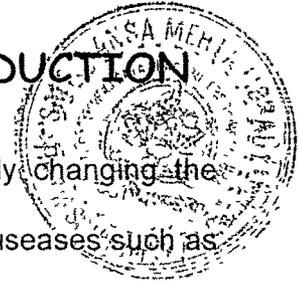




# *INTRODUCTION*

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## ● INTRODUCTION



Rapid improvements in health and longevity are dramatically changing the burden of illness through out the world. Chronic degenerative diseases such as obesity, diabetes, hypertension, and chronic heart diseases are increasing to epidemic proportions and gaining their hold over the developing countries. Over the last two decades, the gratifying gain in cardiovascular health that occurred in the developed countries have been accompanied by an alarming escalation in the other and more populous regions of the world. In fact the World Health Organisation (WHO) has warned of an epidemic of heart disease in developing countries over the next decade. While sharp demographic and lifestyle shift were brought about by recent urbanization and industrialization, globalization, which constituted the tail end of the twentieth century, accelerated the propulsion of the developing countries into the vortex of the global cardiovascular disease epidemic.

Expanding inequities will also mean that the poor among nations and the poor within nations will be the most vulnerable victims of the cardiovascular disease epidemic in the new century. By striking at persons in productive years of life the cardiovascular disease epidemic will debilitate in countries currently confronting a large double burden of diseases.

In fact, in India, post independence has witnessed a change in the dietary habits (more consumption of fatty foods) and an increase in the sedentary life style of the people. Thus, urbanization and industrialization along with these

lifestyle changes has in turn resulted in escalating the prevalence of these chronic degenerative diseases. It has also been observed that the pattern of these chronic degenerative diseases is changing over the time. Once confined to the affluent sections it is now spreading to the economically disadvantaged class as well. While life expectancy has gone up, protective elements in terms of a healthy lifestyle or accessible clinical care have not been readily easy. So

- Obesity has increased
- Exercise has decreased
- There has been an adverse dietary change with a greater reliance on animal fats
- Tobacco consumption has gone up
- Excessive alcohol intake.
- Globalization and marketing contributed to the increased consumption of energy dense foods (fast foods), which are poor in fibre

We know about various risk factors and the preventive strategies to control cardiovascular disease. Although we cannot address the non-modifiable risk factors (such as race/ethnicity, age, sex and family history), we have sufficient knowledge and understanding of various modifiable risk factors that contribute to cardiovascular mortality and morbidity. They are overweight or obesity, high blood pressure, hyperlipidemia, diabetes, type of diet, lack of physical activity, smoking etc.

## OBESITY

The prevalence of obesity is rising to epidemic proportions around the world at an alarming rate. The World Health Organization (WHO) estimates that 1.2 billion people worldwide are affected by overweight and obesity, and the numbers are increasing at an unprecedented rate (Kennedy et al 2001). The rise in obesity is not restricted to more developed countries. With increasing westernization, the prevalence of overweight and obesity appears to be rising even in those countries with current food security problems and significant rates of under nutrition.

Obesity has also been recognized as an underlying risk factor for many of the chronic degenerative diseases (CDD) (Caballero 2001). The major health risk of obesity increases in a curvilinear relationship, with prevalence increasing progressively and disproportionately with increasing weight. Hypertension, diabetes and raised serum cholesterol have been found to be 2-6 times more prevalent among heavier women. Weight increase, beginning during adulthood and continuing for many years have the greatest adverse effects (Blumenkrantz 1999).

Framingham data reveals that obesity has a direct relationship with all the coronary risk factors except smoking (Garreson et al, 1983). Obese subjects have on an average high blood pressure, higher serum triglycerides (TG) and total cholesterol (TC) level, lower High Density Lipoprotein Cholesterol (HDL-C) and higher blood glucose and high plasma insulin level than lean person.

Morbidity and mortality are significantly higher in the overweight than in those of normal subjects, with the death rate from heart and circulatory disorders at least 1.5 times that of non-overweight subjects. The risk of obesity not only increases with its severity but also may be affected by the distribution of body fats. Visceral obesity characterized by excessive adipose fat in the abdomen appears to impart greater risk for Coronary Artery Disease (CAD).

## **HYPERTENSION**

Hypertension is a common concomitant of obesity. In overweight young adults, 20-45 years, the prevalence of hypertension has been found to be six times that of their normal weight peers (Blumenkrantz 1999). Data from NHANES II (non-institutionalized, non-pregnant US residents, ages 20 to 29, 1976-1980), report the prevalence of hypertension (blood pressure, greater than 160/95) to be 2.9 times higher for overweight than for non-overweight. A study was undertaken by Kodali et al (1997) to investigate the role of regional adiposity and metabolic abnormalities in hypertension among Indian subjects, aged between 30-50 years, belonging to middle and low income group. It was found that hypertensives had significantly higher body weight, body fat, Body Mass Index (BMI) and Waist Hip Ratio (WHR) as compared to controls in both men and women.

Hypertension plays a major role in the evolution of Cardiovascular Disease (CVD). Numerous observational, epidemiological studies in geographically and ethnically diverse population have established a direct relation between blood

pressure and incidence of CAD and stroke. Stress and other psychological factors may also play a role in the development of hypertension.

Thus, hypertension is a complex syndrome comprising many abnormalities, including obesity, abnormal lipid metabolism, insulin resistance, altered glucose metabolism, arterial stiffness, and renal disease (Glasser 2001)

## **DIABETES**

The prevalence of type 2 diabetes is increasing all over the world. According to the recent WHO report, the prevalence of diabetes in adults will rise from 135 million in 1995 to 300 million in the year 2025 and the countries with the largest numbers of people with diabetes will be India, China and United States (Munichoodappa 2002)

Ischemic Heart Disease (IHD) is the leading cause of morbidity and mortality in patients with Type 2 diabetes. Several studies have demonstrated that patients with Type 2 diabetes have an increased risk for cardiovascular disorder (American Diabetes Association, 1993, Stamler et al, 1993). Two to three times higher risk for coronary heart disease and four to six times greater cardiovascular mortality rate is seen in diabetic patients (Parikh et al, 2001). Diabetes frequently exists in the presence of other, often-modifiable CAD risk factors.

Diabetes mellitus has been shown to be associated with lipid abnormalities. The frequency of raised plasma lipid levels in diabetic subjects is between 20-90% depending on the degree of diabetic control and the type of diabetes (Mani and Mahida 2001). Patients with Type 2 are typically more obese, and they also show hypertension, high serum triglyceride (TG) and lower levels of High Density Lipoprotein Cholesterol (HDL-C) more frequently than corresponding non-diabetic subjects. Population based prospective studies have shown that only a small proportion of the excess occurrence of atherosclerotic vascular diseases in diabetes can be explained by the effect of diabetes on general risk factors of atherosclerotic vascular diseases and other factors, for example altered very low density lipoprotein cholesterol (VLDL-C) catabolism products, low levels of HDL-C and high plasma insulin levels, have been postulated to contribute to the excess occurrence of atherosclerotic vascular diseases in Type 2 patients.

An integral relationship exists between abnormalities of insulin and glucose metabolism and etiologic and clinical course of hypertension. Thus, hypertension and obesity are common in patients with diabetes.

## **SEDENTARY LIFESTYLE / PHYSICAL INACTIVITY**

It is a well-documented fact that those leading a sedentary life are more prone to be obese and thus at a higher risk of developing other CDD. Physical activity level, physical fitness and other modifiable lifestyle characteristics may influence the risk of chronic disease and premature death (Paffenbarger et al,

1993) In a ten year follow up of Multiple Risk Factor Intervention Trial (MRFIT) subjects in treatment group engaged in moderate physical activity showed a 27% lower CAD mortality rate than less active subjects (Leon and Connett, 1990)

The mechanisms by which increased exercise decreases risk for CAD events may include improvements in HDL-C level, body weight, blood pressure and insulin resistance (Blair et al, 1983) Thus it can be concluded that physical fitness reduces mortality from cardiovascular causes

## **STRESS**

Concern is increasing about the adverse effects that work stress may have on health, particularly the risk of cardiovascular disease Job strain (high demands and low job control) and effort-reward imbalance (high demands, low security, few career opportunities) elicit stress at work

The prospective cohort study of industrial employees showed that job strain and effort-reward imbalance were each associated with a doubling of the risk of cardiovascular death among employees who were free from overt cardiovascular diseases at baseline (Kivimaki 2002) The study also showed that job strain and effort-reward imbalance also predicted adverse changes in biological factors such as cholesterol concentration and body mass index.

The Fukuoka Heart Study Group from Japan showed that Type A behavior

pattern was significantly associated with an increased risk of non fatal acute myocardial infarction in male workers and in women (Yoshimasu 2001)

## **SMOKING**

Smoking is one of the most important modifiable risk factors for coronary heart disease (Doll et al 1994, Ockene and Miller 1997) Cigarette smoking increases the risk of coronary heart disease by itself When it acts with other factors, it greatly increases risk. Smoking increases blood pressure, decreases exercise tolerance and increases the tendency for blood to clot The potential of developing coronary artery disease in male cigarette smokers is approximately 2 14 times greater than in non-smokers (Shapiro et al 1969)

Many epidemiologic studies and reviews (Ciruzzi et al 1998, Law et al 1997, Wells 1998) have pointed to the effect of passive smoking on the risk of coronary heart disease. Even so, the extent of the association between passive smoking and coronary heart disease is not fully known.

Passive cigarette smoking is associated with a smaller increase in the relative risk of coronary heart disease than is active cigarette smoking. For example, in the Cancer Prevention Study II, the risk of coronary heart disease was 1 7 times as high among men who smoked as among those who did not, the corresponding increase in risk among women was by a factor of 1.6. And, the increase in the relative risk of coronary heart disease among passive smokers as compared with nonsmokers was 1 25 However, because of the high prevalence of passive cigarette smoking at home and in the workplace, a

substantial number of coronary events occur, with implications for public health (Jiang et al 1999)

## **ALCOHOL INTAKE**

The evidence relating alcohol intake to CVD is complex. Epidemiological evidences have shown a lower mortality, particularly from ischemic heart disease in people who drink small amount of alcohol. Most of the studies also agree that at high alcohol consumption, there was an increased risk of cardiovascular mortality, notable sudden death (Kozarevic et al, 1983 and Friedman and Kimball 1986)

In the Framingham study, positive dose related associations between alcohol consumption and lower incidence of CHD and higher HDL-C have been found. However, when alcohol consumption was greater than two drinks per day, a rise in mortality from stroke was observed. Hence, it was found that the amount of change in HDL-C was dependent on the amount of alcohol consumed (Friedman and Kimball 1986)

In addition, alcohol consumption has shown to have an adverse effect on blood pressure, body weight and glucose tolerance of an individual. Therefore, it is detrimental rather than beneficial in the prevention of CHD (Hubert et al, 1983)

## DIETARY FACTORS

Dietary factors have a strong influence on the energy balance equation and can be considered to be the major modifiable risk factor, along with physical activity. Changes in dietary constituents can alter plasma lipids and lipoprotein concentrations in various ways. Over the years there has been an increase in the consumption of animal products, sugars and fats in Asian countries. This in turn has definitely led to an increase in the prevalence of chronic degenerative diseases. A study carried out by Fung et al 2001, showed that western pattern of diet which had higher intake of red meats, high fat dairy products and refined grains showed an elevation of blood lipids in comparison to the prudent pattern diet (High intake of fruits, vegetables and whole grains). Also, the amount and type of fat in the diet have a profound effect on the blood lipid levels (Mani and Tiwari 2002).

A consistent and positive relation between saturated fatty acids intake, plasma cholesterol and CHD has been found. Dietary cholesterol can also increase LDL-C levels, although to a much lesser extent than saturated fat.

The influence of dietary carbohydrate (CHO) on the pathogenesis of CHD has received considerable attention in recent years. Though CHO have been reported to be neutral in their effect on TC, an increase of CHO in the diet produces an elevation of TG in both normal and hyperlipidemia persons. High intake of CHO stimulates hepatic synthesis of TG and can raise VLDL-C levels (Grundy 1987).

A high fibre diet is associated with improved ability to handle blood sugar and results in lowering of fasting blood sugar levels and insulin requirements. Dietary fibre also lowers the systolic and diastolic blood pressure when combined with a low fat diet (Hallfrisch et al 1988)

Considerable evidence now suggests that oxidative processes are involved in the development and clinical expression of cardiovascular diseases and that antioxidants may contribute to disease prevention. Observational epidemiological studies, including descriptive, case-control, and cohort studies, have shown that greater intakes of antioxidants are associated with lower disease risk. The data have been strongest for the carotenoids and vitamin E, whereas results regarding other antioxidants such as vitamin C have been equivocal (Krauss et al 2000)

The male health professionals study and the female nurses health study found a 35-40% reduction in the incidence of major coronary events, non-fatal myocardial infarction and death from cardiac causes in the subjects who had Vitamin E intake in the top quintile as compared with those in the lowest quintile

The male health professional and female nurses study has shown that high beta-carotene intakes are associated with reduced coronary risk in smokers. However, no association between vitamin C intake and risk of coronary heart disease (Blot et al 1993, Enstrom et al 1992)

There is some evidence to show that high intake of flavonoids offer protection from CAD. A study from Finland (Finnish Cohort study) showed that men with more than 5.5 mg flavonol intake/day were found to have a lower risk for CHD in comparison to the men who had flavonol intake less than 2-4 mg/day. The main sources of flavonols in this study were onions and apples (Knekt et al 1994). Another study from Norway showed that flavonoids derived from black tea offered some protection in the CHD mortality in men who drank 10 or more cups of tea compared to those who did not drink tea, however this relationship was not significant.

Thus, taking into consideration all of the above mentioned factors, the current study was planned keeping in mind the following objectives:

- To map the prevalence of obesity, diabetes, hypertension and chronic heart disease in an industrial set up in Baroda
- To assess the nutritional status of the subjects
- To analyse the lipid profile, apolipoproteins and the total antioxidant status of the subjects
- To study the risk factors for the development of chronic degenerative diseases in an industrial set-up

## *At a glance.....*

⌘ Chronic degenerative diseases such as obesity, diabetes, hypertension, and chronic heart diseases are increasing to epidemic proportions and gaining their hold over the developing countries

⌘ In India, post independence has witnessed a change in the dietary habits of the people (more consumption of fatty foods) and leading a more sedentary life style. Thus, urbanization and industrialization along with these lifestyle changes has in turn resulted in escalating the prevalence of these chronic degenerative diseases

⌘ Obesity has been recognized as an underlying risk factor for many of the chronic degenerative diseases. The major health risk of obesity increases in a curvilinear relationship, with prevalence increasing progressively and disproportionately with increasing weight

⌘ Visceral obesity characterized by excessive adipose fat in the abdomen appears to impart greater risk for Coronary Artery Disease

⌘ The prevalence of type 2 diabetes is increasing all over the world. According to the recent WHO report, the prevalence of diabetes in adults will rise from 135 million in 1995 to 300 million in the year 2025 and the countries with the largest numbers of people with diabetes will be India, China and United States.

⌘ Physical activity level, physical fitness and other modifiable lifestyle characteristics may influence the risk of chronic disease and premature death

⌘ Smoking is one of the most important modifiable risk factors for coronary heart disease. It increases blood pressure, decreases exercise tolerance and increases the tendency for blood to clot

⌘ High alcohol consumption increases the risk of cardiovascular mortality

⌘ Greater intakes of antioxidants are associated with lower disease risk. Reduction in the incidence of major coronary events, non-fatal myocardial infarction and death from cardiac causes is observed among subjects who consume more of antioxidant vitamins

⌘ Thus, the present study was planned keeping in mind the following objectives

- ▣ *To map the prevalence of obesity, diabetes, hypertension and chronic heart disease in an industrial set up in Baroda.*
- ▣ *To assess the nutritional status of the subjects.*
- ▣ *To analyse the lipid profile, apolipoproteins and the total antioxidant status of the subjects.*
- ▣ *To study the risk factors for the development of chronic degenerative diseases in an industrial set-up.*