International Journal of Pharmaceutical Science Invention
ISSN (Online): 2319 – 6718, ISSN (Print): 2319 – 670X
www.ijpsi.org || Volume 4 Issue 6 || June 2015 || PP. 17-32

A Study of the Prevalence of Cardio-Vascular Diseases and Its Risk Factors (Behavioral, Dietary, Lifestyle and Medical) In the City Of Pune

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ABSTRACT:
BACKGROUND: *Data on Cardio-Vascular Diseases among Urban Indians is sparse and no study has been carried out in the city of Pune. This study is a cross-sectional exploratory study.*

OBJECTIVES: *The objective of this analysis was to estimate the prevalence of CVD and its risk factors in the city of Pune.*

METHODS: *The urban study was a cross-sectional survey among individuals aged 20-60 years, selected by systematic randomization from the district of Pune (3169 women; 3017 men).*

RESULTS: *The analysis conducted here shows a prevalence of cardiovascular diseases as 1.7%, Hypertension at 6.4%, Diabetes as 4.0% and Hyperlipidaemia at 0.4%. It showed that Hypertension and Diabetes have a positive relationship with the socio-economic status and age.*

CONCLUSIONS: *This analysis shows a high burden of adverse risk profile for CVD among all strata of the population. The prevalence of risk factors is especially higher in the higher socio-economic strata.*

I. INTRODUCTION

In the present era, the burden of communicable diseases is reducing and there is an emergence of Non-Communicable disease epidemics. Tropical diseases like malaria, cholera etc are declining where as there is a progressive rise in occurrence of diseases like Diabetes Mellitus, Chronic Obstructive Pulmonary Disease, Cardiovascular Diseases etc. these are diseases with multifaceted aetiology and a varied array of symptoms. They are a result of the cumulative effect of interaction between various risk factors where no apparent direct relationship can be established between one single risk factor and the pathogenesis of the disease. It thus becomes important to identify and investigate the various risk factors responsible for the emergence of the disease. No one risk factor is an isolated entity and its effect on the development of the disease is a result of the interaction of these risk factor with each other.

In India in the past five decades, rates of coronary disease among urban populations have risen from 4 per cent to 11 per cent. In urban China, the death rate from coronary disease rose by 53.4 per cent from 1988 to 1996[2 and 57].

The change in the disease pattern from communicable diseases to non-communicable diseases is blamed to be an aftermath of urbanization. Urbanization is an event that is characterized by continuous alterations in lifestyles of people where in there is a marked increase in the intake of energy dense foods, but a drastic decrease in the levels of physical activity, a heightened level of psychological stress, emergence of other lifestyle diseases, changed eating habits, increased environmental pollutants, increased use of chemicals etc. the effect of these factors is observed on all systems of the body resulting in conditions like Hypertension, Dyslipidaemia, Diabetes Mellitus, Cancers etc.[1]

Among the non-communicable diseases, cardiovascular diseases contribute maximum morbidity of 31% of all non-communicable diseases in the world.[2] In 1990, India contributed 19% of all deaths in the world, 16% of all deaths due to non-communicable diseases and 17% of all deaths due to cardiovascular diseases in the world.[3]

It is estimated that by end of the year 2015 India will have 6.4 crore cases of cardiovascular diseases in comparison to 2.9 crore cases in 2000. Thus a two fold increase in the number of cardiovascular cases is estimated in 15 years[4].

In this study an attempt has been made to estimate the prevalence of cardiovascular diseases and its risk factors (behavioral, lifestyle and dietary) in the city of Pune. Studies with similar objectives have been carried out for different countries across the globe and for some cities as well. This is the first study of its kind in the city of Pune.

Discussion

Prevalence of Cardiovascular Diseases And Its Risk Factors

The word prevalence is derived from a Latin word *prevaelere* which means *widespread in a particular area*. In medical terms *disease prevalence* refers specifically to all current cases (old and new) existing at a given point in time, or over a period of time in a given population. According to *A Dictionary of Epidemiology* prevalence is "the total number of all individuals who have an attribute or disease at a particular time (or during a particular time period) divided by the population at risk of having the attribute or disease at this point in time or midway through the period[9]".

In this study an attempt has been made to identify the Point Prevalence (i.e., number of all current cases, old and new, of a disease at one point in time in relation to a defined population.) of cardiovascular diseases and its risk factors (behavioral, lifestyle and dietary) in the city of Pune in the age group of 20-60 years.

There is a progressive rise in the prevalence of cardiovascular diseases in the face of epidemiological transition. Cardiovascular disease is the world's leading killer, accounting for 16.7 million or 29.2% of total global deaths in 2001[5, 7, and 8]. Of the 16.7 million deaths from CVDs, 7.2 million were due to Ischemic Heart Disease, 5.5 million due to cerebro-vascular disease, and an additional 3.9 million due to hypertension and other heart conditions[46]. It was estimated by WHO that by the end of 2010, India will have 60% of the world's cardiac patients[57 and 58].

The World Health Report of 2002 projects CVD to be the largest cause of death and disability in India by 2020. The World Health Report of 2004 states that every year, more women than men die of CVD and that CVD leads to more deaths in women than cancer, HIV/AIDS and malaria combined. CVD is the largest cause of death in women and the risk for CVD rises with age in both males and females[56 and 57].

Among the cardiovascular diseases, ischemic heart disease and stroke are considered to be the two most common causes for death in the world[3]. It is estimated that 80% of the deaths and 85% of morbidity is because of cardiovascular diseases in the low and middle income groups[1, 5, and 6]. Nearly 50 per cent of CVD-related deaths in India occur below the age of 70, compared with just 22 per cent in the West. The Indian subcontinent has 20% of the world's population and is said to have the highest burden of cardiovascular diseases in the world. Some experts have suggested that South Asians by virtue of their ethnicity are at a higher risk of developing cardiovascular diseases in comparison to the populations in the western countries[7, 8].

However, these prior studies had several important limitations[7]:

(i) Few studies focused on the burden of CVD among South Asians living in their own countries;

(ii) There were relatively few clinical events to reliably compare the contributions of various risk factors on the presence of CVD;

(iii) Data were collected on the presence or absence of certain risk factors, and not the intensity or pattern of exposure to these risk factors and their relationship to CVD;

(iv) Data on dietary patterns, physical activity, abdominal obesity, alcohol intake, and psychosocial factors were often not collected; and

(v) Data on Dyslipidaemia included only crude lipid measures such as total cholesterol instead of apolipoproteins (ApoA1 and ApoB).

Lancet 2000 study showed that, even after adjusting for all known risk factors; South Asians in Canada appeared to have a higher rate of heart disease than Europeans or Chinese living there. Some doctors blame this vulnerability on the "thrifty-gene" theory, which holds that South Asians adapted over many generations to the region's frequent famines. Now with a very recent overabundance of food, their bodies are having difficulty making a metabolic U-turn and the result is high insulin intolerance, with accompanying raised levels of diabetes and obesity[7].

The unusual susceptibility of South Asians to heart disease can be traced to lifestyle issues, diet, rapid urbanization and possible underlying genetic causes. It is considered that the common denominator is an increasingly sedentary lifestyle. And, similar to the epidemiological transition that took place in North America and Western Europe, India is undergoing a demographic shift in cardiovascular disease from the wealthy to the lower classes.

The thrifty-gene theory however remains hypothetical, as Dr. Salim Yusuf of McMaster University in Canada points out, that the culprit gene itself has yet to be identified in the human DNA. One of the world's foremost epidemiologists of cardiovascular disease, Dr. Yusuf once championed the idea that ethnicity was a significant determinant of heart disease, but his recent research points to the fact that ethnicity is not significantly associated with the development of cardiovascular diseases. It has been postulated that the difference in the prevalence rates of cardiovascular diseases is because of the different lifestyles. Researches suggest that 80% of the risk can be accounted for by known risk factors like smoking or obesity or blood pressure, which leaves very little room for genetic risk factors. The postulation that family history is an important risk factor overlooks the fact that families tend to have similar lifestyles and are exposed to the same environment and thus are exposed to similar risk factors. Studies have shown that when Japanese emigrate from Japan, where their rates of heart disease are very low, and move to the West, those rates quickly rise to the Western norm.

However, South Asians were not alone in coping with centuries of famine, as the Chinese can attest. Thus, it's not as if South Asians have more of a thrifty gene, and Chinese don't. Human beings have evolved across all ethic groups similarly. Thus, no one is considered doomed by uncontrollable factors like genes or family history and controlling the pathogenesis of the disease lies in modifying individual lifestyles.

Cardiovascular disease (CVD) is the leading cause of death in India, [50] and its contribution to mortality is rising; deaths due to CVD are expected to double between 1985–2015.[51, 52, 53] Regular physical activity reduces the risk of obesity, blood lipid abnormalities, hypertension, and non-insulin dependent diabetes mellitus,[53] and has been shown to reduce substantially the risk of coronary heart disease (CHD). Conversely, measures of sedentary lifestyles or physical inactivity have been associated with a 1.5- to 2.4-fold elevation in CHD risk.[51, 53]

Ischemic heart disease and stroke are the two most common causes of death worldwide1. Over 80 per cent of deaths and 85 per cent of disability from cardiovascular disease (CVD) occur in low- and middle-income countries[5,6].

The major CVDs include:

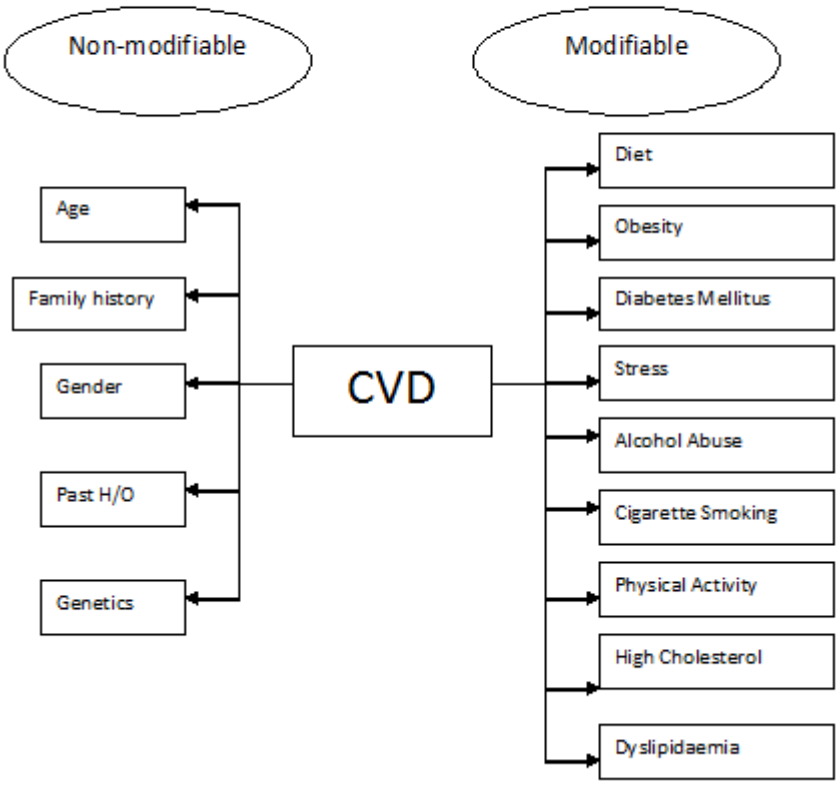
- Coronary (or ischemic) heart disease (heart attack)
- Cerebro-vascular disease (stroke)
- Hypertension (high blood pressure)
- Heart failure
- Rheumatic heart disease

Of the 16.7 million deaths from CVDs every year, 7.2 million are due to ischemic heart disease, 5.5 million to cerebro-vascular disease, and an additional 3.9 million to hypertensive and other heart conditions

CVD affects people in their mid-life years, undermining the socioeconomic development, not only of affected individuals, but families and nations. Lower socioeconomic groups generally have a greater prevalence of risk factors, diseases and mortality in developed countries, and a similar pattern is emerging as the CVD epidemic matures in developing countries.

The rise in CVDs reflects a significant change in diet habits, physical activity levels, and tobacco consumption worldwide as a result of industrialization, urbanization, economic development and food market globalization. People are consuming a more energy-dense, nutrient-poor diet and are less physically active. Imbalanced nutrition, reduced physical activity and increased tobacco consumption are the key lifestyle factors. High blood pressure, high blood cholesterol, overweight and obesity - and the chronic disease of type 2 diabetes - are among the major biological risk factors. Unhealthy dietary practices include the high consumption of saturated fats, salt and refined carbohydrates, as well as low consumption of fruit and vegetables. These risk factors tend to cluster.

2.3) Risk Factors of CVD



In this study an attempt has been made to identify the prevalence of Age, Gender, Family History, Diet, Diabetes, Hypertension, Hyperlipidaemia, Alcohol Consumption, Cigarette Smoking and Sedentary Lifestyle as risk factors in the city of Pune. Most of these factors are modifiable and hence the pathogenesis of cardiovascular diseases can be controlled to some extent.

The major risk factors responsible for the development of cardiovascular diseases are cited to be high blood cholesterol, high blood pressure, smoking, diabetes besides a poor diet and being overweight. There is no conclusive evidence towards the same but a significant relationship is seen. High blood cholesterol levels, smoking and diabetes are said to enhance the process of Atherogenesis and thus increase the risk of CVD.

Some other risk factors apart from the above have also been identified. A large body of epidemiologic studies has demonstrated a link between certain risk markers and CVD. These can be classified into two categories:

(1) Those that have been proven to be causal (risk factors), and

(2) Those that show associations with CVD but for whom a cause and effect association is yet to be proven (risk markers).

The other factors held responsible are C-reactive protein (CRP), Homocysteine, Fibrinogen, Lipoprotein (a). Researches have not yet established a significant relationship between these factors and CVD.

These biochemical markers are found to be important in the diagnosis of CVD and are seen to have abnormal levels during the pathogenesis of the disease.

Diet as a Risk Factor for Cvd

A higher intake of cholesterol and saturated fat and a low polyunsaturated to saturated fat (P: S) were related to increased CVD risk among women with type 2 diabetes[42]. Among diabetic persons, replacement of saturated fat with monounsaturated fat may be more effective in lowering CVD risk than is replacement with carbohydrates[42]. The ratio of polyunsaturated to saturated fat (P: S) was inversely associated with the risk of fatal CVD[43]. In a study conducted in the year 2001 in Edinburg, it was observed that the Cardiovascular mortality was reduced by 9% and cardiovascular events by 16% when either the total intake of dietary fat was reduced or the intake of saturated fat was reduced or the intake of dietary cholesterol was reduced or a shift from saturated to unsaturated fat was introduced. Trials with at least two years' follow up provided stronger evidence of protection from cardiovascular events (0.76; 0.65 to 0.90)[47.48].

It has been observed that a diet high in saturated fats and Trans fats has deleterious effects on the human body and leads to abnormal levels of fats in the blood which is a potent risk factor for CVD[44, 46]. Saturated fats are found in animal products, which when replaced with unsaturated fats (Olive and canola oils and nuts are sources of monounsaturated oils.[45] Soybean and sunflower oils are sources of polyunsaturated fat[46]) have shown to improve the cardiovascular health[45]. The omega-3 and omega-6 fatty acids are essential fatty acids which cannot be synthesized by the human body and thus must be included in the diet. They are found in oily fish, nuts and seeds and have a beneficial effect on the heart and the cardiovascular system[47]. Saturated fat intake should not exceed 10% of total energy and for high-risk groups, like people with diabetes; total saturated fat intake should be 7% or less of total energy[45].Total fat intake should not be greater than 30% of total calories consumed.[47] It is further seen that use of monounsaturated fats lowers the total cholesterol and low-density lipoprotein (LDL) cholesterol[44].

Although meat, poultry and fish along with dairy products and eggs are considered good sources of protein, they are high in total fat, saturated fat and cholesterol[43]. Skim milk rather than whole milk or skinless chicken breast rather than fried chicken patties have lower fat as compared to meat and poultry[44]. Fish is also a good alternative to high-fat meats[43]. Some types of fish such as cod and tuna have less total fat, saturated fat and cholesterol than meat and poultry whereas certain types of fish like salmon, mackerel and herring a beneficial effect on the heart and cardiovascular system because they are rich in omega-3 fatty acids[42,48].

It has been recommended that Saturated fats should provide less than 10% of the total calories in the diet. The sodium levels in the diet should be 6 grams per day[61]. Cereals should contribute 6 servings per day of which atleast 3 servings should be of whole grains. Some researchers suggest that fruits (>2 servings/day) and vegetables (>3 servings/day) are beneficial for cardiovascular health[60].

American Heart Association, 2006: Diet and Lifestyle Recommendations for Cardiovascular Disease Risk Reduction[49]

• Balance calorie intake and physical activity to achieve or maintain a healthy body weight.
• Consume a diet rich in vegetables and fruits.
• Choose whole-grain, high-fiber foods.
• Consume fish, especially oily fish, at least twice a week.
• Limit intake of saturated fat to 10% of energy, *Trans* fat to 1% of energy, and cholesterol to 300 mg per day by
• Minimize intake of beverages and foods with added sugars.
• Choose and prepare foods with little or no salt.
• Consume alcohol in moderation.

METHODOLOGY

The sampling technique for this study was a systematic sample where-in pre-existing geographical division of Pune made by the Pune Municipal Corporation for electoral purposes was used. Pune is divided into 14 ward offices to ensure equal distribution of population within each ward office. The boundaries of these ward offices are very clearly demarcated.

Each ward office is further divided by PMC into various wards. Each ward is further divided into four sub-wards (north, east, south and west).Within each ward, sample was collected from the 'North' sub-ward only. The investigator was required to reach the northern-most point in the sub-ward. From here, while facing the geographical north, they were to collect the data by moving to their left. Every tenth house was selected as part of the sample and a total of sixteen houses were covered in each sub-ward.

If a house was not residential but a commercial place like hostel, bank, shop etc, then it was not considered for counting, which was continued from the next house onwards. If the selected house was found closed then repeated visits were made to the same place to collect the data.

In case of non-response, replacements were not done and thus while deciding the sample size, 20% margin for non-response was considered.

Initially when the data collection started ten households were covered from each ward. This was raised to sixteen households per ward as there was a calculation error initially.

In two ward offices due to security reasons, data was not collected from some wards. This deficiency of data was compensated by doing an extra nine households in any one of the wards of each ward office. Data was collected from all members of each family.

Sample size was decided on the basis of Dr.Reddy's paper where he has given the prevalence of cardiovascular diseases in urban India to be 8-12%. In our study, the prevalence was thus assumed to be 8% along with an error of 5% and 20% non-response. The prevalence of cardiovascular diseases in this study was identified in people falling in the age group 20-60 years. Thus the total number of individuals from whom the data was collected was 9721(1944 households) considering the population of Pune to be 25 lakhs and 47.32% of the population belonging to the required age group.

The exclusion criteria included all individuals below 20years of age or above 60years of age. The respondent should be mentally sane. There were no other exclusion criteria.

The questionnaire was designed for the family and all the information of one family was recorded in a single questionnaire. It was divided into four broad sub-sections i.e., demographic information, burden of disease, dietary habits and lifestyle determinants. The demographic information included the residential address, contact number, type of residence (slum/non-slum), religion, mother tongue, number of family members and monthly income of the family. For each of the family member, information about their age, relationship with the head of the household, educational qualification and occupation was gathered. Data analysis was done for all this information except for occupation which was not included in the data entry.

Under burden of disease, the health status of all family members was noted alongwith the type of illness and the duration of the illness. Then information was taken about cardiovascular diseases, hypertension, diabetes mellitus alongwith their duration of illness and medication details. The diagnosis of the disease was confirmed by requesting to see the doctor's prescription for it. The family history of cardiovascular diseases, hypertension, stroke and angina pectoris was noted. Also recorded were details about age at diagnosis etc.

Under dietary habits details about frequency of intake of green leafy vegetables, roots and tubers, salads, milk, non-vegetarian foods, amount and type of oil were noted.

Lifestyle determinants included exercise frequency, tobacco intake and alcohol consumption.

The questionnaire was administered by the investigator by a face to face interview where the questionnaire was filled by the investigator. Before the questionnaire was administered, consent was taken from the respondent- written or verbal. In case the consent was not given, it was considered as a non-response. The information about one whole household could be obtained from one single respondent on the behalf of the others. The questions were asked in the language understood by the respondent.

The questionnaire was pre- tested among known people. A total of 30 questionnaires were pre-tested. Later after some editing in the questionnaire, it was again pilot tested in a population not known to the investigator.

The data acquired though the questionnaires was entered in the SPSS spreadsheets prepared by the investigator. The analysis of this data was also done by SPSS by the investigator.

For the purpose of analysis, the ages were grouped into various age brackets. Also the income has been grouped into three brackets instead of the seven income brackets according to which the data was collected.

Results and Discussion

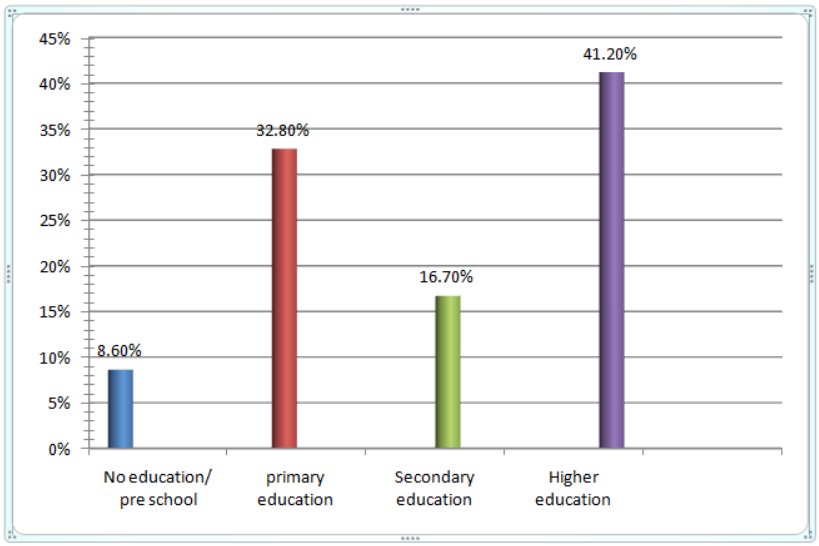
A representative sample of the population residing in Pune was included in the study for the purpose of understanding the prevalence of cardiovascular diseases and its risk factors (behavioral, dietary and lifestyle) belonging to the social strata as defined within the terms of reference of this study.

The analysis of the data collected during the course of the study shows the following significant associations with respect to demography and the various risk factors considered in the study.

4.1) THE DEMOGRAPHIC PROFILE OF THE SAMPLE GROUP

A near equal distribution of both genders across the city of Pune (48.8% males and 51.2% females) residing primarily in Non – slum areas (78.0% of the total population). The sample set shows a distribution of the sample population clustered in the age group interval of 20-29 years at 32.1% and the percentages progressively declined with increasing ages. The distribution of distribution on the basis of the language spoken in the city of Pune 72.4% of the population was Marathi speaking population followed by 7.1% Hindi speaking and 20.5% other languages like Bengali, Sindhi, Telgu etc. The demographic distribution on the basis of monthly income in the city of Pune showed that almost half of the sample population belonged to the income bracket of Rs. 15,000-6000 per month (45.7%). 28.5% of the sample population had a monthly income of less than Rs 6000 and 22.7% had a monthly income of more than Rs. 15,000.

Graph 4.1.1 Distribution of Population based on education

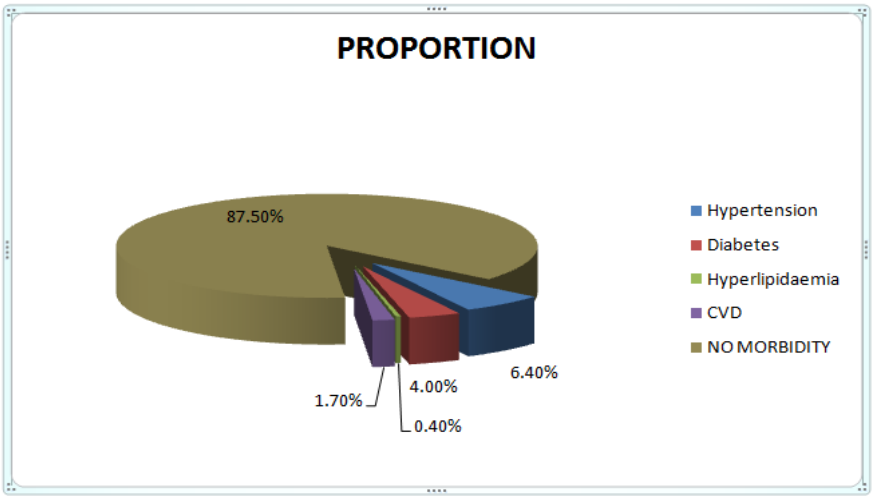


Graph 4.1.1 shows the demographic distribution on the basis of education in the city of Pune. 41.2% of the population had received higher education followed by 32.8% primary educated, 16.7% secondary educated population. 8.6% of the population had not received any formal education. It was observed that more than 80% of the sample population had received some form of formal education.

4.2) BURDEN OF DISEASE IN THE SAMPLE POPULATION

The following is the analysis of the data collected with respect to the health status of the population and prevalence of various diseases in the sample population during the time the survey was carried out. The disease burden in the city of Pune duration the time when the survey was carried out was 4.7% of the total population. Thus 95.3% of the sample population considered in the study was free of any ailments. The diseases considered here were those apart from CVD, diabetes, hypertension and hyperlipidaemia.

Graph 4.2.1 Prevalence of CVD, DM, HTN and Hyperlipidaemia in Sample Population



Graph 4.2.1 depicts the prevalence of various diseases considered as risk factors for the development of cardiovascular diseases. 6.4% of the population was found to be diagnosed with Hypertension, 4.0% with Diabetes Mellitus and 0.4% with Hyperlipidaemia.

The prevalence of cardiovascular diseases in the city of Pune was found to be 1.7%(excluding hypertension).

4.3) PREVALENCE OF HYPERTENSION

The following is the analysis of data with respect to the prevalence of Hypertension in the sample population. The subjects with diagnosed cardiovascular disease have not been included in this analysis. This analysis indicates the prevalence of Hypertension as a risk factor in the population not diagnosed with cardiovascular disease.

Table 4.3.1 Prevalence of Hypertension in various Age Groups

Sr. No	Characteristic (Age group in years)	Proportion
1	20 -29	2.3%
2	30-39	10.1%
3	40-49	24.7%
4	50 -60	60.2%

Table 4.3.1 shows the distribution of hypertensive in the sample population across the various age groups. The prevalence was found to be significantly high in age group 50-60 years with a progressive rise through the various groups of the sample population.

Table 4.3.2 Prevalence of Hypertension According To The Type Of Residence

Sr. No	Characteristic (type of residence)	Proportion
1	Slum	14.2%
2	Non slum	85.8%

Table 4.3.2 shows the prevalence of hypertension in the sample population on the basis of the type of residence the population resided in. the table shows a significantly higher value in the population not residing in slums.

Table 4.3.3 Prevalence of Hypertension in various Income Groups

Sr. No	Characteristic (monthly income)	Proportion
1	>15000	42.9%
2	15000-6000	35.3%
3	<6000	21.7 %

Table 4.3.3 depicts the prevalence of hypertensive in the sample population in various income groups. It was seen that prevalence was highest in the higher economic strata and progressively lower in the lower economic strata.

Table 4.3.4 Prevalence of Hypertension On The Basis Of presence or absence of physical activity

Sr. No	Characteristic	Proportion
1	Presence of physical activity	42.7%
2	Absence of physical activity	57.3%

Table 4.3.4 depicts the distribution of hypertensive in the sample population according to the presence or absence of physical activity. 57.3% of the hypertensive did not involve themselves in any form of regular physical activity.

Table 4.3.5 Prevalence of Hypertension and Use of Tobacco

Sr. No	Characteristic	Proportion
1	No Tobacco use	77.7%
2	Tobacco use present	22.3%

Table 4.3.5 depicts the distribution of hypertensive in the sample population based on the use of Tobacco. It was seen that 77.7% of the Hypertensive did not consume tobacco in any form compared to 22.3% Hypertensive who consumed tobacco in one form or the other.

4.4) PREVALENCE OF DIABETES MELLITUS

The following is the analysis of data with respect to the prevalence of Diabetes Mellitus in the sample population. The subjects with diagnosed cardiovascular disease have not been included in this analysis. This analysis indicates the prevalence of Diabetes Mellitus as a risk factor in the population not diagnosed with cardiovascular disease.

Table 4.4.1 shows the distribution of Diabetics in the sample population among the different age groups. The table depicts the progressive rise in the prevalence with increasing ages, the highest being in the age group 50-60 years at 71.1%.

Table 4.4.2 Prevalence of DM On The Basis Of Type of Residence

Sr. No	Characteristic	Proportion
1	Slum	11.5%
2	Non slum	88.5%

Table 4.4.2 shows the distribution of Diabetics in the sample population on the basis of type of residence they were residing in. It shows that 88.0% of the Diabetic population of the study resided in non slum areas.

Table 4.4.3 Prevalence of DM On The Basis Of presence or absence of Physical Activity

Sr. No	Characteristic	Proportion
1	Presence of physical activity	49.1%
2	Absence of physical activity	50.9%

Table 4.4.3 shows the distribution of Diabetics in the sample population on the basis of presence or absence of physical activity they indulged in. It shows that 50.9% of the Diabetic population of the study did not exercise regularly.

4.5) PREVALENCE OF HYPERLIPIDAEMIA

The following is the analysis of data with respect to the prevalence of Hyperlipidaemia in the sample population. The subjects with diagnosed cardiovascular disease have not been included in this analysis. This analysis indicates the prevalence of Hyperlipidaemia as a risk factor in the population not diagnosed with cardiovascular disease.

Table 4.5.1 Prevalence of Hyperlipidaemia according to various Age Groups

Sr. No	Characteristic	Proportion
1	20 -29	0.0%
2	30-39	5.3%
3	40-49	21.2%
4	50 -60	73.7%

Table 4.5.1shows the distribution of the sample population diagnosed with hyperlipidaemia in various age groups. It was observed that the prevalence was progressively higher among the aged. There was no diagnosed case of hyperlipidaemia in the age group of 20-29 years.

4.6) EXCESSIVE OIL CONSUMPTION

Table 4.6.1 Excess Oil Consumption and the Burden of Diseases

Sr. No	Characteristic	Proportion
1	CVD	64.2%
2	Hypertension	61.0%
3	Diabetes	59.5%
4	Hyperlipidaemia	61.5%

Table 4.6.1 shows the percentages of the population diagnosed with CVD, Hypertension, Diabetes or Hyperlipidaemia consuming excessive oil. The oil consumption of the diagnosed population is found to be beyond the prescribed range but there is no significant statistical relationship between excessive oil consumption and the diseases.

4.7) TOBACCO CONSUMPTION

Table 4.7.1 Tobacco Consumption across the different Age Groups

Sr. No	Characteristic (Age group in years)	Proportion
1	20 -29	14.0%
2	30-39	26.0%
3	40-49	30.9%
4	50 -60	29.1%

Table 4.7.1 shows the incidence of tobacco consumption across the various age groups. It was observed that the tobacco consumption was higher in the older age groups.

Table 4.7.2 Tobacco Consumption According To the Type of Residence

Sr. No	Characteristic	Proportion
1	Slum	11.5%
2	Non slum	88.5%

Table 4.7.2 shows the consumption of tobacco in some form according to the type of residence. It was observed that the incidence of tobacco consumption was perceptibly lower in individuals residing in slums.

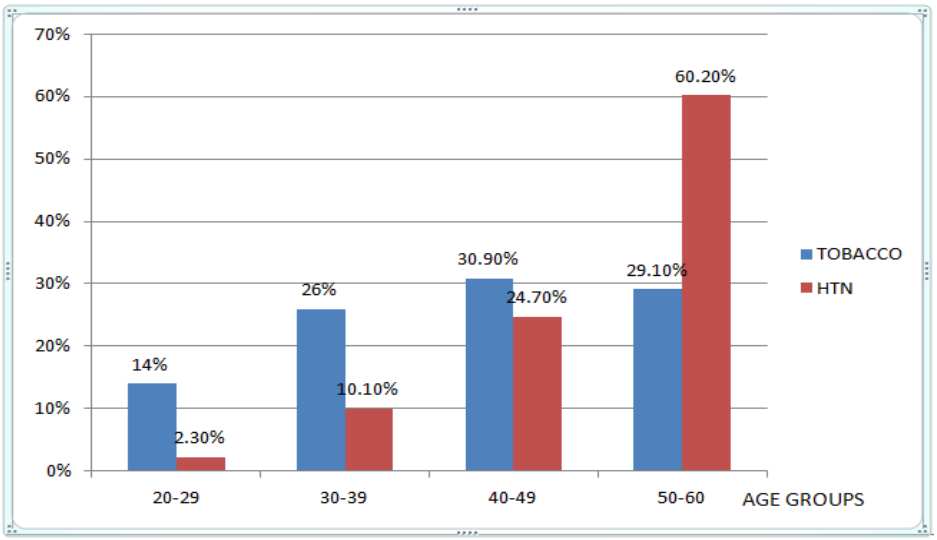
Table 4.7.3 Tobacco Consumption According to Income Groups

Sr. No	Characteristic (monthly income)	Proportion
1	>15000	17.1%
2	15000-6000	33.9%
3	<6000	49.0%

Table 4.7.3 shows the distribution of population which consumes tobacco according to income groups. It was observed that there was a progressive rise in the consumption of tobacco in lower economic strata.

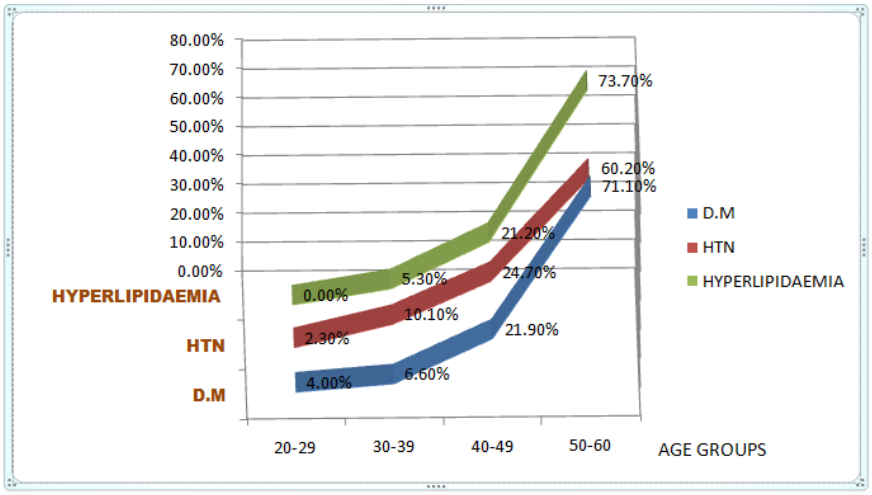
4.8) INTER-RELATIONSHIPS BETWEEN VARIOUS RISK FACTORS

Graph 4.8.1 Distribution of the Hypertensive Population Consuming Tobacco Across The Different Age Groups



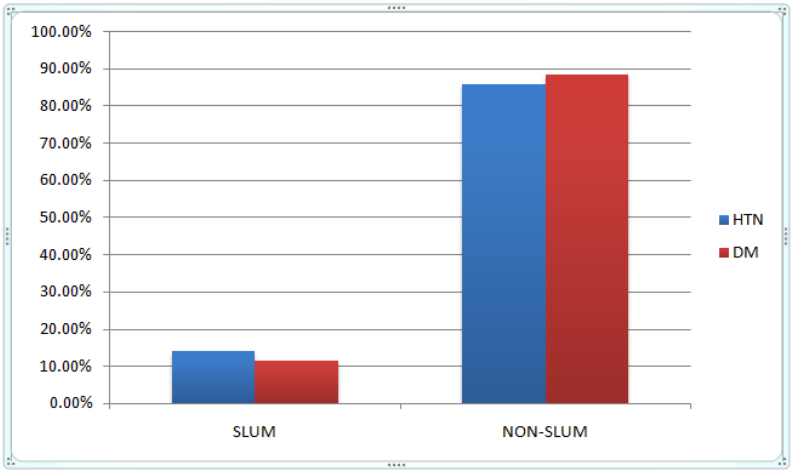
Graph 4.8.1 depicts the distribution of the sample population suffering from hypertension across the various age groups along with consumption of tobacco. It is observed that the prevalence of hypertension increased with increasing age group and higher tobacco consumption indicating a significant relationship between them.

GRAPH 4.8.2 RELATIONSHIPS BETWEEN HTN, DM AND HYPERLIPDAEMIA IN VARIOUS AGE GROUPS



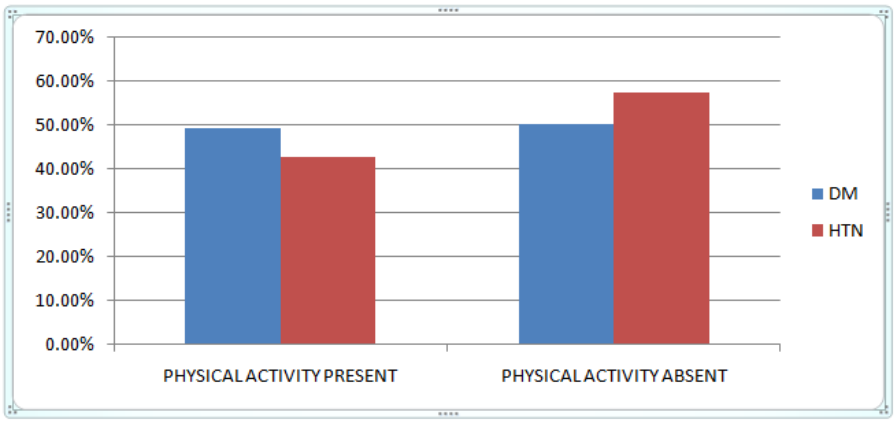
Graph 4.8.2 shows the relationships between the development of HTN, DM and Hyperlipidaemia across the various age groups. It is observed that the three ailments are related linearly to each other and may influence the pathogenesis of each other with increasing age.

GRAPH 4.8.3 DISTRIBUTION OF SAMPLE POPULATION ACCORDING TO TYPE OF RESIDENCE AND PREVALENCE OF HTN AND DM



Graph 4.8.3 depicts the distribution of sample population into the type of residence and prevalence of HTN and DM accordingly. It is observed that the prevalence of both the diseases was 8- times higher in non-slum as compared to slums. This indicated that the socio-economic status affects the pathogenesis of the disease.

GRAPH 4.8.4 DISTRIBUTION OF SAMPLE POPULATION ACCORDING TO PHYSICAL ACTIVITY AND PREVALENCE OF HTN AND DM



Graph 4.8.4 shows the distribution of the sample population with respect to physical activity and the prevalence of HTN and DM. It was observed that prevalence of hypertension was higher in those who did not regularly exercise while there was no significant effect of exercise on development of Diabetes Mellitus.

CONCLUSIONS

The demographic distribution of the sample population showed a near equal distribution of males and females. The population was clustered in the age group interval of 20-29 years at 32.1% and the percentages progressively declined with increasing ages. The population distribution showed a significant difference between the spread of population on the basis of religion in the city of Pune with 87.4% Hindus.72.4% of the sample population was, as expected, found to be Marathi (local language of Pune) speaking followed by 7.1% Hindi speaking. 41.2% of the population had received higher education followed by 32.8% of the population which had received primary educated, 16.7% secondary educated population. 8.6% of the population had not received any formal education. 45.7% of the population belonged to the middle income bracket (Rs. 20,000-6000 per month). 28.5% of the sample population had a monthly income of less than Rs 6000 and 22.7% had a monthly income of more than Rs. 20,000

The burden of disease in the city of Pune during the time when the survey was carried out was 4.7% of the total population. Thus 95.3% of the sample population considered in the study was free of any ailments. 6.4% of the population was found to be diagnosed with Hypertension, 4.0% with Diabetes Mellitus and 0.4% with Hyperlipidaemia. The prevalence of cardiovascular diseases in the city of Pune was found to be 1.7% as compared to 8.0% in urban India according to similar researches.

The prevalence of hypertensives was found to be significantly high in age group 50-60 years with a progressive rise through the various groups of the sample population. It is observed that the prevalence of hypertension increased with increasing age group and higher tobacco consumption indicating a significant relationship between them. The population not residing in the slums had a significantly higher prevalence of hypertension. Similarly, the prevalence was highest in the higher economic strata and progressively lower in the lower economic strata. 57.3% of the hypertensive did not involve themselves in any form of regular physical activity. It was seen that 77.7% of the Hypertensive did not consume tobacco in any form compared to 22.3% Hypertensive who consumed tobacco in one form or the other.

The prevalence of Diabetics in the sample population was found to be highest in the age group 50- 60 years (71.1%) and the trend showed a progressive rise in prevalence with increasing age. 88.0% of the Diabetic population of the study resided in non slum areas and 50.9% of the Diabetic population of the study did not exercise regularly.

The prevalence of diagnosed hyperlipidaemia in the sample population was observed to be progressively higher among the older age groups. There was no diagnosed of hyperlipidaemia in the age group of 20-29 years. It was seen that prevalence of hyperlipidaemia was higher among individuals who indulged in regular physical exercise contrary to the findings of other research studies.

It was observed that Hypertension, Diabetes Mellitus and Hyperlipidaemia are related linearly to each other. There was an increase in the prevalence of these risk factors along a similar curve suggesting a correlation between them.

. It was also observed that the prevalence of Hypertension and Diabetes Mellitus was 8- times higher in non-slum as compared to slums. This indicated that the socio-economic status affects the pathogenesis of the disease. It was seen that prevalence of hypertension was higher in those who did not regularly exercise while there was no significant effect of exercise on development of Diabetes Mellitus. The oil consumption of the population was found to be beyond the prescribed range but there was no significant statistical relationship between excessive oil consumption and development of cardiovascular disease, hypertension, diabetes or hyperlipidaemia.

Recommendations
Suggested policy interventions:

(i) Establishment of a national regulatory agency to enforce tobacco control legislation
(ii) Development of programs to address the high rates of use of smoked beedies and of smokeless tobacco (chewing tobacco and paan).
(iii) Implementation of programs to promote healthy dietary patterns and physical activity in schools and workplaces.
(iv) Identification of cultural norms that might hinder CVD prevention efforts.

Suggested capacity building measures:

(i) Development of research infrastructure and training of clinical researchers.
(ii) Establishment of high-quality national surveillance programs that document causes of death and disability to guide policy and decision makers.
(iii) Assessment of the knowledge of the CVD burden in the Indian subcontinent among lay people, health care workers, and policy makers.

Suggested research initiatives:

(i) Generation of reliable statistics on prevalence and incidence of CVD and its risk factors and CVD-related mortality through the initiation of large cohort studies and trial registries.
(ii) Randomized controlled clinical trials based in South Asian countries to answer research questions of high relevance to the Indian subcontinent (e.g., effectiveness of the polypill in CVD prevention, homocysteine lowering in subjects with vascular disease).
(iii) Studies documenting childhood risk factors, such as obesity, in both urban and rural settings.
(iv) Large registries and case-control studies to document the burden of stroke and its determinants in the Indian subcontinent.
(v) Continuing efforts to address non-atherosclerotic manifestations of CVD, including rheumatic heart disease and Tuberculous Pericarditis.

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