CHAPTER-1
INTRODUCTION

1.1 Coronary Artery Disease

Coronary artery disease (CAD), also called coronary heart disease (CHD), is caused by defacement of heart function owing to plaque building up in the inner artery walls of the heart, as a outcome inadequate blood flow set out to the heart as compared to its needs, caused by obstructive changes in the coronary circulation to the heart” (WHO 2000).

Atherosclerosis is a disorder of large and average sized muscular arteries and is distinguished by intimae lesions called atheromas, atheromalons or fibro fatty plaque, which obtrude into and hinder vascular lumens and weaker the original media.(Erling ..,2006; Navab et al.,2004)

Normal coronary artery has been evaluated with narrowed coronary artery in Fig.1. Figure 1 shows plaque deposits in coronary artery, resulting in narrowing of the artery by deposited plaques restricting flow of oxygen rich blood through artery and which can cause severe damage to the coronary artery.

(http://www.nhlbi.nih.gov/health/health-topics/topics/cad/)11/07/13

![Figure 1.1](http://www.nhlbi.nih.gov/health/health-topics/topics/cad/)
Symptoms and Consequences of the CAD (Yusuf et al., 2001)

Depending upon the rate of growth and ultimate severity of arterial narrowing(s) and the myocardial response, four ischemic syndromes may result:

1. Angina pectoris: strangling sensation (angina) in the chest (pectoris). Based on the clinical history, there are three variants:
   - Stable or typical angina: angina provoked by physical exertion, meals, cold, excitement and fades quickly usually within minutes) with rest;
   - Variant angina: angina occurs with provocation, usually at rest, as a result of coronary artery spasm;
   - Unstable angina: angina of recent onset (<1 month), worsening angina or angina at rest.

2. Myocardial infarction: roughly always occurs in patients with coronary atheroma as a result of plaque rupture with superimposed thrombus.

3. Chronic IHD with Congestive heart failure-development of progressive CHF as a consequence of long-term ischemic myocardial injury;

4. Sudden cardiac death- the most common cardiac lesions in sudden death are those of coronary atherosclerosis and its complications.

(Yusuf et al., 2001) have listed many other symptoms than given above that may indicate angina or accompany the pain or pressure in the chest:

- Shortness of breath
- Nausea, vomiting, and cold sweats
- A sensation of upset stomach or heartburn
- Unsolved tiredness
- Vertigo or lightheadedness
- Palpitations

1.2 Epidemiology of CAD

"Hritshoolo" is same as angina/coronary artery disease (CAD) which was identified to ancient Indian physicians ever since 500 BC (Dwivedi et al., 2000). Conceptually, it was claimed to appoint those who had sedentary lifestyle, consumed lot of fatty food/liquor, led faulty life style, possessed an anger prone personality, and those suffering from "medoroga" (Rao et al., 2011). These pragmatic explanations have been recognized by Framingham studies (Braunwald et al., 1997). Basic pathology of
CAD is atherosclerosis (Kumar et al., 2004). Atherosclerosis occurs when the arteries become clogged and lessened, limiting blood flow to the heart. Without adequate blood, the heart becomes starved of oxygen and vital nutrients, it needs to work properly. Increasing degrees of narrowing of arteries called stenosis, decreases reserve flow, then reduce flow at rest, and finally may totally presentation of CAD (Braunwald et al., 1997).

At the outset of the 21st century, it is clear that coronary artery disease (CAD) has become a widespread cause of morbidity and a leading contribution of mortality in most countries. It is the number one killer in developing countries like India (Enas et al., 2001). Estimates provided by the Global Burden of Disease Study and the World Health Report 1999, indicates that the non-communicable diseases together contributed to 59% of global mortality and 43% of global burden of disease and CVD contributed to 30.9% of all deaths in 1998, making it the leading cause of mortality worldwide (Reddy et al., 1998). Asian Indians around the globe have the maximum ratio of morbidity and mortality from coronary artery disease regardless of the fact that half of them are vegetarian (Enas et al., 1998).

High rates of coronary heart disease are found in south Asians. Prevalence rate of coronary artery disease in India is diverse higher than that in the developed countries and pervasiveness is gradually rising in the last fifty years (Goyal et al., 2006). It has been estimated that prevalence of CAD within the Indian Subcontinent has increased by a factor of 10 within the last 50 years. India is now in the middle of CAD epidemic (Enas et al., 2000). CAD also tends to occur earlier in life and is more severe in Indians than in any other ethnic groups (Enas et al., 2000; Wild et al., 1995; Mammi et al., 1995). Sachar (1997) has reported that CAD is increasing in Indian population compared to west and the hospitalization rate for CAD patients is high in India and its prevalence in young Indian is 12% compared to 2% in American population.

The two most striking features of CAD in people of Indian subcontinent are extreme prematurity and severity, both ensuing from malignant atherosclerosis that begins in earlier age than begins in earlier age than in any other population (Enas et al., 1995).

As per recent estimates, at least 50 million people are suffering from CAD in 35 to 65 years age was estimated as 10.9% in urban males, 10.2% in urban females, and 6.4% in rural families (Reddy et al., 1993).

Of all cases of CAD in the West only 2% to 5% occur in the young in contrast to an incidence of CAD in the young of 12-16% in India. There is an frightening rise in the
incidence of CAD in young Indians less than 45 years, especially in South India. At Calicut Medical College, 17% of patient admitted with attack of first MI in 1983 were less than 40 years of age (Mammi et al., 1991).

1.3 Serum Biochemical Risk Factor of CAD

Coronary artery disease is predictable to become the leading worldwide cause of disability by 2020 (Sandosh et al., 2009). On the basis of epidemiological studies, the risk factors can be largely grouped under three categories: environment and life style factors, biological and psychological factors and physiological factors. Environment factors include social, economic, cultural and geographical location. Life style include alcohol intake, smoking, sedentary lifestyle and eating behavior. Biological factors include age, sex, birth weight, ethnicity and genotype. Psychological factors include attitudes and stress. Physiological factors include cardiovascular fitness, insulin, overweight, blood pressure, triglycerides, heart rate, fibrogen lipids, lipidproteins, central obesity, lung function, glucose and other biochemical markers. These risk factors can be further classified into two categories those that have been proven to be Causal (risk factors) and those that show associations but is yet to be proven (risk markers).

Indians develop CAD 5-10 years earliest compared to the population in other geographies and frequently manifest as myocardial infarction (MI) at <40 years-50 years of age. Young Indians with CAD have extensive atherosclerosis resulting in poorer prognosis (Enas et al., 1992).

The high burdens of CAD in the developing countries are attributable to the increasing incidence of atherosclerotic diseases perhaps due to urbanization and higher risk factor levels. The relatively early age at which they manifest, the larger sizes of the population and the high proportion of individuals who are young adult of middle aged in these countries. In India CAD rate is expected to rise in parallel with life expectancy (Yusuf et al., 2001). It has been estimated that 30-50% of patients with established CAD lack the traditional risk factors had led to the search for additional new risk factors that may predispose the individual to CAD. Over the past years, epidemiological studies have established that prevalence and incidence of clinical CAD are correlated positively with Serum Cholesterol, Triglycerides, and Lipoprotein (a) levels; and negatively with HDL-Cholesterol levels (Gupta et al., 1997).

The various risk factors for CAD can be either - genetic or non-genetic. Genetic factors include increased Apolipoprotein - B, Lipoprotein (a), increased small dense LDL, increased homocystine, decreased HDL, obesity, diabetes mellitus etc, and
Non-genetic factors include smoking, high fat diet, stress and lack of exercise. The various risk factors contributing to premature atherosclerosis in CAD includes hypertension, central obesity, dyslipidemia, hyperinsulinemia, proinflammatory states and pro thrombotic state, Obstructive Sleep Apnea and Gastro-Esophageal Reflux Disease (GERD). These factors have a complex interrelation with each other to cause atherosclerosis. Dyslipidemia plays an important role in genesis of atherosclerosis. The CAD risk is increased many times by the presence of other risk factors like diabetes, hypertension, smoking, sedentary lifestyle, abnormal lipids, i.e. higher level of total cholesterol, TG, LDL-C and lower level of HDL-C. Increased LDL-C and decreased HDL-C are known risk factors for CAD but some studies have shown normal LDL and HDL levels in CAD patients. Therefore Coronary risk factor other than high LDL and low HDL might be deeply involved in the development of CAD. Totality of the data suggests a genetic predisposition to CAD in Indians. Hypercholesterolemia, high concentration of LDL-Cholesterol in particular is generally accepted as one of the strongest risk factors for atherosclerotic cardiovascular disease and mortality, at least in individuals under 70 years of age (Wood et al., 1998). Hypertriglyceridemia, although generally associated with low HDL-Cholesterol, is recognized as an independent risk factor for atherosclerosis. High rate of CAD in Indians is attributed to genetic predisposition and environment (Krishnaswami et al., 1989). Indians are genetically susceptible to CAD from early childhood due to genetic predisposition of lipids such as higher level of lipoprotein (a) and lower level of HDL-C (Dhawan et al., 1996). Lipoprotein (a) is not only better marker of CAD but also independent risk factor for premature CAD (Gambhir et al., 2000).

Apolipoproteins associated with HDL-C and LDL-C, i.e. apolipoprotein A-I (Apo A-I) and apolipoprotein B-100 (Apo B-100) have also been studied in CAD patients. Low Apo A-I and high Apo B-100 levels have been found to be better discriminator of CAD than HDL-C and LDL-Cholesterol levels (Genest et al., 1992; Hamsten et al., 1986; Graziani et al., 1998). An increasing risk towards mortality and morbidity with increasing Lp (a) levels has been shown in females. Some investigators have demonstrated that small dense LDL sub fractions correlated better with Coronary Heart Disease risk than the large less dense LDL fractions (Sniderman et al., 2001). In the early 1970’s, Alarpovic(1971) suggested that apolipoprotein should be
considered while evaluating the contribution of lipid lipoproteins to the development of atherosclerotic disease (Alarpovic 1971).

1.3.1 Role of Apolipoproteins in CAD

Apolipoprotein comprise a set of proteins, which reside in the surface of lipoproteins. These forms are crossing point between lipids and aqueous environments and have significant function in lipid transportation; regulation and lipoprotein metabolism (Mayes, 2000). Apolipoprotein play a vital role in lipoprotein metabolism. There are six categories of lipoproteins established, out of which Apo-A-I and Apo-B have been clinically recognized as the mainly significant types due to their direct association with Coronary Heart Disease. Apolipoproteins A-I and Apo A-II are the main constituents of High density lipoproteins (HDL). It is clearly demonstrated that there occurs an inverse relationship between HDL-Cholesterol and general population (Tailleux et al., 2002). Following are the major physiological functions of Apolipoprotein. (Rifai et al., 1999)

- They activate the important enzymes in the lipoprotein metabolic pathogenesis.
- They maintain the structural integrity of the lipoprotein.
- They facilitate the uptake of lipoprotein into cells through their recognition by specific cell surface receptor.

1.3.1.1 Apolipoprotein a-I:-

It is a major lipoprotein HDL-Cholesterol and its serum concentration is inversely associated to the risk of developing Coronary Artery Disease. The estimation of Apo A-I discriminates patients with highest risk of developing coronary artery disease (Garfagnini et al., 1995).

1.3.1.2 Apolipoprotein B:-

Over 90% of LDL is composed if Apo-B. Apo-B exists in human plasma as two isoforms Apo B 48 and Apo B100. Apo B100 is the main physiological ligand for LDL receptor. Apo B-100 values were increased and Apo A-I values were decreased in people with CAD as match up to Controls (Rifai et al., 1999). Apolipoprotein A1 is the major protein constituent of HDL and Apo B, the major protein constituent of LDL. While Apo A-I and HDL are protective, Apo B and LDL are atherogenic. All the atherogenic lipoprotein (LDL, VLDL) have one molecule of Apo B and anti-atherogenic lipoprotein (HDL) has two
molecule of Apo A1 whereas cholesterol content varies in each of these lipoprotein particles (Alaupovic et al., 1988).

Apo-B provides the function of solubilising cholesterol within LDL complex, which in turn amplifies the transport capacity of LDL for following deposition onto the arterial wall. Apo-B is for this rationale, a suitable marker for assessing the cholesterol depositing capacity of the blood. Measurement of Apo-B was significant in predicting patients with hyperbetalipoproteinemias (Sniderman et al., 1980). Apolipoprotein B (Apo B) is the major component of chylomicrons, remnants, VLDL, IDL, LDL and lipoprotein (a). Apo B proved to be essential for hepatic and intestinal TG secretion, for LDL catabolism and shown to be closely involved in atherogenesis (Durrington et al, 2002). A high concentration of Apo B reflects the presence of increased number of Apo (B) containing lipoprotein particles (VLDL; HDL; LDL). Hence, it may be better to determine a substance, such as Apo B that is directly involved in pathologic process like atheroma, rather than other indicator such as cholesterol (Durrington et al., 2002).

Apolipoprotein B versus lipoprotein lipids was widely studied. The study of (Sniderman et al., 2001) discovered that Apolipoprotein B should be well thought-out as the single most serious and reliable lipid measurement for the precise prediction of CVD risks on-treatment and baseline along with other measurements which is by and large not considered as very significant information. Apolipoproteins, lipoproteins and their classification has been widely discussed. The studies conducted were also helpful in finding out various lipid-lowering agents (Alanpovic, 1971). Apo B is also found to be more closely associated with central adiposity, insulin resistance, thrombosis and inflammation than non-high density lipoprotein cholesterol (NHDLC) (Sattar et al., 2004).

AMORIS study (Wallidus et al., 2001) has recommended that plasma concentration of Apo B might be superior discriminator for CAD than conventional lipid determinants. Apo B is also found to be superior to LDL concentration as a predictor of CAD in 3 other prospective studies,(Lamarache et al., 1999; Moss et al. 1999;Talmud et al. 2002;Sniderman et al., 2003). In several studies, the Apo B/ A1 ratio has been better linked than any cholesterol measure to predict cardiovascular risk (Sniderman et al., 2003; Simes et al., 2002; Gotto et al., 2000).

Deterioration of coronary artery lesions is considerably associated with a lessening in plasma levels of Apo-B among those with CAD who are undergoing treatment with
hypolipidaemic genes (Brewer et al. 1990). Because small dense LDL particles contain less cholesterol than normal LDL particles do, Apo-B is a better marker for LDL particle number than is LDL-Cholesterol. Therefore, Apo-B along with additional markers such as Apo A-I, Lp (a) and ratio of Apo-B/Apo A-I will noticeably improve our capability to make out the truly high risk individuals so that fewer need to be treated (Depress et al. 1996; Lamarche et al., 1997). Studies have indicated that the apoB/apoA-I ratio is at present the best single lipoprotein-related.

1.4 Obesity and Diseases

World Health Organization (WHO) in a current report expressed fear at the growing pervasiveness of obesity. In this report it indicates that globally in 2005, approximately 1.6 billion people aged 15 years and above were overweight; and out of them at least 400 million adults were obese. WHO further projects that by 2015 approximately 2.3 billion adults will be overweight and more than 700 million will be obese. Most astonishingly this pandemic is piercing the developing nations in the world including India, not only among the urban middle-aged adults, but increasingly affecting semi-urban and rural areas, and younger age groups (Andrew et al., 2006).

Body mass index (BMI) provides an easy numeric measure of a person’s “fatness” or “thinness”. It is defined as the individual’s body weight in kilogram divided by the square of the height in meter. The WHO defines “overweight” as a BMI between 25 to 30 kg/m² and “obesity” as a BMI > 30 kg/m². For the Asians, “overweight” criterion is > 23.0 kg/m² while for “obesity” the proposed value is > 25 kg/m² (Andrew et al., 2006).

In India, fatness has been well thought-out a major public health problem. Alarmed by reports that India will become the global diabetes capital by 2050, the Ministry of Health, Government of India has reduced the diagnostic cut-offs for BMI and Waist circumference to struggle the fight against obesity. The standards have been set for the first time in the Ministry’s consensus guidelines for Prevention and Management of Obesity and Metabolic Syndrome for India. The country’s new diagnostic cut-off as overweight for the BMI is 23 kg/m² as opposed to 25 kg/m² globally. According to guidelines, cutoffs for waist circumstances will now be 90 cm for Indian men and 80 cm for Indian women (as opposed to 102, 88 cm for men and women respectively at the international level).

In India, the central fat distribution appears to be a stronger risk factor than overall obesity. A current meta-analysis of the occurrence of hypertension in India recommen
Introduction

It is noted that the prevalence of hypertension is rising steeply in urban areas. Various Community surveys have also documented that during last three to six decades, occurrence of hypertension has amplified by about 30 times among urban dwellers in India (Das et al., 2005). The prevalence of hypertension increases with age and elevated BMI. A higher prevalence of hypertension was noted in subjects with a sedentary occupation. Central obesity measured by waist hip ratio is a strong predictor of higher prevalence of hypertension (Fikru et al., 2009). Studies suggested that estimation Waist Hip Ratio should be included into the routine physical examinations (Manu et al., 2005).

1.4.1 Metabolic Syndrome

(Joshi et al., 2003) had described a typical Asian Indian phenotype of metabolic syndrome with higher percentage of body fat at a lower value of body mass index (BMI), high waist hip ratio (WHR) at a comparatively low waist circumference (WC) and less lean body mass as compared to other population groups which predisposes Indians to Diabetes and Insulin Resistance Syndrome. The body fat pattern and lipids are particularly making the Asian Indians more coronary prone (Joshi et al., 2003). The overall prevalence is 11.2% using EGIR criteria (Deepa. et al., 2002). (Gupta et al. 2003) found 12.8% using ATP III criteria, while study which uses the modified ATP III criteria suitable for Indian population have a report a prevalence of 41% (Ramachandran et al., 2001). One more available study shows that the age-adjusted prevalence was 24.9% in urban Indian population, demonstrating a high prevalence of metabolic syndrome in an urban Indian population (Gupta et al., 2004).

1.4.2 Diabetes

Diabetes prevalence is also on the increase, and in turn, diabetes is related with at least a doubling of risk for cardiovascular diseases (Cambien et al., 2005). Among the 45-54 years age group, the stage at which osteoarthritis becomes a considerable health problem, Population Attributable Risk (PAR) for osteoarthritis associated with obesity is calculated to be 25% for men and 22% for women, using a relative risk (RR) of 2.4 and obesity estimates of 23.3% for men and 20.1% for women. Even some obese patients have numerous obesity-related co morbidities (Altman et al. 2008). Studies has shown an association between body weight and asthma in adults and prospective studies have recognized temporal association between the two (Sithole et al., 2008; Gilliland et al., 2003). Macro vascular diseases or atheroscerious causes 80% of mortality and 75% of hospitalization in diabetic patients (National
Insulin resistance without diabetes also elevates the risk of atherosclerosis, perhaps as much as diabetes (Haffner et al., 1999). The importance of insulin resistance in atherogenesis is likely due to many related atherogenic mechanisms.

1.4.3 Sleep Apnea

Sleep apnea is a breathing disorder characterized by snoring, breathing pauses and excessive sleepiness when awake (Taj et al., 2008). Obstructive Sleep Apnea (OSA) has been recognized in the Western world as a public health burden, but the awareness regarding OSA among general public as well as practicing physicians is low in India. It is a potentially life threatening condition that is far more common than usually understood. There have been very few community-based studies for assessing the prevalence of this condition in India. Scientific evidence shows male gender, age and obesity to be important risk factors for OSA. There are studies signifying that the risk factors and prevalence for OSA in India are comparable to those in the West (Sharma et al., 2006).

Emerging epidemic of obesity on traditional societies in developing countries due to environmental trends and socio-behavioral influences because of agriculture development and cheap promotional offers of multinational companies in food items and lavish life style is discussed (Andrew, 2005).

(Bose, 2002) conducted a study on local adult English white men, resident in Peterborough, England, and the study confirmed that adiposity and central body fat distribution with increasing age can lead to serious health implications and causes coronary heart disease, diabetes mellitus, hypertension etc. Obesity related co-morbid diseases such as congestive heart failure, type-2 diabetes mellitus, coronary artery disease, chronic kidney failure, hypertension and its connection with obstructive sleep apnea syndrome in India has been investigated (Sharma, 2010). Study was conducted to determine the parameters used for efficiently diagnosing metabolic syndrome according to modified WHO NCEP-ATP III and IDF classifications, these classifications are very useful in detecting the presence of metabolic syndrome in patients having Type-2 diabetes mellitus which is very significant factor for coronary heart disease. Metabolic abnormalities in south Asians at a lower body mass index and waist circumference is higher compared to other groups. Hence determination of prevalence of metabolic syndrome is very significant for identifying and taking preventing measures for coronary artery disease (Dhanaraj et al., 2009).
Growing trend of high prevalence of hypertension in India was observed when a study of urban community was conducted. Progressive increase of systolic and diastolic hypertension with age in women was higher compared to men. Systolic hypertension was on rise in men. Bivariate analysis revealed strong relationship of hypertension with age, body mass index, diet, ischemic heart disease and smoking. Multivariate analysis discovered age, BMI and non-vegetarian diet as protective factor with respect to hypertension. Prevalence of prehypertensives was observed high among younger population and needs special attention. The observed prevalence confirms that a national policy should be derived to control hypertension in India. (Shymal et al., 2005).

Cardio vascular disease (CVD) is a serious health hazard around the globe. 30% of 58 million deaths occurred across the world in 2005 was due to cardiovascular disease.

1.5 Body Fat and Anthropometric Indices

1.5.1 Waist circumference (WC)


It is clear that in addition to the level of adiposity, regional distribution of fat storage is an important indicator of medical risk allied with obesity. Much of the focus of risk measurement has been on central obesity, with measure of waist circumference used as a predictor. Mexican National Health Survey was conducted in 2000 and it was found that there was a high prevalence of abdominal obesity in normal-weight women with co-morbidities involving better to Waist circumference than to BMI in both sexes (Castillo et al., 2005). The National Institutes of Health cut-off points for Waist circumference help to identify those at increased health risk within the normal-weight, overweight, and class I obese BMI categories were considered at Kingston, Ontario. Many of the associations remained significant after adjusting for the confounding variables (age, race, poverty-income ratio, physical activity, smoking, and alcohol intake) (Janssen et al., 2002). A cross sectional study in China aimed to identify the usefulness of BMI, WC and waist- to-hip ratio (WHR) in screening for obesity in an Asian population. A cross-sectional sample was chosen. Then receiver-operating characteristic analyses were used to estimate the performances of the three
anthropometric indices. The investigators have concluded that BMI and WC are two important predictors for obesity in Chinese, and WHR is an alternative (Yang et al., 2006).

1.5.2 Hip circumference (HC)

Relationship between Hip circumference and metabolic risk factors has been studied in an urban adult population of Tehranian men by Ahmad Esmaillzadeh (Esmaillzadeh et al., 2006). It was a cross-sectional study with a representative sample of 4040 men aged 18-74 years was assessed in 1998 for R/a between HC and metabolic risk factors. Demographic data were composed; anthropometric indices and blood pressure were measured according to standard protocol. Hypertension was defined based on Joint National Committee (JNC) VI. Biochemical analysis was conducted on fasting blood samples. After adjustment for potential confounding variables, a significant decreasing trend was observed among hip circumference quintile categories for odds of having hypercholesterolemia (odds ratios among quintiles: 1.00, 0.83, 0.76, 0.66, 0.51, respectively, P for trend = 0.03), diabetes (1.00, 0.74, 0.55, 0.29, 0.20, P for trend = 0.01). It was concluded that Hip circumference is independently and negatively associated with metabolic risk factors.

( Han et al.,1998), in their crosssectional study on random sample of 5887 men 7018 women aged 20-59 years, chosen from the civil registries of Amsterdam, associations of waist and hip circumference with lifestyle factors was seen. They found that the risk of having smaller hips than expected from body mass index was times (1.1-1.4) in male and 1.2 times (1.0-1.3) in female smokers, 1.2 times (1.1-1.3) in men and 1.1 times (1.0-1.2) in women who were inactive. It was concluded that understanding the influences of lifestyle factors on size of waist and the hips is vital for health promotion directed at the general public(Han et al.,1998).

Skin fold thickness (SFT): Body fat percentage can be calculated indirectly by measuring the body skin fold thickness. Asians have higher insulin resistance compared to white Caucasians and this is thought to be due to physiological and structural alterations in the muscle due to poor nutritional status. A lower total body muscle mass, which has an independent effect on sensitivity and glucose disposal (Dela et al., 1995 & Ebeling et al., 1993).

The risk of diseases seems to increase as function of the percent fat content in the body, above an upper limit of normal. It also determines the risk for developing insulin resistance. The percent of body fat that considered normal varies with the age and sex of an individual. The exact value of above which a person may be
considered overweight or obese is debatable. However, a value of 20% BF for defining overweight and 25% BF for defining obese has been suggested by various workers (Ardle et al., 1996).

### 1.6 Common health consequences of overweight and obesity

Obesity is a serious, chronic disease that is known to reduce life span, increase disability and lead to many severe illnesses. These illnesses, including diabetes, heart disease, gallstones, and stroke, are the co-morbidities of obesity. A study by Lewin Group confirmed results from other studies in finding a direct correlation between increases in BMI and increases in the prevalence of co-morbid conditions like arthritis, breast cancer, heart disease, colorectal cancer, Type II diabetes, endometrial cancer, end stage renal disease, gallbladder disease, hypertension, liver disease, low back pain, renal cell cancer, sleep apnea, stroke, and urinary incontinence. Studies have calculated the percentage of obese persons with each co-morbid condition and calculated the total expenses to the U.S. health care system of treating patients with obesity exclusive of the costs of treating obesity itself. Ideal body mass was allied with 6.3% to 36.1% lower annual health care expenditure in females and 3.6 to 18.2% lower health care expenditure in males (Heithoff et al., 1997). Obesity is an important risk factor for various medical conditions. Heithoff including certain forms of cancer, osteoarthritis, sleep apnea, gall bladder disease, and non-alcoholic fatty liver disease. In addition, excess weight predisposes to cardiovascular disease through multiple mechanisms the majority of which form part of the definition of the metabolic syndrome. The clinical utility of the metabolic syndrome as opposed to its single components in risk stratification has been debated (Sattar et al., 2008)(National Lung and Blood Institute (1998)). In a cross-sectional study done using data from the Third National Health and Nutrition Examination Survey (NHANES III), it was found out that 63% of men and 55% of women were overweight and a graded increase in the prevalence ratio (PR) was observed with increasing severity of Overweight and Obesity for all of the Health outcomes. The prevalence of having 2 or more health conditions amplified with weight status category across all racial and ethnic subgroups (Castillo et al., 2005). Hypertension: Hypertension has been defined as Systolic blood pressure more than 120 mm Hg or Diastolic blood pressure more than 90 mm Hg by JNC-VII report. It is a complex health problem in the community. It is a risk factor for many non-communicable diseases. It is three times more prevalent in urban areas as compared to rural areas. The prevalence reported in various Indian studies has been tabulated as follows. Waist circumference was also positively related...
with risk in men ($P = .002$ for trend) and in older and younger women ($P < .001$ for trend for both) (Taylor et al., 2005).

1.7 Relevance of the Present Study

It is now apparent that South Asia is home to many metabolic disorders. The prevalence of these metabolic disorders differs according to region, urbanization, lifestyle patterns, socioeconomic factors, culture and genetic factors. Of the biochemical factor, lipid profile and apo-lipoproteins have shown significant extensive association with obesity as well as CAD and there is need to undertake such studies amongst different human populations living in different geographical regions.

Keeping in mind the mounting trends of CAD in India, connection of CAD with obesity and other risk factors, the present study was undertaken on the Punjabi Khatri’s adults of northern India with the objective to generate data about the association of lipid profile, obesity and Apo lipoprotein B with respect to a specific endogamous population/ethnic group. The advantage of such a study is that it would provide basic data on the association of risk factors with the disease in a genetically homogeneous population. To the best of our Knowledge no such detailed study has been previously undertaken on Khatris of Punjab.