ECONOMIC BURDEN OF THE CARDIOVASCULAR DISEASE IN RAWALPINDI: PATIENT PERSPECTIVE

Submitted by:

Kainat Jahangir

Research Supervisor

Dr. Muhammad Nasir

DEPARTMENT OF HEALTH ECONOMICS PAKISTAN INSTITUTE OF DEVELOPMENT ECONOMICS ISLAMABAD

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Pakistan Institute of Development Economics

CERTIFICATE

This is to certify that this thesis entitled "**Economics Burden of the cardiovascular diseases in Rawalpindi (Patient Perspective)".** submitted by Ms. Kainat Jahangir is accepted in its present form by the Department of Health Economics, Pakistan Institute of Development Economics (PIDE), Islamabad as satisfying the requirements for partial fulfillment of the degree of M. Phil in Health Economics.

Supervisor:

Dr. Muhammad Nasir,
PIDE, Islamabad

Internal Examiner:

Dr. Fazli Hakim Khattak
Assistant Professor
PIDE, Islamabad.

External Examiner:

Dr. Javed Iqbal
Associate Professor
QAU, University

Head, Department of Health Economics:

Dr. Fazli Hakim Khattak

Date of Examination: August 13, 2018

THESIS COMPLETION CERTIFICATE

It is certified that the thesis entitled **"Economics Burden of the cardiovascular diseases in Rawalpindi (Patient Perspective)".** Has been completed by Ms. Kainat Jahangir Registration No. PIDE2016FMPHILHE09 under my supervision. It is also certified has the thesis is based on original research work and meets all criteria and standards laid down for M. Phil degree.

The following areas have been critically monitored:-

1. Conformance to APA format.
2. Precision & Correctness of the language.
3. Literature Review is relevant and comprehensive.
4. Relevance of references with the text.
5. Methodology and Estimation techniques are appropriate.

Name of Supervisor/s: Dr. Muhammad Nasir

Designation: SRE, PIDE

Signature: _____

Date: August 13, 2018

CANIDATE DECLARATION FORM

I, Ms. Kainat Jahangir

D/o: Jahangir Khan

Registration: PIDE2016FMPHILHE09

Discipline M. Phil Health Economics

Candidate of M. Phil Health Economics at the Pakistan Institute of Development Economics do hereby declare that the thesis: **"Economics Burden of the cardiovascular diseases in Rawalpindi (Patient Perspective)".** Submitted by me in partial fulfillment of M. Phil Degree, is my original work, and has not been submitted or published earlier. I also solemnly declare that it shall not, in future, be submitted by me for obtaining any other degree from this or any other university or institution.

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Signature of Candidate

Ms. Kainat Jahangir
Name of Candidate

August 13, 2018
Date

ABSTRACT

A cardiovascular disease is defined as condition of heart and blood vessels. They are now the most important cause of morbidity and mortality in worldwide, that effecting men and women equally. It has not only social and health consequences but also has bad economic impacts on individuals, families, health systems and society as well So they have to bear huge economic cost in terms of direct (out of pocket expenditures) and indirect (loss of productivity) also by pushing them into the poverty trap because the individuals with Coronary Heart Disease have to spend high proportion of their income on treatment of these disease. All risk factor such as obesity ,hypertension, lack of physical activity, smoking, high blood pressure leads to coronary heart disease and individuals bear a huge cost both through direct medical expenses and indirect in terms of loss of productivity. The burden of Coronary Heart Disease is not only on the individual but it is also on society as well. So this huge burden also decreases the quality of life and lowers the life expectancy by increasing mortality This study also concluded that due to increase of direct cost patients can be bear huge amount of economic burden and pay by their out of pocket. However, the increasing incidence of the coronary heart disease in our society it is essential to asses and evaluate all these risk factors at national level, it will enable us in formulating policies for promoting healthy lifestyles, frequent and early risk assessment and age specific preventive strategies.

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Chapter 1

INTRODUCTION

A cardiovascular disease is defined as condition of heart and blood vessels. They are now the most important cause of morbidity and mortality in worldwide, that effecting men and women equally. An estimated 16.7 million deaths are occurred globally due to cardiovascular diseases (Gwatkin, Guillot, & heuveline, 14 August 1999). An estimated 50% of death occurred in the United States and Western European countries due coronary heart disease, which is also the leading cause of death. Meanwhile, the mortality rate before the age of 75 years due to cardiovascular disease is estimated to be 50% of deaths in men and 33% in women. (Nichols *et al.* 2012).Cardiovascular diseases consist of modifiable and non-modifiable risk factors. Non-modifiable risk factors included such as age and sex, which are mainly related to cardiovascular diseases. So the increase of cardiovascular disease those are strongly associated with number of modifiable risk factors.

Researchers reveals that CVD arise due to "big five "modifiable risk factors that are high cholesterol, high blood pressure, smoking, obesity, physical inactivity and un healthy diet (Heart disease & stroke, 2012). In developed and developing countries there is high prevalence of risk factors of CVD among young and middle aged adults. These are the major CVD diseases such as coronary heart disease, congestive heart failure, cerebrovascualar disease and stroke. In this study we only incorporate coronary heart disease in order to inspect the economic burden in terms of both direct and indirect cost.

Cardiovascular diseases are not only cause of premature mortality and morbidity but it also decreases the quality of life of the effected individuals (Suhrcke et.al, 2005; Patra et.al, 2007: and Adeyi et.al, 2007). It has not only social and health consequences but also has bad economic impacts on individuals, families, health systems and society as well (Patra et.al,

2007; Puoane et.al, 2008; Boutayeb, 2010). So they has to bear huge economic cost in terms of direct(out of pocket expenditures)and indirect (loss of productivity) also by pushing them into the poverty trap because the individuals with CVD have to spend high proportion of their income on treatment of these disease (Patra et.al, 2007). The prevalence of Cardiovascular disease have serious impact on health and wealth on the people of low-middle income countries stated by (Strong,2005) and by reducing their productivity and then potential earning because disease conditions effects the people of younger and productive ages of the low-middle countries. All this revealed that the prevalence and incidence of cardiovascular disease make a huge burden of disease to increase which shows that an urgent action is required to avoided adverse impact on national socio-economic development.

Coronary heart disease, also called ischemic heart disease or coronary artery disease. It is the foremost and most prevailing CVD disease among the age group of above 20 years. Coronary heart disease is caused when the arteries become narrow due to waxy substance called plaque build-up inside the walls of arteries and does not supply oxygen- rich blood to the heart. So this procedure is called 'atherosclerosis' and the fatty material is called 'atheroma'. As result angina can take place, which is defined as an uncomfortable feeling in the chest area, which can be spread to the arms, jaws, neck, stomach or back. Angina can be stable and unstable which is usually happens when the coronary arteries turn out to be so narrow due to blood clotting and these arteries do not supply enough oxygen and blood to the heart. So, atheroma cracks which causes heart attack. (British heart foundation (British Heart Foundation, 2006),

Coronary heart disease is leading cause of death in all over the world. According to a recent report "More than 61 million Americans suffer from cardiovascular disease, including high blood pressure, coronary heart disease, stroke, congestive heart failure, and other conditions" (Surgeon general, 2005). In America an about 13.5million peoples have diagnosed CVD and above than 2,600 Americans die every day due to coronary heart disease, about 1 death every 33 seconds (Center for Disease Control, 2005).

Cardiovascular diseases needs closer look, when it comes to Pakistan because, Pakistan is a developing and low middle income country with fast growing population. Approximately the population of Pakistan was 188million in 2013, and it is to be predictable that it will be increases by 363 million at the end of 2050. Since the last few years, Pakistan has shown progress in some of the health indicators but on the whole it still lags behind the anticipated level because of the gradual shift from cardiovascular diseases. Pakistan is one of the world's biggest youth bulge nation with 48 % of this age group(15-49) and 56% of population is of this (age15-64) which are productive ages that 's the reason CVD contribute essentially to adults death and ill health.

Due to demographic evolution, epidemiological and negative possessions of hasty urbanization, inactive lifestyle, detrimental nutritional way of life, and in addition to globalization provide incredible increase in cardiovascular diseases in terms of coronary heart disease.

Pakistan is faces huge burden of cardiovascular disease.(Afzal and Yusuf, 2013).literature tells that all risk factor such as obesity ,hypertension, lack of physical activity, smoking, use of alcohol al leads to coronary heart disease and individuals bear a huge cost both through direct medical expenses and indirect in terms of loss of productivity. The burden of Coronary Heart Disease is not only on the individual but it is also on society as well. So this huge burden also decrease the quality of life and lowers the life expectancy by increasing mortality.(Adeyi et.al, 2007).

1.1 Problem Statement

There is huge economic burden of Coronary heart disease, strongly associated with the financial aspects of the diseases. In order to obtain a more accurate and comprehensive cost assessment of coronary heart disease the present research proposal has been designed. There is a need to assess two types of cost. In economics, a cost or burden of illness study estimates that resources which are consumed for the prevention, detection, and treatment of any

cardiovascular disease by patient perspective This type of study has been conducted for many diseases in the world that provides a potentially useful decision making aid for setting priorities in health care research.

1.2 Objectives of Study

The study investigates;

1- Estimate the economic cost: direct cost(attributable to out of pocket payment)and indirect cost(attributable to productivity losses) of coronary heart disease in tertiary care hospitals of Rawalpindi

2- Investigate the socio-economic, demographic and behavioral risk factor that are potentially associated with coronary heart disease.

3- Make a comparison between private and public sector hospital in order to analyze the cost differences for coronary heart disease.

1.3 Hypothesis

Hypothesis of proposed study are follow:

1- **H0:** Coronary heart disease does not involve a high direct economic cost

H1: Coronary heart disease involve a high direct economic cost

2- **H0:** Risk factors are not strongly associated with coronary heart disease

H1: Risk factors are strongly associated with coronary heart disease

3- **H0:** There is no cost difference between public and private sector hospital

H1: There is cost difference between public and private sector hospital

1.4 Significance of the Study

This study contributes to the literature on the direct and indirect cost of coronary heart disease. To my knowledge, this is first study that would estimate both the direct and indirect cost of coronary heart disease in Pakistan. In addition, this study would provide the comparison between costs of coronary, in public and private hospitals. This study will also identify the potential risk factors for coronary heart disease. This will be useful for policy makers in formulating policies, which could reduce the likelihood of coronary heart disease by influencing the risk factors.

1.5 Structure of Study

This study is structured into five chapters. Second chapter consist of literature review on similar topic, from different countries of the world and then related studies that had been done in Pakistan. Third chapter included data and methodology along with theoretical background of conceptual framework. Chapter fourth will provide the empirical analysis. And last chapter will conclude the study.

Chapter 2

LITERATURE REVIEW

This chapter has been reviewed to examine the economic cost of burden and prevalence of its determinants and risk factors of current and previous studies on CVD's at globally and national level. Most of the literature revealed that CVD's is an issue of worldwide that has been affecting both developed and developing countries. The major causes of CVD's are the demographical, socio-economic, environmental, and behavioural determinants that effecting on individuals health that can put up with huge economic burden in terms of loss of productivity along with high direct cost.

This chapter divided into three parts. First part deals with the literature based on international studies which can explain the prevalence, risk factor and economic cost on CVD's in terms of coronary heart disease. Part two gives the literature work done on CVD's by national authors. Last part deals with conclusion of this chapter

2.1 Coronary heart disease: costs &Risk factor

Aim of Gessnert et.al, (1997) research work was to assess direct and indirect health care cost in Switzerland, from period 1988-1993. Societal perspective was taken as prevalence based approach for estimated the direct health care cost such as in patients and out patients health care cost. Indirect cost included loss of productivity due to morbidity, validity and premature deaths were calculated by human capital approach. This study shows that there was large increase of direct economic cost because medicine and preventive measure has proven effective for ischemic heart disease. So these remedies' have required increasing large financial resources. However, society benefits because indirect costs decrease, although this gain does not compensate for all direct costs.

Liu et.al, (2002) investigate the economic consequences in terms of direct and indirect cost and loss of productivity due to coronary heart disease among individuals in UK. Bottom up approach was used to measure direct cost of CHD such as inpatient, outdoor patients, treatment cost, diagnosis cost, hospital admit fee cost and etc. indirect cost was measure by human capital approach in which productivity loss measure due to morbidity. This study concluded that there is huge indirect economic burden of CHD on individuals in United Kingdom.

Chang et.al (2005) was aimed to estimate the socio-economic burden of coronary heart disease in Korea in 2005. A prevalence based approach was used to measure the economic burden by using national health insurance claims data. Top down approach was used to calculate direct cost (medical cost, transportation cost) and indirect cost was measured by human capital approach (productivity loss due to morbidity and premature death). This study concluded that premature deaths was the largest cost attribute for patients with CHD which is about 2 times higher than the cost of angina. However medical cost was covered by total insurance of CHD, which is approximately 6.02% of the total annual NHI expenditure.

The studies of Leal et.al, (2006) examine the financial impact of cardiovascular disease, coronary heart disease and cerebrovascular disease between European Union countries. Societal perspective was calculated. Direct cost consist of health facility cost (expenditure on medicine, cost on health care service, inpatient and outpatient care cost, transportation cost, stay in hospital cost) were measured by top down approach. Indirect cost included informal care and productivity loses due to morbidity and mortality. Productivity loss due to morbidity was calculated by human capital approach: number of absent days due to illness by multiply lost day with actual wages. The study revealed that individuals were bear increase indirect cost as compare to direct expenditures.

Hosey et.al, (2014) was to quantify the relationship between demographic, socio-economic behavrioal risk factors of cardiovascular disease surrounded by adult population in Pohnpei. They are also analyzed that these modified and non-modified able risk factors also has relationship with access to health care. Total sample were used for analysis include 1638 adults' ages between of 25-64 and other independent variables include education, income, employment status, age, gender, place of residence along with cardiovascular disease behavioural risk factors such as smoking , physical inactivity, eating habits, obesity were estimated. SPSS software was used to done STEP wise approach for this relationship. Concluding remarks of this study was a high prevalence of cardiovascular disease among adult population of Pohnpei and now it's time to take steps in handling modifiable risk factors.

Amin et.al, (2014) they did cross sectional study to determine the prevalence of risk factor of chronic conditions among employees working in a university of Saudi Arabia. In this study data were gathered through socio-economic and demographic variables which is age, education, working status, residence, marital status and risk factors include: diabetes, smoking, healthy diet. STEPS wise approach to surveillance was used in order to conduct Univarient and mulitivarient analysis of these variables. The study suggested that diabetes and hypertension is highly prevalent between employed male and the occurrence of obesity, smoking, physical activity was also high in males. They concluded that to overcome the occurrence of NCD's risk factors, health program related to chronic conditions should be introduced.

Meraya et.al, (2015) in order to measure the relationship between four non-communicable chronic conditions along it's out of pocket expenditure. The data was collected from 2009-2011 of medical expenditure condition survey. Total sample was used in these analysis are 9,296 adult individuals between age 21 and above years those were identified with chronic illness: arthritis, diabetes, heart problem and hypertension. Dependent variable for analysis was out of pocket spending and direct health care expenditure (hospital cost, consultation fee, inpatient outpatient, drugs, medicines etc) and explanatory were chronic conditions combinations and socio-demographic and socio-economic variables as well. Logistic regression technique was employed to understand the association between chronic disease and out of pocket spending. Adjusted and un-adjusted regression was also used to examine the relationship between total expenditure with chronic ailments. The total expenditure of four main chronic ailments was high on the prayers.

2.2 Empirical studies in Pakistan

Aziz et.al, (2008) primary concern was to estimate the prevalence and life style risk factors of coronary heart in urban areas of Karachi. The study assessed the awareness of coronary heart disease. Data was collected from 4296 select household including both genders of the age 18 and above. Less than 18 are excluded. Demographic variables i.e. (age, gender, education, occupation, province and place of region) of the selected sample was taken for the analysis along with the behavioural risk factors(BMI, physical activity, poor diet).result concluded that the prevalence of heart disease high in female 8.2%than males 4.5% and the hypertension, stroke also high among females. Physical inactivity is high in females and risk factor smoking high in males. Concluded remarks of the study were the prevalence of chronic heart disease e.g. stroke, coronary heart disease, and hypertension. Ischemic heart disease frequency is high in urban areas. As a result, preventive actions need to be established to reduce the incidence of chronic non- communicable disease in Pakistan.

Abbas et.al (2009) to assessed the risk factors and determined the ischemic heart disease (IHD) burden among Pakistani population residing in Islamabad. It was a small scale and cross sectional based study conducted among randomly selected map of 2009 individual of Islamabad.33% from urban 67%individual is selected from rural areas. Both male and female between the age of 20 and above are taken for analysis. Demographic, gender socio economic variables, lifestyle and behavioural factors (smoking, physically inactivity, tobacco, sedentary lifestyle) and intermediate factors (obesity, overweight, hypertension, cholesterol level, systolic and diastolic BP etc.) are taken and family history on diabetes, cardiovascular and hypertensions. They employed the ANOVA test to check the difference in risk factors with chronic heart disease. Result of their study showed that the high economic burden is bear by individuals an overall cost of IHD is 5.09375 million and it is highly prevalent in males of all age group compared to female. All the risk factors and intermediate factors are responsible for the IHD. Smoking is high among males and cholesterol in females. They concluded that it is time to renew the health policies and implement effective interventions increase taxation on smoking, unhealthy and processed food.

Khuwaja et.al, (2009) estimated the prevalence of cardiovascular disease among currently enrolled school boys of age 14-18. It was also a cross sectional study. Self-reported data collected on behavioural and lifestyle factor like smoking, BMI, physical activity, consumption of unhealthy diet and also questioned about family history regarding chronic disease at are diabetes, hypertension and cardio-vascular disease. SPSS statistical packages are used to analyse the frequencies of behavioural risk factor. They stated this is very alarming situation 58% of school children are prone of these risk factor and their results also showed that the frequency of risk factor is high among school students, 29% was physical inactive, 31% intake unhealthy diet, 6% was overweight, 6% was smoker. They concluded that the strategies should be made related to control the risk factors and promote new health policies to cater the incidence of chronic disease.

Khan et.al, (2015) performed a study to determine the direct cost of treatment of ischemic heart disease patient in tertiary care hospital in Karachi from period may 2015 to October 2105. In this study all patients with an age group (>18years old) were diagnosed from IHD. Total sample was 700 of cardiovascular disease patients from which only selected most relevant 75IHD patients file. Patient clinical information were obtained from the patients 'medical file, and added with the unit cost of services to determine expense. Univarient analysis was performed to estimate the direct cost such as medical cost, diagnose cost, surgical cost. The outcomes of this study there was huge economic burden of IHD on society. Among of its all components of direct cost of treatment surgical procedure was main component that leads huge burden on patient out of pocket expenditure.

2.3 Conclusion

The literature reveals that there are many studies which were estimates several risk factors associated with cardiovascular disease through provider perceptive. Coronary heart diseases are high in cost that leads to huge economic burden on individuals and decrease the quality of life. A study on coronary heart disease has connected to socio-economic, demographic characteristics and behavioural risk factors, which is very useful in developing policies. Therefore, this will decrease the frequency of cardiovascular disease and overcome the massive challenges, which country faces in term of high cost by improving the quality of life. Hence, it is very essential to hit upon the all significant risk factors and economic burden of cardiovascular disease in Pakistan.

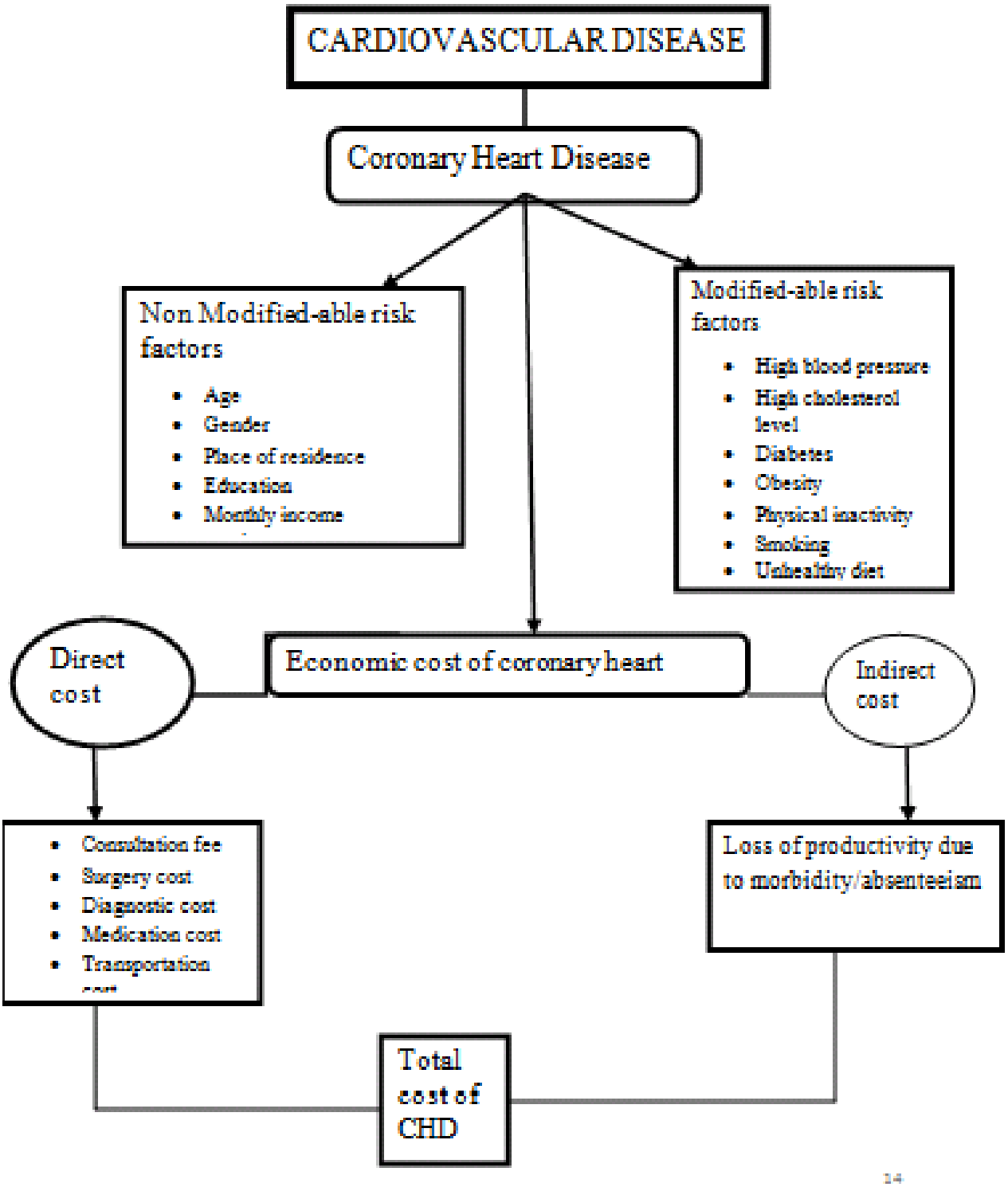
Chapter 3

DATA AND METHODOLOGY

3.1 Conceptual Framework

This conceptual framework demonstrate the economic cost of Coronary heart disease in terms of direct (consultation fee, diagnostic fee, medicines cost and surgical cost) and indirect cost (loss o productivity due to morbidity or absenteeism from work). Both factors have to increase the economic burden of Coronary Heart Disease on the patient, their families and as a whole on the society. This framework also explains the risk factors and determinants that affecting human health and resulting Cardiovascular Disease. The framework has been shown in figure 3.1, which tell us that the cardiovascular disease in terms of coronary heart disease has demographic, social-economic and behavrioal risk factors. Some are modified-able and non modified-able risk factors that causes huge economic burden on the patient's and society which leads to decrease the quality of life and increase mortality rate.

Figure 3.1: Coronary Heart Disease: Costs & Risk factors



3.2 Study Design

This is a cross sectional study in which we estimate the economic cost of CHD directed from hospital point of view. In this Study we used triangulation research methods in which we collect data through multiple sources such as documents, observation, conducting interviews and questionnaires or survey. The nature of study is based on primary research which is held on different times at different places. Outdoor patients are incorporated with age more than 20 years who has been suffered from coronary heart disease.

3.3 Data and Sample size

In this study we collect the data from two tertiary care hospital of Rawalpindi. The one which is public sector hospital "RAWALPINDI INSTITUE OF CARDIOLOGY" and the other one is "ARMED FORCE OF INSTITUTE OF CARDIOLOGY" which is semi-government hospital. Patient's information has been gathered on the basis of socio, demographic and as well as economic characteristics .these demographic characteristics including age, sex, occupation, monthly income.

Social characteristics consist of patient education level and all those behavrioal risk factors that affecting the patient health including diabetes, hypertension, smoking obesity, cholesterol level, physical activity, food intake etc. Economic cost of disease that can bear by the patient include both direct and indirect cost such as laboratory cost ,examine fee, medication cost, surgery cost, transportation cost, productivity loss due to morbidity loss or absentees from work, and length of stay in hospital during CHD. This study is based on random sampling technique, where the sample consist of 384 (CL: 95% and CI: 5%) coronary heart disease patients.

3.4 Methodology and Variables

The methodology consists of three parts. First we estimate the cost of coronary heart disease. This is including both the direct and indirect cost. Secondly, we have to identifying the potential risk factors of coronary heart disease. Lastly, we make a comparison in the cost of coronary heart disease between a public and private hospital.

3.5 Type of Cost

In this study the cost of patient is divided into three categories: direct cost, indirect cost and tangible cost (Byford, 2000; Segal, 2006; Jo, 2014). According to data availability, this study have to compute only direct and indirect cost because intangible cost is only measuring the quality of life and cost in the form of suffering and pain of the patient due to the illness/disease. Due to its measurement complications it is excluded from most of the studies (Jo, 2014; Byford, 2000; Segal, 2006). Therefore it is also emitted in the current study as well.

3.5.1 Direct Cost

This cost has been met by the individual patient, family, society and the health system. It is consist of two parts: direct health care cost and non-health care cost. Direct health care cost is defined as "It is an individual's out of pocket expenditure in terms of: treatment cost, prescription cost, cost on diagnostics, hospitalization cost, transportation cost and surgery cost etc". (Segal, 2006; Parta et.al, 2007; Jo, 2014). The present study is only compute direct medical cost but non medical cost is not added. A self- reported health disbursement question has been asked from patient during survey in hospitals. During last 1 month how much did u spend altogether on consultation fee, laboratory fee, medication fee, heart related test fee and surgery cost if it is possible? How much time did you visit in the hospitals and bear cost on transportation?

Theses variable measure the direct out of pocket expenditure of Coronary Heart Disease. Direct cost included

- Medication cost
- Diagnosis cost
- Surgical cost
- Examine fee
- Transportation cost

3.5.2 Indirect Cost

This cost has been also tolerate by individual patient, family, society and employer as well (Jo, 2014). Although, its measure the productivity losses due to death and ill health (Cooper& Rice, 1997; Segal, 2006; Jo, 2014). Basically indirect cost is categorized into two components: productivity losses due to mortality and productivity losses due to morbidity. In this study we only computed productivity cost due to morbidity because due to data constrained we cannot estimate productivity loss due to mortality. By measuring the indirect cost, most common approach "Human capital approach' (Hodgson & Meiners, 1982; Segal, 2006; Parta et.al, 2007; Jo, 2014) is used to measure indirect cost i.e. loss of productivity (number of days absent from work due to illness). Human capital approach calculates the value of human life with an economic value. This study only estimated the direct and indirect cost of employers of working age; therefore employment and health related questions have been asked to the patient during data collection.

It is assumed that, if an employee is suffering from coronary heart disease and not able to do work and for seeking for health care have to bear huge amount of economic burden: direct cost and indirect cost in terms of being hospitalized and absence from work. So it is effect on their daily wage rate and individuals earning as well. The present study computed productivity loss due to morbidity human capital approach is employed. The no of

day's absence from the work being hospitalized related question has been asked from the patients. How many days u absent from the work in a month due to illness?

This is calculating using this following formula:

Indirect cost = per daily wage rate *number of days absent from work

For computation of per daily wage firstly we need to know the employers monthly income divided by total no of days in a month. After calculations of wage rate we use to multiple daily wage rate by no of days absent from the work in order to computed loss of productivity due to morbidity.

3.5.3 Coronary Heart Disease: Risk factors

In order to identify the risk factors of coronary heart disease, we have to use a linear probability model. Our dependent variable is coronary heart disease which is binary in nature. It is take the value 1 if the patient has coronary heart disease and 0 otherwise. For this purpose, we use the following equation:

$$CHD = \beta 0 + \beta 1(age) + \beta 2(gender) + \beta 3(high\ blood\ pressure) + \beta 4(high\ chloestrol\ level) + \beta 5(obesity) + \beta 6(physcial\ inactivity) + \beta 7(smoking) + \beta 8(foodintake) + \mu$$

3.6 Independent variables

I. Age

Age is a significant demographic variable which plays major part in determination of individual's life as well. Literature investigate that prevalence of cardiovascular disease are increased as age increases (Minh et.al, 2008) because due to increase in age, health behaviours have to be changed which leads to the existence of cardio illness (Hill and Roberts, 2011; Chartash, 2012) some literature concluded that cardiovascular disease has been widely spread among youngsters and those who are between the ages of 30 to 65 (WHO, 2015, Busse et.al, 2010; Miranda et.al, 2009; MeLennan and jayaweera, 2014). In this study we take individual's age as an explanatory variables and check the relationship as age increases chances of heart disease also increases.

II. Gender

Gender is found to be an important and significant variable in cardiovascular disease. Stevens's et.al, 2012 explain that non- communicable diseases are more prevalent in men as compare to women. In this study we take gender as an independent variable. This variable is defined in binary form i-e: 0 = female and 1 = male.

III. Smoking

Smoking is important modified-able risk factors which is leading cause of morbidity and mortality in the developing countries due to chronic diseases like cardiovascular disease, cancer etc (Thakur, 2015). According to some literature there is a positive relationship between non- communicable disease and smoking because it is the most leading risk factor that increases mortality and morbidity rate with an increase in the number of cigarettes smoked per day (Doll & Peto, 1976).

Therefore, approximately 1.3 billion people smoke globally (Guindon and Boisclair, 2003). In order to check the prevalence of risk factors that are potentially associated with cardiovascular disease we take smoking as an independent variable and proxy variable which can be as binary in nature i.e: 1=smoker ,0 = non smoker.

IV. Obesity

Obesity and overweight is considered as the fifth leading cause of mortality in the worldwide, because it is the major contributor that increases the economic burden of coronary heart disease (Kearns et.al, 2014). Some literature indicated that obesity is main risk factor that increases the cardiovascular disease because there is strong association between obesity and cardiac disease (Henry, 2011; Ezzati et.al, 2013). So in this study we measure obesity by BMI (body mass index) ratio which is defined by (WHO 2009), as: weight in kilograms divided by square of the height in meters.

BMI= Weight (kg)/ Height (m2).

But in present we collect and compute the data of obese people and define as in binary form. 1= for obese and 0= for non obese

V. High Blood Pressure

High blood pressure is considered as the major risk factor of cardiovascular disease. Approximately, globally 7.6 million people die due to high blood pressure because it is main cause of mortality and morbidity. In 1994 health survey of Pakistan investigate that 22 that% adults having age 15years or more and 33%of adults having age 45years and more has been suffer from high blood pressure. There is a strong relationship between high blood pressure and cardiovascular disease. In this study high blood pressure is taken as independent variable and we computed the data by asking question to the patients; do you have high blood pressure or not. It is define data in binary form i.e.: 1= yes and 0 = no.

VI. High cholesterol level

It is one of the risk factor of cardiovascular disease that leads to increases mortality and morbidity in the whole world. There are fatty materials that play significant role in the development of heart disease. So in this study it is an independent and defined as binary form i.e. 1= having high cholesterol and 0 = for no cholesterol

VII. Physical inactivity

Rapid economic development, give rise to inactivity and sedentary lifestyle, which is highly associated with increase of the risk of cardiovascular disease. Physical inactivity is an important modifiable risk factor for multiple causes of death due to cardiovascular disease (Durstine, 2013). Cardiovascular disease, hypertension, obesity, diabetes are highly associated with physical inactivity (Musaiger and Hazzaa, 2012). Physical activity can be measure as it is asked as; are u physical active? It is classified as 1= yes, 0= no.

VIII. Food Intake

Due to rapid changes in lifestyle and eating patterns, there is a shift from traditional diet to westernized diet. This give rise to eaten out and dining out trend. Literature tells that, quantity of food eaten outside the home is also an element to understand the un healthy diet relation with cardiovascular disease. (Popkin, 2005; Musaiger and Hazzaa, 2012). Food intake variable data has been calculated and it is asked as; during past week no of meals eaten out" it is classified as 0= No, 1= yes

3.7 Ethical consideration &Consent

Ethical approval was taken from Department of Health Economics (PIDE) and from the two tertiary care hospitals in Rawalpindi.

Chapter 4

RESULT AND DISCUSSION

This chapter deals with data analysis in which we use linear probability model and descriptive statistics. In this chapter we will calculate the direct and indirect cost of Coronary Heart Disease. In addition we will also analyze the risk factors of coronary heart disease by using a sample from coronary heart patient and non patient.

4.1 Calculation of Cost

4.1.2 Direct cost: Public and Private Hospital

The estimate of the direct costs elements (see Table 4. 1) of public and private sector has been derived from information on the average number of patients. Total sample size is 192 in which 96 patients have treated in private hospital and other 96 is treated in public hospital. The total mean cost of coronary heart disease in public sector hospital is Rs 333,337. The overview of each component has average cost per month in which include diagnostic cost (ETT, ECG, ECO, angiography, radioisotopes scan) Rs 37600, laboratory cost (all blood test, x-rays) Rs 2300, surgical procedure cost (stunting, angiography bypass) Rs 285,094.1, transportation cost is Rs 3342.553 and food cost Rs 5000 which is quite high because, it is an expensive disease which required long lasting treatment and care. In public sector hospital there is no medication and consultation cost. On the other hand we take the data of 96 patients in private hospital (see table 4. 1).

The total direct cost of coronary heart disease is Rs 502,284. The other cost components include diagnostic cost Rs 64000, laboratory investigation Rs 5432, consultation and medication cost Rs 648, 4.11, surgical cost 414470.6, transportation cost Rs 5347.368 and food cost is Rs 6550.21. Lastly we take the total sample of 192 patients of both sectors and estimate the total combine cost which is Rs 475,008. In this study data demonstrate that

patient who can bear his/her treatment privately has high economic burden because coronary heart disease is the most expensive disease among the effected individuals.

Table 4.1 Direct cost of hospitals (average cost per month)

Hospitals	Diagnostics cost	Laboratory cost	Consultation Cost	Medication cost	Surgery Cost	Transport cost	Food cost	Total charges
Public hospitals	376,00	2300	0	0	285,094.1	334,2.553	5000	333,337
Observations	96	96	96	96	85	96	96	96
Private hospitals	640,00	543,2.10	1000	548,4.211	414,470.6	5347.368	6550	502,284
Observations	96	96	96	96	85	96	96	96
Both sectors	630,92.63	3860	500	2742.105	399,782.4	284,2.328	5000	475,008
observation	192	192	192	192	170	192	192	192

The estimated average cost of all components in both sectors is on monthly basis. The main cost component in both hospitals is surgical cost which has been estimated on average basis and it is long term cost which can be bear by patients after 10 to 15 years depend upon the conditions. So we concluded that there is huge cost difference between public and private sector hospital in terms of direct cost. The direct cost of private hospital is quite high as compare to public hospital. Therefore there is huge economic burden of disease on ill individuals, which can pay by out of pocket in both hospitals whether it's private or public.

4.1.3 Indirect costs of public and private hospital

The element of indirect cost has been evaluated by using human capital approach. This loss is quantified through "morbidity costs due to absenteeism". Thus the productivity losses have been calculated on the basis of the foregone income, assuming that loss of productivity is approximated by loss of wages. (See table 4.2)

Table 4.2: wage rate* loss of productivity: per month income

Hospitals	**Loss of productivity (per month wage rate on average basis)**
Private hospital	7109.82
Public hospitals	5413.33
Total average cost for both hospital	6261.579

The indirect cost which is directly faces by patient in case of morbidity. The patient who suffer with coronary heart disease has not to do work effiecntly and effectively. Therefore, it is not more productive due absent from work as well as decrease the quality of life. As result patient bear loss of productivity in terms of per month wage rate. The average loss of productivity in public hospital is Rs 5413.33/per month, Rs 7108.92/per month for private hospital and total indirect cost for both hospitals is Rs 6261.579 by per month. Present study data result illustrated that cardiovascular disease (coronary heart disease) are high in out of pocket expenditure and indirect cost which severely effect individual's quality of life and earning as well.

4.1.4 Total Direct and Indirect cost in Public and Private Hospital

This table shows that the estimated direct and indirect cost of coronary heart disease. The total average direct cost is Rs 333,337 and indirect cost is 5413.33 in public hospitals. So the total cost in public hospital is Rs 338,750.33 which is high for a person who is suffers from coronary heart disease, because it is most expensive and long lasting disease and there is huge burden on ill individuals. Hence results shows that in table 3 there is high direct cost as compare to indirect cost which is directly paid by individuals out of pocket expenditure in public hospital. (see table 4.3)

So government needs to make efficient policies for cost minimization in public hospitals because in this hospitals only visited poor population of Pakistan and for this its huge cost as well.

Table 4.3 Total average direct and indirect cost; private public hospital

Hospitals	**Direct cost**	**Indirect cost**	**Total cost**
Public hospital	333,337	5413.33	338,750.33
Private hospital	502,284	7109.82	509,393.82
Total cost	**842,730**	**12,523.15**	**848,144.15**

On the other hand private sector also charges double cost for coronary heart disease. The total average direct cost is Rs 502,284 and in direct cost is Rs 7109.82 In this table results shows that the average total cost for the treatment of coronary heart disease in private hospital is Rs 502,284, which is high as compare to public hospitals. Private hospitals has consultation and medication fee as well but there is no fee in public hospital. Surgical cost is also high in private hospitals. The total average cost of coronary heart disease in Rawalpindi hospital is Rs 848,144.15**.** So in this study we concluded that coronary heart disease has huge economic burden in terms of direct cost on ill individual and it can faces economic burden of disease and also losses its productivity and quality of life as well.

4.2 Coronary Heart Disease: Risk factors

4.2.1 Estimating Risk Factors

Table 4.4 Dependent Variable: Coronary Heart Disease

Independent variables	Coefficient value
Age	0.0392** (0.016)
Age Square	-0.0053** (0.000)
Smoking	0.5665*** (0.087)
HBP	0.1523*** (0.054)
Obese	0.0045 (0.054)
Cholesterol	0.0475 (0.052)
Food intake	-0.0766* (0.052)
Physical active	0.0077 (0.053)
Gender	0.1170* (0.071)
Constant	-0.3301 (0.319)

Note: *, **, and *** are showing 1%, 5% and 10% significance

If age increases the probability of coronary heart disease increases by 0.039 which are statistically significant at 5%. This study shows that there is positive relationship between coronary heart disease and age because as age increases chances of having disease increase. This study is consistent with the study of (Minh et.al, 2008; Hill and Roberts, 2011; Chartash,

2012) because due to increase in age, health behaviour have to be changed which leads to the existence of cardiac illness.

Therefore results concluded that age has strongly associated with cardiovascular disease because as age increase chances of getting ill will be increases and productivity of ill person decrease so they have to bear huge economic cost burden directly and indirectly. On other hand when we take square of age than the probability of having disease increases by 0.05units. It has negative relationship with coronary heart disease which is significant at 5% with very small effect. Therefore, present study result is consistent with study (WHO, 2015, Busse et.al, 2010; Miranda et.al, 2009; MeLennan and jayaweera, 2014) investigate that cardiovascular disease widely spread between the age 30 to 65 years but after individual's will not be more productive .

The effect of smoking is statistically significant on the risk of getting disease. The probability of coronary heart disease has been increases by 0.566 if the respondent has smoking habit. This study results explains that there is strongly positive relationship between coronary heart disease and smoking which is significant at 1 %. According to (Doll & Peto, 1976) smoking increases the risk of cardiovascular disease because it is the leading cause of morbidity and mortality in worldwide. There are so many studies that are conducted in Pakistan which shows a linear relationship between cardiovascular disease and no of cigarettes smoked. So these studies result that concluded that individuals who have been smoke 40 or more cigarettes per day they have nine times higher risk of cardiovascular as compare to those who have been never smoked. Hence, present study is reflected with all these studies which show that smoking is most important and modifiable risk factor of coronary heart disease.

If the person having high blood pressure than the probability of coronary heart disease increases by 0.152 at 5% significance level. So, there is positive relationship between high blood pressure and coronary heart disease. Approxameltly 7.6million people die every year due to high blood pressure in the world. In Pakistan prevalence of high blood pressure has

been increasing day by day. In 1994 a health survey which is conducted in Pakistan investigate that 22% of adults having age 15 years or more and 33%of adults (age 45years and above) are hypertensive.

According to (Kearns et.al, 2014), obesity is the highly contributor in developing the cardio vascular disease. This result is not reflected in the present study because there is insignificant relationship between obesity and coronary heart disease. Although obesity is significant risk factor of cardiovascular disease. There are so many studies that show that overweight and obesity increases the risk of diabetes, hypertension and cardiovascular disease (Henry, 2011)

The effect of gender noted to be an important risk factor. The probability of coronary heart disease has been by 0.0117 which are statistically significant at 10%. Present study is consistent with (Stevens et.al, 2012) which concluded that the prevalence of NCD's in men is higher than women.

Cholesterol is playing a major part for the development of cardiovascular disease or coronary heart disease. There are so many studies conducted in the world that shows that cholesterol has strong positive relationship with coronary heart disease because cholesterols a fatty substance that leads to the blockage of arteries. Therefore present study results revealed that cholesterol has insignificant relationship between coronary heart disease and cannot reflected the other studies.

The probability of having coronary heart disease is increase by 0.076 if the person food intake is unhealthy which shows negative relationship at 10% level of signifance. Food intake is also major contributor for the development of cardiovascular disease because the quality and quantity of food has been eating outside included high fats, high energy but low in dietary fibre, calcium and lots of minerals and vitamins which causes many diseases like cardiovascular disease (heart/BP), diabetes. (Musaiger and Hazzaa, 2012; Ezzati and Riboli, 2013). Hence present study results are consistent with these studies.

Rapid economic development and hasty urbanization leads to inactivity and sedentary lifestyle which is associated with cardiovascular disease. Physical inactivity is most important risk factors for the prevalence of chronic non communicable diseases such as cardiovascular disease, dibeates, etc. (Durstine, 2013). Cardiovascular disease, obesity, diabetes and hypertension are strongly associated with physical inactivity. This study is not reflected with all the studies that have been done.

The results for linear probability model shows that the most significant contributing factors for coronary heart disease are age, gender, smoking, high blood pressure, food intake (table 4.4). On the other hand obesity, physical activity, cholesterol is not strongly associated with coronary heart disease.

Chapter 5

CONCLUSION AND DISCUSSION

Not only developed countries, also developing nations like Pakistan has been faces a tremendously increase in the prevalence of cardiovascular disease such as coronary heart disease. Cardiovascular disease due to its chronic nature it is one of the most heated and prevailing disease among adults. In Pakistan approximately 50% of population is suffering from chronic non communicable disease namely heart disease, diabetes, kidney /renal (Jafar et. al, 2013).

The aim of this study in order to estimate the economic burden of cardiovascular disease in terms of direct and indirect cost in tertiary care hospital of Rawalpindi, mainly focus on patient's perspective. The literature revels that there are socio, economic, behviroal and demographic risk factors that are interconnected for the development of cardiovascular disease. For exploratory this, essential determinants and factors are selected including: age, gender, smoking, obesity, high blood pressure, cholesterol, food intake, physical activity. However, this studies also examining the cost difference in private and public sector hospital.

This study is survey based and total sample is 384 patients in which 96 patients are lie in public hospital and other 96 are treated in private hospital and last 192 are collected from general populations. Direct cost and indirect cost was calculated by laboratory charges, surgery cost, medication cost, travelling cost, consultation cost, monthly income and loss of productivity.

This study concluded that the average direct cost and indirect cost which is directly bear by individuals is Rs 333.337 and Rs5413.33 for public hospital where as Rs 502,284 is and Rs 7109.82 for private hospital. Therefore, total average direct cost is **842,730** for both hospitals and total average indirect cost for both hospitals is Rs **12523.15**. Present study found that direct cost has been high as compare to indirect cost in both sectors. So there is huge cost difference between private and public hospitals which lead to huge economic burden on individuals, family and society as well that can decrease the quality of life.

This study also investigated the risk factors that are strongly associated with coronary heart disease. Our data shows that Age gender, smoking, high blood pressure and food intake are the main cause of coronary heart disease among the adults having age between 20 to 45 years. Our study found that smoking is the dominant risk factors to an earlier onset of coronary heart disease in the line the previous studies. This study also observed that high blood pressure is the second most important risk factor and equally distributed in both sexes. The study also concluded that due to increase of direct cost patients can be bear huge amount of economic burden and pay by their out of pocket. However, the increasing incidence of the coronary heart disease in our society it is essential to asses and evaluate all these risk factors at national level, it will enable us in formulating policies for promoting healthy lifestyles, frequent and early risk assessment and age specific preventive strategies.

5.1 Policy Recommendations:

Pakistan, being a developing and low middle income nation is facing increase in the prevalence of cardiovascular disease and it has become major health issue as well. The following recommendations are needed to be followed which are based on the findings.

- Coronary heart disease is increasing gradually and it is time to give emphasis to the preventive measures, and reduce the risk factors those causing the cardiovascular disease.
- Direct cost are extremely high in both sectors whether it is private or public hospital, so government need to make a policy for cost minimization and reduce the surgery cost of coronary heart disease as well.
- Smoking is the dominant risk factor for coronary heart disease so government should be increase taxes on cigarette and tobacco usage, therefore it is best for those who want to be a smoker.

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QUESTIONNAIRE

TITLE: Economic Burden of the Cardiovascular Disease: Patient perspective

Please kindly give me a little of your time so I can answer these questions with you. You are assured that the answers you give will be strictly confidential and would not be used against you.

Please tick ( ) by the options provided as you deem fit.

Date: _____ Height…….. Weight: _____

SECTION A: SOCIO-DEMOGRAPHIC INFORMATION

NO	Question	No QUESTION
	Area of respondent	
A1	Age in years	**A3** Gender [1] male [2] female
A2	Marital status [1]single [2]married	**A4** Are you employed [1]yes [2]No
A5	Educated [1] yes [2] No	**A6** From where you get treatment? [1]Public hospital [2] private hospital
A7	Whether you are head of your family or not?	
A8	How many numbers of household in your family?	
A9	How many numbers of earners in your family?	
A10	Type of your disease [1] coronary heart disease [2]other heart disease	
A11	Is it due to genetic disorder? [1]yes [2] No	
A12	If yes then how many of other family members are diagnosed with it?	

SECTION B: DIRECT COST

	Item/ Treatment visit	per visits	no of	Total Cost (RS)
B1.1	Registration			
B1.2	Consultation fee			
B1.3	Laboratory investigations			
B1.4	Electrocardiogram (ECG)			
B1.5	Stress echocardiogram			
B1.6	Radioisotope scan			
B1.7	Coronary angiogram			
B1.8	Other test including all blood test(lipid Profile, HB ,urine test)			
B1.9	Medication fee			
B1.10	Surgery cost if its possible? [1] coronary angioplasty, [2]coronary bypass.			

	How much you and your household do spends in a month on these items?	Cost (RS)
B1.11	Travel cost in and out	
B1.12	Food during treatment	
B1.13	Drink during treatment	
B1.14	Others (specify)	

SECTION C: INDIRECT COST

C1.1	Are you employed? [1] yes [2] No
C1.2	What is your monthly income?
C1.3	how long has you been suffering from the disease? Years…….month…….
C1.4	On average, how many days in a month you been absent from work due to heart disease? …….
C1.5	If you have to hire a servant, for household work, how much would you pay per day? …….

SECTION D: RISK FACTORS

D1.1	Do you have high blood pressure [1]yes [2]no
D1.2	Do you have high cholesterol level [1]yes [2]no
D1.3	Are you smoker [1]yes [2]no
D1.4	Are you obese [1]yes [2]no
D1.5	Are you physical active [1]yes [2]no
D1.6	Can you take healthy food or junk food(unhealthy) [1]yes [2] no
D1.7	Do you have other co morbidities [1]yes [2] no

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