Introduction
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Healthy diets and physical activity are key to good nutrition and necessary for a long and healthy life. Eating nutrient dense foods and balancing energy intake with the necessary physical activity to maintain a healthy weight is essential at all stages of life. Nutrition and diet play an important role in the etiology of chronic diseases. Nutrition related non-communicable chronic diseases are becoming more common in the low and middle income countries. Deaths from non-communicable diseases are projected to rise from 36 million in 2008 to 52 million in 2030 (WHO, 2012). Unbalanced consumption of foods high in energy (sugar, starch and/or fat) and low in essential nutrients contributes to energy excess, overweight and obesity. The amount of the energy consumed in relation to physical activity and the quality of food are the key determinants of nutrition related chronic disease. Already 79 percent of deaths attributable to chronic diseases are occurring in developing countries, predominantly in middle-aged men (WHO, 2002). There is increasing evidence that chronic disease risks begin in fetal life and continue into old age. Adult chronic disease, therefore, reflects cumulative differential lifetime exposures to damaging physical and social environments.

With increasing mechanization, urbanization and economic upliftment of the developed as well as the developing nations, the incidence of chronic degenerative diseases is increasing at an alarming rate. Obesity, diabetes, hypertension, cardiovascular diseases and dyslipidemia are the major global outcomes of a drastic imbalance in the food habits, lifestyle and physical activity pattern of people. Type 2 diabetes, obesity and hyperlipidaemia have been traditionally considered as diseases of affluence. A wealth of data indicates that in Asian Indian people abdominal obesity and insulin resistance, and glucose intolerance develop more often at lower BMI (Mohan et al. 2007). According to the world health report (2005), life style related chronic
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Non-communicable diseases (NCDs): diabetes, obesity, hypertension, cardiovascular disease contribute to 52% of the total mortality in India and these figures are expected to increase to 69% by the year 2030 (Roglic et al. 2005). Therefore, countries like India are currently facing an epidemiologic transition with double burden of disease as shown in fig. 1.

![Epidemiologic transition of communicable vs non-communicable diseases](source: Anjana et al. 2011)

**Fig. 1:** Epidemiologic transition of communicable vs non communicable diseases

India is second largest country in the world in terms of population and its population growth rate is far more than the growth rate of economy, so this growing burden of population would increase inequality. Rising inequality in terms of income in India has led to the co-emergence of two type of malnutrition: under nutrition and over nutrition. At the same time as the large number of population suffers from malnutrition, more than 100 million people (11% of Indian population) in India are over nourished. Over-nutrition can be defined as consuming either too much calories or the wrong type of calories such as saturated fat, trans fat or highly refined sugar which leads to obesity and many other chronic diseases.
DIET RELATED CHRONIC DISEASES

Obesity

Obesity is perhaps the most prevalent form of malnutrition in developed countries both among adults and children. It is a misconception that obesity is primarily a problem in the affluent countries; in fact it is found in all countries in varying degrees. In developing countries too, the epidemic has taken deep roots and in many urban populations of low and middle income countries of Asia, Latin America and Africa there is a dual burden of obesity and malnutrition often within the same families (Moterio et al. 2004; Doak et al. 2005 and Mendez et al. 2005). The obesity may be either generalized that result in increased BMI or truncal/central/abdominal resulting in increased waist size and waist-hip ratio (WH- R). These physical changes then translate into increased incidence of standard cardiovascular risk factors-high total and LDL cholesterol, low HDL cholesterol, high triglycerides and other abnormalities, hypertension and diabetes (Zalesin et al. 2008). These risk factors usually cluster and lead to a heightened risk of atherosclerotic cardiovascular diseases. If we correlate the above statement with urbanization, where there is a transition from an active rural to sedentary urban socioeconomic milieu leading to decrease in physical activity, increase in intake of calorie dense foods, it will show the actual reason of increase in obesity. Deedwania and Gupta (2005) have correlated this transition with the coronary heart disease epidemic in urban population. Thus urbanization is the strongest risk factor for obesity. Obesity is at least three times more common in cities than in villages, although it is increasing rapidly even in villages because traditional villages are also becoming urbanized in their habits. Another related risk factor is higher socio-economic status. This situation is opposite to that in developed countries where lower socio-economic groups are more affected (‘reversal’ of socio-economic gradient). In simple mechanistic terms weight gain occurs when energy intake by an individual exceeds energy expenditure over a period of time. Changing patterns of food
intake (both in quality and quantity) and physical activity contribute to the positive energy balance. Genetic as well as non-genetic determinants affect an individual’s response to energy intake as well as physical activity, and therefore influence the balance between the two factors (Prentice, 2001).

**Prevalence of Obesity**

Obesity, which is characterized by an excess accumulation of adipose tissue in the body leading to more than 20% of the desirable weight, has reached epidemic proportions globally with more than 1 billion overweight adults (BMI ≥25) and at least 300 million who are known to be clinically obese (BMI ≥30) and is a major contributor to chronic diseases and disability (WHO, 2008). Over all about 2.5 millions deaths are attributed to overweight/obesity worldwide (WHO Global Info database, 2008). Obesity has reached epidemic proportions in India in the 21st century, with morbid obesity affecting 5% of the country’s population. India is following a trend of other developing countries that are steadily becoming more obese. WHO Global InfoBase (2008) has estimated the prevalence of obesity in India; in 2005 it was 1.4 percent and 1.1 percent (BMI >30) for males and females respectively. This figure will be as high as 2.9 percent and 2.5 percent in the year 2015.

The WHO refers obesity as a global epidemic because of rapid increase in the number of overweight and obese individuals in last 20 years. The problem of obesity is confined not only to adults but also children and adolescents. Sedentary lifestyle, irregular eating habits, excessive junk food intake are some of the leading contributors to obesity. Unhealthy, processed food has become much more accessible following India's continued integration in global food markets. The health consequences of this global epidemic range from increased risk of premature deaths to serious chronic disorders that reduce the overall quality of life (Muley and Subbulakshmi,
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It is a chronic disease prevalent in both developed and developing countries and affecting children as well as adults. Obesity has been identified as a risk factor in a wide range of diseases and illnesses including coronary heart disease, stroke, type 2 diabetes, hypertension, metabolic syndrome, osteoarthritis and cancer (Swaton, 2008). In India, the prevalence of overweight and obesity is on the increase. In the last century focus of health care in India was on problems related to malnutrition and infections. However, with evolving epidemiological transition and demographic change, the problems of malnutrition have receded and phase of chronic degenerative diseases has taken over. Increasing body weight and abnormal fat distribution are consequences of the changed socioeconomic circumstances. A study conducted by Misra et al. (2001) on North Indians stated that the prevalence of obesity is 13.7 percent and 30.7 percent on the basis of BMI and body fat respectively. Obesity and overweight has been reported from various parts of India, especially urban populations. Reddy et al. (2002) performed comparison of obesity and central obesity parameters in Delhi urban and rural cohorts and reported a 2-3 times greater prevalence in urban subjects. Gupta et al. (2012) also reported high prevalence of overweight and obesity (48.1%) in urban middle class of Jaipur.

Etiology and Prevalence of Diabetes

Diabetes is another such escalating epidemic which is becoming the major cause of global concern today. India, the world’s most populous country, now has more people with type 2 diabetes (more than 50 million) than any other nation. Type 2 diabetes results from a genetic pre disposition and from life style factors, especially those of so called Western life style, characterized by high caloric intake and little exercise. The number of people with diabetes is increasing due to population growth, aging, urbanization, and increasing prevalence of obesity and physical inactivity. International Diabetes Federation (IDF) 2009 reported India with highest number of people
with diabetes in the world and China occupies the second position. India is now being dubbed as the "Diabetic capital of the world". It is a chronic metabolic disorder that prevents the body to utilize glucose completely or partially. The global prevalence of type 2 diabetes is expected to double in the period 2000 to 2025 and may reach a level of almost 300 million i.e. 5-7.6% of the total global population by the year 2025 (Sharma and Mishra, 2007). The average age adjusted prevalence of diabetes in India was 8% in 2010, higher than that in most European countries (Shaw et al. 2010).

Sandeep and colleagues of the Madras Diabetes Research Foundation summarize the situation as follows: Diabetes in India is no longer a disease of the affluent or a rich man's problem it is becoming a problem even among the middle income and poorer sections of the society. The age of onset of diabetes in India has been shifted towards ever younger people even within the past decade. Although obesity is a risk factor for diabetes both in India and in west, the disease appears at a lower threshold of obesity in India, as also the case in China, Japan and other Asian countries (Mohan et al. 2007). Currently, 60% of the world’s diabetic population is Asian (Malik et al. 2013). In India Diabetes is a chronic degenerative disease associated with hyperlipidemia, CVD, nephropathy, neuropathy, retinopathy and delayed wound healing. Indians with diabetes are less likely to develop blindness and kidney disease, but much more likely to suffer coronary artery disease at a relatively young age.

The etiology of diabetes is multifactorial and its origin can be traced by a variety of causative factors like genetic inheritance, obesity, infections, acute stress, excessive sugar and fat intake and reduce physical activity. The reasons are those behind the diabetes epidemic—rich, fatty, fast foods cheaply available in cities to rich and poor alike. Another is the increased sedentariness that has resulted from the replacement of manual labor by
service jobs, and from the advent of video games, televisions and computers that people seated lethargically watching screens for hours every day. In India, a wide range of outcomes for different groups is buried within the average diabetes prevalence of 8%. Prevalence is only 0.7% for non-obese, physically active, rural Indians. It reaches 11% for obese, sedentary, urban Indians; and it peaks at 20% in the Ernakulam district of Kerala, one of India’s most urbanized states. Diabetes in India is associated with obesity, high blood pressure and sedentariness. But prevalence of disease is higher among affluent, educated, urban Indians than among poor, uneducated, rural people. In 2004, the prevalence of diabetes averaged 16% in urban Indian and only 3% in rural India (Mohan et al. 2008). Medication clubbed with strict exercise regime and dietary modifications are the only measures to bring this incurable disease under control.

**Causes and Prevalence of Cardiovascular Disease**

Cardiovascular disease (CVD) is the class of diseases that involve the heart or blood vessels. CVD is another chronic degenerative disease which has been identified as a priority area by World Health Organization (WHO) for research in the developing countries. By the year 2020, non-communicable diseases such as cardiovascular diseases (CVD) will be the major causes of mortality and morbidity in developing countries, accounting for almost four times as many deaths as communicable diseases (WHO, 2008). In 2020 AD, 2.6 million Indians are predicted to die due to coronary heart disease which constitutes 54.1% of all CVD deaths. The two main forms of CHD are heart attack (myocardial infarction) and angina. CHD alone is the most common cause of death in England and Wales, accounting for 15% of all deaths (Scarborough et al. 2010). The prevalence of CHD appears to depend on combination of lifestyle, dietary, environmental and population specific risk factors. Studies have shown that elevated levels of blood lipids (TC and TG) are one of the major risk factors for heart disease and that hypercholesterolemia
when present for a longer duration leads to atherosclerosis, which in turn may precipitate cardiovascular disease (Desai et al. 2000).

Cardiovascular diseases are the leading cause of deaths in developing countries accounting for 17 percent of the total deaths. CVD are epidemic in India and the most important cause of death in all regions of the country (Gupta et al. 2012). In India, annual number of deaths from cardiovascular diseases rise from 2.26 million in 1990 to 4.77 million in 2020 (Huffman, 2011). In addition to high CVD mortality in Indian subcontinent, it manifests almost 10 years earlier on an average in this region compared with the rest of the world, resulting in a substantial number of CVD deaths occurring in the working age-group. The huge burden of CVD in Indian subcontinent is the consequence of large population and high prevalence of cardiovascular risk factors like smoking, alcohol, lower fruit and vegetable consumption, physical inactivity, obesity, diabetes, hypertension and dyslipidemia (Kaur et al. 2007). Although the exact reasons why Asian Indians are more prone to type 2 diabetes at a younger age and premature CVD remain speculative, there is a growing body of evidence to support the Asian Indian Phenotype. This term refers to the peculiar metabolic features of Asian Indians characterized by a propensity to excess visceral adiposity, dyslipidemia with low HDL cholesterol, elevated serum triglycerides and increased small, dense LDL cholesterol, and an ethnic susceptibility to diabetes and premature coronary artery disease (Anjana et al. 2011).

The diet related CDDs (chronic degenerative diseases) are largely affected by the food habits and lifestyle of the people which differ widely from community to community. In our own country, we can find a great diversity in the dietary pattern and living standards of the people belonging to different communities and sections of the society. Therefore, it becomes absolutely essential to study the prevalence of these diseases in various
communities so as to have a deeper insight into the causative risk factors as well as the remedial and preventive measures to bring them in control.

RATIONALE FOR UNDERTAKING PRESENT STUDY

The combined effect of changes in lifestyle and eating habits is resulting in a significant change in the food and nutrition issues facing Asian countries. Of growing concern are the significant proportions of the population now witnessing the other facet of malnutrition - the chronic diseases associated with over nutrition. The increased prominence of these diseases is evident in the mortality and epidemiologic data, which vary markedly among countries in the region. The new dimensions in the nutrition situation in developing countries pose great challenges to nutritionists and other health workers.

Several epidemiological studies have considered the impact of increasing body weight, body mass index (BMI) and other anthropometric measurements on the risk of chronic disease (Folsom et al. 2000). According to Asia Pacific Cohort Studies Collaboration (2006) individuals with a higher proportion of abdominal fat have a greater risk of developing coronary heart disease, type II diabetes (Anjana et al. 2004) and CVD-related morbidity and mortality than those with a lower proportion. In India there have been very few studies on communities for specific risk factors related to CDD. Coronary heart disease prevalence rates in India have been estimated over the past several decades and have ranged from 1.6% to 7.4% in rural populations and from 1% to 13.2% in urban populations (Gupta et al. 2008). The prevalence rates of coronary heart disease (CHD) were highest in Sikhs, lowest in Muslims and identical in Hindus and Christians. Sikhs also had the highest prevalence of obesity, hypertension and diabetes. The diseases were also significantly higher among the obese, non-vegetarians, individuals from high socio-economic class and those addicted to alcohol and tobacco. A study conducted by Misra et al. (2001) on North Indians stated that the prevalence
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The prevalence of obesity is 13.7% and 30.7% on the basis of BMI and body fat respectively. Deurenberg - Yap et al. (2002) determined body fat percentages (BF%) in Singaporean, Chinese, Malays and Indians and concluded that Chinese have the lowest BF% while Indians have the highest percentage of body fat. According to Trayhurn (2003), a BMI of 30 is associated with a 10-15 fold increase in the risk of developing type II diabetes.

A study by Gupta et al. (2007) on the family history of coronary heart disease and prevalence of risk factors in Punjabi Bhatia community in Jaipur revealed a high prevalence of obesity (20.8 and 32.3%), truncal obesity (77.4 and 80.2%), hypertension (51.3 and 51.7%), diabetes (17.7 and 14.2%), lipid abnormalities, and metabolic syndrome (36.2 and 47.8%). Family history of CHD was present in 19.9% men and 21.6% women. Subjects with family history of CHD had significantly greater systolic BP, total cholesterol and triglycerides levels.

Data on prevalence and risk factors of CDD among Indian communities are still far from being satisfactory. There are only a few studies from India that have evaluated location specific or group specific cardiovascular risk factor prevalence.

Agrawals, are a large and very influential community in India. Traditionally, the Agrawals have been a trading community in northern India, though in modern times they follow other professions as well. Agrawals are the most prominent ethnic group among business communities in India with a population of about 25-30 million (Timberg, 2014). More of business requires longer sitting hours which make them physically quite sedentary. In a study on the prevalence of risk factors of obesity, among adult population of Agrawal Community of Jaipur showed that 60% male and 49% of female were overweight and obese having BMI ≥ 25 (Mathur, 2005). Agrawals are a well-to-do community. Traditionally Agrawals are strictly vegetarian and a
community not consuming alcohol nor smoking, although with globalization and cultural inter mixing some may have changed their life style in the modern times. The people mostly have traditional lifestyle and food habits. They celebrate even the smallest of festivals with elaborate food preparations. Frequent social gatherings, lavish meals and obligatory exchange of sweets are usual practices in this community. Such food habits place Agrawals at high risk for developing diet related CDDs. Another study in the same community in Jaipur reveals high prevalence of obesity associated with low physical activity and high dietary calorie and fat intake. Lifestyle factors appear to be mediator of the cardiovascular epidemic in this community (Gupta and Agrawal, 2009).

Thus, if the above mentioned factors are summed, following major points can justify the overall rationale of the study:

1. Non communicable diet related chronic diseases are an emerging health problem, so the screening of population is must for early detection of the same and its consequences.

2. Chronic degenerative diseases are consequences of diseases with complex etiology. There are various factors responsible for the development of diet related chronic diseases. There has been the “nutrition transition” in developing countries, or the shift from traditional diets and lifestyle to “western diets” (i.e. high in saturated fat, sugar and refined foods), and the combination of reduced levels of physical activity and increased stress, particularly in rapidly growing urban populations. The feared outcomes of the nutrition transition are obesity and chronic degenerative diseases (Martorell et al. 2000).

3. However India is home to a heterogeneous population for which a one size fit all policy approach to addressing the CVD burden is likely to be insufficient. Different manifestation of CDD can be
observed not only in urban and rural population but also poor and wealthy households who might be living side by side in same neighbourhood in different communities. Thus the present study aimed to evaluate prevalence of diet based chronic diseases in a specific location related ethnic group in Jaipur, to determine lifestyle practices and their association with various risk factors. Thus this study was planned based on the following objectives.

**OBJECTIVES**

1. To determine the prevalence of diet related chronic diseases (over weight and obesity, diabetes mellitus, hypertension and hyperlipidemia) among the Agrawal community, Jaipur, Rajasthan.

2. To know the lifestyle practices (food habits, physical activity, tobacco and alcohol) and other associated factors contributing to chronic diseases.

3. To study the food consumption pattern and intake of nutrients by Agrawals.

4. To study the association between obesity and diabetes mellitus, hypertension, hyperlipidemia among the respondents.

5. To find the association between demographic variables (age, sex, education, occupation) and diet related CDD.