A SOCIO-EPIDEMIOLOGICAL STUDY OF HYPERTENSION AND ITS ASSOCIATED RISK FACTORS AMONG ADULTS (20-60YEARS) IN RURAL FIELD PRACTICE AREA OF SHRI B.M.PATIL MEDICAL COLLEGE HOSPITAL & RESEARCH CENTRE, VIJAYAPUR, KARNATAKA.

By

Dr.KRITI BHAT K.

Dissertation submitted to

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In partial fulfillment of the requirements for the degree of

DOCTOR OF MEDICINE

In

COMMUNITY MEDICINE

Under the guidance of

Dr. M. C. YADAVANNAVARM.D

PROFESSOR

DEPARTMENT OF COMMUNITY MEDICINE

B.L.D.E.U.'S SHRI B.M.PATIL MEDICAL COLLEGE

HOSPITAL & RESEARCH CENTRE, VIJAYAPUR

KARNATAKA

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Date:
Place: Vijayapur

Dr. KRITI BHAT K.
Post Graduate Student,
Department of Community Medicine,
B.L.D.E.U.'s Shri B.
M.PatilMedicalCollege,Hospital
&Research Centre, Vijayapur

B.L.D.E.UNIVERSITY'S

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Date:

Place: Vijayapur

Dr. M. C. YADAVANNAVAR$_{\textbf{M.D.}}$

Professor
Department of Community Medicine,
B.L.D.E.U.'s Shri B.
M.PatilMedicalCollege, Hospital &
Research Centre, Vijayapur

B.L.D.E.UNIVERSITY'S
SHRIB.M.PATILMEDICALCOLLEGE, HOSPITAL& RESEARCH CENTRE, VIJAYAPUR

ENDORSEMENT BY THE HEAD OF DEPARTMENT

This to certify that the dissertation entitled "**A SOCIO-EPIDEMIOLOGICAL STUDY OF HYPERTENSION AND ITS ASSOCIATED RISK FACTORS AMONG ADULTS (20-60YEARS) IN RURAL FIELD PRACTICE AREA OF SHRI B.M.PATIL MEDICAL COLLEGE HOSPITAL& RESEARCH CENTRE, VIJAYAPUR, KARNATAKA**" is a bonafide research work done by **Dr. KRITI BHAT K.,** under the guidance of **Dr. M. C. YADAVANNAVAR**$_{M.D}$ Professor, Department of Community Medicine at B.L.D.E.U.'s Shri. B M Patil Medical College Hospital and Research Centre, Vijayapur.

Date:

Place: VIJAYAPUR

Dr. SHAILAJA.S.PATIL$_{\mathbf{M.D.}}$

Professor and Head
Department of Community Medicine,
B.L.D.E.U.'s Shri B.
M.PatilMedicalCollege, Hospital &
Research Centre, Vijayapur

B.L.D.E.UNIVERSITY'S
SHRI B. M. PATIL MEDICAL COLLEGE, HOSPITAL & RESEARCH CENTRE, VIJAYAPUR

ENDORSEMENT BY THE PRINCIPAL

This to certify that the dissertation entitled"**A SOCIO-EPIDEMIOLOGICAL STUDY OF HYPERTENSION AND ITS ASSOCIATED RISK FACTORS AMONG ADULTS (20-60YEARS) IN RURAL FIELD PRACTICE AREA OF SHRI B.M.PATIL MEDICAL COLLEGE HOSPITAL& RESEARCH CENTRE, VIJAYAPUR, KARNATAKA**" is a bonafide research work done by **Dr.KRITI BHAT K.,** under the guidance of **Dr. M. C. YADAVANNAVAR**$_{M.D.}$Professor, Department of Community Medicine at B.L.D.E.U.'s Shri.B. M. Patil Medical College Hospital and Research Centre, Vijayapur.

Date:

Place: Vijayapur.

DR. S.P.Guggarigoudar$_{M.S.}$

Principal,
B.L.D.E.U.'s
ShriB.M.PatilMedicalCollege,
Hospital& Research Centre,
Vijayapur.

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Date:

Place: Vijayapur

Dr. KRITI BHAT K.

Post Graduate Student,
Department of Community Medicine,
B.L.D.E.U.'s Shri B.
M.PatilMedicalCollege, Hospital &
Research Centre, Vijayapur

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Date: **Dr. KRITI BHAT K.**

Place: Vijayapur

LIST OF ABBREVIATIONS USED

WHO	:	World Health Organization
HTN	:	Hypertension
JNC	:	Joint National Committee
ESH	:	European Society of Hypertension
SBP	:	Systolic Blood Pressure
DBP	:	Diastolic Blood Pressure
SES	:	Socioeconomic status
BMI	:	Body Mass Index
PR	:	Pulse Rate
F/H/O	:	Family history of
NCDs	:	Non-communicable Diseases
SPSS	:	Statistical Package for social sciences
H/O	:	History of
SD	:	Standard Deviation
ANOVA	:	Analysis of variance
NPCDCS	:	National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke

ABSTRACT:

Introduction: Hypertension is an emerging public health problem due to its high prevalence and association with cardiovascular and overall morbidity and mortality.According to World Health Organization (WHO), by the year 2020 cardiovascular disease will be the leading cause of death and disability worldwide.

India is slowly and steadily acquiring the status of the global chronic disease capital. The rise is attributed to stress, high blood pressure, dyslipidemia, steep rise in blood sugars, cholesterol, obesity, physical inactivity, poor diet and smoking. Half of the cardiovascular disease related deaths in India occur below 50 years of age. About 25% of the acute myocardial infarction in India occurs below 40 years of age.

A rise in the prevalence of non-communicable disease risk factors in rural areas has important public health implications, since, two-thirds of India's one billion population still lives in rural areas.Several surveys have examined the prevalence of risk factors for non-communicable disease in urban India, but recent data from rural India is inadequate.Vijayapur is one of the district headquarters in northern Karnataka which is undergoing rapid socioeconomic transition & lifestyle modifications. Data regarding NCDs is very sparse in this area. Hence, the present study intended to find out the prevalence & associated risk factors of hypertension among adults in rural parts of Vijayapur.

Objectives:

1. To study the prevalence of hypertension among adults (20-60 years of age).
2. To study the socio-demographic, economic and other factors influencing hypertension among adults (20-60 years of age).

Material and methods: After obtaining ethical clearance from the Institutional Ethical Committee, the study was carried out in the rural field practice area of Shri B. M. Patil Medical College Hospital & Research Centre, Vijayapur. Participants were selected by systematic random sampling with house as the sampling unit. Informed consent was obtained after informing all the participants about the nature and purpose of the study. Participants were then interviewed using a predesigned, pretested questionnaire and examined. Height was measured by using a measuring tape. Weight was recorded using a standardized weighing machine. Body mass index was then calculated. Participants were seated quietly for at least 5 mins on a chair, with feet on the floor, and arm supported at heart level. Two readings of blood pressure (BP) were taken 5 minutes apart using mercury sphygmomanometer on right arm in the sitting posture.All the instruments used for the study were calibrated before using them each time.

Results: The overall prevalence of hypertension among the subjects was 4.6%. It was highest among females (6.9%), 41-50 years of age (65%), illiterates (51.6%), lower middle class (64.5%), stress due to aging (80.6%) and health status (41.9%), tobacco users (6.5%) and alcoholics (6.7%) and this was statistically significant ($p<0.05$). Also, a positive association was found between body mass index (BMI) and hypertension ($p<0.05$).

Conclusion: Hypertension is more prevalent among adults in their fourth decade of life in rural India. This has been found to be influenced by some of the modifiable and non-modifiable risk factors due to lifestyle changes. Therefore, it is necessary to create awareness about hypertension and its complications rather than just avoiding the risk factors.

Keywords: hypertension, rural, prevalence, risk factors

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INTRODUCTION:

"The heart speaks from the vessels of every limb"

Ebers Papyrus

Hypertension or raised blood pressure is an emerging public health problem due to its high prevalence and association with cardiovascular and overall morbidity and mortality.Defining hypertension is difficult, and by necessity, arbitrary. Sir George Pickering first formulated the concept that blood pressure in a population is distributed continuously as a bell-shaped curve with no real separation between 'normotension' and 'hypertension'. As a consequence, the dividing line between normotension and hypertension can be defined only in an operational way. Evans and Rose defined it as that level of blood pressure at which detection and treatment can do more good than harm.[1,2]

Based on diastolic and/or systolic blood pressure; high diastolic blood pressure has commonly been used to measure blood pressure. But there is evidence showing that cardiovascular risk is strongly associated with both systolic and diastolic blood pressures. The current definition of hypertension is therefore a level of systolic blood pressure of 140 mmHg or above, or a level of diastolic blood pressure of 90 mmHg or above.[1,3] This is followed by Joint National Committee and European Society of Hypertension as well.[3,4]According to Seventh Joint National Committee on Detection, evaluation and treatment of hypertension (JNC VII, 2004) criteria, hypertension is classified as follows[3];

Sl. No.	Category	SBP in mmHg	DBP in mmHg
1.	Normal blood pressure	<120	<80
2.	Pre-hypertension	121-139	80-89
3.	Stage 1 hypertension	140-159	90-99
4.	Stage 2 hypertension	>160	>100

According to World Health Organization, by the year 2020, cardiovascular disease will be the leading cause of death and disability worldwide.[5] In the INTERHEART and INTERSTROKE study, hypertension accounts for 17.9% and 34.6% population attributable risk for coronary artery diseases and stroke respectively.[6]A direct relation exists between cardiovascular risk and blood pressure: the higher the blood pressure, the higher the risk of both stroke and coronary events. Therefore, the dividing line between normal and high blood pressure is defined only in an operational way.[2]

Hypertension is an "iceberg" disease. Patients seeking medical attention owing to symptomatic disease may represent the "tip of the ice-berg" when considering manifest and subclinical disease together.[7]This became evident in the early 1970s. Only about half of the hypertensive subjects in the general population of most developed countries were aware of the condition, only about half of those aware of the problem were being treated, and only about half of those treated were considered adequately treated.Among the income group of countries, the prevalence of elevated blood pressure was consistently high for low, lower-middle and upper-middle income countries. All of them have a

prevalence of around 40% for both sexes. The prevalence is 35% for both sexes in high income countries which is lower.[2]Hypertension is thus emerging as a major public health problem in developed as well as developing countries.

India is slowly and steadily acquiring the status of the global chronic disease capital. It is undergoing an epidemiologic, socioeconomic and nutritional transition and is on the threshold of an epidemic of cardiovascular diseases. The rise is attributed to stress, high blood pressure, dyslipidemia, steep rise in blood sugars, cholesterol, obesity, physical inactivity, poor diet and smoking.[5] These factors are interrelated to such an extent that the occurrence of one factor leads to another factor, thereby leading to the development of non-communicable diseases.[8]Though the extent of organ damage is often correlated with the level of blood pressure, it is not the case at most times. Also, the rate of progression of organ damage varies from one individual to another depending on many influences, most of which are partly understood.[6]Half of the cardiovascular disease related deaths in India occur below 50 years of age. About 25% of the acute myocardial infarction in India occurs below 40 years of age.Hypertension has been found to be a major risk factor not only for cerebrovascular morbidity and mortality, but also for cognitive impairment and dementia.[8] A high prevalence has been reported in both rural and urban areas of India in some recent studies.[9,10] High blood pressure is one of the most preventable causes of premature death worldwide.

The World Health Day theme for the year 2013 was hypertension which is ‘a silent killer being the cause of global public health crisis’. The slogan for the campaign was “healthy heart beat, healthy blood pressure”. This highlighted an important priority area of public health concern all over the world.

A rise in the prevalence of non-communicable disease risk factors in rural areas has important public health implications, since, two-thirds of India's one billion population still lives in rural areas.[8]Lifestyle interventionssuch as reducing dietary salt intake and increasing the consumption of fruit and vegetables will be of great benefit when applied to a population. Blood pressure-lowering trials have demonstrated immense benefits in preventing stroke, heart failure and coronary heart disease. Also, there is no difference in outcome between the different methods used to lower blood pressure and the benefit is proportional to the degree of blood pressure-lowering.[11]

Studies on the prevalence of the risk factors in adults are warranted to study the trend and to formulate guidelines for periodicity of monitoring and management.[5]Several surveys have examined the prevalence of risk factors for non-communicable disease in urban India, but recent data from rural India is inadequate.Vijayapur is one of the district headquarters in northern Karnataka which is undergoing rapid socioeconomic transition & lifestyle modifications. Data regarding NCDs is very sparse in this area. Hence, the present study intends to find out the prevalence & associated risk factors of hypertension among adults in rural parts of Vijayapur.

OBJECTIVES:

1. To study the prevalence of hypertension among adults (20-60 years of age).
2. To study the socio-demographic, economic and other factors influencing hypertension among adults (20-60 years of age).

REVIEW OF LITERATURE:

History of hypertension:

Ebers Papyrus, an Egyptian compilation of all medical texts dating back to 1550 B.C., has writings on high blood pressure. This is one of the oldest known medical works. The father of Medicine, Hippocrates, and the greatest physician of Ancient Greek Medicine, Galen, mentioned high blood pressure in their teachings. The aetiopathogenesis of vascular diseases relates back to the ancient medical text SushrutaSamhita. In 1827, a British Clinician Richard Bright, brought to our attention the existence of hypertension in man which was linked to disease. Then in 1854, Karl von Vierordt created a device called a 'sphygmograph' for indirect measurement of blood pressure. He also constructed a 'hemotachometer' which is an apparatus used to monitor the velocity of blood flow. Following this, Samuel Siegfried Von Basch developed the first non-invasive sphygmomanometer in 1881. In 1896, the first clinically acceptable sphygmomanometer was introduced by Scipione Riva Rocci.[12]

In 1905, Nicolai Korotkoff, a Russian surgeon, discovered auscultatory sounds in relation to systolic and diastolic blood pressure called Korotkoff sounds while taking blood pressure using a non-invasive procedure. Also, in 1911, Eberhard Frank coined the term 'essential hypertension' so as to describe elevated blood pressure for which no cause could be found. In 1928, physicians from Mayo clinic coined the term 'malignant hypertension' while describing a syndrome of very high blood pressure, severe retinopathy and inadequate renal function. These usually resulted in death within a year as a result of stroke, cardiac failure or renal failure. Franklin D. Roosevelt was a prominent individual with severe hypertension.[13]The changing concepts of hypertension

have led the scientists to advocate programmes to control hypertension at the community level.

PREVALENCE OF HYPERTENSION: WORLD

Hypertension prevalence estimates rely on the cut-off point by which it is defined. The literature available around the world needs to be handled with utmost caution as standardization may not have been exercised with regard to definition of hypertension, measurement methods used, observers, and age structures of populations. The lower the threshold value, the higher the prevalence estimates would be.[14]

According to WHO, the prevalence of raised blood pressure was highest in Africa, where it was 46% for both sexes combined and was lowest in the WHO Region of the Americas at 35% for both sexes.Across the income groups of countries, the prevalence of raised blood pressure was consistently high with low, lower middle and upper middle countries all having rates of around 40%. The prevalence in high income countries was lower, at 35%.[15]

The British Hypertension Society (2004) classified hypertension as[16],

Sl.No.	Category	SBP (in mm Hg)	DBP (in mm Hg)
1	Optimal	<120	<80
2	Normal	<130	<85
3	High normal	130-139	85-89
4	Mild hypertension (Grade 1)	140-159	90-99
5	Moderate hypertension (Grade 2)	160-179	100-109
6.	Severe hypertension (Grade 3)	≥ 180	≥ 110
7.	Isolated systolic hypertension Grade 1	140-159	< 90
8.	Isolated systolic hypertension Grade 2	≥ 160	< 90

Also, the American Heart Association Council on High Blood Pressure Research Recommendations (2004) for blood pressure measurement in humans and experimental animals have classified hypertension as[17];

Sl. No.	Category	SBP (mm Hg)	DBP (mm Hg)
1.	Normal	119 or lower	79 or lower
2.	Prehypertension	120 to 139	80 to 89
3.	Stage 1 hypertension	140 to 159	90 to 99
4.	Stage 2 hypertension	160 or higher	100 or higher

Sun Z et al (2007) conducted a study among rural adults in Liaoning Province of China. They found that the prevalence of prehypertension was 44.1% and that of hypertension was 37.8%. Also, among the hypertensive patients, only 23.6% patients were taking antihypertensive medication and 1.1% patients achieved blood pressure control.[18]

Williams B et al (2010) classified hypertension based on etiology[16];

- ✓ Primary (Essential) hypertension
  - Sympathetic nervous system hyperactivity
  - Abnormal cardiovascular development
  - Renin-angiotensin system activity
  - Defect in natriuresis
  - Intracellular sodium and calcium
  - Exacerbating factors
- ✓ Secondary hypertension
  - Renal disease
  - Genetic causes
  - Renal vascular hypertension
  - Primary hyperaldosteronism
  - Cushing's Syndrome
  - Pheochromocytoma
  - Coarctation of aorta
  - Pregnancy induced hypertension
  - Estrogen use
  - Others

Schmeider RE et al (2010) classified hypertension based on end organ damage as[19];

Vasculopathy ▪ Endothelial dysfunction ▪ Remodeling ▪ Generalized atherosclerosis ▪ Arteriosclerotic stenosis ▪ Aortic aneurysm	**Cerebrovascular damage** ▪ Acute hypertensive encephalopathy ▪ Stroke ▪ Intracerebral hemorrhage ▪ Lacunar infarction ▪ Vascular dementia ▪ Retinopathy
Heart disease ▪ Left ventricular hypertrophy ▪ Atrial fibrillation ▪ Coronary microangiopathy ▪ CHD, Myocardial infarction ▪ Heart failure	**Nephropathy** ▪ Albuminuria ▪ Proteinuria ▪ Chronic renal insufficiency ▪ Renal failure

In a study conducted by Chataut J et al (2011) among adults living in Central Development Region of Nepal, the prevalence of hypertension was found to be 22.4%.[20]

Rahim MA et al (2012) conducted a study in rural population of Bangladesh. The overall prevalence rate of hypertension was found to be 30.64%.[21]

In a study conducted by Alikor CA et al (2013) in a rural community in Rivers State, Nigeria it was observed that the prevalence of hypertension was 20.2%. The mean

systolic blood pressure was 120.46±21.59 mmHg and the mean diastolic blood pressure was 73.86±12.63 mmHg.[22]

European Society of Hypertension and European Society of Cardiology (2013) classified hypertension as[4];

Sl. No.	**Category**	**Systolic (in mm Hg)**	**Diastolic (in mm Hg)**
1	Optimal	<120	<80
2	Normal	120-129	80-84
3	High normal	130-139	85-89
4	Grade 1 hypertension	140-159	90-99
5	Grade 2 hypertension	160-179	100-109
6	Grade 3 hypertension	≥ 180	≥ 110
7	Isolated systolic hypertension	≥ 140	<90

Ahmed A et al (2014) conducted a study in some selected rural areas of Bangladesh it was found that the prevalence of systolic hypertension among respondents is 15.6% and that of diastolic pressure was 12.3%.[23]

A similar study was conducted (2015) in a rural area of Chandpur District of Bangladesh where they found that 65.1% of the subjects were suffering from hypertension and 61.6% respondents' blood pressure was within normal limits.[24]

In a study conducted by Ratovoson R et al (2015) in rural and urban areas of Madagascar the prevalence of hypertension in rural population was found to be 27% and that in urban population was 29.7%. Amongst the hypertensive subjects, 1.7% and 5.3% were found to be on antihypertensive treatment for at least 1 month before the survey in rural and urban population respectively.[25]

Tagurum YO et al (2015) conducted a study in a rural community in Plateau State, Nigeria. It was found that the prevalence of hypertension, diabetes mellitus and obesity was found to be 40.2%, 9.7% and 27.2% respectively.[26]

A community-based study (2016) in rural Nepal which showed that the prevalence of hypertension was 32.5%.[27]

A similar study done (2016) among adults in Burkina Faso, West Africa revealed that overall prevalence of low and high range prehypertension was 41% and 59% respectively.[28]

Wang Y et al (2016) demonstrated that the prevalence of hypertension was 32.1% among adults in remote rural areas of Xinjiang, China.[29]

Another cross-sectional study (2017) conducted countrywide in West Africa showed that overall prevalence of hypertension in Burkina Faso was 18%. The prevalence was 24.81% in urban areas and 15.37% in rural areas.[30]

A similar study conducted (2017) among adult males living in rural area revealed that 53% of the subjects gave a history of hypertension and 6% of the subjects were new cases of hypertension.[31]

PREVALENCE OF HYPERTENSION: INDIA.

AUTHORS	**PLACE**	**YEAR**	**PREVALENCE (%)**
Agrawal VK[32]	North India	**2008**	18.5
Raina DJ[33]	Jammu & Kashmir	**2009**	13
Kannan L[34]	Tamil Nadu	**2009**	25.2
Yuvaraj BY[35]	Davanagere	**2010**	18.3
Sachdev B[36]	Rajasthan	**2011**	31
Kokiwar PR[37]	Central India	**2011**	19.04
Esam MS[38]	Bareilly	**2012**	27.4
Bharati DR[39]	South India	**2012**	27.6
Pooja[40]	Dehradun	**2013**	33.2
Govindan R[41]	Kancheepuram	**2013**	20
Singh A[42]	Amritsar	**2014**	10
Madhumita[43]	Raichur	**2014**	37.6
Rao KN[44]	Bengaluru	**2015**	31
Choudhury SA[45]	Assam	**2015**	20.68
Kishore J[46]	Delhi	**2016**	14.1
Gupta A[47]	Dakshina Kannada	**2016**	43.6
Satheesh BC[48]	North Kerala	**2017**	18.5
Singh PS[49]	Central India	**2017**	17

EPIDEMIOLOGY OF HYPERTENSION:

Hypertension is a global health problem and is a major public health problem in many developed as well as developing countries.

1. **AGE:**

   A positive correlation between age and blood pressure has been demonstrated consistently by several studies. Also, data obtained from Framingham Heart Study has revealed that systolic blood pressure shows a continuous increase between ages of 30 and 84 years or over.[50-52]

   Ballantyne D et al (1994) conducted a study in Glasgow to investigate the interrelation between age and blood pressure along with other factors which showed a stronger correlation between age and blood pressure in men than women.[52]

2. **GENDER:**

   Generally, males exhibit a higher blood pressure than females which is more evident in young and middle aged. But in the age group of 50 years or more, the blood pressure is slightly higher in females.[50,53]

   Daugherty SL et al (2011) conducted a study on Age Dependent Gender Differences in Hypertension Management wherein a significant gender based interaction was detected with men aged 18–49 having 17% lower odds of hypertension control and men aged ≥ 65 having 12% higher odds of hypertension control compared to women of similar ages ($p<0.001$).[53]

3. **HEREDITY:** A strong family history of hypertension is an important risk factor for development of hypertension in individuals. Sex dependent genetic effects in hypertension have also been noted by many.[54-58]

   Biino G et al (2013) conducted an epidemiological survey with cross-sectional design on Sardinian genetic isolates to detect environmental and genetic contribution to hypertension where about 50% of the hypertensives had prior cardiovascular disease. Also, heritability was found to be 27% for diastolic and 36% for systolic blood pressure which was significantly higher in men (57%) than in women (46%).[57]

4. **ETHNICITY:** According to several population based studies, people of South Asian, African-Carribean and Irish ethnicity are known to have worse cardiovascular outcomes than those from the White British group. This may be as a result of interplay of complex factors like genetics and lifestyle.[59-62]

   Eastwood SV et al (2015) conducted a multiethnic cohort study to detect the ethnic differences and associations between blood pressure and stroke in South Asian and European men. It was found that South Asians were having higher systolic BP, diastolic BP, and mean arterial pressure than Europeans.[59]

5. **WEIGHT:** Almost all epidemiological studies on non-communicable diseases have established that overweight and obesity are risk factors for hypertension, which in turn, is associated with increased risk for cardiovascular diseases, stroke, renal diseases, and all-cause mortality.[63-65]

6. **DIET:** Several epidemiological studies and clinical trials have showed that dietary intake of sodium is directly related to blood pressure while dietary calcium intake was inversely associated with blood pressure.[66,67]

   Schroder H et al (2002) conducted a study to investigate the relationship between dietary habits and blood pressure in a representative Mediterranean population. Following multiple linear regression analysis, it was found that dietary intake of sodium was directly related to blood pressure. Also, moderate sodium incombination with a calcium intake of more than 800 mg/d reduced the risk of inadequate blood pressure control, by 52% (Odds ratio 0.48; 95% CI 0.24–0.95) in subjects undergoing hypertension drug treatment.[66]

7. **ALCOHOL INTAKE:** Several epidemiological, preclinical and clinical studies have consistently proved that drinkers at the highest levels of alcohol consumption show an increase in blood pressure. Also, increased alcohol intake has been presumed to be the cause of increase in liver function abnormalities in hypertensive patients.[68-71]

   Criqui MH et al (1981) conducted a study to find the relationship of alcohol consumption and blood pressure which showed that men aged ≥ 35 years of age consuming ≥ 30 ml alcohol per day were 1.5 to 2 times more likely to be hypertensive than nondrinkers.Also, systolic and diastolic BP were positively and significantly ($p<0.05$) related to alcohol consumption.[71]

   McFadden CB et al (2005) conducted a systematic review of the effect of daily alcohol intake on blood pressure which showed a significant rise in systolic

and diastolic blood pressure of 2.7 mmHg and 1.4 mmHg, respectively, following alcohol intake.[69]

Nunez-Cordoba JM et al (2009) conducted a prospective study on Spanish men and women to assess the association between alcohol consumption and the incidence of hypertension which showed that the hazard ratio for hypertension among those who consumed alcohol on ≥ 5 days a week was1.28 (95% confidence interval, 0.97-1.7) compared to abstainers.[68]

8. **PHYSICAL ACTIVITY:** A few recent epidemiological studies have proved that a consistent, dose-response relationship exists between physical activity and the development of hypertension. Beyond simple accumulation of fat stores, there are many other factors like excessive intake of sodium and lower levels of physical activity which are important causal risk factors for hypertension.[72,73]
9. **ENVIRONMENTAL FACTORS:** Significant correlation between environmental factors and systolic and diastolic blood pressure has been detected as they have been found to share common environmental influences.[55,57,74,75]

   Forjaz CLM et al (2012) conducted a study to estimate environmental correlation of blood pressure in nuclear families of Brazil which showed the existence of an environmental cross-trait correlation with diastolic blood pressure.[74]

10. **SOCIOECONOMIC STATUS:** There is an inverse association between socioeconomic status and cardiovascular disease. Several cross-sectional studies have shown that there is a significant association between various markers of socioeconomic status and hypertension.[76,77]

11. **PSYCHOLOGICAL FACTORS:** Psychosocial stress can either be a cause or a consequence of hypertension because of an intricate relationship between physical health and psychological status. It was found by many investigators that people suffering from either depression or anxiety had a higher chance of developing hypertension. Also, a bad psychological environment may lead to permanent and irreversible hypertension.[78,79]

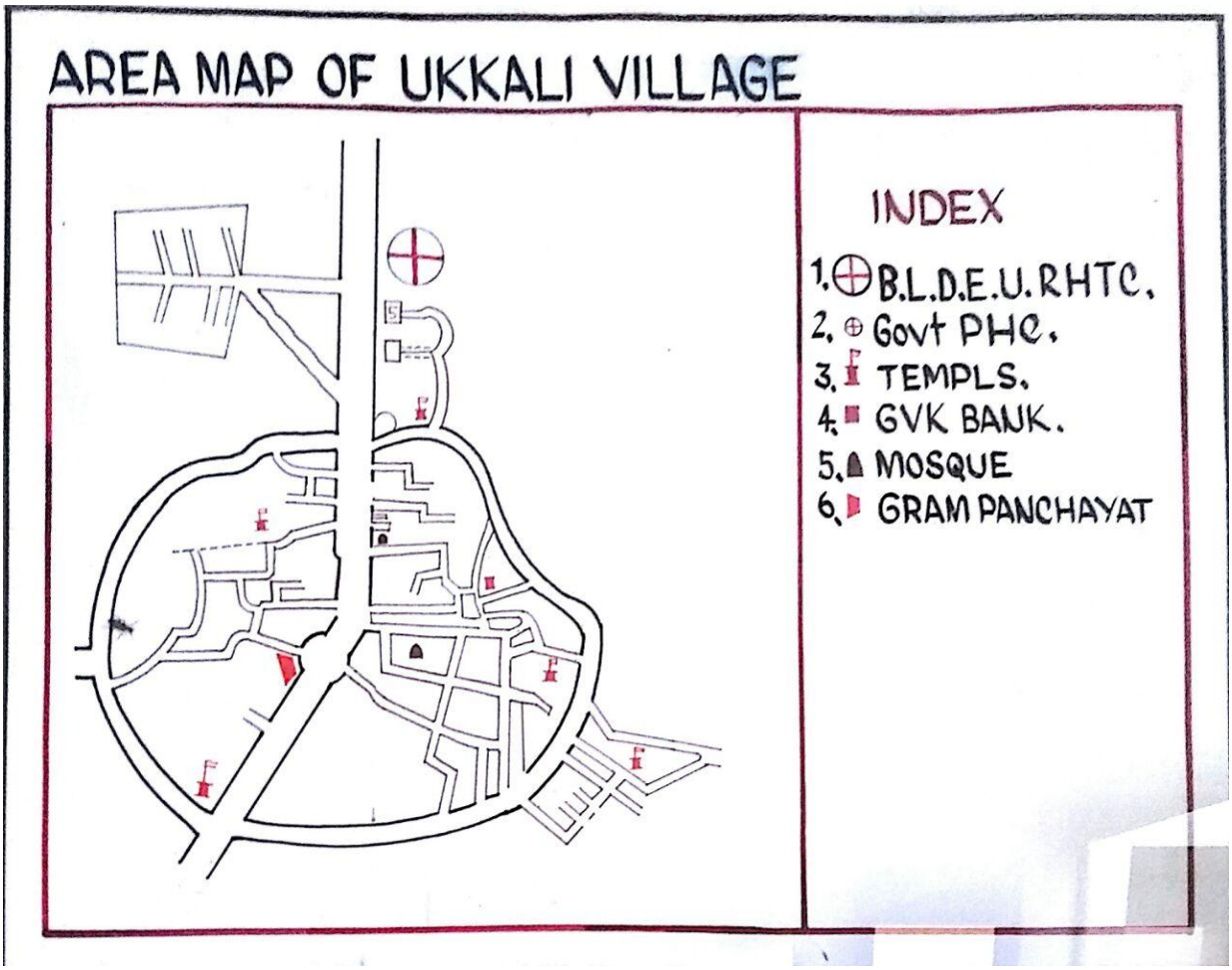
    Cheung BMY et al (2005) conducted a study to assess the association between hypertension and anxiety in adults from Hong Kong. It was found that the score in the anxiety subscale correlated with age and sex, and was higher among women. Also, hypertension was associated with anxiety, but not depression.[78]

    Garcia-Vera MP et al (2009) conducted a study to detect differences in emotional personality traits and stress between sustained hypertension and normotension which revealed that sustained hypertensive group showed higher levels of trait anxiety, trait depression and stress than the normotensive group.[79]

MATERIALS & METHODS:

Study area: The present study was conducted at Rural Health Training Centre, Ukkali which is the field practice area of Department of Community Medicine of Shri B.M.Patil Medical College, Hospital and Research Centre, Vijayapur.

MAP OF RURAL FIELD PRACTICE AREA:



Study population: Adults of the age group of 20-60 years of age.

Study design: Cross-sectional study

Study technique: Interview technique

Study Period:1 year (March 2016 – Feb 2017).

Sample size: Considering 37.6% prevalence of hypertension among adults from previous studies[10], sample size calculated using the formula, sample size, $n = \frac{Z_\alpha^2 \times p \times q}{l^2}$ at 95 % confidence level would be 670.

Z_α^2 = 1.96 with p<0.05 at 95% confidence level (probability of alpha error <5%)

p is the prevalence from previous studies,

q = 1-*p*,

l is the allowable error (10% of the prevalence).

METHODOLOGY:

After obtaining ethical clearance from the Institutional Ethical Committee, the study was carried out in the rural field practice area of Shri B. M. Patil Medical College Hospital & Research Centre, Vijayapur.

Sampling method: Systematic random sampling. House was taken as the sampling unit.

Step 1: Sampling interval, $m = \frac{\text{total number of houses}}{\text{sample size}} = \frac{1800}{670} = 2.68 \approx 3.$

Step 2: k, random number was less than or equal to sampling interval i.e., m.

Random number, k, was selected by using lottery method and so k^{th} house was taken as the first house and from then on every 3^{rd} house was visited to find the eligible person. If more than one eligible person was present at the time of the visit, the subject to

be interviewed was selected by lottery method. If the inhabitants were not at home at the time of the visit, the next house was visited.

Step 3: k, k+3, (k+3)+3,……This process was continued till the required sample size was reached.

Informed consent was obtained after informing all the participants about the nature and purpose of the study. Participants were then interviewed using a predesigned, pretested questionnaire and examined.

INCLUSION CRITERIA:

- Adults of the age group of 20-60 years willing to participate in the study.

EXCLUSION CRITERIA:

1. Those who were not willing to participate in this study.
2. Persons with severe chronic illness, immuno-compromised individuals, those with physical disability, mental disability and pregnant & lactating women were excluded from the study.
3. Individuals on steroids.

Study variables:

- Age : Age was recorded in completed years as revealed by the subjects
- Gender: Male/ female.
- Type of family:[80]
  - Nuclear family: It comprises of a married couple and their children while they are still regarded as dependents.
  - Joint family: It includes a number of married couples and their children who live together in the same household wherein all the men are related by blood and women of the household are their wives, unmarried sisters and their family kinsmen.
  - Three Generation family: Here, the representatives of three generation are living together. Young married couples continue to stay with their parents and have their own children as well.
- Education : [80]
  - Illiterate : Not able to read, write and understand in any language
  - Primary school: Studied up to 7^{th} standard
  - Secondary & higher: Studied from 8^{th} standard to PUC or any Diploma
  - Graduate : Studied up to graduation
  - Postgraduate : Studied up to postgraduation and above.
- Occupation : [80]
  - Unemployed : people who are not employed
  - Unskilled : Watchman, Peon, Domestic servant etc
  - Semi-skilled : Factory, workshop, labourer, shopkeeper etc

- Skilled : Clerk, typist, Station master, Salesman etc
- Professional: Engineers, teachers, doctors, managers etc.

❖ Stress: Presumptive stressful life events scale[81];

1. Aging stress: Unable to take part in household activities as a result of decreased memory, perception, disability, loneliness, etc.
2. Financial stress: Improper budgeting in the family, loss of financial autonomy, loss of income leading to dearth of money, huge loans, etc.
3. Job stress: Unhealthy work environment leading to poor job satisfaction, loss of job, no regular income from job, etc.
4. Marital stress: Dowry, poverty, unco-operative in-laws, unfaithful spouse, etc.
5. Family stress: Frequent fights within the family and with relatives, poor parent-child relationship, disharmony, maladjustment, etc.
6. Social stress: Lack of participation in social activities, no social contacts.
7. Health stress: Debilitating illnesses, hospital admissions, etc
8. Others: Any major stressful events in life like, bereavement of spouse or children, terminal illnesses in family members, stress due to theft, loss of property, etc.

❖ Socio-Economic status: [82,83]

- Self- reported per capita monthly income was recorded. Modified BG Prasad's classification was used to assess the social class of the study subjects.
- Correction factor = $\frac{\text{Current Index value}}{\text{Base Index value (100)}}$

= 275 /100 =2.75

- Multiplication factor (MF) = Correction factor X 4.63 X 4.93
  - = 2.75 X 4.63 X 4.93
  - = 62.77
- This MF obtained is multiplied with the income limits of B G Prasad's classification 1961. Socio-economic classes obtained were as follows:

Socio-economic class	**B.G.Prasad's classification(1961)**	**Modified B G Prasad classification(June 2016)**
Upper	Rs 100 & above X MF	6277 & above
Upper middle	Rs 50-99 X MF	3139-6276
Lower middle	Rs 30-49 X MF	1883-3138
Upper lower	Rs 15-29 X MF	942-1882
Lower	Rs<15 X MF	Below 941

❖ Habits :

- Tobacco consumption: Yes/No
- Yes: Person who at the time of the data collection smokes/uses tobacco in any form either daily or occasionally for the past one year. (Smoke form – cigarettes, beedis, etc. Smokeless form – plug, loose leaf, pellets, snuff, tambak, gutkhaetc)
- No: Person who at the time of the data collection does not smoke or use tobacco in any form either daily or occasionally for the past one year.
- Duration of consumption.

- Form of tobacco used.

❖ Alcohol consumption: Yes/No

- Yes: Person who at the time of the data collection consumed any alcoholic beverage daily or occasionally for the past one year.
- No: Person who at the time of the data collection did not consume any alcoholic beverage for the past one year.
- Duration of consumption.
- Form of alcohol consumed.

❖ Physical exercise: Whether subjects were exercising regularly in the form of walking, swimming, etc. They were categorized based on whether regular physical exercise was present or absent.[84]

❖ Dietary habits: Consumption of veg or mixed diet (veg + non-veg).

❖ Extra salt intake: Regular use of items containing high salt in their daily diet. Eg: pickle, papad, groundnut chutney, etc.

❖ Extra fat intake: Regular use of items with high fat content like oil, butter, or ghee in their daily diet.

❖ **Measurement of height[85]:**

Firstly, a flat, smooth wall with no skirting at the bottom, as close to a reference vertical line as possible, like the corner of a wall was chosen for measurement. Subjects were explained regarding the procedure and assent was confirmed. Subjects were made to remove their footwear and stand with heels touching each other and toes apart and head positioned so that the line of vision was perpendicular to the body (Frankfurt line) against the wall. The arms were

hung freely by the sides, with the head, back, buttock and heels in contact with the wall. A wooden scale was brought down to the topmost point on the head and marking was made on the wall. Measurement was taken using measuring tape in centimeters (cm). Height was recorded to nearest 0.5 cm.

- **Measurement of weight [85]:**

The weight was measured in kilograms (kg) using standardized bathroom weighing machine with the study subject standing erect on centre of platform, with the body weight evenly distributed between both the feet together and toes apart bare-feet with accepted clothing and looking straight ahead with the arms held loosely by the side. The weight was recorded to nearest 0.5 kg. The instrument was calibrated before using it each time.

- **Body Mass Index (BMI) [85]:**

In this study, BMI classification proposed by the WHO Western Pacific Regional Office in collaboration with IOTF (International Obesity Task Force) steering committee (2000) for Asian people was used. It is also called as Quetlet Index and was used to assess obesity and is computed by

BMI=Weight (in kg) / Height (in metre)^2

WHO has classified as BMI <18.5 (Underweight),

18.5-22.9 (Normal),

23.0-24.9(At risk obesity),

25.0-29.9 (Obese I) and

> 30 (Obese II).

❖ **Waist circumference[86]:**

This was done in as private a place as possible. The procedure was explained to the subject and total privacy was assured while doing this measurement. The subject was made to stand erect with feet close together and look straight ahead with the umbilical area exposed both at the front and the back and hands away from the abdominal region and body weight evenly distributed. The tape was placed horizontally around the abdomen at the level of the umbilicus. It was ensured that there was no gap between tape and skin surface and that it was not pulled tightly. Reading to the nearest 0.1cm was taken at the end of normal expiration. A reading of > 90 cm in males and > 80 cm in females indicates the presence of abdominal obesity.

❖ **Blood Pressure measurement[3]:**

- Participant was seated quietly for at least 5 minutes in a chair (rather than on an exam table), with feet on the floor, and arm supported at heart level. Caffeine, exercise, and smoking were avoided for at least 30 minutes prior to measurement. Measurement of BP in the standing position was indicated for those at risk for postural hypotension and in those who reported symptoms consistent with reduced BP upon standing. An appropriately sized cuff (cuff bladder encircling at least 80% of the arm) was used to ensure accuracy. For manual determinations, palpated radial pulse obliteration pressure was used to estimate SBP—the cuff was then inflated 20–30 mmHg above this level for the auscultatory determinations.The cuff deflation rate forauscultatory readings was 2

mmHg per second. SBP is the point at which the first of two or more Korotkoff sounds is heard (onset of phase 1), and DBP is the point at which there is disappearance of Korotkoff sound (onset of phase 5). Two measurements were taken and the average was recorded and considered for analysis.

- Diagnostic criteria were based on JNC VII & VIII guidelines, Systolic blood pressure ≥ 140mmHg and/or Diastolic blood pressure ≥ 90mmHg.The instrument was calibrated before using it each time.

❖ **Pilot study:** A pretesting was done on 50 participants, who were selected by simple random sampling following which the main data collection was done.

Statistical Analysis:

All characteristics were summarized descriptively. For continuous variables, the summary statistics of mean, standard deviation (SD) were used. For categorical data, the number and percentage were used in the data summaries. Chi-square (χ^2)/Freeman-HaltonFisher exact test was employed to determine the significance of differences between groups for categorical data. The difference of the means of analysis variables between two independent groups was tested by unpaired t test. If the p-value was < 0.05, then the results were considered to be statistically significant otherwise it was considered as not statistically significant. Data were analyzed using SPSS software v.23.0. and Microsoft office.

RESULTS

Table 1: Distribution of subjects according to blood pressure category

Blood pressure categories	N	%
Normal	534	79.7
Pre-hypertension	105	15.7
Hypertension stage 1	31	**4.6**
Hypertension stage 2	0	0
Total	**670**	**100.0**

Figure 1: Distribution of subjects according to blood pressure category

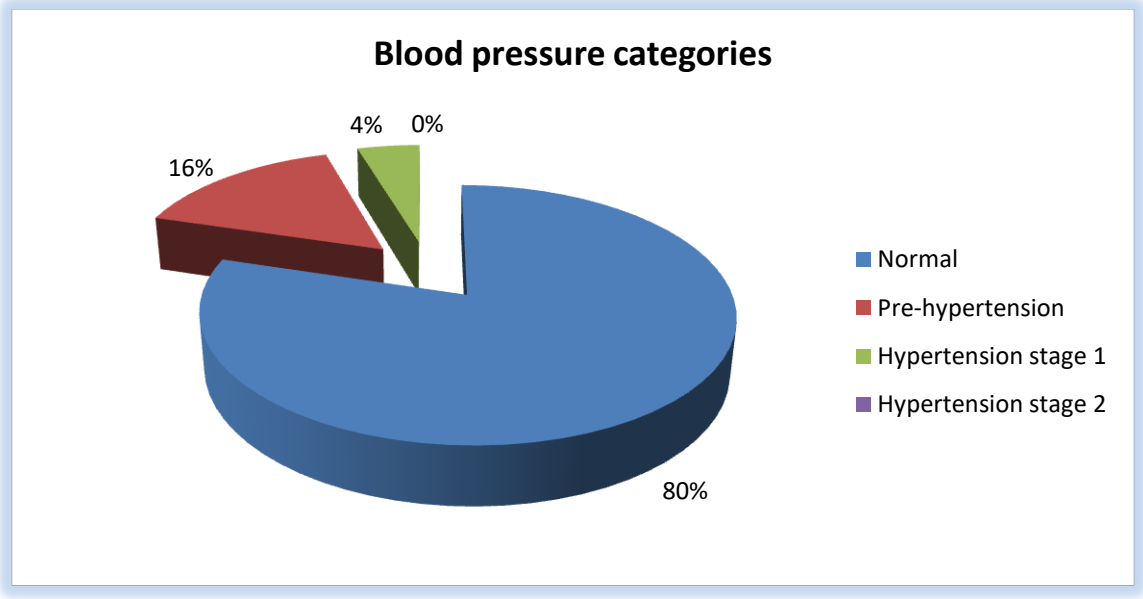


Table 1 & figure 1 depict that the prevalence of hypertension among the study participants was 4.6% and that of pre-hypertension was 15.7%.

Table 2: Distribution of blood pressure categories versus Known case of hypertension

Known case of hypertension	Normal		Pre-hypertension		Hypertension stage 1		Total		p value
	N	%	N	%	N	%	N	%	
Yes	0	0.0	0	0.0	28	90.3	28	4.2	
No	534	100.0	105	100.0	3	9.7	642	95.8	**<0.001***
Total	534	100.0	105	100.0	31	100.0	670	100.0	

Note: * significant at 5% level of significance (p<0.05)

Figure 2: Distribution of blood pressure categories versus Known case of hypertension

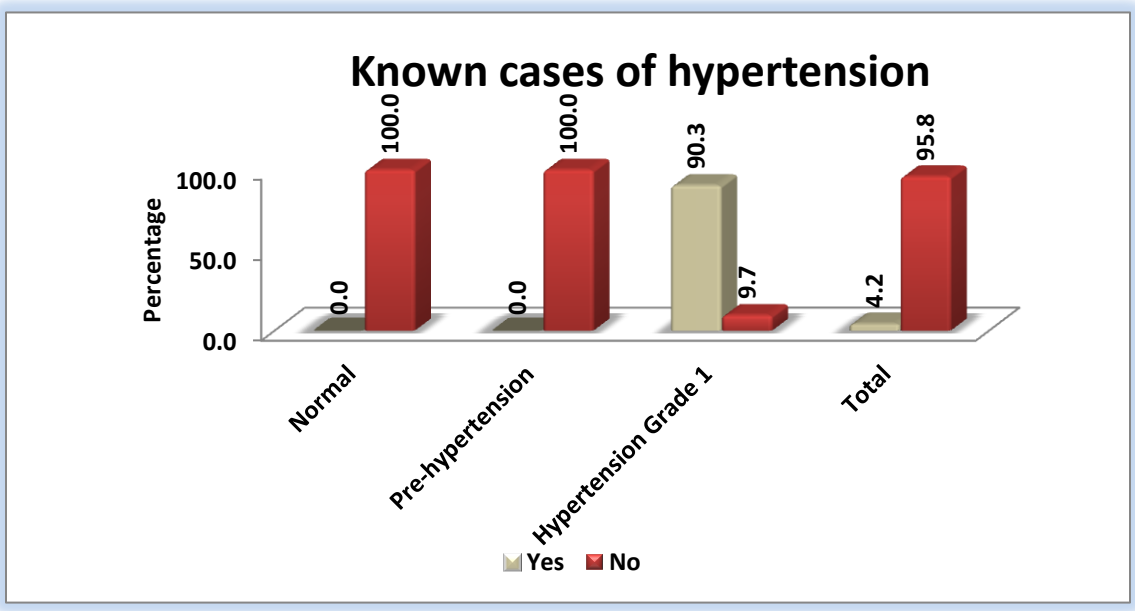


Table 2 & figure 2 – Among the hypertensives, 90.3% were known cases while 9.7% were newly diagnosed with hypertension. This was statistically significant.

Table 3: Distribution of blood pressure categories according to Age

Age (Yrs)	Normal		Pre-hypertension		Hypertension stage 1		Total		p value
	N	%	N	%	N	%	N	%	
20-30	248	46.4	33	31.4	2	6.6	283	42.2	
31-40	162	30.3	32	30.5	3	9.7	197	29.4	
41-50	84	15.7	26	24.8	20	**64.5**	130	19.4	**<0.001***
51-60	40	7.6	14	13.3	6	19.4	60	9.0	
Total	534	100.0	105	100.0	31	100.0	670	100.0	

Note: * significant at 5% level of significance (p<0.05)

Figure 3: Distribution of Blood pressure categories according to age

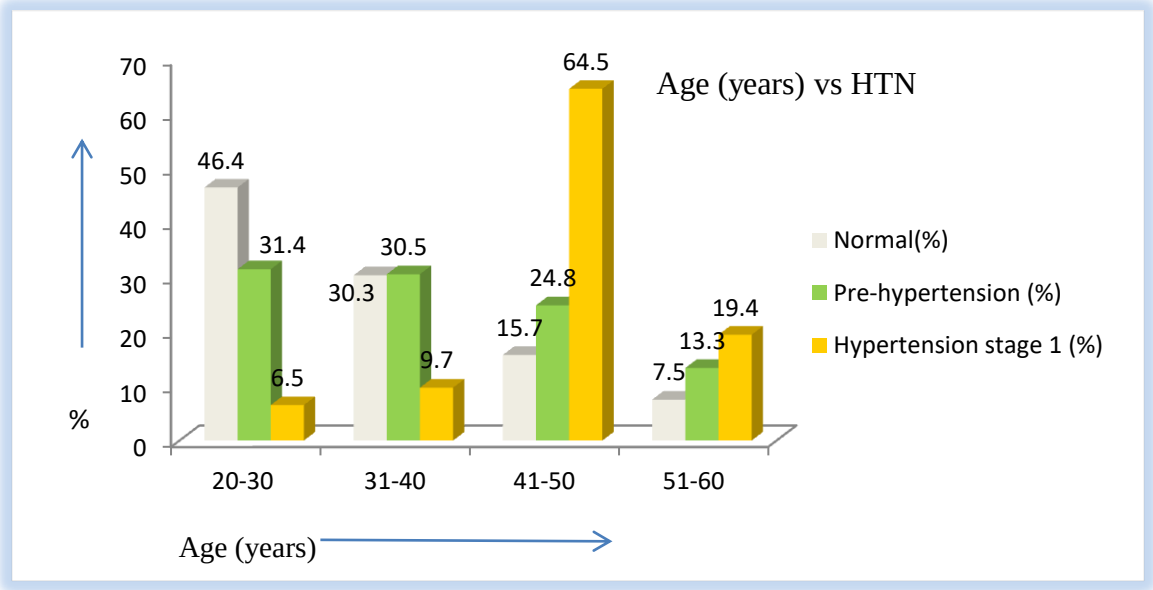


Table 3& figure 3 show that 46.4% of the study subjects belonged to 20-30 yr age group. Only 7.6% of the study subjects were from the 51-60 yr age group. It is evident from the table that the prevalence of hypertension is increasing with age. It was 6.6% in the 20-30 yr age group and 64.5% in the 41-50 yr age group. This steep rise in the prevalence of hypertension in the fourth decade was statistically significant (p<0.05). On the contrary, the prevalence of pre-hypertension was higher in the 20-30yr age group (31.4%) when compared to the 41-50yr age group (13.3%).

Table 4: Distribution of Blood pressure categories according to Gender

Gender	Normal		Pre-hypertension		Hypertension stage 1		Total		p value
	N	%	N	%	N	%	N	%	
Male	217	81.3	47	17.6	3	1.1	267	100.0	
Female	317	78.7	58	14.4	28	6.9	403	100.0	**0.002***
Total	534	79.7	105	15.7	31	4.6	670	100.0	

Note: * significant at 5% level of significance ($p<0.05$)

As per table 4, genderwise 6.9% females were hypertensive while only 1.1% of the males had HTN and this was statistically significant ($p<0.05$). However, pre-hypertension was more among the males (17.6%).

Table5: Distribution of Blood pressure categories according to Education

Education	**Normal**		**Pre-hypertension**		**Hypertension stage 1**		**Total**		**p value**
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	
Illiterate	124	23.2	17	16.2	16	**51.6**	157	23.4	
Primary	107	20.1	22	21.0	6	19.4	135	20.1	
Secondary & Higher	155	29.0	32	30.5	4	12.9	191	28.5	**0.008**
Graduate	88	16.5	18	17.1	5	16.1	111	16.6	*****
Post Graduate	60	11.2	16	15.2	0	0.0	76	11.4	
Total	534	100.0	105	100.0	31	100.0	670	100.0	

Note: * significant at 5% level of significance ($p<0.05$)

Table 5 implies that majority of the subjects completed secondary level of education (28.5%) followed by illiterates (23.4%) and primary education (20.1%). The prevalence of hypertension was highest among illiterates (51.6%) as compared to literates and this difference was statistically significant ($p<0.05$).

Table6: Distribution of Blood pressure categories according to Occupation

Occupation	Normal		Pre-hypertension		Hypertension stage 1		Total		p value
	N	%	N	%	N	%	N	%	
Professional	225	42.2	58	55.2	5	16.1	288	43.0	
Skilled	104	19.5	17	16.2	5	16.1	126	18.8	
Semiskilled	75	14.0	5	4.8	1	3.3	81	12.1	**<0.001***
Unskilled	130	24.3	25	23.8	20	**64.5**	175	26.1	
Total	534	100.0	105	100.0	31	100.0	670	100.0	

Note: * significant at 5% level of significance ($p<0.05$)

Table 6 reveals that most of the subjects were professionals (43%) followed by unskilled workers (26.1%). The prevalence of hypertension was highest among unskilled workers (64.5%) and this was statistically significant ($p<0.05$). On the other hand, professionals had the highest prevalence of pre-hypertension (55.2%).

Table 7: Different types of Stresses (PSLEScale) according to Blood pressure categories

Stress	Normal		Pre-hypertension		Hypertension stage 1		Total		p value
	N	%	N	%	N	%	N	%	
Aging stress	65	12.2	20	19.0	25	80.6	110	16.4	**<0.001***
Financial stress	161	30.1	32	30.5	10	32.3	203	30.3	0.989
Job stress	12	2.3	3	2.9	1	3.2	16	2.4	0.888
Marital stress	0	0	0	0	0	0	0	0	-
Family stress	5	0.9	1	1.0	0	0.0	6	0.9	0.863
Social Stress	0	0	0	0	0	0	0	0	-
Health Stress	24	4.5	10	9.6	13	41.9	47	7.0	**<0.001***
Other Stress	5	0.9	3	2.9	0	0.0	8	1.2	0.208

Note: * significant at 5% level of significance (p<0.05)

Figure 4: Distribution of different stresses according to Blood pressure categories

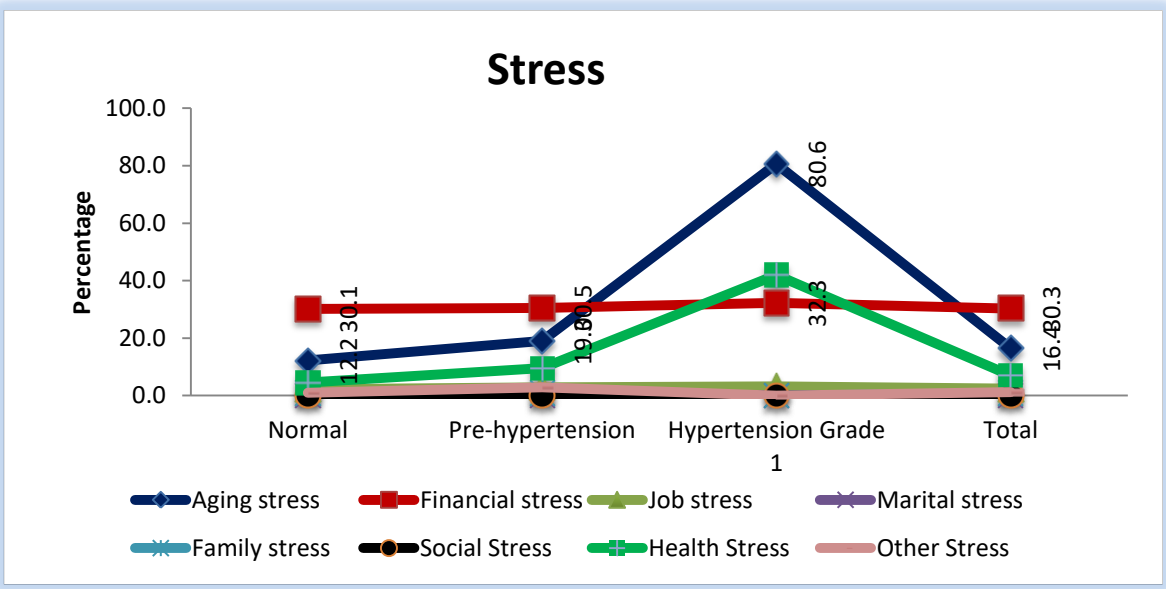


Table 7 and figure 3 show that 16.4% of the subjects had aging stress and 7% had stress due to their health issues. 80.6% of the hypertensives said that they had aging stress and 41.9% had health related stress which was higher than the other stresses listed above and they were statistically significant (p<0.05).

Table8: Distribution of Blood pressure categories according to SES

SES	Normal		Pre-hypertension		Hypertension stage 1		Total		p value
	N	%	N	%	N	%	N	%	
I	29	5.4	10	9.5	0	0.0	39	5.8	0.003*
II	101	18.9	19	18.1	0	0.0	120	17.9	
III	227	42.5	46	43.8	20	64.5	293	43.7	
IV	120	22.5	28	26.7	6	19.4	154	23.0	
V	57	10.7	2	1.9	5	16.1	64	9.6	
Total	534	100.0	105	100.0	31	100.0	670	100.0	

Note: * significant at 5% level of significance ($p<0.05$)

Majority of the hypertensives belonged to SES III (64.5%) followed by SES IV (19.4%) and SES V (16.1%) and this difference was statistically significant.

Table9: Distribution of Blood pressure categories accordingto tobacco use in any form

H/o tobacco use	Normal		Pre-hypertension		Hypertension stage 1		Total		p value
	N	%	N	%	N	%	N	%	
Yes	76	70.4	25	23.1	7	6.5	108	100.0	
No	458	81.5	80	14.2	24	4.27	562	100.0	0.031*
Total	534	79.7	105	15.7	31	4.62	670	100.0	

Note: * significant at 5% level of significance ($p<0.05$)

Table 9 HTN was found to be 6.5% and 4.3% among tobacco users and non-users, respectively. This difference was statistically significant ($p<0.05$). Pre-hypertension was present among 23.1% tobacco users.

Table10: Distribution of Blood pressure categories according to alcohol intake

H/O alcohol intake	Normal		Pre-hypertension		Hypertension stage 1		Total		p value
	N	%	N	%	N	%	N	%	
Yes	73	69.5	25	23.8	7	6.7	105	100.0	
No	461	81.6	80	14.2	24	4.2	565	100.0	0.018*
Total	534	79.7	105	15.7	31	4.6	670	100.0	

Note: * significant at 5% level of significance ($p<0.05$)

Table10 - Among the alcohol consumers, 6.7% had hypertension and 23.8% had pre-hypertension which was statistically significant ($p<0.05$).

Table 11: Distribution of Blood pressure categories according tofamily history of(F/H/O) hypertension

F/H/O hypertension	Normal		Pre-hypertension		Hypertension stage 1		Total		p value
	N	%	N	%	N	%	N	%	
Yes	37	6.9	18	17.1	12	38.7	67	10.0	
No	497	93.1	87	82.9	19	61.3	603	90.0	<0.001*
Total	534	100.0	105	100.0	31	100.0	670	100.0	

Note: * significant at 5% level of significance (p<0.05)

Table 11– Statistically significant association was found between HTN and family history of hypertension (p<0.05).38.7% of hypertensives and 17.1% pre-hypertensives gave family history of HTN.

Table 12: Distribution of blood pressure categories according to Food Habits

Food Habits	Normal		Pre-hypertension		Hypertension stage 1		Total		p value
	N	%	N	%	N	%	N	%	
Veg	315	59.0	62	59.0	21	67.7	398	59.4	
Non-veg	219	41.0	43	41.0	10	32.3	272	40.6	0.626
Total	534	100.0	105	100.0	31	100.0	670	100.0	

Table 12 - Majority of the hypertensive subjects were vegetarians (67.7%) as compared to non-vegetarians (32.3%) though it was not statistically significant (p>0.05).

Table 13: Distribution of Blood pressure categories according to Extra Salt intake

Extra Salt	Normal		Pre-hypertension		Hypertension stage 1		Total		p value
	N	%	N	%	N	%	N	%	
Yes	37	62.7	19	32.2	3	5.1	59	100.0	
No	497	81.3	86	14.2	28	4.5	611	100.0	0.001*
Total	534	79.7	105	15.7	31	4.6	670	100.0	

Note: * significant at 5% level of significance ($p<0.05$)

Table 13 – The prevalence of HTN was found to be more among those who consumed extra salt in the form of pickle, papad, or groundnut chutney (5.1%) as compared to those who did not consume these (4.5%). This was statistically significant ($p<0.05$).

Table 14: Distribution of Blood pressure categories according to Extra Fat intake

Extra Fat	Normal		Pre-hypertension		Hypertension stage 1		Total		p value
	N	%	N	%	N	%	N	%	
Yes	40	7.5	12	11.4	1	3.2	53	7.9	
No	494	92.5	93	88.6	30	96.8	617	92.1	0.241
Total	534	100.0	105	100.0	31	100.0	670	100.0	

Table 14 - 3.2% hypertensives and 11.4% pre-hypertensives consumed extra fat in the form of ghee, oil, or butter. However, this association was not statistically significant.

Table 15: Distribution of Blood pressure categories according to BMI

BMI	Normal		Pre-hypertension		Hypertension Grade 1		Total		p value
	N	%	N	%	N	%	N	%	
Underweight	31	5.8	1	1.0	1	3.2	33	4.9	
Normal	315	59.0	46	43.8	20	64.5	381	56.9	
Overweight	168	31.5	55	52.4	8	25.8	231	34.5	0.002*
Obese	20	3.7	3	2.8	2	6.5	25	3.7	
Total	534	100.0	105	100.0	31	100.0	670	100.0	

Note: * significant at 5% level of significance ($p<0.05$)

Figure 5: Categories of blood pressure Vs.BMI

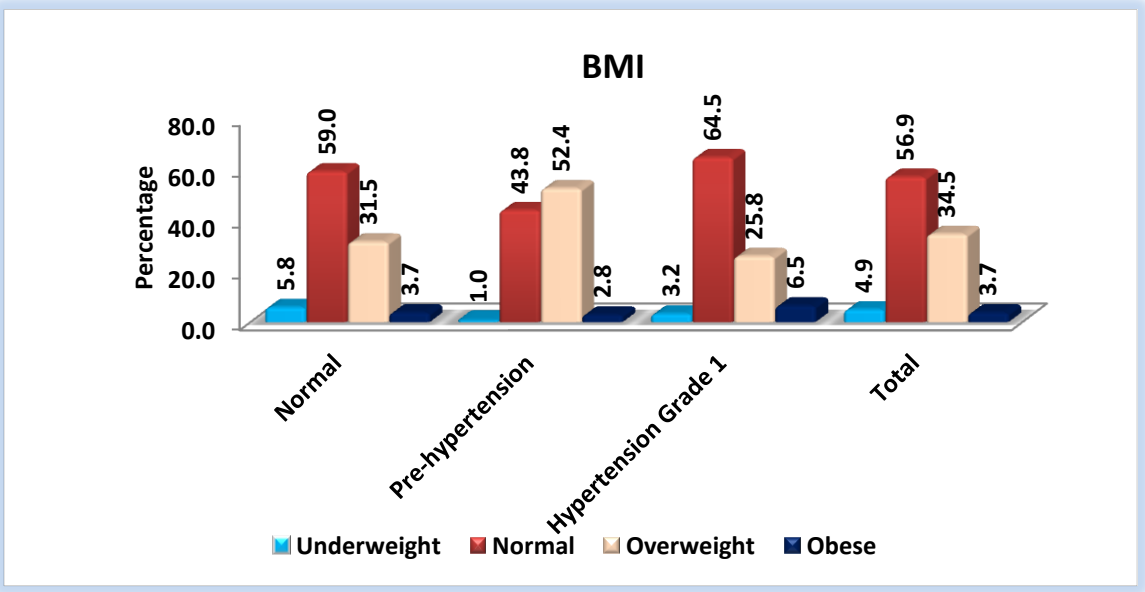


Table 15 & figure 5 imply hypertension was significantly associated with BMI ($p<0.05$). 25.8% hypertensives and 52.4% pre-hypertensives were found to be overweight.

Table 16: Comparison of mean BMI according to blood pressure categories

Variable	Normal		Pre-hypertension		Hypertension stage 1		ANOVA p value
	Mean	SD	Mean	SD	Mean	SD	
BMI	23.8	3.6	25.1	2.9	25.1	3.0	<0.001*

Note: * significant at 5% level of significance (p<0.05)

Figure 6: A Comparison of mean BMI according to blood pressure categories

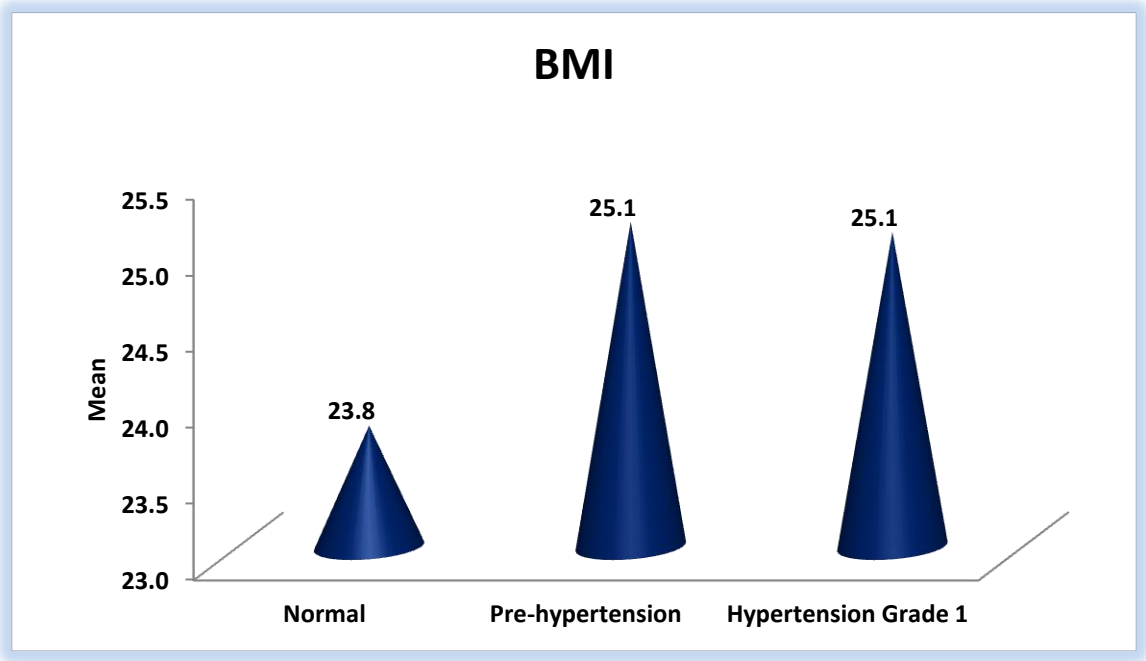


Table 16 & figure 6 - The mean BMI among normotensives was 23.8±3.6. Those with pre-hypertension had a mean BMI of 25.1±2.9 and the hypertensives had a mean BMI of 25.1±3.0. This difference in the mean BMI according to the blood pressure category was statistically significant (p<0.05).

Table 17: Comparison of mean Pulse rate according to blood pressure categories

Variable	Normal		Pre-hypertension		Hypertension stage 1		ANOVA p value
	Mean	SD	Mean	SD	Mean	SD	
PR	77.9	6.6	79.2	6.5	82.1	6.7	0.001*

Note: * significant at 5% level of significance ($p<0.05$)

Figure 7: A Comparison of mean Pulse rate according to grade of Hypertension

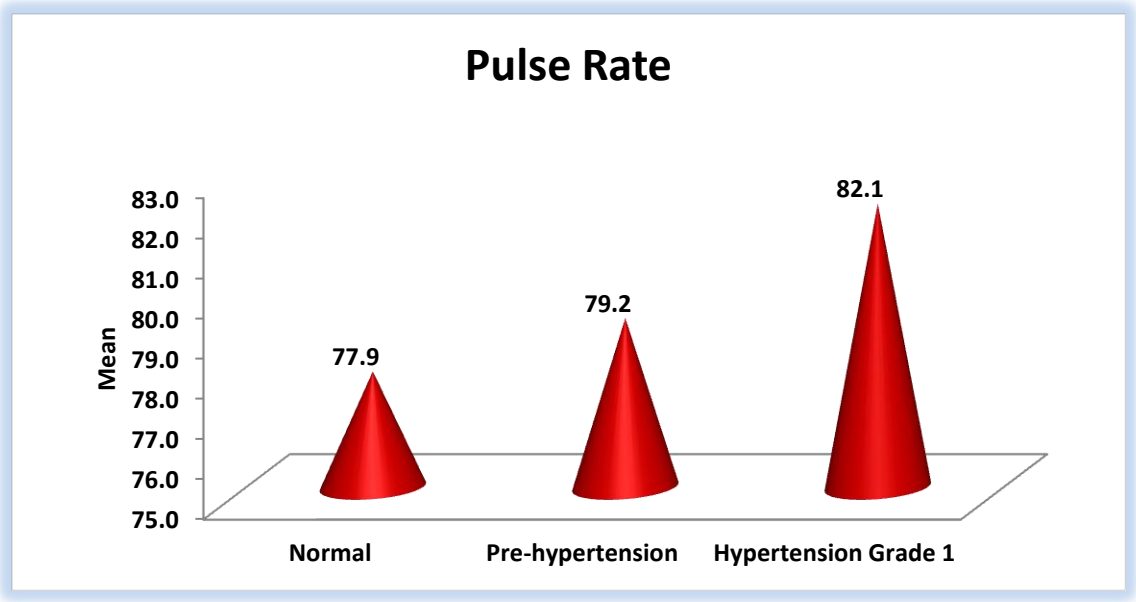


Table 17 & figure 7 reveal that the mean pulse rate among the hypertensives was 82.1 ± 6.7 and among those with pre-hypertension was 79.2 ± 6.5. This difference was statistically significant ($p<0.05$).

Table 18: Comparison of mean SBP/DBP according to blood pressure categories

Variable	Normal		Pre-hypertension		Hypertension stage 1		ANOVA
	Mean	SD	Mean	SD	Mean	SD	p value
SBP	113.6	6.7	129.5	3.3	143.8	3.4	<0.001*
DBP	69.0	5.2	74.4	5.6	75.5	33.9	<0.001*

Note: * significant at 5% level of significance (p<0.05)

Figure 8: A Comparison of mean SBP/DBP according to blood pressure categories

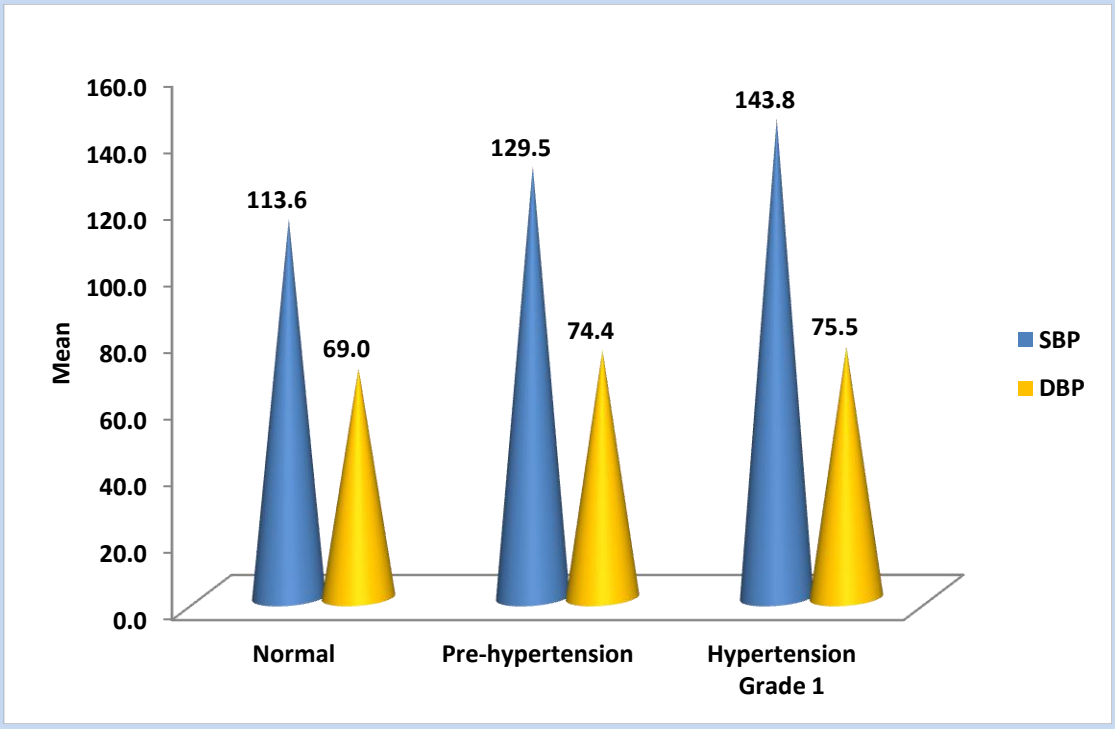


Table 18 & figure 8 infer that the mean systolic blood pressure among those with HTN was 143.8 ± 3.4 and was 129.5 ± 3.3 among those with pre-hypertension. This difference was statistically significant (p<0.05). The mean diastolic blood pressure among the hypertensives was 75.5 ± 33.9 and was 74.4 ± 5.6 in the pre-hypertension group. This was statistically significant.

DISCUSSION:

The present study was carried out to study the prevalence of hypertension among adults (20-60 years of age) residing in Ukkali village of Vijayapur District, Karnataka and also to determine the socio-demographic, economic and other factors influencing hypertension among them. A total of 670 subjects were part of the study. Based on our observations, the magnitude of HTN and its distribution according to various risk factors are discussed below.

Prevalence of HTN: (Table 1,2& fig.1)

The prevalence of hypertension in India is increasing. The average prevalence of hypertension in the villages of India is 10%.[87]Lifestyle and dietary changes, environmental factors, rapid urbanization, demographic transition, behavioural factors like tobacco use or alcohol consumption, and increased life expectancy are few of the factors which may be responsible for this.

The prevalence of hypertension in our study was found to be 4.6% which is comparable to the prevalence rate of 4.5% in a study by Malhotra P[88] in North India. Many other studies have reported a higher prevalence of hypertension in rural areas. Few of these studies include those done by Kumar K[89] in rural Jaipur (13.17%), Galav A[90] in rural Rajasthan (18.67%), Shrivastava SRBL[91] in rural Pondicherry (24.7%), Kashyap V[92] in rural Jharkhand (19.8%), Kumar S[93] in rural Nagpur (20.38%), Hasan I[94] in Haridwar (11%), and Madhukumar S[95]in rural Bengaluru (8.06%). In the present study, 90.3% hypertensives were known cases while 9.7% were newly diagnosed which was statistically significant ($p<0.05$). 80.6% hypertensives reported adherence to treatment.

1. **Age:**(Table 3& fig.2)

In our study the prevalence of HTN was maximum (64.5%) in the fourth decade which is comparable to the results obtained by Shrivastava SRBL[91] in rural Pondicherry. There was a steep rise in the prevalence which was probably the result of age related stress or deprivation of sufficient rest to the mind and the body.

Several studies have shown a positive association between age and blood pressure. To name a few, Jogdand KS[96]in rural Andhra Pradesh (50.44%), Paul PJ[97] in Pondicherry (91.7%), and Dastan I[98] in rural Turkey (62.6%) found that age specific prevalence of HTN was maximum in the sixth decade compared to other age groups.

2. **Gender:**(Table 4)

The prevalence of HTN was higher among females (6.9%) in our study. Similar results were observed in a study done by Radhakrishnan S[99] in Tamil Nadu. This was probably because the number of females who participated in the study were more than the number of males who did so. Also, stress related to aging and financial stress could have posed as risk factors for developing HTN in them.

On the contrary, quite a few studies have shown a higher prevalence of HTN among males. These include those done by More A[100] in rural India, Reddy VS[101] in Coastal Karnataka, and Madhumitha M[102] in North Karnataka.

Parveen Z[103] found no difference in prevalence between males and females in rural Jammu.

3. Occupation:(Table 6)

In our study the prevalence of HTN was found to be highest among unskilled workers. This is probably due to their economic instability or financial insecurity.

Few studies have found a higher prevalence of HTN among the unemployed group. They include those done by Rani R[104] in rural Jammu, Kashyap V[92] in rural Jharkhand, Kannan L[34] in rural Tamil Nadu, and Nagammanavar R[105] in a rural area of Koppal district of Karnataka.

Madhumitha M[102] and Kumar K[89] found a higher prevalence of HTN among professionals of North Karnataka and rural Jaipur, respectively.

Kishore J[46] observed a higher prevalence of HTN among retired individuals of rural Delhi. Sen A[106] elicited a significantly higher prevalence among policemen when compared with civilians.

4. Education:(Table 5)

In the present study, the prevalence of HTN was highest among illiterates (51.6%) which was consistent with the findings of Satheesh BC[48] in rural Kerala, Choudhury SA[45] in rural Assam, Kashyap V[92] in rural Jharkhand, and Kishore J[46] in rural Delhi. This might be attributed to their ignorance with regard to the risk factors related to the causation of disease.

In contrast to this, some studiesBasu G[107] in rural West Bengal, Shrivastava SRBL[91] and Bharati DR[39] in rural Pondicherry found a higher prevalence of HTN among literates.

5. SES:(Table 8)

In our study the prevalence of HTN was highest among subjects belonging to SES III. This was probably because majority of the study population belonged to SES III.

Kashyap V[92] observed that in rural Jharkhand the prevalence of HTN was directly proportional to the SES in that area.

Studies by Paul PJ[97] in rural Pondicherry, Kokiwar PR[37] in rural Central India, and Kishore J[46] in rural Delhi have shown a higher prevalence of HTN among those with higher SES.

But, Anand E[108] found a higher prevalence of HTN among those belonging to lower SES.

6. Family history of HTN:(Table 11)

A family history of raised blood pressure is an important risk factor for the future development of HTN in individuals who are a part of the family. There are studies which have suggested that at least 20% of essential HTN is inherited and remaining may be acquired or environmental.

In our study, 38.7% of the hypertensives had a family history of HTN which is comparable to the results obtained by Jogdand KS[96] in rural Andhra Pradesh.

Studies done by Bharati DR[39] in rural Pondicherry and Gupta S[109] in rural Haryana have shown that lesser number of hypertensives had a family history of HTN.

7. Smoking or tobacco consumption:(Table 9)

Nicotine and carbon mono-oxide are potent vasoconstrictors produced as a result of tobacco combustion which have been reported to cause an acute rise in blood pressure. There is absolutely no tolerance to their pressor effect even though some tolerance may be developed to many of their effects.[2] Several Indian studies have shown a significant correlation of tobacco usage in any form with HTN prevalence. In our study, 6.5% of the subjects with a history of tobacco usage in any form had HTN which is comparable to the rates found by Pooja[40]in rural Uttarakhand and Kadu AV[110] in central Maharashtra.

Kokiwar PR[37] and Choudhury SA[45] in their studies conducted in rural Central India and rural Rajasthan respectively found a higher prevalence of HTN among tobacco users.

8. Alcohol consumption:(Table 10)

Several mechanisms have been considered to be responsible for the relationship of alcohol consumption with HTN. They include a direct pressor effect of alcohol on the vessel wall, a sensitization of resistance vessels to alcohol, stimulation of the sympathetic nervous system, and an increased production of adrenocorticoid hormones[2,111]. In the present study, 6.7% of those who consumed alcohol regularly had HTN which is consistent with the rates observed in rural Delhi[46], rural Uttarakhand[40] and Haryana[112].

Kannan L[34] and Oomen AM[113] have shown a higher prevalence of HTN among alcoholics in rural Tamil Nadu which is in contrast to a study by Kokiwar PR[37] who found a negative association between alcohol intake and HTN.

9. Stress:(Table 7& fig.3)

Throughout our lifetime, we all face challenges and adjustments in response to life experiences such as coping with losses and change, establishing meaningful roles, exercising independence and control, and finding meaning in life.It is difficult to define stress and even more difficult to measure it. Acute stressful stimuli are known to elevate blood pressure, lead to an increase in the circulating levels of catecholamines, vasopressin, endorphins, and aldosterone and a reduction in the urinary sodium excretion. Therefore it has been speculated that in the long run, stress might have a crucial role in the development and maintenance of HTN.

In our study, aging stress (80.6%) and stress due to health issues (41.9%) were significantly associated with HTN which is similar to the findings of a study done in North India by Ahmad S[114].

Anand E (38.4%) observed a lower prevalence of HTN among the stressed in his study[108].

10. Extra salt intake:(Table 13)

Salt plays an important role in the auto-regulation of the water and fluid balance in the body. Excess dietary intake of sodium is a burden on the kidneys as they have to excrete the extra amount of salt administered. Also, cardiovascular system is one of the most vulnerable to the adverse effects of excessive dietary salt intake. Over the years, it has been found to be directly related to the occurrence of high blood pressure.

In our study, it has been observed that extra salt intake has a significant association with hypertension ($p<0.05$). Only 5.1% of those who were consuming extra salt in the form of pickle, papad, etc had HTN which is lower than the rates observed by Basu G[107] in a village of West Bengal and Subhasinghe AK[115] in lower middle income countries.

In contrast a study done by Rani R[116] showed that extra salt had no causal relationship with hypertension in Jammu.

11. Extra fat intake: (Table 14)

Our study did not show any causal relationship between hypertension and extra fat intake ($p>0.05$). Also, it was observed that the prevalence of pre-hypertension was higher (11.4%) among those who consumed extra fat regularly than that of hypertension (3.2%).

Agrawal VK[32] and BasuG[107]observed a significant association between extra fat intake and hypertension in rural Pune and West Bengal respectively.

12. BMI:(Table 15 & 16, fig. 4 &5)

In our study, hypertension was significantly associated with BMI ($p<0.05$). 25.8% of the hypertensives were found to be overweight which is similar to the findings of Anand E[108], Gupta S[112], and Bharati DR[39] in rural India. 38.7% hypertensives and 55.2% pre-hypertensives had central obesity in this study which is comparable to the rates observed by Bharati DR[39].

In several studies, overweight is associated with atleast a two-fold increase in the risk of developing HTN. According to the Framingham study[2], for every 10% increase in weight the systolic blood pressure rose by 6.5 mmHg.

In the present study, stress and reduced physical activity might have predisposed to the development of high BMI which cause hemodynamic and metabolic changes in the body that contribute to the development of HTN.

SUMMARY:

Hypertension is a major public health problem due to its increasing prevalence and association with cardiovascular and overall morbidity and mortality. This study was carried out among 670 adults (20-60 years of age) residing in Ukkali village of Vijayapur District, Karnataka to study the prevalence of hypertension and also to determine the socio-demographic, economic and other factors influencing hypertension among them.

- The overall prevalence of hypertension among the subjects was 4.6%. Of them, 90.3% were known cases and 9.7% newly diagnosed. 80.6% hypertensives reported adherence to treatment.
- A positive association was found between age and hypertension.
- The prevalence of hypertension was maximum (65%) in the fourth decade of life and thereafter. However, pre-hypertension was highest among subjects in the 21-30 years age group.
- The prevalence of hypertension among femaleswas 6.9% as compared to males 1.1%.. But pre-hypertension was more among the males (17.6%).
- Based on occupation, the prevalence of HTN was found to be highest among unskilled workers.
- The prevalence of hypertension was highest among illiterates (51.6%) as compared to the literates (48.4%) and level of education was significantly associated with HTN ($p<0.05$).
- Maximum percentage of hypertensive subjects (64.5%) belonged to the income group of Rs. 1883 – 3138 per capita per month.

- Stress due to aging (80.6%) and stress due to health status (41.9%) were significantly associated ($p<0.05$) with HTN.
- 38.7% of the hypertensives gave a family history of hypertension which was significant ($p<0.05$).
- 6.5% of the subjects with a history of tobacco usage and 6.7% who consumed alcohol regularly had HTN.
- It was observed that extra salt intake has a significant association with hypertension ($p<0.05$).
- 3.2% of the hypertensives were consuming extra fat in the form of extra ghee, oil, or butter.
- A positive association was found between hypertension and BMI ($p<0.05$). 25.8% of the hypertensives were found to be overweight.
- 38.7% hypertensives and 55.2% pre-hypertensives had central obesity.
- The mean systolic blood pressure among those with HTN was 143.8±3.4 and was 129.5±3.3 among those with pre-hypertension and difference was statistically significant ($p<0.05$).

CONCLUSION:

Based on our study findings, it can be concluded that hypertension is more prevalent in the adults in their fourth decade of life in rural India. The non-modifiable risk factors like age, gender, family history appear to greatly influence the prevalence of hypertension along with the modifiable ones like dietary practices (extra salt and fat consumption), sedentary lifestyle and habits like tobacco use and alcohol consumption, and stress in all walks of life resulting due to changes in lifestyle. Therefore, rather than plainly avoiding the risk factors, it is necessary to create awareness about hypertension and its complications by health education programmes for lifestyle modification to decrease the risk of hypertension in the community.

RECOMMENDATIONS:

Health education of the community will be a cornerstone for successful detection, evaluation, and treatment of hypertension.

- ✓ NCD screening camps must be conducted on a monthly basis so that blood pressure can be checked and monitored regularly for those aged > 30 years and an annual lipid profile and renal function tests should be made mandatory as per NPCDCS guidelines.
- ✓ Also, the prevalence of pre-hypertension was highest among the 20-30 year olds in our study. Therefore, tracking of blood pressure can be done to identify children and adolescents at risk of developing hypertension at a later date.
- ✓ Health education should mainly focus on dietary restriction of salt and fat intake, cessation of tobacco usage and alcohol intake, increase physical activity and weight reduction.
- ✓ Reducing stress by addressing their spiritual dimension by way of transcendental relaxation techniques like yoga, meditation and other recreational activities which support the integration of body, mind and spirit.
- ✓ Multidisciplinary research is warranted for developing cost-effective programmes for primordial prevention of hypertension which should focus on general population as well as those at risk of developing hypertension.

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ANNEXURE – I

PROFORMA:

Serial No:

Date:

A. Socio-demographic profile:

1. Name:
2. Age: yrs 1)20-30yrs 2)31-40yrs 3)41-50yrs 4)51-60yrs
3. Sex: 1)Male 2)Female
4. Address:

5. Religion: 1)Hindu 2)Muslim 3)Christian 4)Others (specify)

6. Marital status: 1)Single 2)Married 3)Widow 4)Separate 5)Divorced

7. Education: 1)Illiterate 2)Primary 3)Secondary & higher 4)Graduate 5) Postgraduate

8. a. Occupation: 1)Professional 2)Skilled 3) Semiskilled 4)Unskilled 5) Unemployed

   b. Stress: i) Stress due to aging 1) Yes 2) No
   ii) Stress due to finances 1) Yes 2) No
   iii) Job stress 1) Yes 2) No
   iv) Stress due to marital status 1) Yes 2) No
   v) Stress due to family 1) Yes 2) No
   vi) Stress due to social status 1) Yes 2) No
   vii) Stress due to health status 1) Yes 2) No
   viii) Others (any major stress in life) 1) Yes 2) No

9. Type of family: 1) Nuclear 2) Joint 3) Others

10. No. of members in the family: 1) Adults: 2) Children:

11. a) Monthly income of respondent:
    b) Total income of family:
    c) Per capita income:

12. Socioeconomic class: 1)I 2)II 3)III 4)IV 5)V

B. Personal History:

13. Any present or past h/o habits: 1) Yes 2) No

14. Present h/o habits: 1) Yes 2) No(Go to Q15)

If Yes,

Habits	**Type**	**Amount**	**Frequency**	**Duration**
a) Alcohol				
b) Smoking				
c) Tobacco chewing				
d) Any other (drugs, etc.)				

15. Past h/o habits: 1)Yes 2)No

If Yes,

Habits	**Type**	**Amount**	**Frequency**	**Duration**
a) Alcohol				
b) Smoking				
c) Tobacco chewing				
d) Any other (drugs, etc.)				

16. Taking any long term medications: 1) Yes 2) No

17. Physical activity:
Doing regular exercises- 1) Yes 2) No

i. If yes, type- 1) Cycling 2) Walking 3) Running 4) Swimming 5) Playing 6) Others(specify)

C. Family history:

18. History of hypertension in the family: 1) Yes 2) No

Sl. No.	Relative	Yes/No	Duration
a.	Father		
b.	Mother		
c.	Both		

19. Any other health problem (specify)

D. History of illness

20. Whether person is a known hypertensive? 1) Yes 2) No

i. If yes, taking regular treatment? 1) Yes 2) No

ii. If yes, what type of treatment is being taken? 1) Allopathic 2) Ayurvedic

3) Herbal or traditional remedies 4) Any other

iii. Associated diseases / conditions: 1) Diabetes 2) UTI

3) Others (specify)

E. Dietary history:

21. Food habits: 1)Vegetarian 2) Non-vegetarian
22. Amount of salt intake/day …..grams or monthly salt consumption - …..
23. Extra salt intake-
    i. Do you regularly consume pickle/papad or any other food preparation containing high salt content? 1) Yes 2) No
    ii. Do you regularly add extra table salt to your dishes on dining table? 1) Yes 2)No
24. Extra fat intake-
    i. Do you regularly add visible fat like ghee/butter to chapatti and/or any food preparation on dining table? 1) Yes 2) No
25. Per day consumption of
    i) Salt:
    ii) Oil: Type: Refined/non refined
    iii) Ghee:
26. Do you regularly consume groundnut chutney? 1) Yes 2) No

F. General Examination:

a. Height: cm

b. Weight: kg

c. Waist circumference: cm

d. Pulse rate: /min

e. BP recording:

1st reading: mm of Hg
2nd reading: mm of Hg
Average: mm of Hg

ANNEXURE II

ANNEXURE – III

INFORMED CONSENT FORM

B. L. D. E UniversityShri B.M. Patil Medical College, Hospital And Research Centre, Vijayapura

Department Of Community Medicine

CONSENT FORM

Title of the Project

A Socio-epidemiological study of Hypertension and its Associated Risk Factors among Adults (20-60years) in Rural field practice area of ShriB. M. Patil Medical College Hospital & Research Centre, Vijayapur, Karnataka.

PG Student: Dr. KritiBhat K

Guide: Dr.M. C. Yadavannavar

PURPOSE OF RESEARCH:

I have been informed that this study will help to know the prevalence of hypertension and its associated risk factors among adults (20-60 years) in rural areas of Vijayapur district. The study is intended to interview the adults in the rural areas of Vijayapur district.

PROCEDURE:

I understand that this is a field based programme. In this procedure I will be asked a series ofquestions by the researcher regarding the topic.

RISK AND DISCOMFORTS:

I understand that I may experience some discomfort during this procedure. The procedures of this study are not expected to exaggerate these feelings which are associated with the usual course of study.

BENEFITS:

I understand that my participation in the study as one of the study subjects will help the researcher to analyse the presence of hypertension & its risk factors in rural areas of Vijayapur district.

CONFIDENTIALITY:

Your answers are kept secret. Your name and contact information will never be identified to anyone outside the study.

REQUEST FOR MORE INFORMATION:

I understand that I may ask more questions about the study at any time to Dr. KritiBhat K. at the department of community medicine to answer my questions or concerns. I understand that I will be informed of any significant new findings discovered during the course of the study, which might influence my continued participation. A copy of this consent form will be given to me to keep for careful reading.

REFUSAL OR WITHDRAWAL OF PARTICIPATION:

I understand that my participation is voluntary and that I may refuse to participate or may withdraw consent and discontinue participation in the study at any time without prejudice. I also understand that Dr. KritiBhat K. may terminate my participation in the study at any time after she has explained the reasons for doing so.

STUDY SUBJECT CONSENT STATEMENT:

I confirm that Dr. KritiBhatK. has explained to me the purpose of research, the study procedure that I will undergo & the possible discomfort as well as benefits that I may experience in my own language. I have been explained all the above in detail in my language and understand the same.

Therefore, I agree to give consent to participate as a subject in this research project.

_____ _____

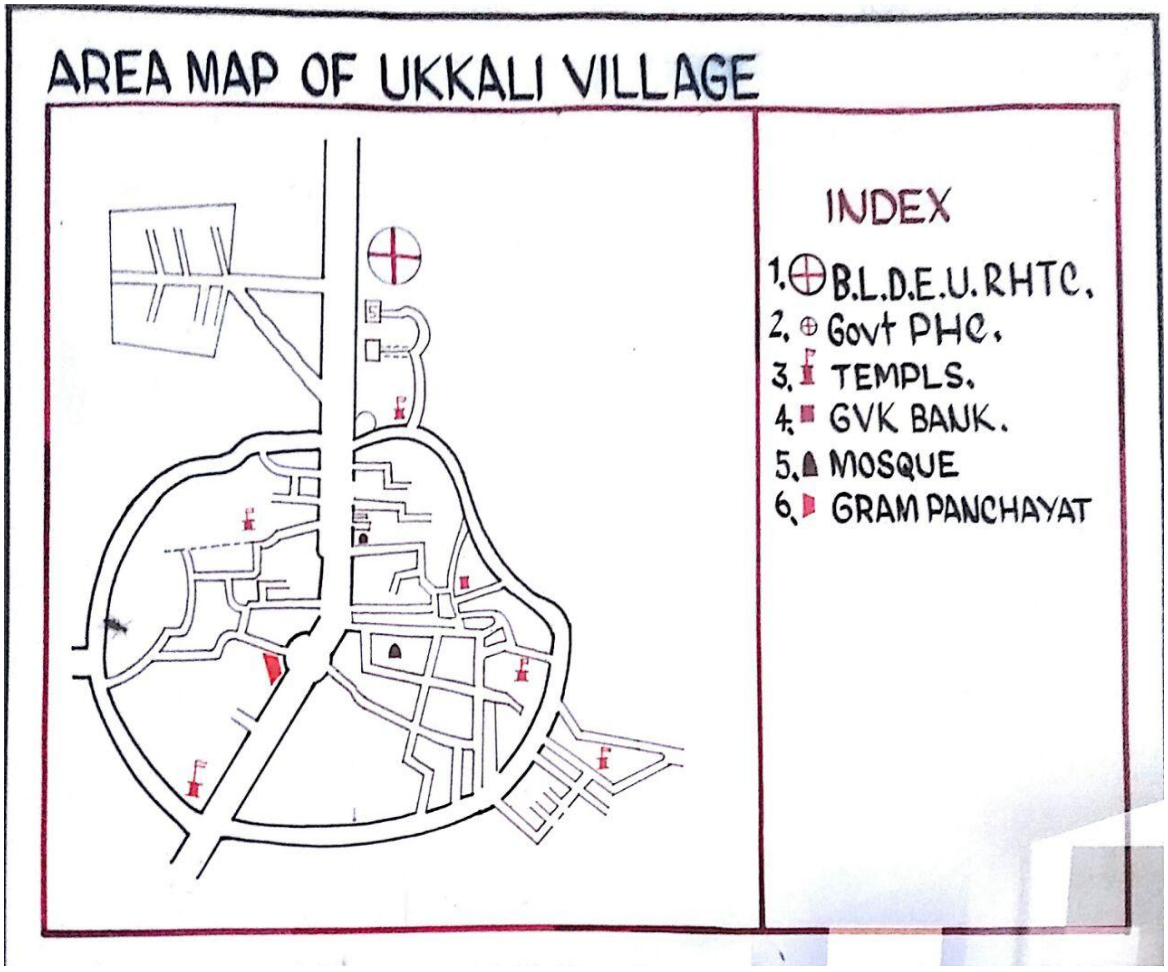
(Participant signature) Date

_____ _____

(Witness signature) Date

ANNEXURE – IV

MAP OF RURAL FIELD PRACTICE AREA:



ANNEXURE – V

GANTT CHART

ANNEXURE – VI

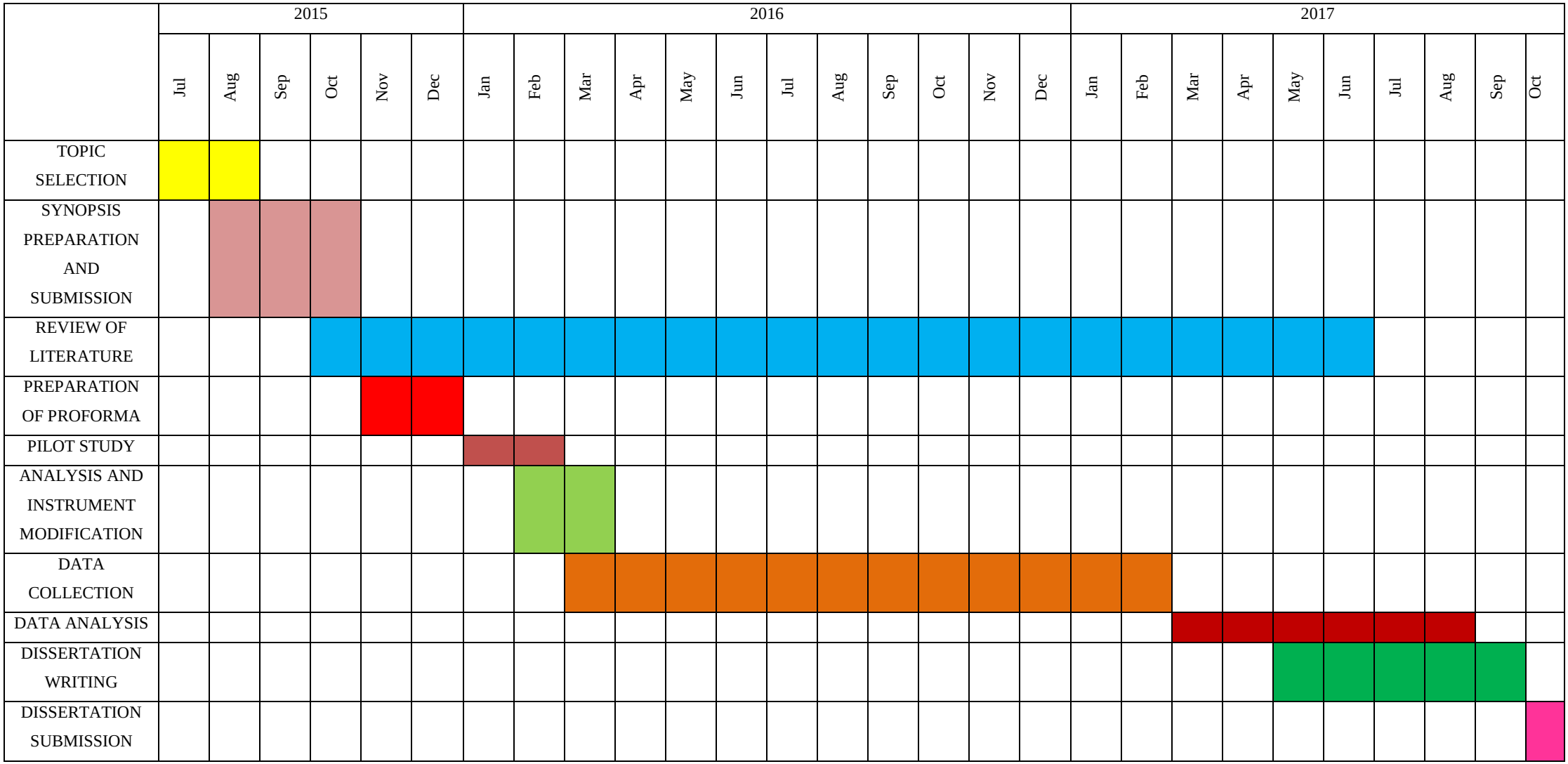
PHOTOGRAPHS

Photo 1: Rural study area – Ukkali village.

Photo 2: Interviewing a subject

Photo 3: Measuring blood pressure of a subject

GANTT CHART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TOPIC SELECTION
SYNOPSIS PREPARATION AND SUBMISSION
REVIEW OF LITERATURE
PREPARATION OF PROFORMA
PILOT STUDY
ANALYSIS AND INSTRUMENT MODIFICATION
DATA COLLECTION
DATA ANALYSIS
DISSERTATION WRITING
DISSERTATION SUBMISSION