ABSTRACT

“Life is not merely to be alive, but to be well” - Marcus Valerius Martial. Every person aspires to live long. But living long enough is not only desirable, what is needed more is to enhance the quality of life. Advancement in science and technology has made tremendous progress in quality of lives. But even today people are surrounded by myriad risks affecting health and quality of life. No person in this world perhaps can lead a disease free life. Some short term illnesses are quite common and recovering from such illness is easy. But some long term chronic diseases have detrimental health effects and may result in premature and painful death.

Two clear trends have been visible in the domain of health statistics in the course of the last few decades. First the scourge of infectious diseases have steadily declined. Second and as a consequence of the first, longevity has seen a steady increase. However increasing longevity has meant that chronic diseases are increasing at an alarming pace. Due to alternations in diet and lifestyle, more young people are also developing chronic diseases. Chronic diseases such as diabetes, cardiovascular diseases and cancer are the leading causes of mortality and morbidity in India. Though chronic diseases are sometimes life threatening and costly to treat, the pleasing fact is that they are also among the most preventable.

Since chronic diseases are preventable, attention has to be focussed on its risk factors. In this context, the risk factors leading to chronic diseases can be broadly classified into two types - modifiable and non modifiable. Identification of major risk factors, their prevention and control form the basis of the prevention of chronic diseases. Modifiable risk factors are given primary importance in chronic disease prevention. However, pretty little can be done to tackle the impact of non modifiable risk factors. Identification of risk factor and setting preventive strategies is important, but what required more is to calculate population attributable fraction (PAF) in order to understand the impact of the risk factors on the chronic diseases, thereby setting prevention strategies for the risk factors which poses maximum disease burden.

The thesis is divided into seven chapters. The first chapter deals with introduction about chronic diseases. Introductory concepts on chronic disease such as meaning, misconceptions and realities about chronic disease, global burden of chronic
disease etc. are the topics included in the first chapter. Due to epidemiological transition, chronic diseases are replacing infectious and parasitic diseases as the leading cause of morbidity and mortality worldwide. Presently a new era of chronic disease has arisen which is reflective of diseases and health problems of adults rather than that of children. Chronic diseases have detrimental health effects and affects young and elderly population. According to Kirch (2008) “as the population ages, more and more people are living long enough to develop chronic diseases, but also that in today’s socio economic environment, more young people are developing chronic diseases.” Heart disease, stroke, cancer, chronic respiratory diseases and diabetes are said to account for 63% of all deaths worldwide (WHO, 2012a). Literature review on risk factors of heart disease, diabetes and cancer also add up the first chapter.

Second chapter is on materials and methods. Data needed for the analysis has been taken from the Indian Human Development Survey (IHDS), 2005. IHDS was jointly organized by researchers from the University of Maryland and the National Council of Applied Economic Research (NCAER) India. It is a nationally representative multi topic cross section survey of 41554 households in 1503 villages and 276 towns and cities across all states and union territories of India except Andaman Nicobar and Lakshadweep islands. The IHDS (2005) has two major datasets: individual dataset and household dataset. The individual dataset consists of 2,15,754 cases, each with 211 variables. The household dataset has 41,554 cases each with 937 variables. Our analysis is carried out on individual dataset. In 2009, IHDS was the top most download survey for surveys outside of United States in respect of downloads from ICPSR (Interuniversity Consortium for Political and Social Research located at University of Michigan, USA) archive of over 7000 studies. Data cleaning relating to height and weight data, exclusion of variables, construction of variables such as BMI and diet related variables, recoding of variables are described in details in this chapter. The analysis of chronic diseases for the thesis is restricted to three important diseases namely heart diseases, cancer and diabetes. The technique used is logistic regression. Estimate of the parameter (B), corresponding standard error, p values, odds ratio and 95% Odds ratios (OR) were calculated and estimates are presented with 95% confidence intervals (CI). p values of 0.05 or less (2-tailed) were considered statistically significant.
Third chapter deals with identification of modifiable and non modifiable risk factors using chi square test of association. In advanced countries, there have been a number of large scale studies on identification of risk factors. The same cannot be said about India. While small scale studies in segments of the country have been reported, we are not aware of any such exercise conducted on any large scale India based survey. Often such exercises have been carried out on a smaller scale based upon hospital records or at best on a limited geographical area for example a city or a few cities. On other occasions, results of similar studies in other countries have been used by public health professionals in India. Consequently often the experience in other countries is imposed on India. Hence we aim to identify the risk factors for leading chronic disease viz. heart disease, diabetes and cancer in India based on a relatively recent large scale nationally representative survey.

Fourth chapter of the thesis is based on modifiable risk factors. Modifiable risk factors can be modified and controlled and are given primary importance in chronic disease prevention. Logistic regression analyses were carried out separately for heart disease, diabetes and cancer with respect to different modifiable risk factors. For the logistic analysis, the dependent variable was disease, operationalized as a binary response variable – yes (having disease) and no (do not have disease). Independent variables in the logistic regression equation were modifiable risk factors. We also aim to assess and compare the influence of modifiable risk factors among different age groups and different areas of residence.

Fifth chapter of the thesis is on the influence of non modifiable risk factors on modifiable risk factors of chronic diseases. Non modifiable risk factors also play vital role for the onset of chronic diseases. However, such risk factors are beyond our control capacity. Risk factors related to health behaviors such as diet, exercise, smoking, alcohol consumption can be modified and controlled. Health behaviour is influenced by a broad variety of determinants such as age, gender or social status (Neumann and Kirch, 2009). The aim of the chapter is to examine and quantify the influence of non modifiable risk factors on modifiable risk factors for leading chronic diseases in India using the technique of logistic regression.

Sixth chapter focuses attention on population attributable fraction (PAF) of leading chronic diseases in India. It is a well known fact that a strong risk factor but low
prevalence exposure could have less impact on the population. This necessitates the calculation of PAF that takes into account both the strength of association between the risk factor and the outcome and the prevalence of the risk factor in the population. Chandelia et al. (1999) and Raji et al. (2001) have pointed out that “metabolically obese” phenotype, characterized by greater abdominal obesity despite a normal BMI, less muscle mass, higher percentage of body fat and increased propensity for insulin resistance compared with the Western population, renders higher susceptibility for diabetes in Asian populations. This fact highlights the fact that even normal BMI persons are at risk of developing diabetes in India. Hence in addition to overweight/obese persons, the contribution of normal BMI persons to diabetes disease burden in India need to be quantified. The burden attributable to each risk factor varies considerably across regions (Brown et al., 2014). Hence our fourth aim of the present thesis is to calculate the PAF of leading chronic diseases in India associated with significant modifiable risk factors. We have calculated both unadjusted and adjusted PAFs. To assess adjusted PAFs focus was given on modifiable risk factors amenable to prevention taking non modifiable risk factors as confounders.

Chapter 7 is based on BMI variation in different zones of India. We are fully aware of the fact that both low BMI (underweight) and high BMI (overweight and obesity) is detrimental to health and are associated with increased morbidity and mortality. In fact obesity in particular is an epidemic of the present century. BMI has an inverted U relationship with age. Physical activity level, diet, income differs among young (22-35 years) and middle aged (36-50 years), which in turn lead to difference in BMI among the two mentioned age groups. This fact highlights the importance of a study on BMI among the age groups and to examine if BMI differs among different zones of India, different types of occupation, income using Median test.

There are some key findings of the present thesis. Except sex, all other non modifiable risk factors are found to be significantly associated with heart disease whereas among modifiable risk factors, tobacco smoking, per capita edible oil and per capita non veg consumption are significantly associated with heart disease. Except tobacco smoking, all other modifiable risk factors are found to be associated with diabetes. All non modifiable risk factors considered for the study are found to be significantly associated with diabetes. Among non modifiable risk factors, education
completed years and highest female education are found to be significant with cancer at 1% level of significance. Tobacco smoking and high BP are significantly associated with cancer, other modifiable risk factors are not associated with cancer. A detailed perusal of our analysis would indicate that while our results are similar to some studies, it is different from others. We believe this is where the importance of our study lies. The current practice of blanket import and use of results from studies in other countries do not necessarily apply to India. For example, we have not found a significant association between BMI and heart disease. There is now a growing realization that hip to waist ratio is perhaps more important risk factor than BMI (Noble, 2001).

The findings in the present study reveal that non modifiable risk factors have influence on modifiable risk factors and if not given attention may allow chronic disease to increase further. Age has influential effect on all modifiable risk factors considered in the present study. Consumption of tobacco, edible oil, milk product and non veg is more among higher age groups. They also have more high BP and are more overweight. It can be observed that conventional education fails to inform about adverse effect of tobacco consumption. It can also be observed that as education level increases, people tend to become more overweight. Moreover as educational level increases, people tend to have more high BP and have greater intake of non veg and edible oil. Also, urban people are more prone to have high BP, to be overweight, to have higher intake of edible oil and non veg. Manual workers consume more tobacco smoke, have less BP, are less overweight, have less intake of oil and non veg. According to the study, females have high BP consume more diet and are overweight. Widowed and sep/div consume consume less tobacco than married. Higher age group individuals, females, urban dwellers should be given importance in modifiable risk factor prevention. Conventional educational fails to increase health awareness w.r.t high BP and also fails to inform people about problems associated with higher intake of diet related variables and the problem associated with overweight/obesity. This necessitates the importance of health education in India.

Our study quantified the theoretical reduction in chronic diseases such as heart disease, diabetes and cancer with the elimination of significant modifiable risk factors in presence as well as in the absence of non modifiable risk factors as confounders. Findings suggest that tobacco smoking is the most important factor for reducing risk of
heart disease and cancer. Moreover we find that the PAF of diabetes attributable to BMI (normal weight and overweight) outweighs other risk factors.

Effective prevention and management of high and low BMI are necessary in states of Punjab (state with high BMI) and Orissa (state with low BMI) respectively. From our analysis we find that for both young adults and middle aged, BMI is significantly different for different types of occupation and for different quartiles of income. Though all India present the picture of significant difference of BMI of manual and non manual workers for 22-35 age group, but the picture is slightly different in case of zone wise analysis. Central and North East zones have significant p values which point to the fact that BMI of manual and non manual workers for these two zones do not differ. However for 36-50 yrs age group, the picture matches up to that of all India. For both age group considered, all India present the picture of significant difference of BMI of different quartile boundaries of per capita income. But in case of zonewise analysis, North East zone do not show any significant differences in BMI thus pointing to the fact that BMI of different quartile boundaries of per capita income for this zone do not differ. However for 36-50 years age group, significant differences of BMI of different quartile boundaries of per capita income can be observed for each zone. As compared to people of lower income categories, people of higher income group show increasing trend of having similar BMI.

To sum up, our analysis points to the importance of diet and lifestyle behaviours in order to be able to cope with the burgeoning epidemic of chronic diseases. Our study which is based on a large scale countrywide survey makes a humble point here. There is no alternative to confronting the largely silent epidemic of chronic diseases by adopting preventive measures. Our analysis also points to the importance of non modifiable risk factors. The importance lies in the fact by which they influence modifiable risk factors thereby targeting special groups in need of risk factor prevention and modification. The findings of the study highlight that an agenda to improve public health in India must include effective interventions to control tobacco use for cancer and heart disease prevention. There is an urgent need to educate the general public to maintain proper BMI level thereby reducing diabetes burden in India. Moreover a detailed perusal of analysis of BMI w.r.t occupation and income over two age groups helps us to have deeper knowledge about BMI.