45 years, 188 (12.80%) between 46 to 50 years, 192 (13.00%) between 51 to 55 years and 302 (20.50 %) were between 56 to 60 years.

Table 2. Distribution of the study participants according to sex (n=1472)

Gender	Number	Percentage
Male	780	53.00
Female	692	47.00
Total	**1472**	**100**

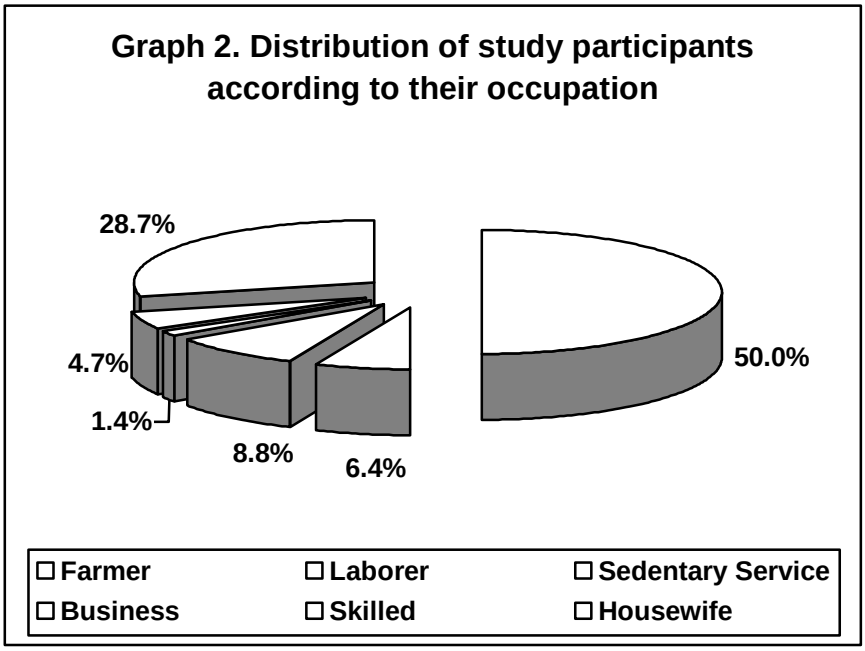
Out of 1472 study participants, male participants were 780 (53%) and female participants were 692 (47%).



Maximum number of male participants 174 (11.8%) were in age group of 56 to 60 years and minimum 88 (6.0%) in 51 to 55 years age group. Maximum number of female participants 156 (10.6%) were in below the age group of 35 years and minimum 98 (6.7%) were in 46 to 50 years age group. The mean age of male participants was 45.3 ± 9.97 and mean age of female participants was 45.1 ± 9.61.

Table 3. Distribution of study participants according to their occupation (n=1472)

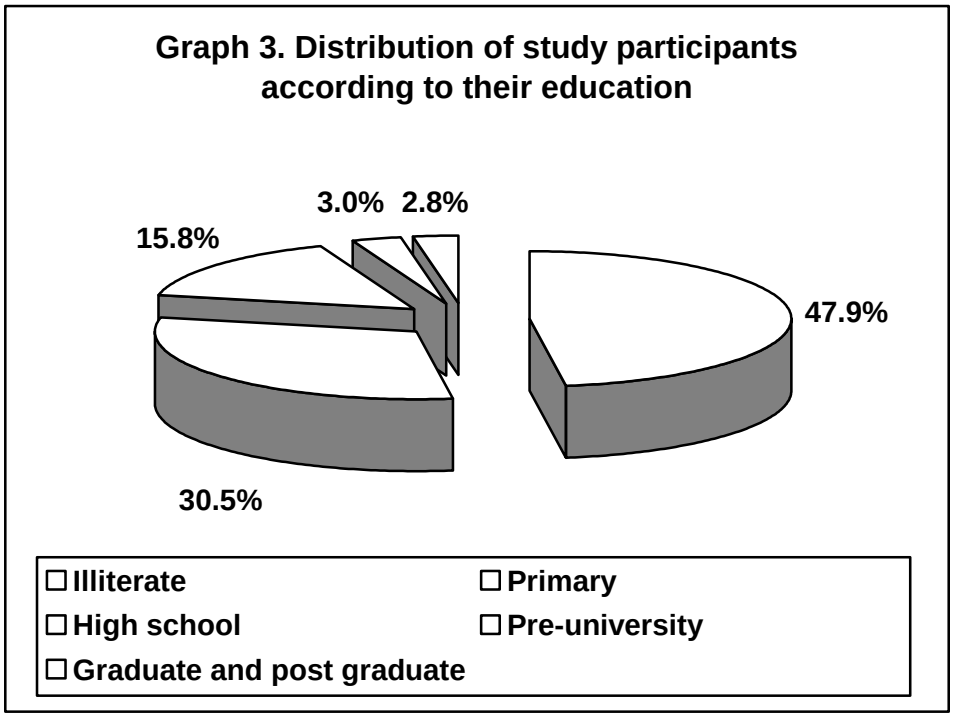
Occupation	Number	Percentage
Farmer	736	50.0
Laborer	94	6.4
Sedentary Service	130	8.8
Business	20	1.4
Skilled	70	4.7
Housewife	422	28.7
Total	**1472**	**100**



50% of study participants were farmers, 28.70% housewives. 8.80%. 6.40%, 4.70% and 1.40% of were employed in sedentary service, labour, skilled work and business profession respectively.

Table 4. Distribution of study participants according to their education (n=1472)

Education	Number	Percentage
Illiterate	706	47.9
Primary	448	30.5
High school	232	15.8
Pre-university	44	3.0
Graduate + Post graduate	42	2.8
Total	**1472**	**100**



In the present study, 706 (47.90%) were illiterates, 448 (30.5%) were studied upto primary level, 232 (15.80%) upto high school level, 44 (3.0%) upto pre university or diploma and 42 (2.80%) were graduates or postgraduates**.**

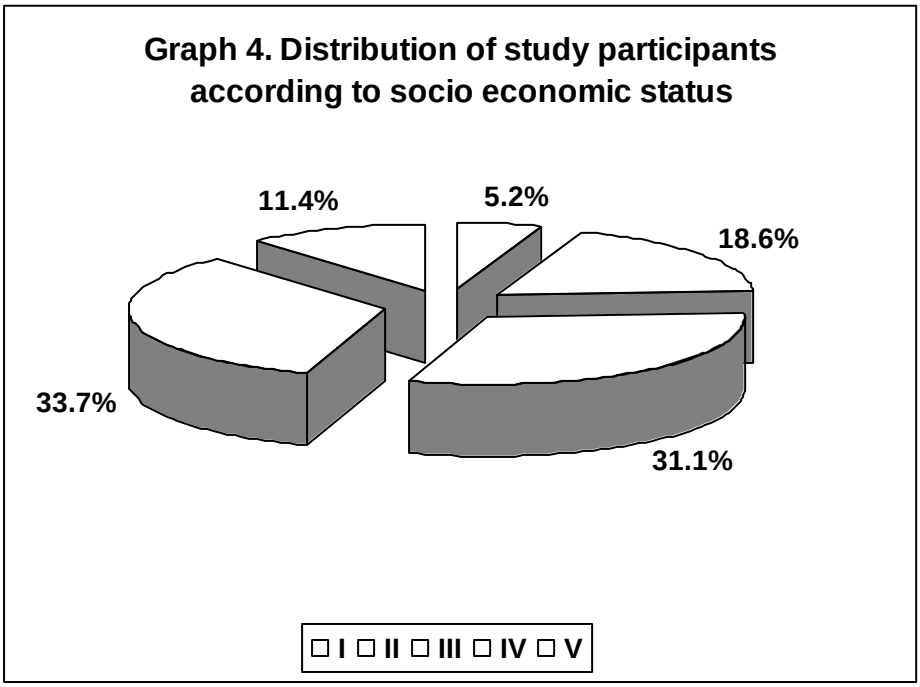
Table 5. Distribution of study participants according to type of family (n=1472)

Type of family	Number	Percentage
Nuclear	814	55.30
Joint	612	41.50
3 generation	42	2.90
Others	4	0.30
Total	**1472**	**100**

In the present study, 814 (55.3%) participants belonged to nuclear family, 612 (41.5%) to joint family, 42 (2.90%) to third generation and 4 (0.30%) to broken family.

Table 6. Distribution of study participants according to socio economic status (n=1472)

Socio economic status	Number	Percentage
I	76	5.2
II	274	18.6
III	458	31.1
IV	496	33.7
V	168	11.4
Total	**1472**	**100**



In the present study, majority of study participants 496 (33.7%) and 458 (31.1%) belonged to Class IV and class III socio economic status as per modified B.G. Prasad's classification. 274 (18.6%), 168 (11.4%) and 76 (5.20%) participants belonged to class II, class V and class I respectively.

Table 7. Distribution of study participants according to marital status (n=1472)

Marital status	Number	Percentage
Unmarried	44	3.00
Married	1284	87.20
Divorced	10	0.70
Widow	112	7.60
Widower	20	1.40
Separated	2	0.10
Total	**1472**	**100**

In the present study, 1284 (87.20%) were married, 112 (7.60%) widow, 44 (3.0%) unmarried, 20 (1.4%) widower and 2 (0.10%) were separated.

Table 8. Distribution of study participants according to type of work (n=1472)

Type of work	Number	Percentage
Sedentary	442	30.00
Moderate	768	52.20
Heavy	262	17.80
Total	**1472**	**100**

In the present study, 768 (52.20%) were involved in moderate work, 442 (30%) in sedentary work and 262 (17.80%) in heavy work.

Table 9. Distribution of study participants according to diet consumed (n=1472)

Type of diet	Number	Percentage
Vegetarian	334	22.7
Non-vegetarian (Mixed diet)	1138	77.3
Total	**1472**	**100**

In this study 334 (22.7%) consumed vegetarian food and 1138 (77.3%) were mixed diet**.**

Table 10. Distribution of study participants according to consumption of extra salt (n=1472)

Extra salt consumption	Number	Percentage
No	946	64.30
Yes	526	35.70
Total	**1472**	**100**

In the present study, 946 (64.3%) participants did not consume extra salt whereas 526 (35.7%) consumed.

Table 11. Distribution of study participants according to consumption of extra fat (n=1472)

Extra fat consumption	Number	Percentage
No	1262	85.70
Yes	210	14.30
Total	**1472**	**100**

In the present study 1262 (85.7%) participants did not consume extra fat whereas 210 (14.3%) consumed.

Table 12. Distribution of study participants according to habits (n=1472).

Habits	Number	Percentage
No	548	37.3
Yes	924	62.7
Total	**1472**	**100**

In the present study, 924 (62.7%) participants had one or the other habits of tobacco or alcohol and 548 (37.3%) had no habit of use of tobacco or alcohol.

Table 13. Distribution of study participants according to smoking habit (n=1472)

Form	Number	Percentage
Non smoker	1328	90.2
Cigarette	54	3.7
Beedi	90	6.1
Total	**1472**	**100**

In the present study, 1328 (90.2%) were non smokers whereas 54 (3.7%) smoked cigarette and 90 (6.1 %) beedi.

Table 14. Distribution of smokers according to duration of smoking (n=1472)

Duration of smoking (years)	Number	Percentage
Non smoker	1328	90.2
< 5	8	0.5
5 – 10	32	2.2
10 – 15	50	3.4
15 – 20	18	1.2
20– 25	14	1.0
> 25	22	1.5
Total	**1472**	**100**

In the present study, 1328 (90.2%) were nonsmokers whereas 90 (6.1%) smoked for less than 15 years, 32 (2.2 %) and 22 (1.5%) smoked over a period of 15 to 25 years and more than 25 years respectively.

Among smokers, 136 (out of 144) smoked daily and 112 (out of 144) smoked half pack or more.

Table 15. Distribution of study participants according to habit of using Smokeless tobacco (n=1472)

Form of smokeless tobacco	Number	Percentage
Not using smokeless tobacco	614	41.7
Gutkha	82	5.6
Plane tobacco	762	51.8
Others (Betel quid, application of tobacco to teeth)	14	0.9
Total	**1472**	**100**

762 (51.8%) were plane tobacco users, 82 (5.6%) gutakha and 14 (0.9%) other forms of smokeless tobacco whereas 614 (41.7%) had no habit of smokeless tobacco.

Table 16. Distribution of smokeless tobacco users according to duration of consumption (n=1472)

Duration of smokeless tobacco consumption (years)	Number	Percentage
No habit of using smokeless tobacco	614	41.8
< 5	52	3.5
5 – 10	226	15.4
10 – 15	176	11.9
15 – 20	102	6.9
20 – 25	134	9.1
> 25	168	11.4
Total	**1472**	**100**

In the present study, 614 (41.8%) had no habit of smokeless tobacco whereas 454 (30.8%) had habit for less than 15 years, 236 (16.1 %) and 168 (11.4%) had over a period of 15 to 25 years and more than 25 years.

Among smokeless tobacco users, 846 out of 858 (98.6%) had a habit daily. Among smokeless tobacco users, 54.5% used less than 5 times and 55.5 % consumed more than five times a day.

Table 17. Distribution of study participants according to habit of alcohol consumption. (n=1472)

Forms of alcohol	Number	Percentage
Non alcoholic	1130	76.8
Beer	28	1.9
Whiskey	52	3.5
Rum	182	12.4
Vodka	2	0.1
Local arrack and others (wine, fenny etc.)	78	5.3
Total	**1472**	**100**

In the present study, 182(12.4%) were consuming rum, 52 (3.5%) whiskey, 2 vodka, 28 (1.9%) beer and 78 (5.3%) were consuming local hooch or arrack whereas, 1130 (76.8) were non alcoholic.

Table 18. Distribution of alcoholics according to duration of consumption (n=1472)

Duration of alcohol consumption (years)	Number	Percentage
Non alcoholic	1130	76.8
< 5	46	3.1
5 – 10	120	8.2
10 – 15	52	3.5
15 – 20	40	2.7
20 – 25	28	1.9
> 25	56	3.8
Total	**1472**	**100**

In the present study, 166 (11.3%) , 120 (8.1%) and 56(3.8%) were consuming alcohol for less than 10 years, 10 to 25 years and more than 25 years respectively, whereas 1130 (76.8%) were non alcoholics. In alcoholics 26 consumed everyday and 230 once or more than once a week.

Table 19. Distribution of study participants according to family history of hypertension (n=1472)

Family history of hypertension	Number	Percentage
No	1070	72.70
Yes	402	27.30
Total	**1472**	**100**

In the present study, 402 (27.30%) gave family history of hypertension.

Table 20. Distribution of study participants according to their relation with hypertensive family members (n=1472).

Relation	Number	Percentage
Not applicable	1070	72.70
Father	52	3.50
Mother	300	20.40
Sister or brother	6	0.40
Grand parents	10	0.70
I degree relative	10	0.70
Others(maternal uncle, aunt; paternal uncle, aunt)	24	1.60
Total	**1472**	**100**

In the present study, 300 (20.4%) participant's mother were hypertensive, 52 (3.50%) father and 30 participants gave a family history of hypertension among close relatives.

Table 21. Distribution of study participants according to exercise performed (n=1472)

Routine	Number	Percentage
No	770	52.30
Yes	702	47.70
Total	**1472**	**100**

In the present study, 702 (47.20%) were doing routine exercise.

Table 22. Distribution of study participants according type of exercise. (n=1472)

Type	Number	Percentage
Not applicable	770	52.30
Walking	608	41.30
Jogging	16	1.10
Swimming	4	0.30
Cycling	74	5.0
Total	**1472**	**100**

In the present study, 608 (41.30%) participants performed exercise in the form of walking and 74 (5.0%) by cycling. Among them 674 (out of 702 i.e 96 %) were exercising daily. 212(out of 702 i.e 30.5%) for more than half an hour daily.

Among 1472 study participants only 14 (0.9%) were practicing Yoga from past two years

Table23 . Distribution of study participants according to hypertensive status (n=1472)

Sex	Hypertensive		Normotensive		Total	
	Number	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Male	240	30.8	540	69.2	780	100
Female	168	24.3	524	75.7	692	100
Total	**408**	**--**	**1064**	**--**	**1472**	**--**

In the present study, total prevalence of hypertension was found to be 27.7%. Among them, 240 out of 780(30.8%) males and 168 out of 692 (24.3%) females were found hypertensive.

The General physical examination of study participants showed, 44% (648/1472) had anemia, 2.2% (32/1472) had icterus, 0.80% (12/1472) had clubbing, 2.70% (40/1472) had edema of face or lower limbs and 0.80% (12/1472) had enlarged lymph nodes.

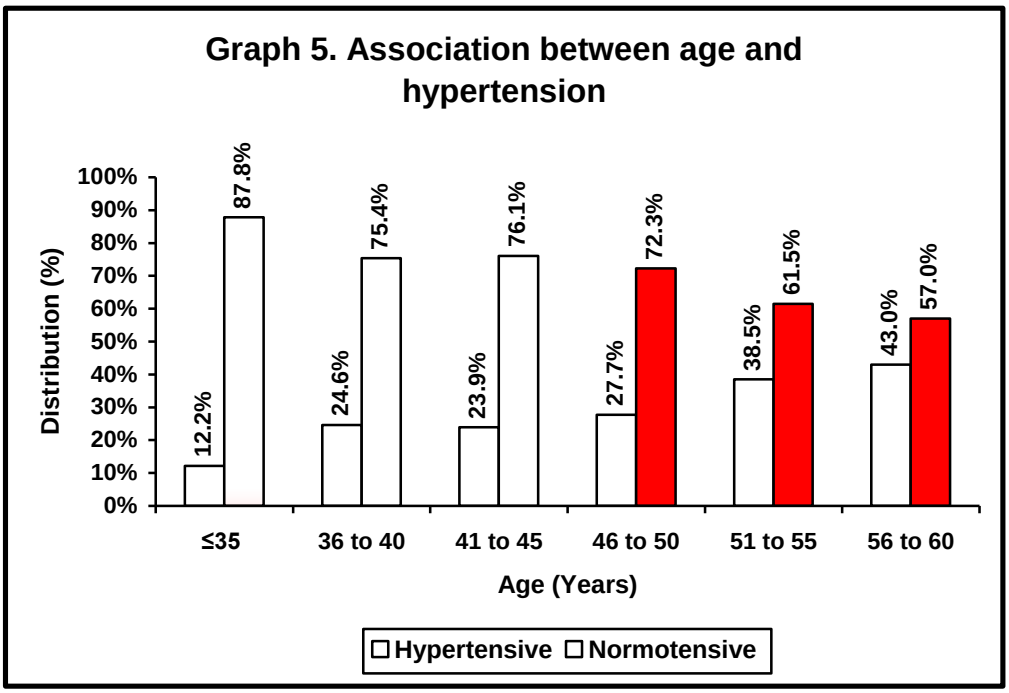
Systemic examination of study participants (n=1472) showed that, 6.4% (94/1472) had some abnormality of cardiovascular system. 4.80% (70/1472) had abnormal respiratory system finding, 1.50% (22/1472) had hepatomegaly or splenomegaly and 0.80% (12/1472) had some abnormality of central nervous system like hemiplegia and hemiparesis.

II COMPARISON OF PROFILE OF NORMOTENSIVES AND HYPERTENSIVES

Table 24. Association between age and hypertension (n=1472)

Age (Years)	Hypertensive		Normotensive		Total	
	Number	Percent	Number	Percent	Number	Percent
≤ 35	40	12.2	288	87.8	328	100
36 – 40	56	24.6	172	75.4	228	100
41 – 45	56	23.9	178	76.1	234	100
46 – 50	52	27.7	136	72.3	188	100
51 – 55	74	38.5	118	61.5	192	100
56 – 60	130	43.0	172	57.0	302	100
Total	**408**	**---**	**1064**	**----**	**1472**	**---**

X^2 = 88.901 **p < 0.001**

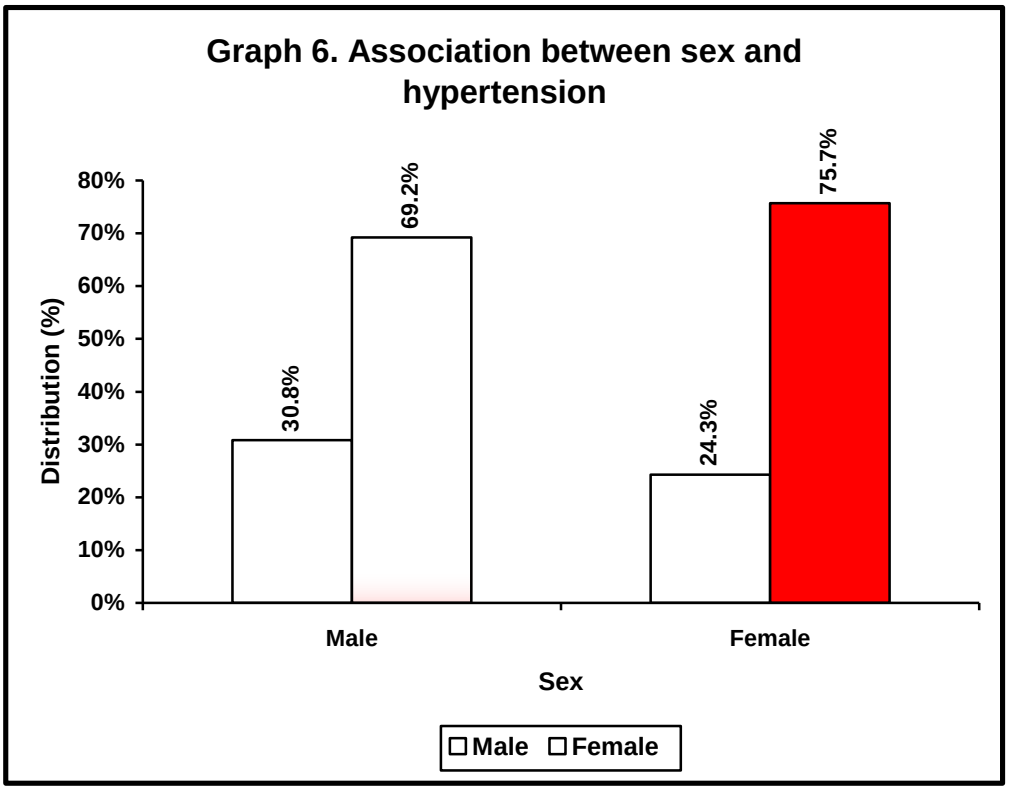


The prevalence of hypertension among the age group of 30 to 35 years was found 12.2% compared to 24%, 23.9%, 27%, 38.5%and 43% in 36 to 40, 41 to 45, 46 to 50, 51 to 55 and 56 to 60 years respectively. This shows that as the age advances the prevalence of hypertension also increases. This difference was statistically significant.

Table 25. Association between sex with hypertension (n=1472)

Sex	Hypertensive		Normotensive		Total	
	Number	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Male	240	30.8	540	69.2	780	100
Female	168	24.3	524	75.7	692	100
Total	**408**	**--**	**1064**	**--**	**1472**	**--**

X^2 = 7.713 **p = 0.005**

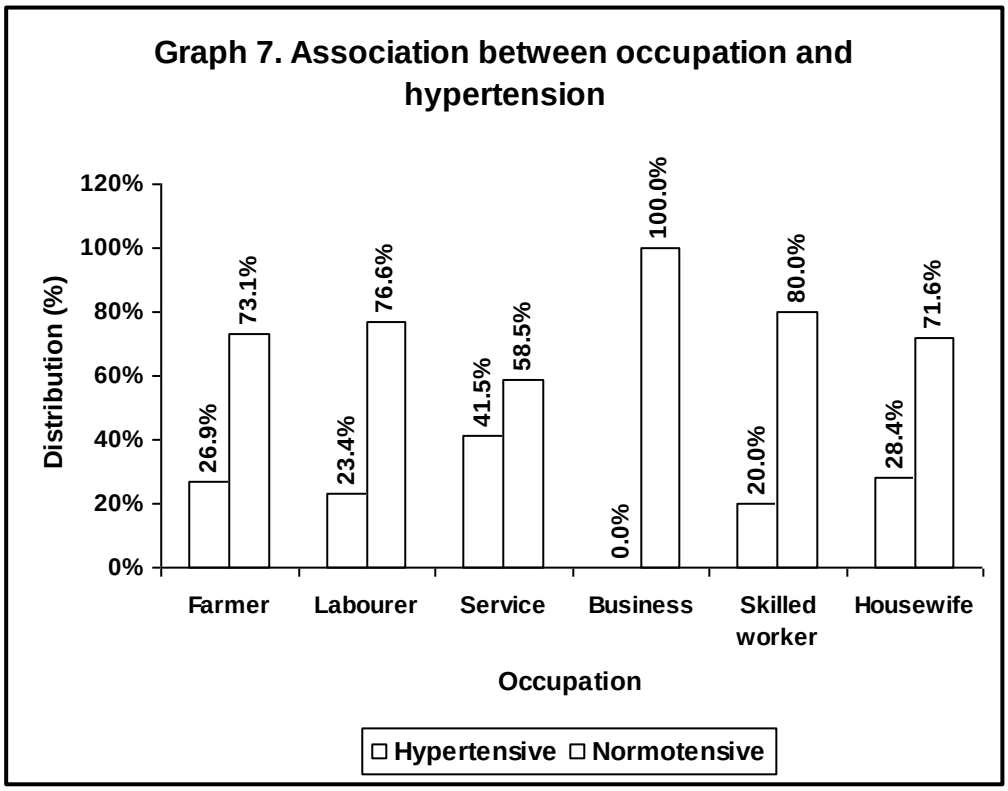


The prevalence of hypertension in male participants was 30.8% compared to 24.3% in female. This difference was statistically significant.

Table 26. Association between occupation and hypertension (n=1472)

Occupation	Hypertensive		Normotensive		Total	
	Number	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Farmer	198	26.9	538	73.1	736	100
Labourer	22	23.4	72	76.6	94	100
Sedentary service	54	41.5	76	58.5	130	100
Business	0	0.0	20	100	20	100
Skilled worker	14	20	56	80	70	100
Housewife	120	28.4	302	71.6	422	100
Total	**408**	**--**	**1064**	**--**	**1472**	**--**

X^2 **= 23.371** **p < 0.001**

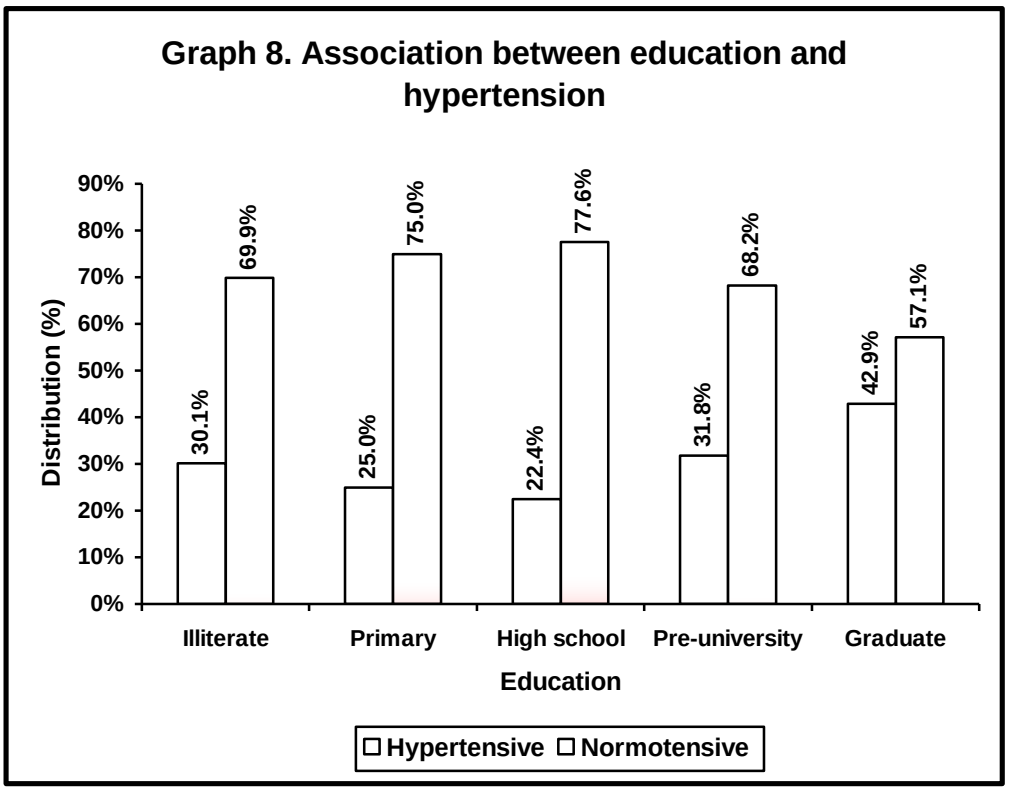


In the present study, prevalence of hypertension was 41.5% in sedentary service occupants than 28.4% and 26.9% in housewives and farmers. This difference was found statistically significant.

Table 27. Association between education and hypertension (n=1472)

Education	Hypertensive		Normotensive		Total	
	Number	Percent	Number	Percent	Number	Percent
Illiterate	212	30.1	494	69.9	706	100
Primary	112	25.0	336	75.0	448	100
High school	52	22.4	180	77.6	232	100
Pre University	14	31.8	30	68.2	44	100
Graduate	18	42.9	24	57.1	42	100
Total	**408**	**---**	**1064**	**---**	**1472**	**---**

X^2 = 12.089 p = 0.017

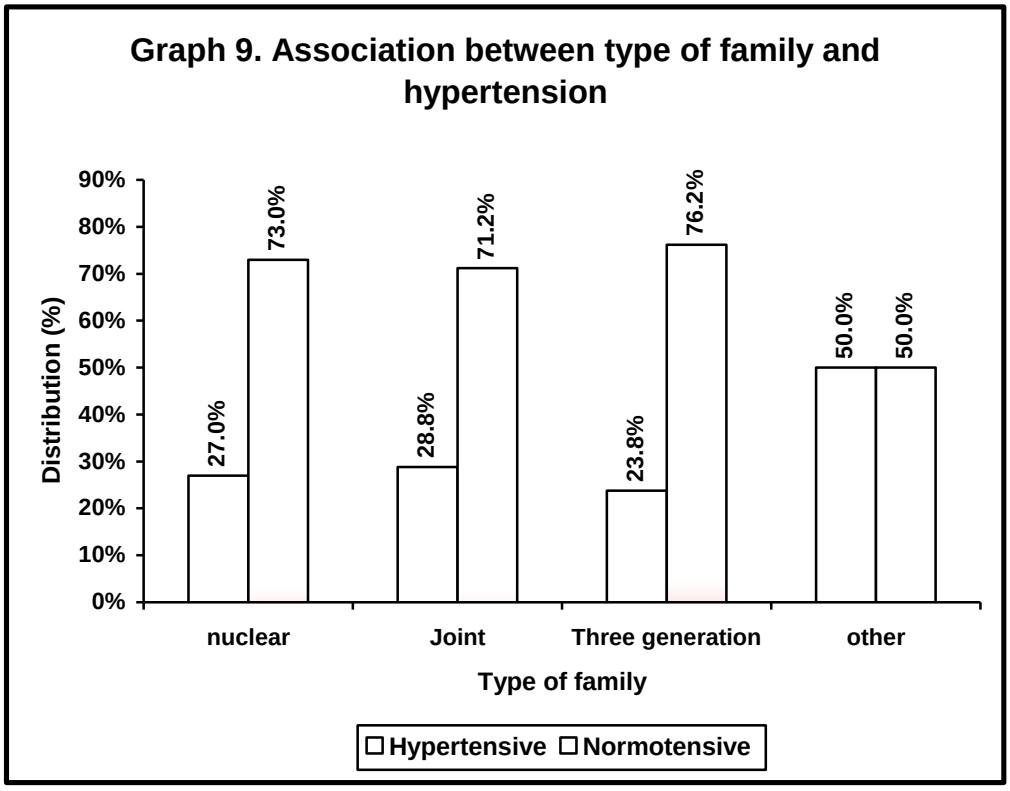


The prevalence of hypertension was more in graduates and postgraduates (42.9%) compared to primary school educated (25.0%). This difference was statistically significant.

Table 28. Association between type of family and hypertension (n=1472)

Family type	Hypertensive		Normotensive		Total	
	Number	Percent	Number	Percent	Number	Percent
Nuclear	220	27.0	594	73.0	814	100
Joint	176	28.8	436	71.2	612	100
Three generation	10	23.8	32	76.2	42	100
Other	2	50.0	2	50.0	4	100
Total	**408**	**---**	**1064**	**---**	**1472**	**---**

X^2 = 1.836 **p = 0.607**

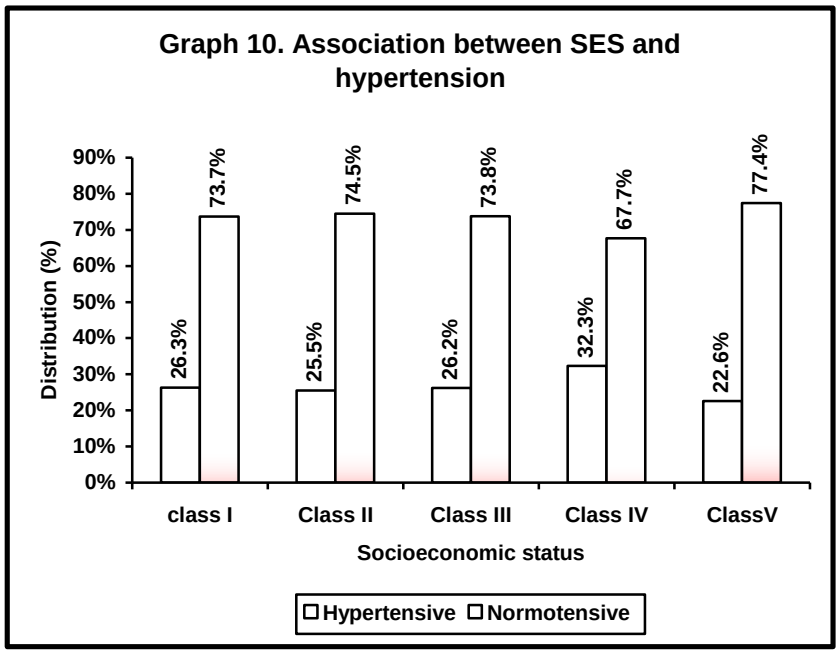


The prevalence of hypertension was 50.0% in those who belonged to broken family as compared to 27.0%, 28.8%, 23.8% and in participants belonged to nuclear, joint, three generation type of family. This difference was not statistically significant.

Table 29. Association between SES and hypertension (n=1472).

SES	Hypertensive		Normotensive		Total	
	Number	**Percent**	**Number**	**Percent**	**Number**	**Percent**
I	20	26.3	56	73.7	76	100
II	70	25.5	204	74.5	274	100
III	120	26.2	338	73.8	458	100
IV	160	32.3	336	67.7	496	100
V	38	22.6	130	77.4	168	100
Total	**408**	**---**	**1064**	**---**	**1472**	**---**

X^2 = 8.409 **p = 0.078**



The prevalence of hypertension was 26.3%, 25.3%,26.2%, 32.3% and 22.6% in participants belonging to class I, class II, class III, class IV and class V respectively**.** This difference was marginally significant.

Table 30. Association between marital status and hypertension (n=1472).

Marital status	Hypertensive		Normotensive		Total	
	Number	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Unmarried	10	22.7	34	77.3	44	100
Married	344	26.8	940	73.2	1284	100
Divorce/ separated	6	50.0	6	50.0	12	100
Widow/ Widower	48	36.4	84	63.6	132	100
Total	**408**	**---**	**1064**	**---**	**1472**	**---**

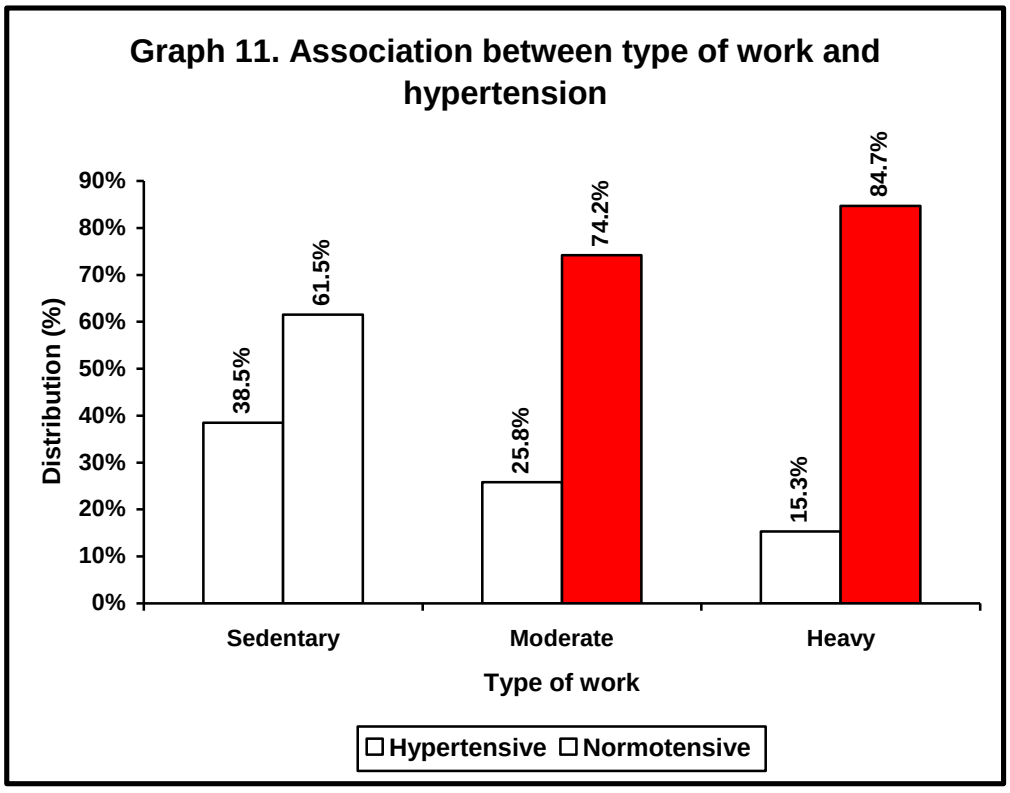
X^2 **= 8.995** **p = 0.029**

The prevalence of hypertension was found 50.0% in divorcee/ separated participants as compared to 22.7% and 28% in unmarried and married. This difference was statistically significant.

Table 31. Association between type of work and hypertension (n=1472)

Type of work	Hypertensive		Normotensive		Total	
	Number	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Sedentary	170	38.5	272	61.5	442	100
Moderate	198	25.8	570	74.2	768	100
Heavy	40	15.3	222	84.7	262	100
Total	**408**	**---**	**1064**	**---**	**1472**	**---**

X^2 **= 47.175** **p < 0.001**

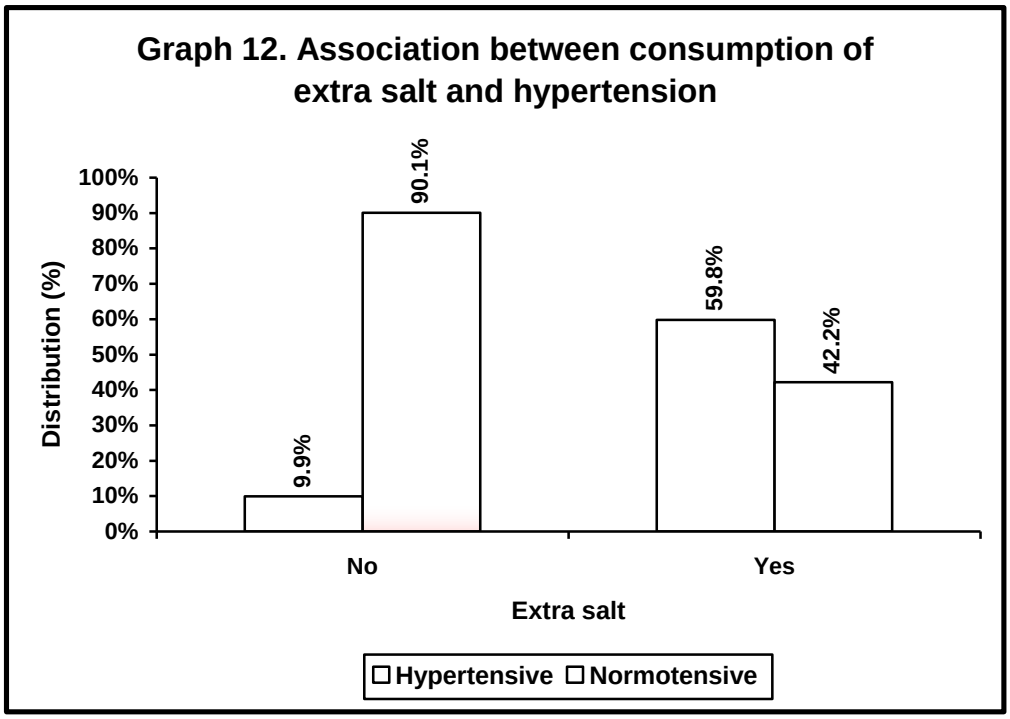


Prevalence of hypertension was 38.5% among participants involved in sedentary work as compared to 15.3% who were involved in heavy work. This difference was statistically significant.

Table 32. Association between consumption of extra salt and hypertension (n=1472)

Extra salt	Hypertensive		Normotensive		Total	
	Number	Percent	Number	Percent	Number	Percent
No	94	9.9	852	90.1	946	100
Yes	314	59.8	212	42.2	526	100
Total	**408**	**---**	**1064**	**---**	**1472**	**---**

X^2 = **417.8** **p < 0.001**

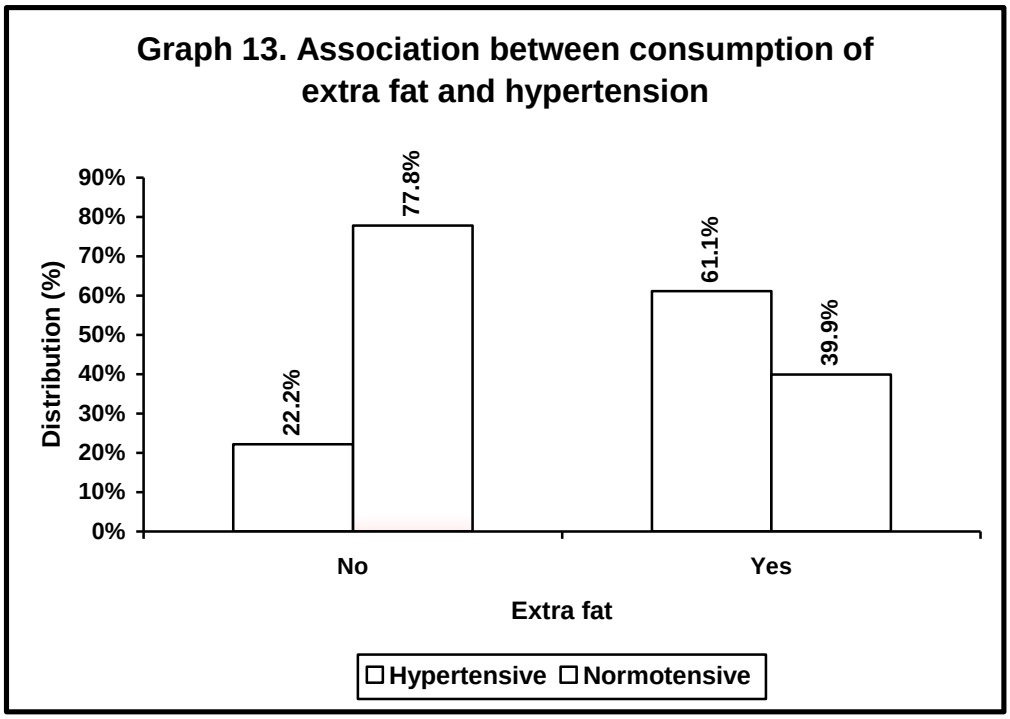


Prevalence of hypertension was 59.8% among those who consumed extra salt when compared to 9.9% among those who did not. This difference was statistically significant.

Table 33. Association between consumption of extra fat and hypertension (n=1472)

Extra fat	Hypertensive		Normotensive		Total	
	Number	**Percent**	**Number**	**Percent**	**Number**	**Percent**
No	280	22.2	982	77.8	1262	100
Yes	128	61.1	82	39.9	210	100
Total	**408**	**---**	**1064**	**---**	**1472**	**---**

X^2 = 135.02 **p < 0.001**

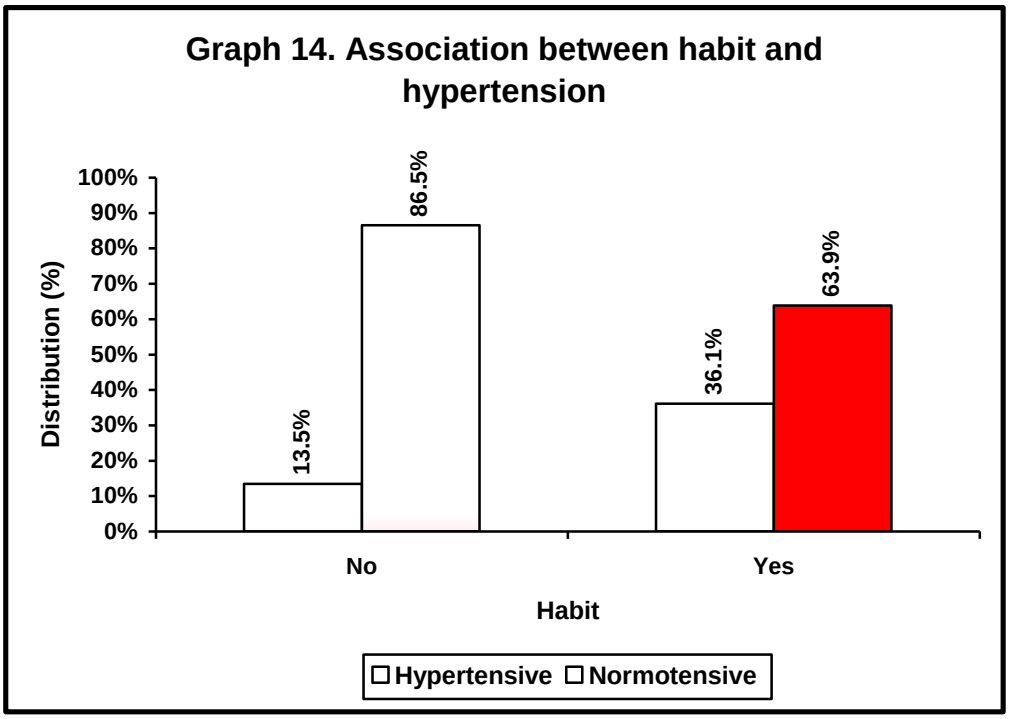


Prevalence of hypertension was 61.1% among those who consumed extra fat when compared to 22.5% among those who did not. This difference was statistically significant.

Table 34. Association between habits and hypertension (n=1472).

Habit	Hypertensive		Normotensive		Total	
	Number	Percent	Number	Percent	Number	Percent
No	74	13.5	474	86.5	548	100
Yes	334	36.1	590	63.9	924	100
Total	**408**	**---**	**1064**	**---**	**1472**	**---**

X^2 **= 88.033** **p < 0.001**

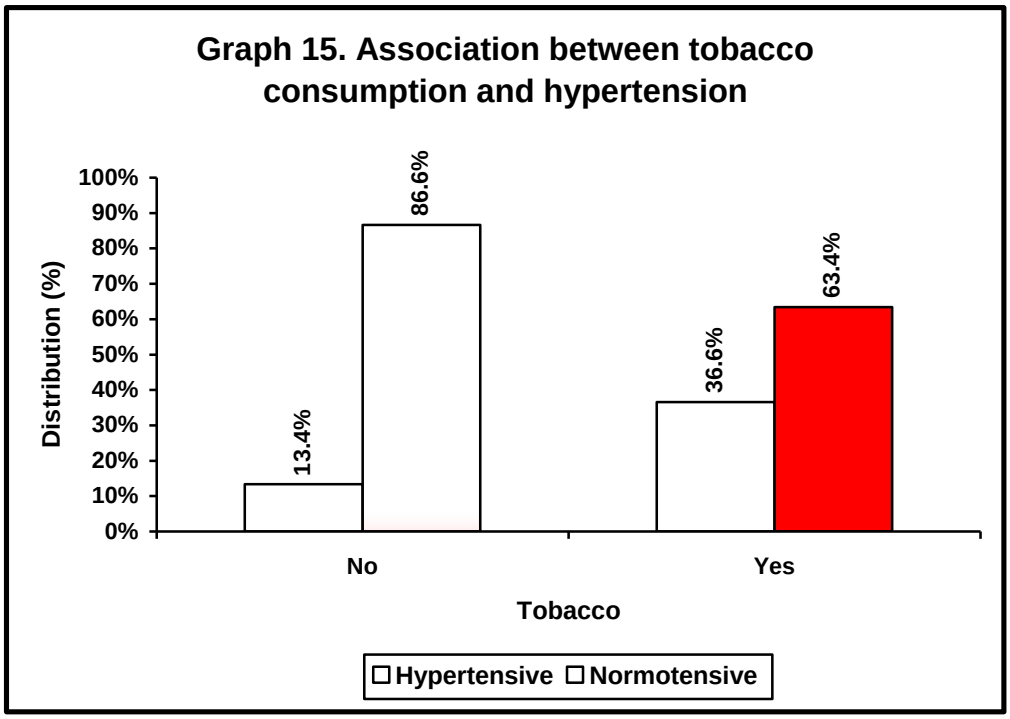


Prevalence of hypertension was 36.1% among those who had habit of either tobacco or alcohol consumption when compared to 13.5% among those who did not. This difference was statistically significant.

Table 35. Association between tobacco consumption and hypertension (n=1472)

Tobacco	Hypertensive		Normotensive		Total	
	Number	Percent	Number	Percent	Number	Percent
No	76	13.4	490	86.6	566	100
Yes	332	36.6	574	63.4	906	100
Total	**408**	**---**	**1064**	**---**	**1472**	**---**

X^2 **= 93.727** **p < 0.001**

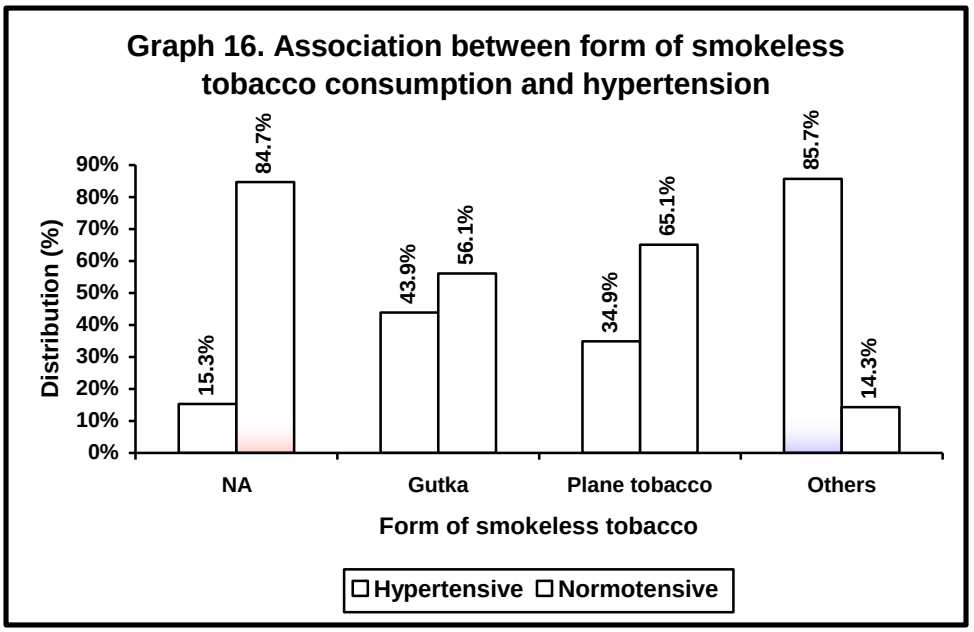


Prevalence of hypertension was 36.6% among those who had habit of tobacco consumption when compared to 13.5% among those who did not. This difference was statistically significant.

Table 36. Association between form of smokeless tobacco consumption and hypertension (n=1472)

Forms of smokeless Tobacco	Hypertensive		Normotensive		Total	
	No	%	No	%	No	%
Not using smokeless tobacco	94	15.3	520	84.7	614	100
Gutka	36	43.9	46	56.1	82	100
Plane tobacco	266	34.9	496	65.1	762	100
Others (beetle quid/ application of tobacco to teeth)	12	85.7	2	14.3	14	100
Total	**408**	**---**	**1064**	**---**	**1472**	**---**

$X^2 = 101.1$ $p < 0.001$

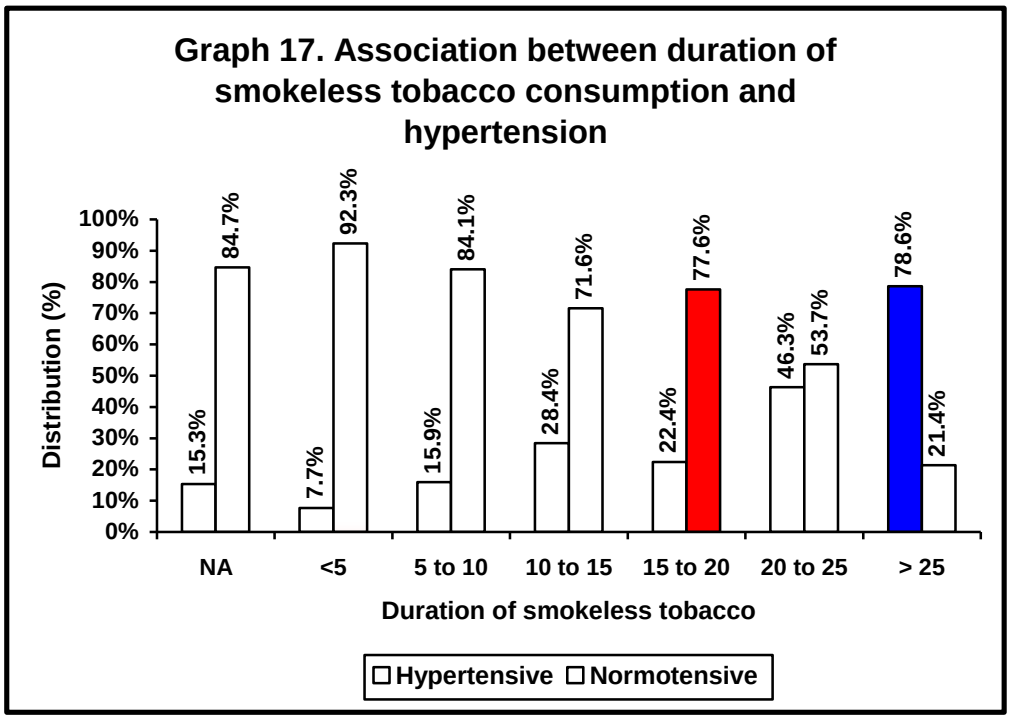


Prevalence of hypertension was 43.9% and 34.9% among those who had habit of eating gutka and plane tobacco when compared to 15.3% among those who did not have habit of consuming smokeless tobacco. This difference was statistically significant.

Table 37. Association between duration of smokeless tobacco consumption and hypertension (n=1472)

Duration of smokeless tobacco consumption (in years)	Hypertensive		Normotensive		Total	
	Number	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Not using smokeless tobacco	94	15.3	520	84.7	614	100
< 5	4	7.7	48	92.3	52	100
5 – 10	36	15.9	190	84.1	226	100
10 – 15	50	28.4	126	71.6	176	100
15 – 20	30	22.4	72	77.6	102	100
20 – 25	62	46.3	72	53.7	134	100
> 25	132	78.6	36	21.4	168	100
Total	**408**	**---**	**1064**	**---**	**1472**	**---**

X^2 = 312.5 **d f= 6** **p < 0.001**



The prevalence of hypertension increased from 7.7% among those who consumed smokeless tobacco for less than 5 years to 78.6% among those who consumed for more than 25 years. As the duration of smokeless tobacco consumption increased, prevalence of hypertension also increased. This difference was statistically significant.

Table 38. Association between smoking and hypertension (n=1472).

Smoking form	Hypertensive		Normotensive		Total	
	Number	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Non smokers	340	25.6	988	74.4	1328	100
Cigarette	28	51.9	26	48.1	54	100
Beedi	40	44.4	50	55.6	90	100
Total	**408**	**---**	**1064**	**---**	**1472**	**---**

X^2 = 31.233 **p < 0.001**

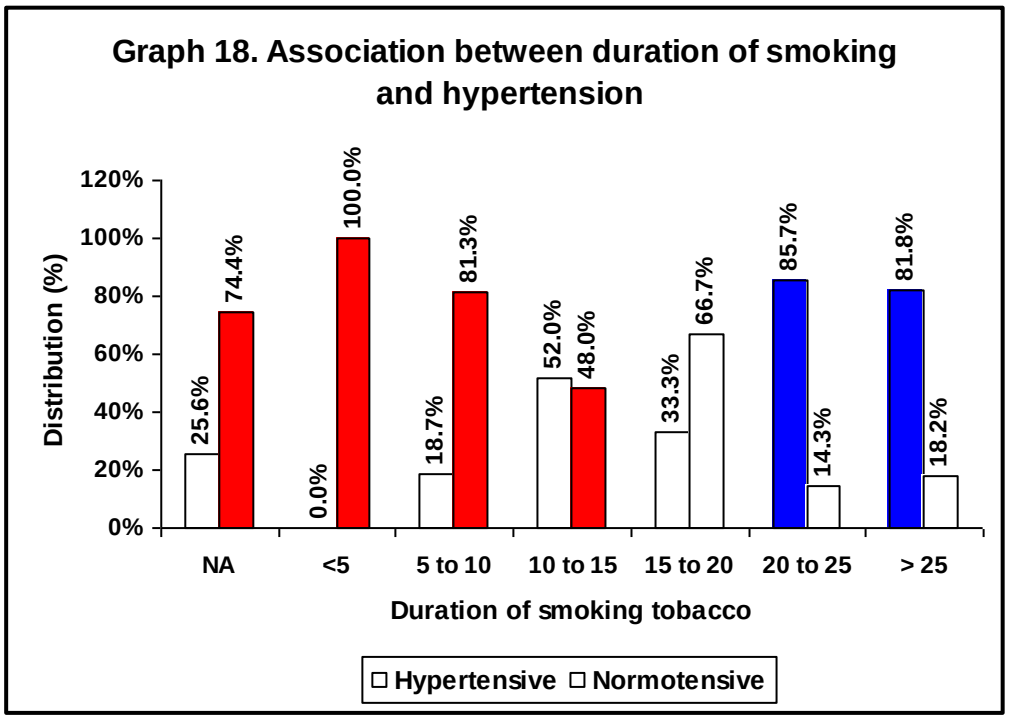
Prevalence of hypertension was 51.9% and 44.4% among those who had habit of smoking cigarette and beedi when compared to 25.6% among those who did not smoke. This difference was statistically significant.

.

Table 39. **Association between duration of smoking and hypertension (n=1472)**

Duration of smoking (in years)	Hypertensive		Normotensive		Total	
	Number	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Non smoker	340	25.6	988	74.4	1328	100
< 5	0	0.0	8	100	8	100
5 – 10	6	18.7	26	81.3	32	100
10 – 15	26	52.0	24	48.0	50	100
15 – 20	6	33.3	12	66.7	18	100
20 – 25	12	85.7	2	14.3	14	100
> 25	18	81.8	4	18.2	22	100
Total	**408**	**---**	**1064**	**---**	**1472**	**---**

X^2 **= 37.960** **d f= 6** **p < 0.001**

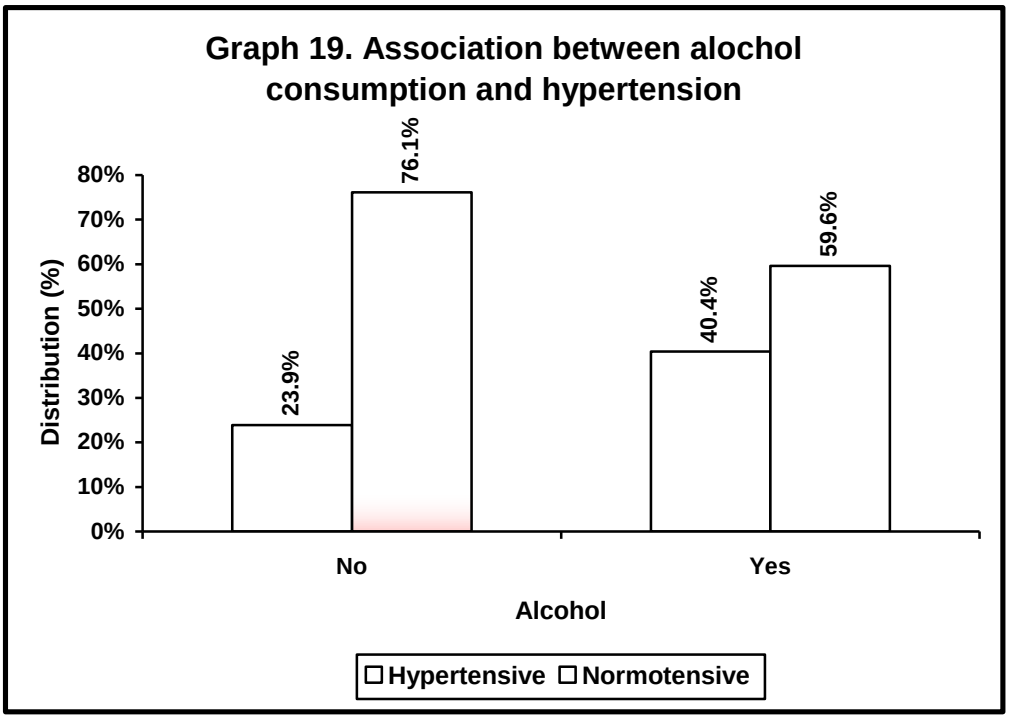


As the duration of smoking increased prevalence of hypertension also increased. It was 18.7% among those who smoked for 5 to 10 years compared to 81.8% among those who smoked for more than 25 years. This difference was statistically significant.

Table 40. Association between alcohol consumption and hypertension (n=1472)

Alcohol	Hypertensive		Normotensive		Total	
	Number	Percent	Number	Percent	Number	Percent
No	270	23.9	860	76.1	1130	100
Yes	138	40.4	204	59.6	342	100
Total	**408**	**---**	**1064**	**---**	**1472**	**---**

X^2 **= 35.491** **p < 0.001**

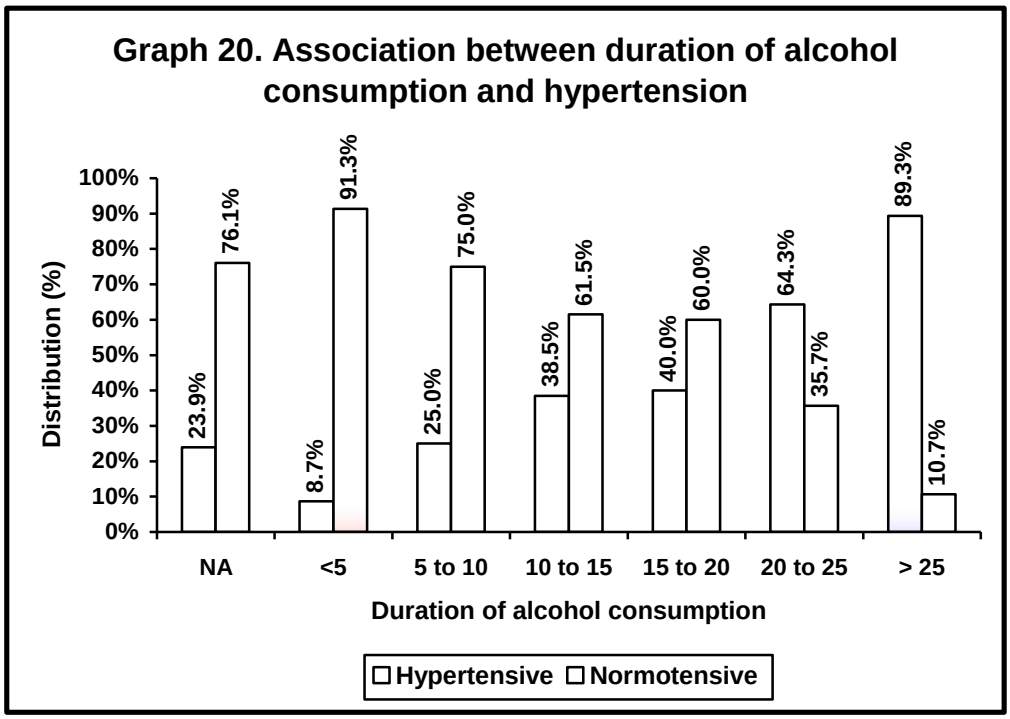


Prevalence of hypertension was 40.4% among those who consumed alcohol when compared to 23.9% among those who did not. This difference was statistically significant.

Table41 . Association between duration of alcohol consumption and hypertension (n=1472)

Duration of alcohol consumption (years)	Hypertensive		Normotensive		Total	
	Number	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Non alcoholic	270	23.9	860	76.1	1130	100
< 5	4	8.7	42	91.3	46	100
5 – 10	30	25.0	90	75.0	120	100
10 – 15	20	38.5	32	61.5	52	100
15 – 20	16	40.0	24	60.0	40	100
20 – 25	18	64.3	10	35.7	28	100
> 25	50	89.3	6	10.7	56	100
Total	**408**	**---**	**1064**	**---**	**1472**	**---**

X^2 **= 147.644** **p < 0.001**

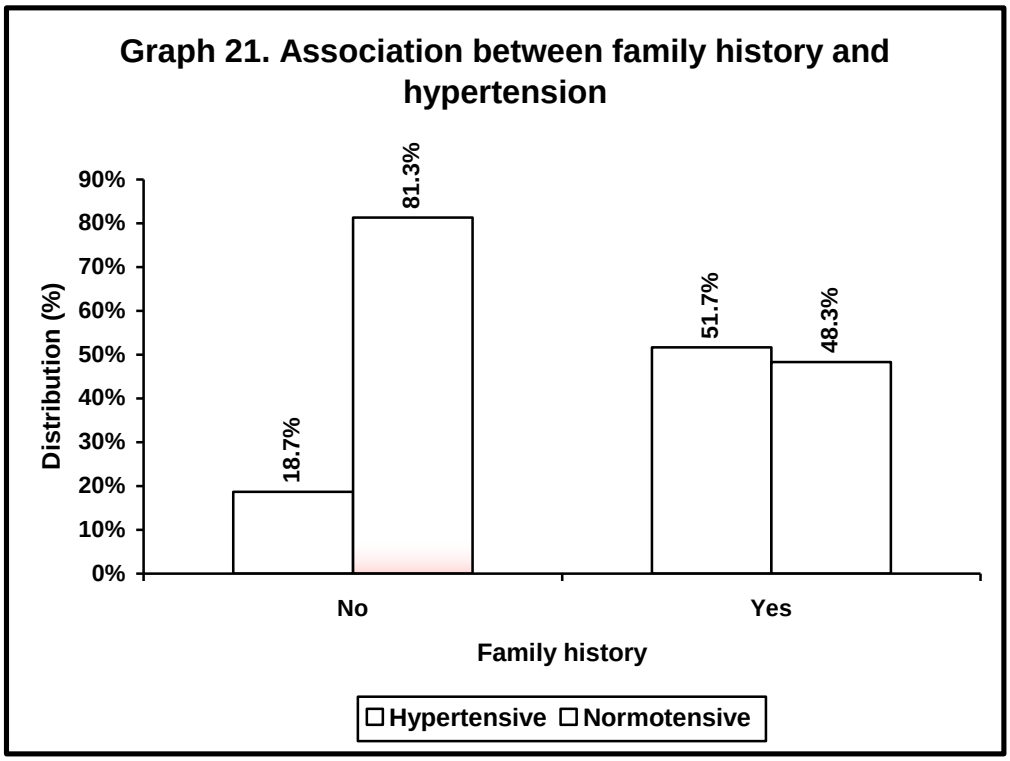


The prevalence of hypertension was 8.7% among those who consumed alcohol for less than 5 years and gradually increasd as the duration of alcohol consumption increased, it was 89.3% among those who consumed for more than 25 years. This difference was statistically significant.

Table 42. Association between family history and hypertension (n=1472)

Family history of HT	Hypertensive		Normotensive		Total	
	Number	Percent	Number	Percent	Number	Percent
No	200	18.7	870	81.3	1070	100
Yes	208	51.7	194	48.3	402	100
Total	**408**	**---**	**1064**	**---**	**1472**	**---**

X^2 **= 159.3** **p < 0.001**

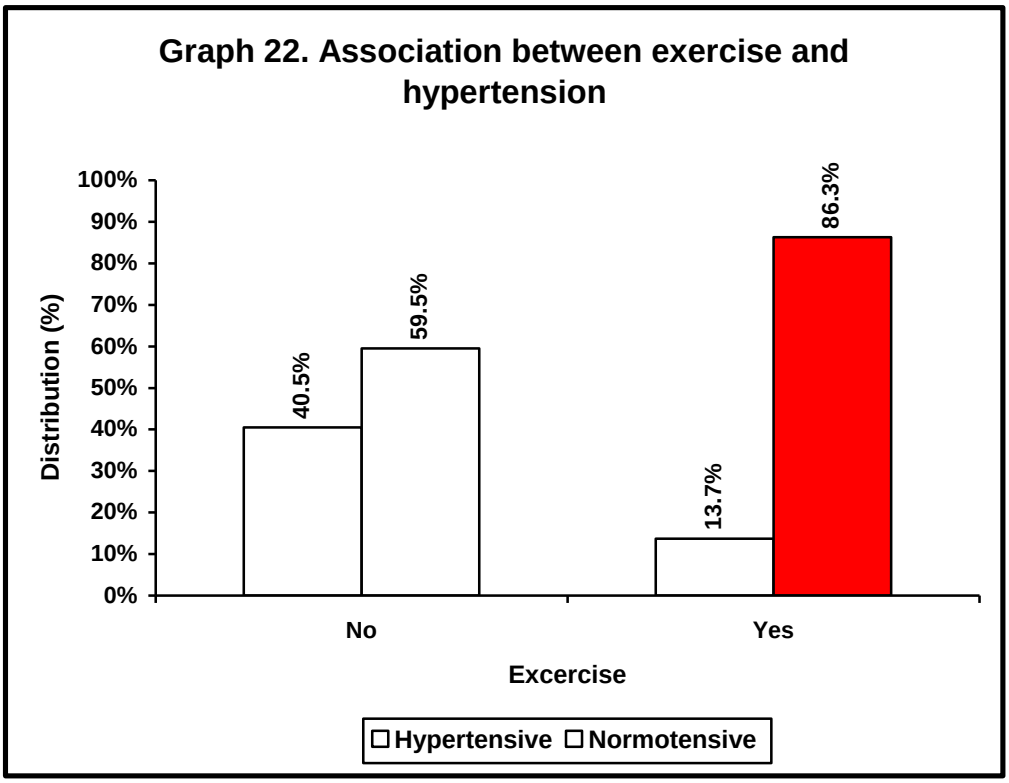


Prevalence of hypertension was 51.7% among those who had a family history of hypertension when compared to 18.7% among those who did not. This difference was statistically significant.

Table 43. Association between Exercise and hypertension (n=1472)

Exercise	Hypertensive		Normotensive		Total	
	Number	Percent	Number	Percent	Number	Percent
No	312	40.5	458	59.5	770	100
Yes	96	13.7	606	86.3	702	100
Total	**408**	**---**	**1064**	**---**	**1472**	**---**

X^2 **= 132.1** **p < 0.001**

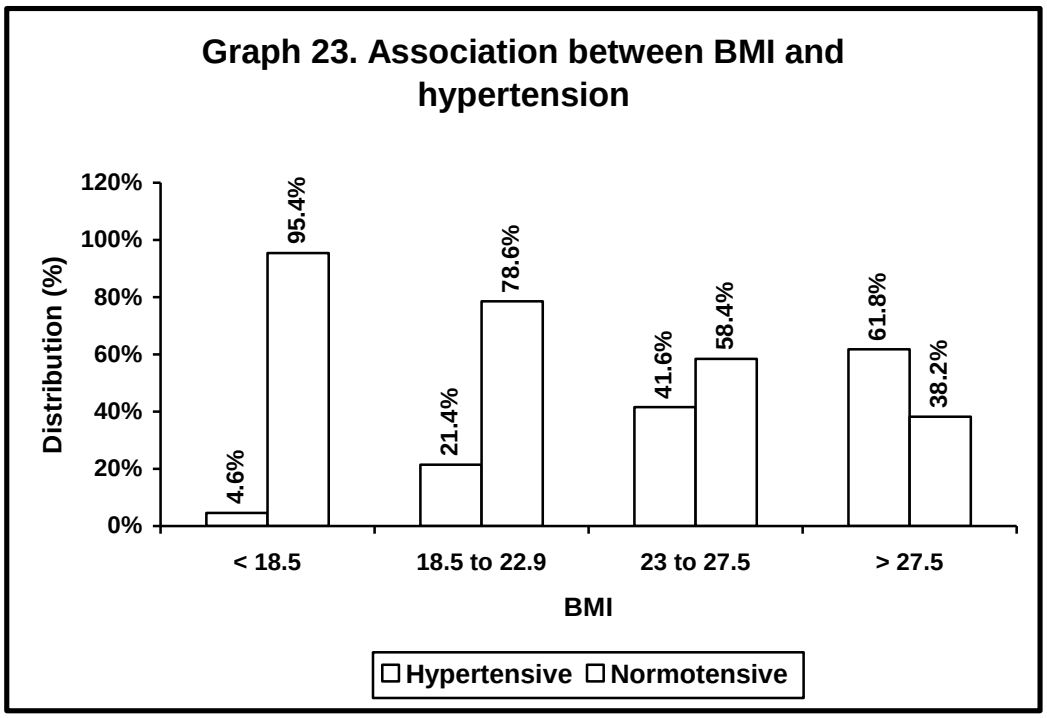


Prevalence of hypertension was 13.7% among those who exercised compared to 40.5% among those who did not. This difference was statistically significant.

Table 44. Association between BMI and hypertension (n=1472).

BMI (Kg/m^2)	Hypertensive		Normotensive		Total	
	Number	Percent	Number	Percent	Number	Percent
< 18.5	10	4.6	208	95.4	218	100
18.5 – 22.9	160	21.4	588	78.6	748	100
23 – 27.5	154	41.6	216	58.4	370	100
> 27.5	84	61.8	52	38.2	136	100
Total	**408**	**---**	**1064**	**---**	**1472**	**---**

X^2 = 187.6 **p < 0.001**



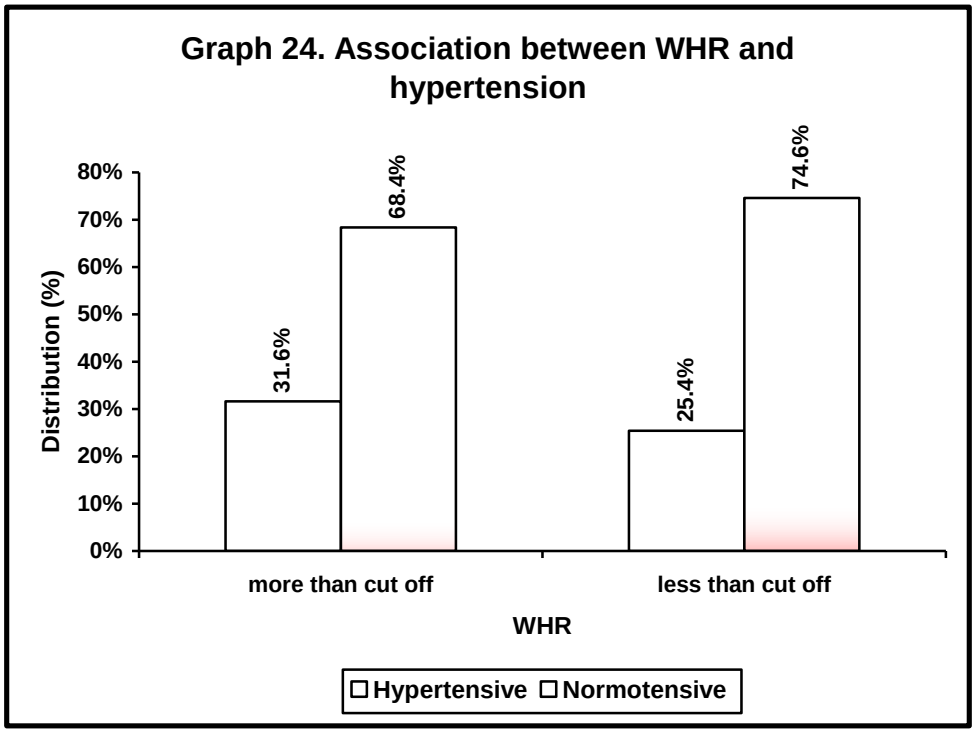
Prevalence of hypertension was 61.8% among those who had body mass index more than 27.5 Kg/ m^2 when compared to 22.9% among those who had 18.5 to 22.9 Kg/m^2. As the BMI increased prevalence of hypertension also increased and this difference was statistically significant.

Table 45. Association between WHR, and hypertension (n=1472).

WHR	Hypertensive		Normotensive		Total	
	No.	%	No.	%	No.	%
More than cut off*	174	31.6	376	68.4	550	100
Less than cut off*	234	25.4	688	74.6	922	100
Total	**408**	**---**	**1064**	**----**	**1472**	**---**

X^2 = 581.2 **p = 0.009**

(* 0.85 in female and 0.90 in male were cut off point for WHR)



Prevalence of hypertension was 31.6% among those who had WHR more than cut off value when compared to 25.4% among those who had less. This difference was statistically significant.

Table 46. The Univariate logistic regression analyses of hypertension and various risk factors

Risk factors	Unadjusted OR	Probability	95% CI
Sex male/female	1.38	0.006	1.1-1.74
Age			
<35	Reference	Reference	Reference
36-40	2.34	<0.001	1.50 - 3.66
40-45	2.36	<0.001	1.45 - 3.54
46-50	2.97	<0.001	1.74 - 4.36
51-55	4.52	<0.001	2.90 -6.99
56-60	5.43	<0.001	3.63 – 8.13
Occupation			
Farmer	1.99	0.022	1.1 – 3.61
Labor	1.66	0.182	0.79 -3.48
Service	3.86	<0.001	1.97 -7.51
Housewife	2.15	0.013	1.17 -3.97
Business profession	Reference	Reference	Reference
Education			
Illiterate	1.49	0.024	1.05 – 2.11
Primary	1.15	0.455	0.79 – 1.68
High School	Reference	Reference	Reference
Pre- University/ diploma	1.61	0.183	0.80 – 3.26
Graduate	2.59	0.006	1.31 – 5.15
Socioeconomic status			
Class I	1.22	0.530	0.65 – 2.28
Class II	1.18	0.461	0.75 – 1.86
Class III	1.21	0.361	0.8 – 1.84
Class IV	2.45	0.019	1.08 – 2.45
Class V	Reference	Reference	Reference
Marital status			
Unmarried	Reference	Reference	Reference
Married	1.24	0.550	0.61 – 2.54
Widow or widower	1.94	0.099	0.88 – 4.27
Divorced or separated	3.40	0.072	0.89 – 12.82
Work type			
Sedentary	3.47	<0.001	2.35 – 5.10
Moderate	1.92	0.001	1.32 – 2.80
Heavy	Reference	Reference	Reference
Asian BMI			
<18.5	Reference	Reference	Reference
18.5 – 22.9	5.65	<0.001	2.93 – 10.98
23 – 27.5	14.92	<0.001	7.63 – 28.57
>27.5	33.33	<0.001	16.39 – 71.42
Waist Hip Ratio	1.36	0.010	1.08 – 1.72
Consumption of extra salt and fat			
Extra salt	13.51	<0.001	10.2 – 17.54
Extra fat	5.46	<0.001	4.03 – 7.46
Habit	3.62	<0.001	2.74 – 4.78
Tobacco	3.73	<0.001	2.82 – 4.92
Smoking form			
Cigarette	3.12	<0.001	1.81 – 5.40
Beedi	2.32	<0.001	1.50 – 3.58
Alcohol	1.23	<0.001	1.15 – 1.31
Family history of hypertension	4.67	<0.001	3.63 – 5.98
Exercise	0.23	<0.001	0.18 – 0.30

After performing univariate logistic regression analysis, risk factors associated with hypertension in the present study were sex, age, occupation (farmers, sedentary service occupants, housewives), education (illiterates, graduates), socio economic status (class IV), type of work (sedentary and moderate worker), body mass index (according to Asian standards), extra salt consumption, extra fat consumption, tobacco consuming, cigarette smoking, beedi smoking, alcohol consumption, family history of hypertension and exercise. Labourer, primary educated, SES (class I, class II, Class III), marital status were not associated with hypertension.

Table 47. Multivariate logistic regression analyses of hypertension and various risk factors

Risk factors	Adjusted OR	Probability	95% CI
Sex male/female	1.78	0.094	0.90 – 3.56
Age			
<35	Reference	Reference	Reference
36-40	2.73	0.002	1.42 – 5.23
40-45	3.13	0.000	1.57 – 6.25
46-50	2.31	0.025	1.11 – 4.78
51-55	4.01	0.000	1.93 – 8.33
56-60	3.24	0.001	1.67 – 6.29
Occupation			
Farmer	1.41	0.440	0.24 – 1.67
Labor	3.16	0.041	1.23 – 4.78
Service	1.32	0.297	0.62 – 2.14
Housewife	0.78	0.647	0.42 – 1.77
Business profession	Reference	Reference	Reference
Education			
Illiterate	0.87	0.668	0.45 – 1.65
Primary	0.60	0.101	0.32 – 1.10
High School	Reference	Reference	Reference
Pre- University/ diploma	1.04	0.937	0.36 – 3.05
Graduate	4.54	0.016	1.32 – 15.62
Socioeconomic status			
Class I	0.60	0.381	0.19 – 1.88
Class II	1.42	0.336	0.69 – 2.94
Class III	1.78	0.078	0.94 – 3.39
Class IV	2.03	0.022	1.10 – 3.74
Class V	Reference	Reference	Reference
Marital status			
Unmarried	Reference	Reference	Reference
Married	0.79	0.671	0.27 – 2.32
Widow or widower	0.73	0.621	0.21 – 2.50
Divorced or separated	1.67	0.598	0.24 – 11.49
Work type			
Sedentary	2.36	0.013	1.19 – 4.65
Moderate	2.19	0.005	1.26 – 3.83
Heavy	Reference	Reference	Reference
Asian BMI			
<18.5	Reference	Reference	Reference
18.5 – 22.9	3.57	0.002	1.62 – 7.87
23 – 27.5	5.43	0.000	2.38 – 12.5
>27.5	**11.36**	0.000	4.61 – 27.77
Waist Hip Ratio	**1.06**	0.795	0.66 – 1.71
Consumption of extra salt and fat			
Extra salt	10.98	<0.001	7.63 – 15.87
Extra fat	**6.09**	< 0.001	3.86 – 9.71
Habit	**0.42**	0.317	0.07 – 2.31
Tobacco	**4.58**	0.073	0.86 – 24.39
Smoking form			
Non smoker	Reference	Reference	Reference
Cigarette	1.02	0.951	0.44 – 2.38
Beedi	**1.09**	0.805	0.54 – 2.23
Alcohol	**1.10**	0.127	0.92 – 1.24
Family history of hypertension	**3.41**	< 0.001	2.36 – 4.95
Exercise	0.21	< 0.001	0.13 – 0.32

After adjusting confounding variables multiple logistic regression analysis showed, risk factors associated with hypertension in the present study were age, occupation (labourer), education (graduates), socio economic status (class IV), type of work (sedentary and moderate worker), body mass index(according to Asian standards), extra salt consumption, extra fat consumption, family history of hypertension and exercise. Association between habits, WHR and marital status was not statistically significant.

Table 48. t test showing mean ± SD values of anthropometric indicator and other variables among normotensive and hypertensive individuals (n=1472).

Variables	Hypertensive (408)	Normotensive (1064)	T	Df	p
Pulse	73.57 ± 11.79	72.47 ± 6.44	2.300	1470	0.022
SBP	151.9 ±18.46	119 ± 13.08	37.458	1470	< 0.001
DBP	96.6 ± 8.79	77.3 ± 7.24	43.008	1470	< 0.001
BMI	24.4 ± 4.18	21.2 ± 3.73	14.129	1470	<0.001
Age	49.1 ± 9.14	43.7 ± 9.63	9.776	1470	< 0.001
Waist hip ratio	0.93 ± 0.07	0.90 ± 0.39	1.573	1470	< 0.116

Mean values of pulse, systolic blood pressure, diastolic blood pressure, BMI, and Age was significantly higher in hypertensives than normotensives and it was found statistically significant whereas in Waist hip ratio it was not statistically significant.

III THE PROFILE OF HYPERTENSIVE

Table 49. Distribution of study participants depending on history of hypertension

History of hypertension	Number	Percentage
Not hypertensive	1332	90.50
K/C/O hypertension	140	9.50
Total	**1472**	**100**

In the present study, known hypertensives were 140 (9.5%) as per the history given by study participants.

Table 50. Distribution of study participants according to years of diagnosis of hypertension (n=1472)

Years of diagnosis	Number	Percentage
Normotensives	1064	72.3
Newly diagnosed hypertensive at the time of study	268	18.2
0 – 1 year	30	2.0
1 – 2 years	36	2.5
2 – 3 years	30	2.0
3 – 4 years	12	0.8
> 4 years	32	2.2
Total	**1472**	**100**

In the present study, 72.3% (n=1064) were normotensive, 18.2% (n= 268) were diagnosed at the time of study and 9.5% were known cases of hypertension.

Table 51. Distribution of known case of hypertension according treatment behavior (n=140)

Treatment	Number	Percentage
Known case taking treatment	124	88.6
Known case not taking treatment	16	11.4
Total	**140**	**100**

Among known cases of hypertension, 88.6 % were taking treatment.

Table 52. Distribution of known cases of hypertension according to regularity of treatment (n=140).

Regularity of treatment	Number	Percentage
Not taking treatment	16	11.4
Regular	64	45.7
Irregular	60	42.9
Total	**140**	**100**

Among known cases of hypertension 11.4% (n=16) were not on treatment, 45.7% taking regular treatment and 42.9 were irregular in taking treatment.

Among all study participants (n=1472), 1080 (73.4%) never went to physician to get their blood pressure checked. 290 (19.7%) went once in a year, rest all (6.1%) went more frequently as they had hypertension or other chronic diseases.

Among hypertensives (n=408), those who were known case of hypertension (n=140), only 66 (47.1%) went once a month to physician to check their blood pressure and 74 (52.9%) had no fixed schedule.

Table 53. Urine examination findings for presence/ absence of albumin among hypertensives (n=408)

Albumin in urine	Number	Percentage
Absent	382	93.6
Present	26	6.40
Total	**408**	**100**

The present study showed that, 6.40% (26/408) of hypertensives showed presence of albumin in their urine examination**.**

Table 54.Duration of hypertension and presence of albumin in urine among hypertensives. (n=408)

Duration of hypertension in years	Albumin in urine absent		Albumin in urine present		Total	
	Number	percent	Number	percent	Number	Percent
Newly diagnosed	262	97.8	6	2.2	268	100
0 – 1	26	86.7	4	13.3	30	100
1 – 2	28	77.8	8	22.2	36	100
2 – 3	26	86.7	4	13.3	30	100
3 – 4	12	100	00	0.0	12	100
> 4	28	87.5	4	12.5	32	100
Total	**382**	**---**	**26**	**---**	**408**	**---**

2.2%(6 out of 268) of newly diagnosed hypertensive had albumin in their urine as compared to 14.3% (20 out of 140) among known cases.

Table 55. ECG findings among hypertensive study participants

ECG findings	Number	Percentage
Normal	260	63.70
IHD (Ischemic heart disease)	66	16.20
LBBB (Left bundle branch block)	6	1.50
RBBB (Right bundle branch block)	12	2.90
LVH (Left ventricular hypertrophy)	48	11.90
RVH Right ventricular hypertrophy)	--	--
LAD (Left atrial dilation)	8	2.00
RAD (Right atrial dilation)	--	--
IHD + LVH	4	0.90
Arrhythmia (AF, VF, etc)	4	0.90
Total	**408**	**100**

In this study, 36.3% (148 out of408) had abnormal ECG findings. 16.20% (66/408) showed ischemic heart disease changes, and 11.90% (48/408) showed left ventricular hypertrophy. 8 participants had LAD, 6 had LBBB, 12 had RBBB, 4 had arrhythmia and 4 had IHD with LVH.

Table 56. Distribution of hypertensive participants according to their ECG findings and duration of hypertension (n=408)

Duration of hypertension in years	Normal ECG		IHD		LVH		LAD		Other ECG finding		Total	
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Newly diagnosed	192	71.6	38	14.1	16	6.0	8	3.0	14	5.3	268	100
0 – 1	18	60.0	6	20.0	6	20.0	0	0	0	0	30	100
1 – 2	18	50.0	10	27.7	8	22.3	0	0	0	0	36	100
2 – 3	12	40.0	12	40.0	4	13.3	0	0	2	6.7	30	100
3 – 4	6	50.0	0	0	4	33.3	0	0	2	16.7	12	100
> 4	14	43.7	0	0	10	31.3	0	0	8	25.0	32	100
Total	**260**	**---**	**66**	**---**	**48**	**---**	**8**	**---**	**26**	**---**	**408**	**---**

28.4% (76 out of 268) of newly diagnosed hypertensives had abnormal ECG findings as compared to 51.4% (72 out of 140) in known cases. Among abnormal ECG findings 51.3% were belonged to newly diagnosed hypertensives (76/148).

Table 57. Fundus examination findings among hypertensive participants. (n=408)

Fundus examination	Number	Percentage
Normal	250	61.30
I grade	46	11.30
II grade	108	26.50
III grade	4	0.9
IV grade	--	--
Total	**408**	**100**

In the present study, 38.7% (158 out408) of hypertensive participants had hypertensive retinopathy. 11.30% (46/408) had grade I hypertensive changes, 26.50% (108/408) had grade II and 0.9% (4/408) had grade III hypertensive retinopathy finding.

Table 58.Distribution of hypertensive participants according to their fundal examination findings and duration of hypertension (n=408)

Duration of hypertension in years	Normal		Grade I		Grade II		Grade III		Total	
	No	%	No	%	No	%	No	%	No	%
Newly diagnosed	184	68.6	34	12.7	48	17.9	2	0.8	268	100
0 – 1	20	66.7	0	0.0	10	33.3	0	0	30	100
1 – 2	16	44.4	4	11.1	14	38.9	2	5.6	36	100
2 – 3	12	40.0	4	13.3	14	46.7	0	0.0	30	100
3 – 4	0	0.0	2	16.7	10	83.3	0	0	12	100
> 4	18	56.3	2	6.2	12	37.5	0	0.0	32	100
Total	**250**	---	**46**	---	**108**	---	**4**	---	**408**	---

27.6% (74 out of 268) of newly diagnosed hypertensives had hypertensive retinopathy changes as compared to 60.0% (84 out of 140) among known cases. Among abnormal fundal finding 53.1% were seen in newly diagnosed hypertensives (84 out of 158).

Chapter 6

Discussion

DISCUSSION

The present study was conducted in the sub centre, Agasaga under Primary Health Center (PHC), Handignur which is a rural field practice area of department of community medicine, Jawaharlal Nehru Medical College, Belgaum. The study was conducted during the period January 2010 to December 2010.

I. PROFILE OF STUDY PARTICIPANTS (Table 1 to 23)

In the present study, 53% were males with mean age 45.3±9.97 and 47% were females with mean age 45.1±9.61. Maximum number (11.8%) of male participants were in age group of 56 to 60 years and minimum (6.0%) in 51 to 55 years. Maximum number of female participants were (10.6%) below 35 years and minimum (6.7%) were in 46 to 50 years age group. Two studies conducted in rural area of north India showed that, female participants were more than male participants.[1,37] A study in West Bengal showed that, participants aged above 50 years were only 16.2%.[63]

In the present study, majority of study participants were farmers (50%) and housewives (28.7%), 47.9% were illiterates and 52.1% were educated, 87.2% were married and 9.0% were widow or widower. A turkey study showed that, more number of literates (76.0%) and similar portion of married (84.3%) participants.[6]

In the present study, majority of study participants belonged to nuclear (55.3%) and 41.5% to joint family. 52.20% were involved in moderate work,

30% in sedentary work and 17.80% in heavy work. Unlike this, a study conducted in Kolkata showed 93.0% belonged to joint family and these findings were similar with other studies. This study also showed more number of sedentary workers (55.3%) compared to our study, as ours is a rural study sedentary workers were less.[41]

In the present study, 77.3% were non-vegetarians, 35.70% consumed extra salt and 14.30% consumed extra fat. Extra salt consumption was 26.4% in study done at West Bengal and very less i.e 10.2% in a study done at Turkey.[63,6]

In the present study, 62.7% participants had habit of tobacco consumption or alcohol. 9.8% were smokers, among them 6.1% smoked for less than 15 years. 58.3% had habit of using smokeless tobacco and majority (51.8%) of them were consuming plane tobacco. 23.2% were alcoholics and 11.3% were consuming it from past 10 years. Similar findings were found for use of alcohol and tobacco, in studies done at Hariyana and north India.[58,1] In contrast to ours study, a study done at turkey showed more number of smokers (59.3%) and less alcoholics (12.1%).[6]

In the present study, 27.30% gave family history of hypertension, this was similar to West Bengal study (27.5%).In contrast, Kolkata based study showed only 13.8% participants had family history of hypertension.[63,41]

In the present study, prevalence of hypertension was 27.7%. 30.8% in males and 24.3% in females. Similar prevalence rate were found in studies conducted in Wardha (20.9%), Kolkata (25.6%) and Mumbai (29.7%).[30,41,80] In

contrast less prevalence was found in studies at North India (6.19%) and Jammu and Kashmir (12.3%).[1,37]

II. ASSOCIATION BETWEEN RISK FACTORS AND HYPERTENSION. (Table 24 to 48)

In the present study, the prevalence of hypertension increased with increasing age in both males and females. This difference was statistically significant. Similar findings were reported by other studies.[1,31,37,81,82,83]

In the present study, the prevalence of hypertension was 42.9% in graduates as compared to 30.1%, 25 %, 22.4% and 31.8% in illiterates, primary school educated, high school and college educated. This difference was statistically significant. Similar findings were reported in other studies with more prevalence among literates than illiterates.[82,84]

In the present study, the association between prevalence of hypertension among study participants who belonged to different socioeconomic status was marginally significant and no association between hypertension and type of family. A study done at Kolkata reported similar finding (p=0.679 for SES and p=0.409 for type of family).[41]

In our study hypertension was more among sedentary workers compared to moderate workers, similar findings were found in studies conducted in Kolkata and south India (X^2=21, p<0.01).[41,47]

In the present study the difference of prevalence in hypertension among study participants who consumed extra salt (59.8%), extra fat (61.1%) was

statistically significant as compared to those who did not. Similar findings in other studies conducted in Kolkata ($p < 0.001$ for extra salt and $p< 0.001$for extra fat) and central India (for extra salt CI=1.9 – 5.7, $p < 0.001$: for extra fat CI= 1.5 – 4.7, $p < 0.001$).[41,31] In our study prevalence of hypertension was more among tobacco users. The difference was statistically significant. Similar findings were found in other studies.[41,31]

In the present study prevalence of hypertension was 40.4% among those who consumed alcohol when compared to 23.9% among those who did not. This difference was statistically significant. A study done at Kolkata found high prevalence of hypertension among alcoholics i.e 60.7% as compared to non-alcoholics.[41] Similar finding was observed in a study done at Thailand.[81]

In the present study the difference in prevalence of hypertension among study participants consuming different forms of tobacco and alcohol was found associated with duration and regularity of the usage, this was statistically significant. Study conducted in Mozambique during 2005 found lower prevalence of hypertension (28.5%) in non-alcoholics compared to those who consumed more than one drink a week i.e., 40.5%.[43] A study done in rural Hariyana found difference in DBP (O.R. = 2.7, 95%, CI=1.4-4.9, p=0.0018) among smokeless tobacco users and no change in SBP (O.R. = 1.4, 95% CI=0.8-2.7, p=0.39), as compared to non users.[58]

In the present study, prevalence of hypertension was 51.7% among those who had a family history of hypertension when compared to 18.7% among those who did not. This difference was statistically significant. In Kolkata study,

prevalence of hypertension was 75.9% among those with family history of hypertension.[41] Similar finding was found in other study.[31]

In the present study, prevalence of hypertension was 13.7% among those who did exercise when compared to 40.5% among those who did not, and this difference was statistically significant. Prevalence of hypertension increased as BMI increased and it was statistically significant. Similar findings in Thailand, central India and Kolkata study.[81,31,41] Prevalence of hypertension was 31.6% among those who had WHR more than cut off when compared to 25.4% among those who had less. This difference was statistically significant in univariate analysis not in multivariate regression analysis. In contrast to ours study, a study in rural area of central India in 2004 showed that, there was significant difference in prevalence of SBP and DBP among participants with WHR more than cut off and less than cut off (CI= 3.5 – 11.6, $p < 0.01$; CI= 4.1 – 14.5, $p< 0.01$).[31]

In this study after performing univariate logistic regression analysis, factors associated with hypertension were sex, age, occupation, literacy status, socio economic status, sedentary and moderate type of work, body mass index, extra salt consumption, extra fat consumption, tobacco consumption, smoking, alcohol consumption, family history of hypertension and exercise. A study in West Bengal reported that, after performing univariate logistic regression analysis, hypertension was associated with risk factors like sedentary workers, BMI, smoking, and vegetarian diet.[63]

In our study after adjusting confounding variables multiple logistic regression analysis showed, risk factors associated with hypertension were age, occupation, education, socio economic status (class IV), type of work, body mass index, extra salt consumption, extra fat consumption, family history of hypertension and exercise. There was no association between habits, WHR and marital status and hypertension. The study conducted in rural area of north India during 1994 - 95 showed that, age, BMI and sedentary lifestyle were associated with hypertension both among males and females after logistic regression analysis.[1] A study done in West Bengal reported that, after adjusting for the effects of all other variables, age, body mass index and vegetarian diet were independent risk factors for hypertension.[63] Similar study done in Kerala showed that, after performing multiple logistic regression analysis, only smoking was statistically significant.[85] Study in Turkey during 2007 showed association for age, education level, marital status, health insurance, types of fats and family history of hypertension ($P \leq 0.01$ for each one).[6]

In the present study, mean values of pulse, systolic blood pressure, diastolic blood pressure, BMI, and Age were significantly higher in hypertensive than normotensive and it was found statistically significant whereas Waist hip ratio was not statistically significant.

III. THE PROFILE OF HYPERTENSIVES (Table 49 to 58)

In the present study 23.7% were hypertensives, among them 18.2% were diagnosed first time during survey and 9.5% were known hypertensives. Among known cases of hypertension, 11.4% were not on treatment, 45.7% were taking regular treatment and 42.9 were irregular in taking treatment.

A study conducted in rural area of north India during 1994 - 95 showed that, 95.7% were normotensives and 4.3% were hypertensives. Among hypertensives 73.3% were diagnosed at the time of survey, 15.8% of diagnosed persons discontinued the treatment, 3.5% were not on treatment, and 3.5% were on regular treatment with controlled BP and 3.5% were on regular treatment with uncontrolled BP.[1]

A study done in Kerala showed that, 51.8% were hypertensives. Among hypertensive 44.8% were aware of their hypertensive status and 55.2% were diagnosed during the survey. Among those who were aware 95.1% were on treatment and in them 26.6% had controlled hypertension. This was in contrast to our study. Better literacy status in Kerala could be the reason for this difference.[85] A study conducted in Parsi community in Bombay showed that, compliance to treatment was observed in 63.3% men and 64.0% women.[80] This could be because of higher literacy status among Parsis. A study conducted in Chennai southern India showed that, 32.8% were known case of hypertension and 67.2% were diagnosed during study. Among known cases, 70.8% were on treatment and 15.4% participants blood pressure was under control.[82]

In the present study, 6.40% of hypertensive participants had presence of albumin in their urine and among them 2.2% were newly diagnosed 4.2% were known hypertensives. Study conducted in Genova showed that, 7.52% of hypertensive subject had albumin in their urine.[86]

In the present study, 36.3% of hypertensive participants had abnormal ECG findings, of them 16.20% showed ischemic heart disease changes, 11.90% showed left ventricular hypertrophy, 2.0% had LAD, 1.5% had LBBB, 2.9% had RBBB, 0.9% had arrhythmia and 0.9% had IHD with LVH. 28.4% of newly diagnosed hypertensive had abnormal ECG findings as compared to 51.4% in known cases. A study conducted in Mangalore showed that, 11.0% LVH and 13.0% IHD changes in hypertensive patient above the age of 60 years and LVH was 5.0% and IHD was 6.0% in hypertensive patient below the age of 40 years.[87]

In the present study, 38.7% of hypertensive participants had hypertensive retinopathy changes and majority (26.50%) of them had grade II. 27.6% of newly diagnosed hypertensives had hypertensive retinopathy changes as compared to 60.0% in known cases. A study conducted in Mangalore among hypertensives showed that,19%, 20.0% and 1.5% had grade I, grade II and grade III hypertensive retinopathy changes in patient above the age of 60 years and it was 3.0%, 8.0% and 1.0% among those aged below 40 years.[87]

In the present study end organ damages were more commonly seen in newly diagnosed hypertensives as compared to known hypertensives because, may be they were hypertensive from long duration, but were diagnosed during the present survey.

Chapter 7

Conclusion

CONCLUSION

The present study was a community based cross sectional study undertaken to measure the prevalence of hypertension among rural adults aged between 30 to 60 years and also to determine the risk factors associated with hypertension among them.

Total 1472 participants were included in study. Prevalence of hypertension was 27.7%. 30.8% in males and 24.3% in females. Prevalence of hypertension showed increasing trend with increasing age. Prevalence of hypertension was found to be associated with sedentary service occupants (41.5%), graduates and postgraduates (42.9%), divorcee and separated (50.0%), consumption of extra salt (59.8%), consumption of extra fat (61.1%), tobacco consumption (36.6%), alcohol use (40.4%), family history of hypertension (51.7%), physical inactivity (40.5%) trunkal obesity (31.6%) and obesity (61.8%).

Among hypertensives majority were diagnosed during survey (61.8%). Majority of known hypertensives were taking treatment (88.6%), among them only half were taking regular treatment (51.6%).

Among hypertensives one third had cardiac (36.3%) complications and majority of them were newly diagnosed (51.4%) hypertensives. Two fifth had hypertensive retinopathy changes (38.7%), among them majority were newly diagnosed (53.2%) hypertensives. Very few had proteinuria (6.4%) and among them one forth were newly diagnosed (23.0%).

Chapter 8

Limitations

LIMITATIONS

The limitations of the study were:

1. Participants were excluded from the study, who were not residing in the study area but whose names were included in the voter list.

2. The exact quantity of salt consumption could not be assessed.

3. Invisible fat intake was not considered.

4. Other indicators of nephropathy like blood urea and serum creatinine were not estimated.

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Chapter 9

Recommendations

RECOMMENDATIONS

Based on the findings of present study, following recommendations are being suggested for prevention, early detection, treatment and control of complications of hypertension:

1. Health education about modifiable risk factors like
    - ❖ Maintaining ideal body weight by regular exercise
    - ❖ Reducing intake of extra salt and extra fat
    - ❖ Decreasing or stopping the use of tobacco and alcohol
2. Screening for detection of hypertension – Mass screening and high risk screening.
3. Regular treatment and follow-up of patients with hypertension to prevent end organ damage.
4. Self care amongst hypertensives.

Chapter 10

Summary

SUMMARY

The present study was a community based cross sectional study undertaken to measure the prevalence of hypertension among rural adults aged between 30 to 60 years and also to determine the risk factors associated with hypertension among them.

The study included 1472 participants aged between 30 to 60 years in subcentre Agasaga under PHC, Handignur which is a field practice area of department of community medicine, J N Medical College, Belgaum using pre-designed and pre-tested questionnaire. The duration of study was one year from 1st January 2010 to 31st December 2010.

The socio-demographic characteristics of study participants showed that, majority were below 35 years (22.3%) and between 56 to 60 years (20.5%) of age group. Mean age of male participants was 45.3 ± 9.97 and 45.1 ± 9.61 in females.

Half of the participants were farmers (50.0%), four fifth were illiterates (47.9%) or did primary schooling (30.5%), majority belonged to nuclear family (55.3%) followed by joint family (41.5%). Majority of study participants belonged to class III (33.7%) followed by class IV (31.1%) SES, most of them were married (87.20%) and more than half were doing moderate work (52.20%).

Three fourth of study participants consumed mixed diet (77.3%), one third consumed extra salt (35.70%) and 14.30% consumed extra fat. Majority of study participants had one or other habit of tobacco or alcohol consumption (62.7%), one tenth were smokers (9.8%); three fifth used smokeless tobacco

(57.4%) and one fourth were alcoholics (23.2%). One fourth participants had family history of hypertension (27.3%), among them three fourth participant's mother were hypertensive.

One among four participants was found hypertensive (27.7%). Three men among ten (30.8%) and about two women among ten (24.3%) were hypertensive.

As the age advanced the prevalence of hypertension increased both in males and females (12.2% in less than 35 years to 43.0% in 56 to 60 years age group). Half of the participants in sedentary service were hypertensive (41.5%) as compared to one fourth in farmers (26.9%). Half of graduates and postgraduates (42.9%) were hypertensive as one fourth among those who had primary education (25.0%). Half of divorced or separated (50.0%) were found hypertensive compared to one fourth in married (26.8%). Majority of participants performing sedentary work (38.5%) were hypertensive followed by moderate work (25.8%). There was marginal association between SES and hypertension. Hypertension has no association among participants belonged to different type of families.

Prevalence of hypertension was found more in participants who consumed extra salt (59.8%), extra fat (61.1%) and had a habit of either tobacco or alcohol consumption (36.1%) as compared to those who did not. This difference was statistically significant.

Prevalence of hypertension was significantly more among those who had habit of smoking (47.2%), consuming smokeless tobacco (36.7%), and alcohol (40.4%). As the duration of consumption of these habits (either tobacco or

alcohol) increased, there was significant increase in the prevalence of hypertension.

Prevalence of hypertension was significantly more among those who had a family history of hypertension (51.7%) when compared to those who did not (18.7%). Prevalence of hypertension was more in physically inactive (40.5%) when compared to active participants (13.7%). Prevalence of hypertension was more in obese (61.8%) as compared to normal weight (21.4%) participants. As the body mass index of study participants increased, the prevalence of hypertension also increased (21.4% in normal weight, 41.6% in pre-obese as compared to 61.8 in high risk obese). Prevalence of hypertension was more (31.6%) among those who had WHR more than cut off point when compared to among those who had less than cut off point (25.4%).

Univariate analysis showed, risk factors associated with hypertension were sex, age, occupation, education, type of work (sedentary and moderate worker),SES (class IV), body mass index, extra salt consumption, extra fat consumption, use of tobacco and alcohol, family history of hypertension and exercise. Labourer, primary educated, SES (class I, class II, Class III), marital status were not associated with hypertension.

After adjusting confounding variables, risk factors associated with hypertension were age, occupation (labourer), education (graduates), type of work (sedentary and moderate worker), SES (class IV), body mass index, extra salt consumption, extra fat consumption, family history of hypertension and

exercise. Association between habits, WHR and marital status was not statistically significant.

Out of 408 hypertensives identified in the study more than two third were diagnosed at the time of study (65.7%). Among known cases of hypertension (n=140) more than four fifth (88.6%) were on treatment. Those who were on treatment (n=124) half of them were taking regular treatment (51.6%) and rest were irregular (48.4%).

Our study, cardiac involvement was 36.3% among hypertensives, one third had retinal involvement (38.7%) and very few had presence of albumin in the urine (6.4%). One fourth of newly diagnosed hypertensives showed presence of albumin in their urine. Among those who had cardiac involvement majority had IHD (44.6%; 66 out of 148) and LVH (11.90%; 48 out of 148). More than half of participants having cardiac complications were newly diagnosed (51.4%; 76 out of 148).Two fifth of hypertensives had hypertensive retinopathy changes (38.7%: 158 out of 408) among them majority had grade II (26.50%) changes followed by grade I (11.3%). More than half of the participants having retinopathy changes were newly diagnosed (53.2%: 84 out of 158).

Chapter 11

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Annexures

Annexure I

ANNEXURE I – ETHICAL CLEARANCE CERTIFICATE

K.L.E SOCIETY'S
JAWAHARLAL NEHRU MEDICAL COLLEGE,
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Ref. No. :MDC/DOME/ Date: 14/10/2009

To,

Dr. Umesh S. Charantimath,
Postgraduate student in
Department of Community Medicine,
J.N.Medical College,
Belgaum.

Dear Dr. Umesh S. Charantimath,

The JNMC - Institutional Ethics Committee on Human Subjects Research met on 12th October, 2009 to consider your application for approval of the research project "A CROSS SECTIONAL STUDY TO KNOW THE PREVELENCE OF HYPERTENSION AMONG RURAL ADULTS.".

After review of the documents submitted by you and satisfactory explanations provided to the members, the committee has provided approval date through October 11th, 2010 at which time the study will be reviewed by the committee.

If you have any questions concerning the above, please feel free to contact the committee office.

Sincerely,

(Dr.V.D.Patil)
Chairman,
JNMC Institutional Ethics Committee on
Human Subjects Research

Annexures

Annexure II

ANNEXURE II – CONSENT FORM

K.L.E. UNIVERSITY, BELGAUM, INFORMED CONSENT FORM

"A CROSS SECTIONAL STUDY TO KNOW THE PREVALENCE OF HYPERTENSION AMONG RURAL ADULTS".

Investigator: Dr. Umesh S Charantimath

Guide: Dr. (Mrs.) Padmaja R Walvekar

INTRODUCTION

You are being invited to participate in this study to find out the prevalence of hypertension among rural adults, and also to know the risk factors associated with it.

EXPLANATION OF PROCEDURE

In this study you will have to answer a few prepared questions about your general health information and socio-demographic details. Few questions on habits like smoking, alcohol consumption and questions on routine activities of daily living are asked. Then physical examination will be done and if, the participant is found hypertensive then some investigation will be done. The entire procedure may take 30 minutes.

Participation in this study is completely voluntary, and you are free to withdraw your consent at any point of time.

POSSIBLE BENEFITS

The investigator does not promise or guarantee that you will receive direct benefits for being in the study. It will benefit the whole community because; by this study we will come to know the prevalence of hypertension and risk factors associated with it. This study will surely help in future for the reducing the

prevalence of hypertension by undertaking some intervention to reduce risk factors.

POSSIBLE RISKS

The tools employed for conducting the tests are safe, and such are not likely to cause any harm to the person.

CONFIDENTIALITY

Your identity will not be revealed. All information collected will be compiled and analyzed, so that no one will know your identity.

WITHDRAWAL

Participation in this study is voluntary. If you don't wish to participate in this study; you will not lose benefits to which you are enrolled. . You can withdraw from study at any point of time.

COST OF PARTICIPATION

The cost of the study will be borne by the researcher. There will be no additional cost to you for participating in this study.

PAYMENT OF INCENTIVES

There will be no incentives paid to you for participating in this study.

QUESTIONS

If you have any questions about this study, you should contact Dr (Mrs.) Padmaja. R. Walvekar or Dr Umesh. S. Charantimath mobile number 9663712777. If you have any questions about your rights as study participant, you may contact Dr. V. D. Patil, chairman, JNMC Institutional Ethical Committee on human subject research, at his office or contact him at (0831)2741701.

AUTHORIZATION TO PUBLISH RESULTS

The researcher may use the information gathered from this study for presentation in science journals. However your identity will not be disclosed in such presentation or publication.

LEGAL RIGHTS

By signing this consent form, you are not waiving off any of your legal rights.

CONSENT STATEMENT

"I volunteer and consent to participate in this study. I have read the consent or it has been read to me. The study has been fully explained to me and I was given the opportunity to ask questions and they have been answered to my satisfaction, and that I have received a copy of this signed consent form."

1. Signature or Left hand thumb impression _____

(Volunteer subject) and Name_____

2. Signature of person (obtaining consent) _____

And name _____

3. Signature of witness _____

And name _____

Date: _____ Place: _____

Annexures

Annexure III

ANNEXURE III – PROFORMA

K.L.E. UNIVERSITY'S J.N.MEDICAL COLLEGE, BELGAUM.

DEPARTMENT OF COMMUNITY MEDICINE.

RESEARCH QUESTIONNAIRE

Investigator: Dr. Umesh S Charantimath

Guide: Dr. (Mrs). Padmaja R Walvekar

"A CROSS SECTIONAL STUDY TO KNOW THE PREVALENCE OF HYPERTENSION AMONG RURAL ADULTS".

[Note: All the personal information provided during this study will be kept confidential. Only aggregated data will be published.]

I SOCIODEMOGRAPHIC DATA:

1) NAME: _____

2) AGE: _____ 3) SEX: male/ female

4) OCCUPATION: _____

5) RELIGION: Hindu/Muslim/Christian/Sikh/Others

6) ADDRESS AND CONTACT NUMBER:_____

7) EDUCATION: Illiterate/Primary/High-school/Pre-university/Graduate

8) TYPE OF FAMILY: Nuclear/Joint/3 Generation/Others _____

9) TOTAL INCOME OF THE FAMILY: _____

PER CAPITA INCOME: _____

SOCIO-ECONOMIC STATUS: CLASS I/ II/ III/ IV/ V

10) MARRITAL STATUS: Unmarried/ Married/ Divorcee/ Widow/ Widower/ Separated

11) TYPE OF THE WORK: Sedentary/ Moderate/ Heavy

II DATA REGARDING RISK FACTORS:

1) NUTRITION/ DIET HISTORY:

A) TYPE OF FOOD: Vegetarian/ Non vegetarian

B) USE OF EXTRA SALT: Yes/No

If yes in which form:

Extra salt in plate/ Pickle/ Papad

C) USE OF EXTRA OIL:

If yes in which form

Oil in the food/ Ghee Butter/ Vanaspati

D) OTHER EATING HABITS:

WHICH OIL IS USED FOR COOKING:

Groundnut/ Coconut/ Sunflower/ Palm/ Other, Specify _____

EATING BETWEEN THE MEALS:

Yes/ No:_____

DRINKING SOFT DRINKS:

Yes/ No: _____

2) HABITS:

A) TOBACCO: Yes/ No

i) IF YES IN WHICH FORM: Smoking/ Smokeless

_____

ii) IF SMOKING:

a) IN WHICH FORM:

Cigarette/ Beedi/ Hukka/ Pipe/ Others, Specify _____

b) SINCE WHEN: Years/ Months/ Days _____

c) REGULARITY: Daily/ Once a week/ Once in fortnight/ Occasional

d) QUANTITY: <½ pack/ ½ pack / > ½ pack

iii) IF SOKELESS:

a) IN WHICH FORM:

Gutakha/ Plane tobacco/ Snuff/ Others, Specify _____

b) SINCE WHEN: Years/ Months/ Days _____

c) REGULARITY: Daily/ Once a week/ Once in fortnight/ Occasional

d) QUANTITY: 1/ 2-5/ 6-10/ >10

B) ALCOHOL: Yes/ No _____

If Yes:

i) IN WHICH FORM: Beer/ Whiskey/ Rum/ Vodka/ Champagne/ Others, Specify_____

ii) SINCE WHEN: Years/ Months/ Days _____

iii) REGULARITY: Daily/ Once a week/ Once in fortnight/ Occasional

iv) QUANTITY:

<650 ml/ >650 ml in case of beer

<60 ml/ >60 ml in case of hot drinks

3) ANY FAMILY MEMBERS IS HAVING HYPERTENSION: No/ Yes/

IF YES;

WHO IS SUFFERING: Father/ Mother/ Sister/ Grand parents/ 1ST Degree relatives/ Others

4) DO YOU EXERCISE: No/ Yes

IF YES;

i) TYPE OF EXERCISE: Walking/ Jogging/ Swimming/ Cycling/ Others, specify_____

ii) REGULARITY: Daily/ Once in a week/ Once in a fortnight/ Occasionally

iii) HOW LONG DO YOU EXERCISE: <30 min/ >30 min

iv) DO YOU PRACTICE YOGA OR MEDITATION: Yes/ No

If yes; since when you are practicing _____

5) ARE YOU HYPERTENSIVE? Yes/ No

IF YES;

i) WHEN IT WAS DIAGNOSED: _____

ii) ARE YOU TAKING TREATMENT: Yes/ No

If yes: Regular/ Irregular

iii) HOW OFTEN YOU VISIT DOCTOR FOR CHECKING BLOOD PRESSURE:

- Once a week/ Once a month/ Once a year/ No fixed schedule
- Regular/ Irregular

III GENERAL PHYSICAL EXAMINATION:

1) Height: _____ cms

2) Weight: _____ kg

3) Body mass index: _____kg/ (cms)2

4) Hip circumference: _____cms

5) Waist circumference: _____ cms

6) Waist hip ratio: _____

Pallor: yes/no_____

Icterus: yes/no_____

Clubbing: yes/no_____

Edema: yes/no_____

Enlarged lymph nodes: yes/no_____

Pulse : _____/minute

Blood pressure: (1^{st} reading) _____ mm.hg

(2^{nd} reading) _____ _mm.hg

(Average reading) _____mm.hg

IV. SYSTEMIC EXAMINATION

1) CARDIOVASCULAR SYSTEM:

2) RESPIRATORY SYSTEM:

3) PER-ABDOMEN:

4) CENTRAL NERVOUS SYSTEM:

V. INVESTGATION REPORT:

1) URINE- ALBUMIN: Present/ Absent_____

SUGAR: Present/ Absent_____

2) ECG Finding: _____

_____

3) FUNDUS REPORT: _____