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Modifiable risk factors of cardiovascular diseases in adults –a cross sectional descriptive study

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Abstract
Cardio Vascular Diseases (CVD) are one of the major NCDs comprising of a group of diseases of Heart and Vascular system. CHD accounts for nearly 50% of all deaths in the developed world and 25% in developing countries, such as India. The aetiology of CVD is multi-factorial. Most of the Risk factors of CVD are easily modifiable on simple IEC activities(Information, Education and Communication). This Cross Sectional Descriptive study on modifiable risk factors of Cardio Vascular diseases in adults at Kankipadu Village, Krishna district is conducted to estimate the prevalence of risk factors in a rural area of Andhra Pradesh. Prevalence of various risk factors in this study are systolic hypertension 16.42%, diastolic hyper tension 9.14%, over weight and obesity 19%, smoking habit 21.14%, alcohol consumption 18.86%, physical inactivity 45%.

Keywords: High blood pressure, Obesity, Smoking, Alcohol consumption, Dietary habits

Introduction
Chronic Non - Communicable Diseases (NCDs) are assuming increasing importance among the adult population in both developed and developing countries. The prevalence of chronic diseases is showing an upward trend in many countries for the following reasons.

1. Life expectancy is increasing in many countries. As a result of this, a large number of people are living up to older age and are at greater risk to chronic diseases of various kinds.
2. The rapidly changing life styles and behavioral patterns of the people (ex: smoking, alcoholism etc.) combined with predicted decrease in the morbidity and mortality from Infectious diseases. The future burden of Non-communicable diseases is likely to be a major emerging Health Challenge for developing countries.

Cardio Vascular Diseases (CVD) are one of the major NCDs comprising of a group of diseases of Heart and Vascular system. The major conditions are Ischemic Heart Disease (IHD), Hypertension, Cerebro Vascular Disease (Stroke), Rheumatic Heart Disease (RHD) and Congenital Heart Disease. In the South East Asia region, cardiovascular diseases cause an estimated 3.6 million deaths or a quarter of all deaths annually. Cardiovascular diseases are killing people at a relatively younger age in the region; 27% of all deaths due to cardiovascular diseases in the region occur before the age of 60 years compared to 16% in the rest of the world.(1)

Studies show that at the beginning of the 20th century, coronary heart disease(CHD) accounted for less than 10% of all deaths worldwide. At the beginning of the 21st century, CHD accounts for nearly 50% of all deaths in the developed world and 25% in developing countries, such as India.(2) Overall prevalence has increased from 2.06% in 1970 to 5% in 2002 in rural area and 1.04% in early 1960 to 13.02% in 2004 in urban area.(3)

Cardiovascular diseases (CVD), comprising coronary heart diseases (CHD)and cerebro-vascular diseases, are currently the leading cause of death globally, accounting for 21.9 per cent of total deaths, and are projected to increase to 26.3 percent by 2030.(4)

It was reported that the mortality from CVD was projected to decline in the developed countries from 1970 to 2015, while it was projected to almost double in the developing countries.(5) For men and women, cardiovascular risk is known to increase with age, smoking, hypertension, blood lipids, glucose levels, and central obesity.(6) Despite that over the lifespan, approximately the same proportion of the female population as the male population dies of complications resulting from CVD. It has been traditionally considered as a middle-aged “male” disease, the consequence has been for long, the exclusion of women from clinical trial and epidemiologic studies, making extensive to women the results obtained for men. In the 1970s, it was suggested that endogenous hormones protect against CVD in women, and that oestrogen deprivation after menopause increased their cardiovascular risk.(7) It was also evident that among the Asian Indian women, postmenopausal women were more susceptible to diabetes and cardiovascular diseases than premenopausal women.(8)

A peculiar cause of concern is the relative early age of CVD Deaths in India. India is at the mid - point of the emerging Epidemic and will face its full impact in the coming years. India can be benefited from the strategy of primary prevention.

The present morbidity and mortality rates are the consequence of previous exposure to behavioural risk factors such as inappropriate Nutrition, Insufficient physical activity and increased Tobacco consumption. It is called the "lag-time" effect of risk factors for CVD. Over weight, central obesity, High Blood pressure, Dyslipidaemia, Diabetes and low cardio – Respiratory fitness are among the Biological factors contributing principally to increased risk.

It is now well established fact that a persistently high cholesterol level can almost certainly precipitate a cardiac event such as IHD. Still most people do not have an idea of Nutritional requirements and a balanced diet. Unhealthy dietary practices include a high consumption of saturated fats, salts, and refined carbohydrates, as well as low consumption of vegetables and fruits and these tend to cluster together.

Coronary Heart Disease (CHD, Syn: Ischemic Heart Disease) has been defined as impairment of Heart function due to inadequate blood flow to the heart compared to its needs caused by obstructive changes in the coronary circulation to the Heart.(9)

In view of the above reasons, a Cross Sectional Descriptive Study of Modifiable Risk factors of Cardio Vascular diseases in adults at Kankipadu Village, Krishna district was conducted to estimate the prevalence of risk factors in a rural area of Andhra Pradesh.

Aims & Objectives

1. To estimate the prevalence of selected modifiable risk factors of cardiovascular diseases.
2. To find out any significant Association between selected demographic variables and risk factors.
3. To find out any significant Association between selected risk factors with other risk factors.

Materials and Methods

This study was a cross sectional descriptive study on the modifiable risk factors of cardio vascular diseases in adults of aged about 30 years and above of both sexes at Kankipadu Village, Krishna district in the period between January 2012 and August 2013. The required sample size of 700 individuals was selected using systematic random sampling technique. Both Descriptive and Inferential Statistics were used to analyze the data.

Inclusion Criteria:

1. Men and Women aged above 30 years.
2. Adults who can understand Telugu and reside at Kankipadu village.
3. Adults who are present at the time of study.
4. Adults who are willing to participate in the study.

Exclusion Criteria:

1. Adults who were previously diagnosed as Hypertensive and are on treatment.
2. Adults who are ill and are on treatment for other Ailments.
3. Antenatal and postnatal mothers.
4. Visitors or Guests who are not normally residing in Kankipadu Area.

Sample Size

Formula: n = zα2 * pq / d2

Where, n is the required sample size, Z α is the standard normal deviate, which is equal to 2 at 95% confidence interval. p is the prevalence in the population of the factor under study.

q = 100-p, d = allowable error

Different sample sizes can be calculated based upon different prevalence level of different risk factors. Here the sample size was arrived with the prevalence of major CVD Risk factor hypertension 20%, as reported in a study conducted by ICMR(Indian Council of Medical Research) and WHO in India. (Surveillance of Risk factors for non communicable diseases. The WHO STEP wise approach).

p = 20%, q = 80%, d = Allowable error, n = number of samples is to be studied

Allowed Error (limit of accuracy) = 15% of prevalence is allowed to calculate the value of `d'.

d = 15% of 20% =3%

So,

n = zα2 * pq / d2

= (1.96)2 * 20*80 / (3)2 =682

Study Method: The required sample size of 700 individuals was selected using systematic random sampling technique. Kankipadu village consists of a population of 13026 people residing in approximately 3210 houses. In Andhra Pradesh, People aged 30 years and above constitute around 50% of the population 89. This means that in Kankipadu village there are 6513 people aged 30 years and above. These 6513 adults are residing in 3210 houses, which gives approximately 2 individuals aged 30 years and above in each house. So to get the required sample size of 700 people in Village the investigator had to survey approximately 350 houses.

These 350 houses out of the total 3210 houses were selected using systematic random sampling; where in the sampling unit is a house.

The sampling interval is = n/N

Where, n = sample size = 350

N= population size =3210

Sampling interval = n/N

=350/3210

= 1/9

In systematic random sampling, the denominator of the sampling interval is considered. The voter’s list for Kankipadu village was obtained from the President of the village at the Gram Panchayati office. Next a random number was taken using the currency note method in the field. This was equal to 7. Therefore the first house for the study was taken as the seventh house in the voter’s list. For the selection of the subsequent

houses, the denominator of the sampling fraction is added to the random number, i.e.
7+9 = 16th house in the voter's list was taken as the second house for the study.
16 + 9 = 25th house in the voter's list was taken as the third house for the study
25 + 9 = 34th house in the voter's list was taken as the fourth house for the study and so on.

In this way every 9th house was selected till the investigator reached a total of 700 people. In each of the houses visited by the investigator, maximum two adults aged 30 years and above who were present at that time were included in the study. If any house does not have individuals aged 30 years and above, then the next house is included in the study (10th house).

Classification of Blood Pressure

Category	SBP	DBP
Normal	<129	<85
High Normal	130-139	85-89
Grade-I Hypertension	140-159	90-99
Grade-II Hypertension	160-179	100-109
Grade-III Hypertension	> 180	>110

Classification of Body Mass Index (BMI)

Category	BMI
Underweight	<18.5
Normal	18.51-24.99
Overweight	25.00-29.99
Obese	>30

Results

Table 1: Distribution of study population according to Age and Sex (n = 700)

Age Group	No. of Persons (%)	Male (%)	Females(%)
30-39	345 (49.29)	172(24.57)	173(24.71%)
40-49	174(24.86)	117(16.71)	57(8.14%)
50-59	83(11.86)	56(8%)	27(3.86%)
60-69	48(6.86)	36(5.14%)	12(1.71%)
70-79	38(5.43)	25(3.57%)	13(1.86%)
80-89	12(1.71)	6(0.86%)	6(0.86%)
Total	700	412(58.86%)	288(41.14%)

(Note: Percentage refers to % of Total (n = 700))

Table 1 shows that majority of the study population (49.29%) belonged to the age group of 30 – 39 followed by 40-49 (24.86%) and 50-59 (11.86%). Males constituted 58.86% of the study population and females constitute 41.14% of the study population. Majority of the males (24.57%) and females (24.71%) belonged to the age group 30-39. The mean age of the study population was 42.73 with a standard deviation of 13.64 and standard error of 0.515.

Table 2: Classification of Blood Pressure among the study population (n = 700)

Category	SBP	Frequency(%)	DBP	Frequency(%)
Normal	<129	471(67.29%)	<85	491((70.14%)
High Normal	130-139	114(16.29%)	85-89	145(20.72%)
Grade I Hypertension	140-159	88(12.57%)	90-99	50(7.14%)
Grade II Hypertension	160-179	25(3.57%)	100-109	12(1.71%)
Grade III Hypertension	>180	2(0.29%)	>110	2(0.29%)
Total		700		700

Note: (SBP= Systolic Blood Pressure (mm of Hg))
(DBP = Diastolic Blood Pressure (mm of Hg))

Table 2 shows that 16.42% of the study population has Systolic hypertension of >140 mm of Hg and 9.14% has Diastolic hypertension of > 90 mm of Hg.

Table 2 depicts the classification of blood pressure levels. 83.58% of the population fell in optimal systolic (120 +/- 10 mm of Hg) blood pressure and 90.86% in optimal diastolic (80 +/- mm of Hg) blood pressure, 12.57% of the population fell in Grade I systolic (140 - 159 mm of Hg) hypertension and 7.14% fell in Grade I diastolic (90-99 mmHg) hypertension. 3.57% of population fell in Grade 2 systolic (160 - 179 mmHg) hypertension. 1.71% of population fell in Grade 2 Diastolic (100-109 mm of Hg) hypertension.

Table 3: Classification of Body Mass Index (BMI) among the study population (n = 700)

Category	BMI	Frequency(%)
Underweight	<18.5	65(9.28%)
Normal	18.51-24.99	502(71.72%)
Overweight	25-29.99	98(14%)
Obese	>30	35(5%)

Table 3 shows that 71.12% of the study population has normal BMI. 9.28% of the study population were underweight, 14% were overweight and 5% of the study population were obese.

Table 4: Smoking

1. Habit of Smoking (n=700)	Frequency(%)
Absent	552(78.86%)
Rarely	39(5.57%)
Weekly twice	6(0.86%)
Daily	103(14.71%)
Total	700
2. Type of tobacco used (n=148)	
Filter cigarette	52(35.14%)
Filter less cigarette	41(27.70%)
Beedi	40(27.03%)
Cigar	15(10.14%)
Total	148
3. No. Used per day(n=148)	
1-5	114(77.03%)
6-10	32(21.62%)
11-15	2(1.35%)
Grand total	148

Table 4 shows that 21.14% of the study population had habit of smoking. All the respondents (148) who have the habit of smoking were males.

Among 148 respondents who have the habit of smoking, 103 (69.59%) respondents smoke daily, 52 (35.14%) respondents use filter cigarette, 41(27.70%) respondents use filter less cigarette, 114 (77.03%) respondents smoke 1 to 5 cigarettes per day and 32 (21.62%) respondents smoke 6 to 10 per day.

Table 5: Alcohol Consumption

1. Habit of Alcohol Consumption (n=700)	Frequency(%)
Absent	568(81.14%)
Rarely	95(13.57%)
Monthly once	69(0.86%)
Weekly twice	16(2.29%)
Daily	15(2.14%)
Total	700
2. Type of alcohol (n=132)	
Toddy	24(18.18(%)
Beer	10(7.58%)
Wine	2(1.52%)
Gin/brandy/whisky/vodka	64(48.48%)
Country liquor(arrack)	32(24.24%)
Total	132
3. Amount of alcohol consumed per day(n=132)	
30-90ml	72(54.55%)
120-180ml	32(24.24%)
210-270ml	14(10.61%)
300-360ml	14(10.61%)
Total	132

Table 5 shows the habit of alcohol consumption among the study population. 18.86% of the study population has the habit of alcohol consumption. All the respondents (132) who have the habit of alcohol consumption are males. Among 132 respondents who have the habit of alcohol consumption, 64(48.48%) respondents use Gin/ Brandy/ Whisky/ vodka.32 (24.24%) respondents use country liquor. 72 (54.55%) respondents consume 30-90 ml of alcohol per day, 32(24.24%) respondents consume 120-180 ml of alcohol per day.

Table 6: Physical in Activity

1. Household activity per day (hrs)	Frequency (%)
10hrs	116(16.57%)
6-9 hrs	133(19.00%)
2-5 hrs	33(5.43%)
<2 hrs	225(32.14%)
Never do	188(26.86%)
Total	700
2. Rest including nap per day (hrs)	
<5hrs	46(6.57%)
6-8hrs	556(79.43%)
9-11hrs	59(8.43%)
12-14hrs	35(5.00%)
>15hrs	4(0.57%)
Total	700
3. External activities per day(Hrs)	
10hrs	289(41.29%)
6-9 hrs	92(13.14%)
2-5 hrs	29(4.14%)
<2 hrs	118(16.86%)
Never do	172(24.57%)
Total	700
4. Exercises if any	
Going to gym	4(0.57%)
Swimming	4(0.57%)
Cycling	29(4.14%)
Walking/runniny	348(49.71%)
Never do	315(45.00%)
Total	700
5. Exercise per Day (hrs)(n=385)	

>2	12(3.12%)
1.6-2hrs	2(0.52%)
1-1.5hrs	2(0.52%)
30 min -1hr	164(42.60%)
<30min	205(53.25%)
Total	385

Table 6 shows the percentage distribution of prevalence of the modifiable risk factors associated with physical activity. Considering household activities, 32.14% perform less than 2 hours daily and 26.86% are non engaged. 16.57% do more than 10 hours of household activities daily. 24.57% of the population never do external activities, while 41.29% perform more than 10 hours. 79.43% take rest for 6-8hrs per day including nap. 49.71% of the population walks fast or run as exercise and 45% never exercise apart from their daily activities. Among those who do exercises, 53.25% do exercise for less than 30 minutes per day and 42.6 % do for 30 minutes to 1 hour per day.

Dietary Patterns: 90.57% of the population were non - vegetarians, among them 72.56% consume once per week and 1.26% takes daily. 36.86% use refined sunflower oil for cooking where as 31.71% use groundnut oil. 60.57% has Percapita oil consumption of less than 20 ml per day and 5.71% has Percapita oil consumption of more than 35 ml per day. 64.14% has Percapita salt consumption of less than 5grams per day and 4.86% has Percapita salt consumption of more than 20 grams per day. 8.71% consume fried foods daily. 18.43% of the population consume pickles daily and 23% consume rarely. 38.71% of the population eat papad twice a week, 2.29% consume papad daily.

Table 7: Frequency distribution of the levels of risk for various modifiable risk factors among adults

Risk Factors	Low Risk(<50%)	Moderate Risk(51-75%)	High Risk(>75%)
	Frequency (%)	**Frequency (%)**	**Frequency (%)**
Smoking	618(88.29%)	82(11.71%)	0(0%)
Alcohol	627(89.57%)	73(10.43%)	0(0%)
Physical inactivity	111(15.86%)	532(76%)	57(8.14%)
Diet	206(29.43%)	488(69.71%)	6(0.86%)
Cumulative risk	545(77.85%)	155(22.15%)	0(0%)

Table 7 elicits the score obtained by the clients for the modifiable risk factors. In view of diet, 29.43% were under low risk, 69.71% were at moderate risk and 0.86% at high risk. Regarding physical inactivity, 15.86% had low risk and 8.14% were at high risk. It was found that that in smoking 88.29% were at low risk, and 11.71% were under high risk. Studying the alcohol intake pattern, 89.57% were under low risk and 10.43% were found to fall under moderate risk category. The overall cumulative risk (smoking+alcohol+physical inactivity+ diet) findings revealed that 77.85% were found under low risk and 22.15% were at moderate risk of developing CVD.

Association between Age and Risk factors: Statistically significant association was found between < 40 age group and >40 age group with respect to the following risk factors. The difference between the two groups was found to be statistically significant.

Table 8

Risk factor or variable	<40 year age group	>40 year age group	P value
SBP of >140 mm of Hg	8.17%	25.52%	<0.05
DBP of > 90 mm of Hg	4.08%	14.71%	<0.05
Filter cigarette usage among males	54.54%	19.31%	<0.05
Gin/brandy/whisky/vodka usage among males	60%	38.8%	<0.05

Statistically Non- significant association was found between < 40 age group and> 40 age group with respect to the following risk factors. The difference between the two groups was found to be statistically Non-significant.

Table 9

Risk factor or variable	<40 year age group	>40 year age group	P value
History of smoking in males	35.48%	65.42%	>0.05
History of alcoholism in males	32.25%	31.85%	>0.05
Males who smoked >5 cigarettes per day	21.22%	24.4%	>0.05
Male who consumed >90ml of alcohol per day	43.34%	47.23%	>0.05
>2 hours of household activity per day among females	74.59%	71.97%	>0.05
Those who do exercise or physical activity daily	55.31%	54.65%	>0.05
>1hour of exercise or physical activity per day	3.95%	4.4%	>0.05
Percapita oil consumption of >20ml per day	41.42%	37.24%	>0.05
Percapita salt consumption of >5ml per day	38.7%	32.74%	>0.05
BMI>25	20.17%	17.72%	>0.05

Association between Systolic Blood Pressure and various risk factors: Statistically significant association was found between study population who have Systolic Blood Pressure of <140 mm of Hg and those who have > 140 mm of Hg with respect to the following risk factors. The difference between the two groups was found to be statistically significant.

Table 10

Risk factor or variable	SBP <140 mm of Hg	SBP <140 mm of Hg	P value
BMI >25	13.67%	46.08%	<0.05
History of smoking in males	23.85%	82.35%	<0.05
Filter cigarette usage among males	40.81%	24%	<0.05
History of alcoholism in males	20.18%	77.64%	<0.05
Non vegetarian diet pattern	89.57%	95.65%	<0.05
Percapita oil consumption of >20ml per day	36.23%	55.65%	<0.05
Percapita salt consumption of >5ml per day	32.99%	50.43%	<0.05

Statistically Non significant association was found between study population who have Systolic Blood Pressure of < 140 mm of Hg and those who have > 140 mm of Hg with respect to the following risk factors. The difference between the two groups was found to be statistically Non-significant.

Table 11

Risk factor or variable	SBP <140 mm of Hg	SBP >140 mm of Hg	P value
Males who smoked >5 cigarettes per day	10.2%	48%	>0.05
Those who do exercise or physical activity daily	54.18%	59.13%	>0.05
Use of refined sunflower oil	37.43%	33.91%	>0.05

Association between Diastolic Blood Pressure and various risk factors: Statistically significant association was found between study population who have Diastolic Blood Pressure of < 90 mm of Hg and those who have > 90 mm of Hg with respect to the following risk factors. The difference between the two groups was found to be statistically significant.

Table 12

Risk factor or variable	DBP <90 mm of Hg	DBP >90 mm of Hg	P value
BMI >25	16.98%	39.06%	<0.05
History of smoking in males	32.98%	77.77%	<0.05
Males who smoked >5 cigarettes per day	0.01%	66%	<0.05
History of alcoholism in males	28.83%	77.7%	<0.05

Statistically Non- significant association was found between study population who have Diastolic Blood Pressure of < 90 mm of Hg and those who have > 90 mm of Hg with respect to the following risk factors. The difference between the two groups was found to be statistically Non-significant.

Table 13

Risk factor or variable	DBP <90 mm of Hg	DBP >90 mm of Hg	P value
Filter cigarette usage among males	36.22%	28.57%	>0.05
Those who do exercise or physical activity daily	55.5%	50%	>0.05
Non vegetarian diet pattern	90.73%	89.09%	>0.05
Use of refined sunflower oil	37.89%	26.56%	>0.05
Per capita oil consumption of >20ml per day	38.37%	50%	>0.05
Per capita salt consumption of >5ml per day	34.75%	46.88%	>0.05

Association between Body Mass Index and various risk factors: Statistically significant association was found between study population who have Body Mass Index of < 25 and those who have > 25 with respect to history of alcoholism in males only. 25.64% of males with BMI < 25 and 66.15% of males with BMI > 25 have habit of alcohol consumption. The difference was found to be statistically significant.

Statistically Non- significant association was found between study population who have Body Mass Index of < 25 and those who have > 25 with respect to the following risk factors. The difference between the two groups was found to be statistically Non-significant.

Table 14

Risk factors or variable	BMI<25	BMI<25	P value
Those who do exercise or physical activity daily	55.02%	54.88%	>0.05
Non vegetarian diet pattern	90.3%	91.73%	>0.05
Percapita oil consumption of >20ml per day	37.92%	45.87%	>0.05

Association between History of smoking among males and selected risk factors: Among males, history of alcoholism is seen in 75.67% of respondents who smoke and in 7.57% of respondents who does not smoke. The difference was found to be statistically significant.

Discussion

Hypertension: Analysis of the collected Data in table 2 depicts 83.58% of the population fell in optimal systolic (120+/- 10 mm Hg) blood pressure and 90.86% in optimal diastolic (80 +/- 10 mm Hg) blood pressure, 12.57% of the population fell in Grade I systolic (140 - 159 mm Hg) hypertension and 7.14% fell in grade I diastolic (90 - 99 mm Hg) hypertension. 3.57% of population fell in Grade 2 systolic (160 - 179 mmHg) hypertension. 1.71% of population fell in Grade 2 Diastolic (100-109 mm of Hg) hypertension. 16.42% of the study population has Systolic hypertension of > 140 mm of Hg and 9.14% has Diastolic hypertension of >

90 mm of Hg. Systolic blood pressure reading showed a mean score of 121.4 with a standard deviation of 15.17. Diastolic blood pressure results showed a mean score of 80.5 with a standard deviation of 10.43. Systolic hypertension of > 140 mm of Hg and Diastolic hypertension of > 90mm of Hg was seen more commonly in > 40 age group than < 40 age group. This difference was statistically significant. Males have Systolic hypertension of > 140 mm of Hg more commonly than females (20.63% and 10.41% respectively) and the difference was statistically significant. Similarly females have Diastolic hypertension of > 90 mm of Hg more commonly than males (12.84% and 6.55% respectively) and the difference was statistically significant.

A cross sectional study conducted by Joshi SV and co-workers in Mumbai, shown that, the prevalence of hypertension was 7.77% with higher prevalence in females (10.57%) compared to males (6.13%). Prevalence was similar to the prevalence of Diastolic hypertension in present study which was also more common in females than males.[10] In a study done by Yajnik CS, in rural India in adults above 40 years of age 14% were hypertensive which was similar to the prevalence of Systolic hypertension in our present study.[11] In South India the prevalence has been reported as high as 17.8±1% by Kutty VR in Kerala which was similar to the prevalence of Systolic hypertension in our present study.[12] In a study done by Bharadwaj et al in a rural community, prevalence of Hypertension was found to be 14.8% among males and 15.9% among females.[13] These findings are similar to the prevalence of Systolic hypertension in our present study(16.42%). A cross sectional study conducted by Avadaiammal Vimala et al in Urban Kerala, reported that the prevalence of hypertension was 47%, with stage-1 hypertension (21.6%) was more compared to stage-2 (9.34%). The prevalence in this study was high compared to the prevalence (16.42%) in our present study most probably because of rural urban differences.[14] Analysis of epidemiological studies on hypertension in Western Indian urban and rural cohorts by Rajeev Gupta revealed that the mean systolic BP was 126±15mmHg and the diastolic BP 81±9mmHg which was similar to the findings in our present study.[15] A study conducted by Meenakshi Bhakshi Mehan et al, in Baroda city, among people with age group of 18-65years, revealed that, prevalence of hypertension was 6.6%, and prevalence was more in males (8.9%) compared to females (4.6%).[16] Prevalence in this study is similar to the prevalence of Diastolic hypertension in our present study which is more common in females than males. A cross sectional study conducted by Thankappan et al in Kerala, reported that, hypertension was prevalent in 34.9% of people, and the hypertension prevalence was more in men (36.2%) compared to women (33.6%)[17] Prevalence in this study is more than the prevalence in our present study (16.42%) but Systolic hypertension in our study is more common in males than females which are similar to the above mentioned study.

Obesity: Table 3 shows that 71.12% of the study population has normal BMI. 9.28% of the study population were underweight, 14% were overweight and 5% of the study population were obese. The mean score of BMI was 22.62 with a standard deviation of 3.76. 15.77% males and 23.61% females have BMI of > 25 and the difference was statistically significant. 13.67% of study population who have Systolic Blood Pressure of < 140 mm of Hg and 46.08% of study population who have Systolic Blood Pressure of > 140 mm of Hg were overweight (BMI > 25). The difference was statistically significant. 16.98% of study population who have Diastolic Blood Pressure of < 90 mm of Hg and 39.06% of study population who have Diastolic Blood Pressure of > 90 m of Hg were overweight (BMI > 25). The difference was statistically significant. 15.75% males and 23.61% females are overweight and the difference is statistically significant.

In a study done by Chow et al in a rural area in Andhra Pradesh, the prevalence of Overweight and Obesity was found to be 25% and 4.4% respectively.[18] Prevalence of obesity is similar to the prevalence of obesity in our present study (5%). In as study done by Nawi et al in rural Indonesia, Prevalence of Obesity was found to be 4.8% among males and 12% among females.[19] Prevalence of obesity among males is similar to the prevalence of obesity in our present study (5%). A study conducted by Anand K, Bela Shah and co- workers revealed that, the prevalence of overweight was 16% among men and 21.9% among women.[20] These findings are similar to the findings in our study. In a study done by Yajnik CS, in rural India in adults above 40 years of age the mean BMI was 19.4±2.8kg/m2 in men and 19.7±3.8 in women.[11] Mean BMI in our present study is higher(22.62). The difference is most probably due to dietary patterns and physical inactivity. A study done by Chadha SL, Gopinath N, Shekhavat S in Delhi revealed that 21% urban men, 33% urban women, 10% rural men and 10% rural women were obese.[21] These findings are higher than the findings in our present study (5%) and the difference is most probably due to dietary patterns and lack of physical activity. In a study done in rural India, by Gupta R, Gupta VP, Ahluvalia NS, it was observed that 6% of the population (males 5% and females 6%) had a BMI > 27.[22] In the present study 13% had BMI of >27 and the difference may be due to dietary patterns, environmental factors etc. A cross sectional study conducted by Ranjan Tiwari and co-workers in Gwalior city, reported that prevalence of obesity was 32.7% with 34.4% of males and 31.3% of the females.[23] The prevalence in our present study was low (5%) and this may be due to rural urban difference. A cross sectional study conducted by Meenakshi

Bhakshi Mehan et al, in Baroda city, among people with age group of 18-65years, revealed that, the prevalence of high BMI (overweight and obesity) was 54.5%, and prevalence was more in males (57.1%) compared to females (52.3%).[16] The prevalence of Overweight and Obesity in our present study was 19% and this may be due to rural urban differences, dietary pattern differences and lack of physical activity in urban people

Smoking: Table 4 shows that 21.14% of the study population has habit of smoking. All the respondents (148) who have the habit of smoking are males (35.92% of males). Among males, history of smoking was present in 63.63% of Illiterates and 31.65% of Literates. The difference was found to be statistically significant. Among males, history of smoking was present in 23.85% of respondents who have Systolic blood pressure of <140 mm of Hg and 82.35% of respondents who have Systolic blood pressure of > 140 mm of Hg. The difference was found to be statistically significant. Among males, history of smoking was present in 32.98% of respondents who have Diastolic blood pressure of <90 mm of Hg and 77.77% of respondents who have Diastolic blood pressure of > 90 mm of Hg. The difference was found to be statistically significant.

A study conducted by Meenakshi Bhakshi Mehan et al, in Baroda city, among people with age group of 18-65years, revealed that, total tobacco usage habit, in any form, was 22.3%.[16] This is similar to the prevalence of smoking in our present study(21.14%). A cross sectional study conducted in Chandigharh city by Bharadwaj S, reported that prevalence of current smoking was 17.7%, with 29.9% among males and 5.6% among females.[24] This is similar to the prevalence of smoking in our present study (21.14%).In a study done by Bharadwaj et al in a rural community, prevalence of Smoking was found to be 20.5% among males.[13] This is similar to the prevalence of smoking in our present study (21.14%). In a study done by Nath et al in a urban community, prevalence of Smoking was found to be 18.4%.[25] This is similar to the prevalence of smoking in our present study (21.14%). In a study done by Chow et al in a rural area in Andhra Pradesh, the prevalence of Tobacco usage in any form was found to be 19.9%.[18] This is similar to the prevalence of smoking in our present study (21.14%). A cross sectional study conducted by Thankappan et al in rural Kerala, reported that, Tobacco usage in any form was prevalent in 17.8% of people.[17] This is similar to the prevalence of smoking in our present study (21.14%). A cross sectional study conducted by Sugathan TN et al, in Kerala, reported that 40% of males were current smokers. The prevalence of smoking habit was almost nil in females (0.4%).[26] In our present study 35.92% of males are smokers and smoking habit is not seen in females which is similar to the above study. In a study done by Gupta R et al in Rajasthan Smoking was seen in 58.7% of the population.(females 4.3% and males 42.4%).[27] In our present study smoking was seen in 35.92% of males which is less than that of the above study.

Alcohol Consumption: Table 5 shows the habit of alcohol consumption among the study population. 18.86% of the study population has the habit of alcohol consumption. All the respondents (132) who have the habit of alcohol consumption are males (32.03% of males). Among males, history of alcoholism was present in 65.45% of Illiterates and 26.89% of literates. The difference was found to be statistically significant. A study conducted by Meena, Pradeep Khanna et al in Rohtak city showed that, prevalence of alcohol use was 19.7% in urban males.[28] This is similar to the prevalence in our present study (18.86%).

A cross sectional study conducted by Thankappan et al in Kerala, revealed that, prevalence of alcohol usage was 13.2%; it was 26.5% in men and only 0.1% in women.[16] The overall prevalence and prevalence in men was less than that of the present study (18.86% and 32.03% respectively). A multi-centric study conducted by Bela Shah et al, reported that, ever consumption of alcohol in urban men was ranging from 40-50%.[29] These findings are higher than that of the findings in our present study(32.03%) most probably due to rural urban differences. A cross sectional study conducted in Amritsar, Punjab by Jagjeet Singh et al, reported that prevalence of alcohol consumption in urban population was 25.1%.[30] These findings are higher than that of the findings in our present study (18.86%) most probably due to rural urban differences.

Physical in Activity: Table 6 shows that 49.71% of the population walks fast or run as exercise and 45% never exercise apart from their daily activities. 38.59% of males and 54.16% females never do exercises. Among those who do exercises, 53.25% do exercise for less than 30 minutes per day and 42.6% do for 30 minutes to 1 hour per day.

In a study done by Gupta R Sedentary lifestyle was seen in 33.6% of the population (males 20.3% and females 29.7).[27] This is lower than our present study finding of 45%.In a study done in rural Rajasthan, by Gupta R, Gupta VP, Ahluvalia NS it was observed that only 15% of the males and 19% of the females were physically active.[22] In our study 60.41% males and 45.84% females are physically active. The difference may be due to increased awareness regarding exercises and their importance. In a study done by Amitavbanerjee, Swati Kathri in Pune 48.2% indulge in walking 15.29% indulge in jogging.[31] This is similar to the finding in our present study (49.71%).

Summary and Conclusions

- Almost two thirds of the study population are males and majority of the males(24.57%) and females (24.71%) belong to the age group 30-39.
- Approximately every sixth person of the study population has Systolic hypertension of > 140 mm

of Hg and every tenth person has Diastolic hypertension of > 90 mm of Hg.

- 12.57% of the study population fell in Grade I systolic (140 - 159 mm of Hg) hypertension and 7.14% fell in Grade I diastolic (90-99 mmHg) hypertension. 3.57% of population fell in Grade 2 systolic (160 - 179 mmHg) hypertension. 1.71% of population fell in Grade 2 Diastolic (100-109 mm of Hg) hypertension.
- More than two third of the study population has normal BMI. 9.28% were underweight, 14% were overweight and 5% of the study population were obese.

Risk Profile

Table 15: Prevalence of various risk factors in this study

S. No	Risk Factor	Prevalence
1	Systolic hypertension	16.42%
2	Diastolic hypertension	9.14%
3	Over weight and obesity	19%
4	Smoking habit	21.14%
5	Alcohol consumption	18.86%
6	Physical inactivity	45%
7	Per capita salt consumption of >5 grams per day	35.86%

- Approximately one fifth of the study population has habit of smoking. All the respondents who have the habit of smoking are males.
- Among those who have the habit of smoking, 69.59% smoke daily, 35.14% use filter cigarette, 77.03% respondents smoke 1 to 5 cigarettes per day.
- Habit of alcohol consumption was observed in less than one fifth of the study population. All of them were males.
- Among those who have the habit of alcohol consumption, 48.48% use Gin/ Brand/ Whisky/ vodka, 24.24% use country liquor, 54.55% respondents consume 30-90 ml of alcohol per day, 10.61% consume more than 300 ml of alcohol per day.
- Among females, 8.33% never do any house hold activities and 30.2% do more than 10 hours of household activities per day. Among males, 12.62% never do any external activities and 54.12% do more than 10 hours of external activities per day.
- Nearly half of the study population walks fast or run as exercise and 45% never exercise apart from their daily activities. Among those who do exercises, more than half of them do exercise for less than 30 minutes per day and 42.6% do for 30 minutes to 1 hour per day.
- Majority (90.57%) of the study population were non – vegetarians. About two thirds of the study population use non refined cooking oils. About one third of the study population had per capita oil consumption of more than 20 ml per day and per capita salt consumption of more than 5 grams per day. 8.71% consume fried foods daily. 18.43% of the population consume pickles daily.
- Considering the frequency distribution of the levels of risk for various modifiable risk factors, more than three fourth of study population were found to be under low risk and less than one fourth under moderate risk of developing CVD.

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