

Characterization of Lipid parameters in Myocardial Infarction patients and its Life Style Risk Factor



DEPARTMENT OF PHARMACY



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Characterization of Lipid parameters in Myocardial Infarction patients and its Life Style Risk Factor

**A research paper submitted to the Department of Pharmacy,
East West University in the partial fulfillment of the
requirements for the Degree of Bachelor of Pharmacy.**

CERTIFICATE

This is to certify that, the thesis 'Characterization of Lipid parameters in Myocardial Infarction patients and its Life Style Risk Factor' submitted to the Department of Pharmacy, East West University Mohakhali, Dhaka for the partial fulfillment of the requirements for the degree of Bachelor of Pharmacy (B.Pharm) was carried out by Sadia Zahan (ID: 2005-1-70-027) under our guidance and supervision and that no part of the thesis has been submitted for any other degree. We further certify that all the sources of information and laboratory facilities availed of this connection is duly acknowledged.

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ABSTRACT

Coronary heart disease is the most common form of disease affecting the heart and an important cause of premature death through out the World.

The risk factors of MI are age, gender, education, socioeconomic factors, that can not be modified but there are some modifiable risk factors like hypertension, diabetes mellitus, obesity, and hypercholesterolemia that can be changed by using drugs, proper diet and physical activity. Hypercholesterolemia is associated with markedly increased mortality in acute myocardial infarction. Life style can change and modify some of the risk factors. Myocardial infarction is the most common problem in Bangladesh. Hypercholesterolemia also has important role in Myocardial Infarction. The aim of the study was to find out the relationship between hypercholesterolemia and myocardial infarction.

To find out the relationship between Hypercholesterolemia and myocardial infarction we conducted a study with 60 MI patients and then evaluate their medical history, diagnosis and treatment. The results of the study showed that 56-60 years old patients were more prevalent to MI. In this study about fifty five (91%) patients were married. Thirty seven percent (37%) patients did not receive any education and 43% received primary education. Ten percent of the patients passed H.S.C. and 10% patients were graduate.

Among 60 patients LDL concentrations in 12 patients (20%) were near optimal level. LDL concentrations in 28 (47%) patients were in borderline. Eighteen patients (30%) were at high risk level in terms of their LDL concentration. Two (3%) patients were at very high risk level. HDL concentrations of 28 patients (46%) were near optimal level, 26 patients (43%) were in borderline level, 4 (7%) were at high risk level and two (4%) were at very high risk level. Total Cholesterol level of 16 (26%) patients was in optimal level,

25 (42%) patients were in borderline level in terms of their total cholesterol. Total cholesterol level of fifteen (25%) patients was at high risk level and only 4 (7%) patients were at very high risk level.

The results of the study suggest that myocardial infarction may be associated with hypercholesterolemia and also other modifiable and non modifiable risk factors.



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CHAPTER-1



INTRODUCTION

1.1 Communicable Disease:

Different types of infectious diseases in the first half of the twentieth century cause increase death of the people that called communicable disease. But now a day in the developed countries were able to decrease mortality and morbidity from infectious diseases in the first half of the twentieth century because of the development of vaccines and other public health measures. They shared successful approaches and resources with developing countries through international assistance programs after World War II [Christopher P. Howson, 1998].

1.2 Non-communicable disease:

Globally, non-communicable diseases are increasingly recognized as a major cause of morbidity and mortality. The global burden of disease study assessed and ranked the individual disease/condition contributing to burden of disease in the world in 1990. Their ranking with the projection global burdens in the year 2020, where heart disease(myocardial infarction) and cerebrovascular disease, are projected to occupy the 1st and 4th positions in 2020 which was the 5th and 6th positions respectively in 1990 [WHO, 2002].

1.2.1 Coronary Heart Disease:

The most common non communicable disease .Coronary heart disease (CHD) is a leading cause of death among men and women globally .There is now overwhelming evidence that dietary factors influence risk of coronary heart disease (CHD) both favorably and unfavorably. The three most atherogenic dietary risk factors are saturated fat, cholesterol, and obesity. Diets are recommended to address these problems and are aimed at reducing intake of total fat, saturated fat, and cholesterol.

On average, blood cholesterol levels can be reduced an estimated 5% to 15% through the diet approach, with some hyperlipidemic patients experiencing even greater reductions. Increased carbohydrate intake, especially complex carbohydrates, is also recommended to replace the majority of calories lost through reduced fat intake. Choosing fiber-rich carbohydrate sources may foster additional cholesterol lowering and other nutritional benefits beyond those derived from fat modification alone. Inconsistent findings from studies on fiber and lipids have recently contributed to some confusion regarding fiber's potential benefits

[Linda Van Horn, 1997].

There are two types of coronary heart disease:

1.2.1.1 Congenital heart disease

1.2.1.2 Acquired heart disease

1.2.1.1 Congenital heart diseases are the malformation of the heart or the large blood vessels associated with the heart, affecting various parts or function. It is one of the leading causes of mortality in the first year of life. Coronary Heart Diseases are the common single group of abnormalities accounting for about 30% of the total congenital abnormalities. It has been estimated that some types of Coronary Heart Diseases can be related to the defects in the chromosome, gene or environmental factor. In ~90% of the Coronary Heart Disease cases, there is no identifiable cause that can be attributed as multi factorial defects. The majority of these structural abnormalities occur as isolated malformation in most patients, but about 33% have associated anomalies **[Frias JL, 1993].**

Table-1: Prevalence of congenital heart diseases at global.

Country	Year	Frequency per 1000 live birth
UK	1981	5.51
USA	1990	6.60
Austria	1996	6.90
Karachi	1997	4.0
Australia	2004	17.5

[R. Smitha1, 2004].

1.2.1.2 Acquired heart disease:

Acquired heart disease is much more common in adults than in children. Current myocardial protection practices, all 4,393 United States board-certified thoracic surgeons were surveyed in 1992. Of the 1,413 respondents (32% total response), 936 are in active practice dealing with acquired heart disease. Based on their frequency of cases, respondents perform approximately 32% of all acquired heart disease operations in the United States yearly and individually average 157 patients/year

[Lary A. Robinson, 1994].

The three most common types of acquired heart disease are:

- **Coronary Artery Disease** (acronym CAD) – This is a problem with the blood vessels that deliver blood to the heart muscle. If these blood vessels get very small, or if they become blocked, blood cannot flow through them normally. Since less blood is supplied to the heart muscle the muscle cannot work at normal capacity. The heart muscle can become sick and weak. IHeart

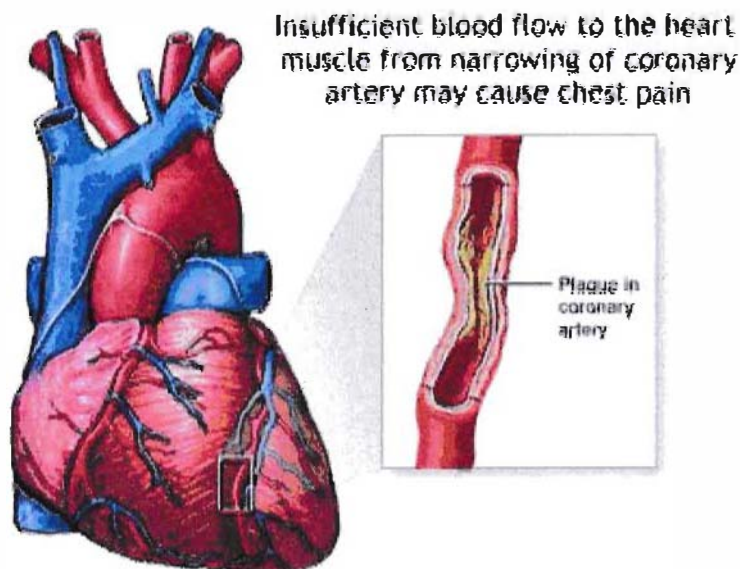
muscle can even die if blood flow stops. Blocked arteries in the heart are often the caused by smoking, high cholesterol, high blood pressure, diabetes and inherited traits from parents. All of these problems damage the lining of the heart's blood vessels and make them become narrowed or blocked completely.

- **Congestive Heart Failure (CHF)** – This is a condition that means that the heart is not pumping at normal levels. Two common causes are a weak or sick heart muscle and the other is abnormal heart valves. The valves may not let enough blood through because they are too narrowed. Or the valve may "leak" and let blood flow backwards (the wrong direction) inside the heart. When the heart valves don't work normally, the heart muscle has to do extra work and it can become tired or fatigued.
- **Bad Heart Rhythms** – This is a problem with electrical activity in the heart. This can make the heart beat too fast or too slow. Very bad heart rhythms may make the heart stop pumping blood. The heart needs a normal rhythm to pump the blood well. If the rhythm is too fast the heart may not have time for blood to enter the chambers,so there is not enough blood moving through the heart with each beat. If the heart is too slow there may not be enough contractions of the heart to supply the body with the blood that it needs [**Schwartz's Principles of Surgery, Chapter 20**].

1.2.2 Myocardial Infarction:

Myocardial infarction (MI or AMI for acute myocardial infarction), commonly known as a heart attack, occurs when the blood supply of the heart is interrupted causing some heart cells to die. This is most commonly due to occlusion (blockage) of a coronary artery following the rupture of a vulnerable atherosclerotic plaque, which is an unstable collection of lipids (like cholesterol) and white blood cells (especially

macrophages) in the wall of an artery. The resulting ischemia (restriction in blood supply) and oxygen shortage, if left untreated for a sufficient period of time, can cause damage and / or death. (infarction) of heart muscle tissue (myocardium).



[Fig: 1. Myocardial Infarction]

Classical symptoms of acute myocardial infarction include sudden chest pain (typically radiating to the left arm or left side of the neck), shortness of breath, nausea, vomiting, palpitations, sweating, and anxiety (often described as a sense of impending doom). Women may experience fewer typical symptoms than men, most commonly shortness of breath, weakness, a feeling of indigestion, and fatigue [Kosuge, 2006].

Heart attacks are the leading cause of death for both men and women all over the world.

[Robert Beaglehole,2004].

1.2.2.1 Perspective of Myocardial Infarction:

Cardiovascular disease is a major global health problem reaching epidemic proportions [WHO, 1999].

Low and Middle income countries, including the South Asian countries of India and Pakistan, contribute significantly to the global burden of cardiovascular disease, accounting for 78% of all deaths and 86.3% of all loss of disability adjusted life years attributable to this cause [WHO, 1999].

South Asia (Pakistan, India, Bangladesh, Nepal and Sri Lanka) represents more than a quarter of the developing world, and is likely to be strongly affected by the increase in the cardiovascular disease.



Table 2: Percentage of Risk Factor MI of patients of different countries in South Asia

	Pakistan (Gentler MM, White PD, 1994)	India (Nefzger MD, Hrubee, 1969)	Bangladesh (Denbrough MA, 1962)	Nepal (Meshalkin EN, 1981)	<i>Sri Lanka</i> (<i>WHO</i> , 1988)
Men	17%	36.4%	9.8%	....	17%
Woman	....	37.5%	15.6%	....	....
Cigarette Smoking	....	....	....	73.7%	....
Men	34%	36.5%	50.3%		57.9%
Woman				57.95%	
Oral Smokeless Tobacco	10%	22%	....	....	....
Men	....	....	16.3%	....	....
Woman	....	....	21.4%	....	....
Diabetes#	5%	....	....	....	....
Men	....	13.1%	2.9%	....	5.8%
<i>Woman</i>	....	11.3%	0.7%	....	....

*Classified according to WHO criteria. #defined as random blood suger of > 140 mg/dl (7.8 mmol/L) apart from the study from India. Where a fasting cutoff of 126 mg/dl (7.0 mmol/L) was used.

In indigenous population of South Asia, high prevalence of rates for CHD risk factors are also apparent (table-1.5.1). in India, prevalence of coronary artery disease has been reported as being 11% in 2001;prevalence of coronary artery disease and its relationship to lipid in a selected population in South India; the Chennai Urban population Study [**Mohan V, 2001**].

In Bangladesh, acute myocardial infarction is the leading cause of mortality and morbidity and also emerging as a major health problem in developing countries [Rashid K.M. 1999].

High risks of cardiovascular disease have been reported in South Asian populations, regardless of whether they live overseas or in their native countries [WHO, 1999].

Epidemiological studies show that Migrant populations of South Asian descent have higher risks of ischemic heart disease than the native population [McKeigue PM, 1989].

Coronary heart disease is an important cause of morbidity and mortality in most of the industrialized nations and is gaining an importance as a major disease in developing countries. Approximately 1.5 Million myocardial infarction cases and 520,000 deaths related to this occur per year in the USA. Although cardiovascular disease is considered an acquired problem of the industrialized western world, the Improvement in the socioeconomic industrial base in developing countries has brought this problem to the doorstep of the third world country [WHO, 1988].

Coronary heart disease is already the most common form of disease affecting the heart and an important cause of premature death in Europe, the Baltic States, Russia, North and South America, Australia and New Zealand. And by 2020, it is very likely that all regions of the world will be affected [Boon NA, 1998].

With industrialization and developing of the country, now a day, like other developing countries, there are more cases on myocardial infarction in Bangladesh. It was reported that coronary heart disease ranks third among the cardiovascular disease in Bangladesh. Prevalence of the disease was found to be 3.38 and 14/1000 in two different studies carried out in 1976 and 1984 respectively. An important observation among hospitalized patients in the country is that as many as 32% of the patients

belong to 41 and 50 years age group indicating premature occurrence of the disease. Male to female ratio is 8.1, which is higher as compared to that in other country [Rhashid AKMH, 1997].

Moreover, coronary artery disease tends to emerge earlier in life, and thus mortality rate ratios are greatest in the youngest South Asians compared with other ethnic groups [Reddy KS 1998].

However, acute myocardial infarction in young South Asians has not been extensively studied, and most of the existing data are on Migrant South Asian populations. Furthermore, studies of Migrant South Asians have focused on explanations for between-population differences, such as triglyceride and insulin resistance, rather than determining important risk factors within that population, which are not the same but, are critical when considering disease prevention policies. We therefore conducted a case-control study of young individuals (aged 15–45 years) with a first myocardial infarct in Karachi, Pakistan, to determine the risk factors and the relative importance of these factors for acute myocardial infarction among young South Asians [Reddy KS, 1998].

Worldwide immigration has created ethnic diversity in many countries such as the United States, Canada, Malaysia, and Singapore. Several studies from these countries indicate important differences in the incidence of CVD for recent immigrants now exposed to a new set of environmental risks. Some of these differences may be attributable to socioeconomic factors and culturally based patterns of diet, behavior, and activity, whereas others may be attributable to genetic factors. Studies of ethnically diverse groups in their original homeland and their newly adopted country continue to provide insights that improve understanding of the complexities and

approaches for reducing the burden of CVD in the wider population [**Christopher P. Howson, 1998**].

Cardiovascular disease claimed the lives of 958,775 people (445,871 men and 512,904 women) in the United States in 1999. This equates to 2600 deaths/day or one death from cardiovascular disease every 33 seconds in this country. Coronary heart disease (CHD) was responsible for 48% and stroke for 17% of deaths due to cardiovascular disease. According to the National Health and Nutrition Examination Survey III, an estimated 12.6 Million Americans have CHD. The estimated direct and indirect cost of cardiovascular disease and stroke for 2002 was \$329.2 billion, with \$111.8 billion attributable to CHD alone. Direct medical costs account for more than half of this figure.

[**Jim Koeller, 2002**]

1.2.2.2 Risk factors for myocardial infarction:

- Diabetes (with or without insulin resistance) - the single most important risk factor for ischaemic heart disease (IHD)
- Tobacco smoking
- Hypercholesterolemia (more accurately hyperlipoproteinemia, especially high low density lipoprotein and low high density lipoprotein)
- High blood pressure
- Family history of ischaemic heart disease (IHD)
- Obesity (defined by a body mass index of more than 30 kg/m², or alternatively by waist circumference or waist-hip ratio).
- Old age
- Hyperhomocysteinemia (high homocysteine, a toxic blood amino acid that is elevated when intakes of vitamins B2, B6, B12 and folic acid are insufficient)

- Stress (occupations with high stress index are known to have susceptibility for atherosclerosis)

1.2.2.3 Non-modifiable risk factors:

Those factors is not changing by changed food pattern or by taking medications that are called non modifiable risk factors.

1.2.2.3.1 Age: About four out of five people who die of coronary heart disease are 65 or older. At older ages, woman who have heart attacks are more likely than men to die from them within a few weeks. Myocardial infarction rates increases with age. Atherosclerosis is rare in children, except in familial hyperlipidemia but is often detectable in young men between 20-30 years of age. It is almost universal in the elderly in the west .African Americans are 20 times more likely to develop heart failure before age 50 years than whites the same age, and their risk is linked to risk factors earlier in adulthood. Age is important because women's risk of heart disease starts to rise during Middle age, in part because of the drop in estrogen levels that comes with menopause. But Middle age also is when many women develop heart disease risk factors [**Robert W. Griffith, 2002**].

1.2.2.3.2 Male sex (gender): Men have a greater risk of myocardial infarctions than woman do, and they have attacks earlier in life. Eeven after menopause, it's not as great as men's. The framingham Heart Study presented prospective population data showing possible sex based differences in initial clinical manifestation of CHD. Pattern of coronary heart disease morbidity and mortality in heart disease in the sexes. Males are more at risk than females [**Wilson PW, 1998**].

1.2.2.3.3 Female sex (gender): Women who use combined oral contraceptive pills have a modestly increased risk of myocardial infarction, especially in the presence of other risk factors, such as smoking [**Khader YS, 2003**].

About two-thirds of the women who have a heart attack do not make a full recovery. Heart disease is the number 1 killer of American women. One of every three deaths for American women is from heart disease - only one in every thirty death is from breast cancer. Women's heart disease risk starts to rise in Middle age. One in eight American women aged 45-64, and one in three women over 65, have some form of heart disease. Nearly two-thirds of American women who die suddenly of a heart attack have no prior symptoms. About two-thirds of American woman who have a heart attack do not make a full recovery [**Robert W. Griffith, 2002**].

1.2.2.3.4 Socioeconomic factors: Shorter education and lower income (particularly in women), and unmarried cohabitation may also contribute to the risk of Myocardial Infarction. To understand epidemiological study results, it's important to note that many factors associated with Myocardial Infarction mediate their risk via other factors. For example, the effect of education is partially based on its effect on income and marital status. An unhealthy dietary intake, assessed by a simple dietary risk score, increases the risk of Acute Myocardial Infraction globally and accounts for 30% of the population-attributable risk [**Romaina Iqbal, PhD, 2007**].

1.2.2.3.5 Family history: Family history of Myocardial Infarction is positively associated with the risk of early Myocardial Infarction in women. While the association with parental history of Myocardial Infarction is mediated through the clustering of other common risk factors, the association of sibling history of MI with

early-onset MI in young women is only partially explained by the clustering of established and newly-identified risk factors [**Robert W. Griffith, 2002**].

1.2.2.4 Modifiable risk Factors:

Those risk factors changed by changing the life style and taking medications that are called modifiable risk factors. Modifiable risk factors describe below:

1.2.2.4.1 Tobacco smoking: smoker's risk of Myocardial Infarction is more than twice that of nonsmokers. Cigarette smoking is the biggest risk factor for sudden cardiac death. Smokers have two to four times the risk of nonsmokers. Cigarette smoking also acts with other risk to greatly increase the risk for coronary heart disease. It is responsible for 25% of CHD deaths under 65 years of age in men [**WHO, 1979**]. Cigarette smoke oxidizes LDL and unmasks its binding to scavenger cell receptors. Adaptation to smoking decreases HDL, but increases on cessation of smoking [**Gershlick AH, 2001**].

Among all the risk factors, cigarette smoking showed evidence of increasing the risk of MI. [**Savotham SG Berry JN, 1968**].

Cigarettes smoking may be an important risk factors associated with myocardial infarction among the people residing in rural area [**Guptal R, 1994**].

It has been described by many workers in many countries that smoking is strongly related to atherosclerosis including coronary artery diseases. It exerts its effect through its alkaloid, the nicotine, the actions of which are on different components of cardiovascular system. Some are mediated via nervous system and some due to a direct action of nicotine on blood vessel. Sympathetic and basal ganglia both may be stimulated causing bradycardia and sometime tachycardia. It may cause

vasoconstriction by release of adrenaline leading to hypertension and aggravation of cardiac disease. Nicotine may initiate and enhance platelet aggregation, thrombosis. Raised carboxyhemoglobin and nicotine levels may jeopardize left ventricular function and lower ventricular fibrillation threshold. Smoking increases morbidity and mortality in underlying heart diseases [**Levine PH, 1973**].

Tobacco use is one of the most important causes of Acute Myocardial Infarction globally, especially in men. All forms of tobacco use, including different types of smoking and chewing tobacco and inhalation of SHS, should be discouraged to prevent cardiovascular diseases [**Teo KK, 2004**].

Current levels of risk factors, most notably tobacco usage, will determine future age-specific mortality and morbidity rates. The numbers of global deaths and of disability-adjusted life years (DALYs) that result from tobacco use are expected to increase to about 8.3 Million and 124 Million, respectively, by 2020, with more than 70 percent of these occurring in developing countries. These trends amount to a doubling of the percentage of current deaths due to tobacco use worldwide and a tripling of current DALYs lost. Thus, decreasing tobacco use would reduce both the substantial burden of CVD-associated disease projected for developing countries and the significant burden of other tobacco-related diseases, including certain cancers and chronic obstructive pulmonary disease [**Christopher P, 1998**].

Nearly three-quarters of the more than 1 billion people who regularly use tobacco live in developing countries [**Johan, 1997**].

Research on tobacco control can help reduce the substantial burden of disease projected for several tobacco-related diseases, including certain cancers and chronic obstructive pulmonary disease as well as CVD [**WHO, 1997**].

1.2.2.4.2 Diabetes mellitus: Diabetes seriously increases the risk of developing Myocardial Infarction. Even when glucose levels are under control, diabetes greatly increases the risk of heart disease and stroke. The overall prevalence of MI is as high as 55% among the patient with diabetes compared with 2-4% for general population without diabetes. About two thirds of the people with diabetes die of some form of heart [MaCconel RB 1996].

About diabetes in different countries: More than seven Million diabetes cases in the 46 countries of the WHO African Region in 2000 resulted in a total economic loss of US\$25.51 billion. Diabetes and the presence of prior coronary disease are important risk factors for initial and recurrent coronary heart disease in persons infected with HIV. Given the increased life expectancy of HIV-infected persons after the use of effective antiretroviral therapy, prevalence of diabetes and CHD risk are likely to increase. South Asians with type 2 diabetes are significantly more at risk of losing their eyesight and this may occur up to seven years earlier than their white European counterparts. Only one-third of 39.8 Million diabetics in China are aware of their condition, according to the Chinese Ministry of Health. The number of diabetics in urban areas has increased by 39% in the past six years. Diabetes cases in the UK increased by 74% between 1997 and 2003, an increase linked to growing obesity rates. Diabetes prevalence increased from 2.8% in 1996 to 4.3% in 2005 [Procor, 2009].

1.2.2.4.3 High blood pressure: Hypertension has been established unequivocally as a risk factor in that individual with accelerated atherosclerogenesis, an increased incidence of coronary heart disease (CHD). Hypertension is probably directly or indirectly responsible for 10-20% of all deaths. High blood pressure increases the heart's workload, causing the heart to enlarge and weaken. It also increases the risk of

atherosclerosis; both the systolic and diastolic hypertension is associated risk of MI. The risk is same for men and woman. While reduction of blood pressure reduces the risk of cerebrovascular events. It does not appear to affect the risk of MI [Islam N, 1998].

Using a conservative definition for hypertension as blood pressure above 160 mm Hg systolic or above 95 mm Hg diastolic, the prevalence of hypertension, even in Sub-Saharan Africa, ranges from 10 to 33 percent in 30- to 49 year-old men and women. The INTERSALT study carried out in 32 countries, many of them developing, used carefully standardized measurements of blood pressure to confirm substantial prevalence of blood pressures above 140/90 mm Hg in most countries, both developed and developing countries. In addition, the level of awareness worldwide is low, as are treatment and control of elevated blood pressure [Marques-Vidal, 1998].

A study finds that Taiwanese women with pregnancy-induced hypertension have a significantly higher risk of stroke during pregnancy. Lower vitamin D levels are independently associated with a higher risk of incident hypertension in young women. A study finds that hypertension is a significant health problem in the adult population of the Trabzon region in Turkey. Prevalence of hypertension and pre-hypertension was 44% and 14.5% [Professor Joseph O.M. Pabee, 1974].

1.2.2.4.4 Hypercholesterolemia: High serum cholesterol, especially when associated with a low value of high density lipoprotein (HDL), is strongly associated with coronary atheroma. There is increasing evidence that high serum triglyceride is also independently linked with coronary atheroma. Familial hypercholesterolemia, combined with hypertriglyceridemia and remnant hyperlipidemia are also associated with MYOCARDIAL INFARCTION. Although some investigators have shown a

strong association of total cholesterol and LDL, with coronary artery disease **[Ramachandran, 2001]**.

Other findings suggest that this disease arises at lower lipid concentration in people from south Asia than in those from other regions. On the other hand characteristics lipid abnormalities, such as high triglycerides and low HDL with normal LDL values are common in American recommendation of the use of statins as first-line agents may not be entirely applicable to all population. Only data from heart protection study clearly show benefit with LDL reduction from 2.5 mol/L, where 24% reduction in even was observed. This suggests that clinical endpoint trials will be required in the South Asian setting to define the best therapeutic strategy for treatment of CHD. Cost of coronary prevention might not be prohibitive, if generic drugs are used. Rural communities have lower risk factors than urban westernized populations, this difference may be attributable to a low fat (15-20 g per day) diet based on whole grain (400g per day) combined with physically demanding occupations. With the rapid rural to urban migration in South Asia. Risk reduction strategies should therefore focus on protection of health life style **[Bhatnagar D, 1995]**.

1.2.2.4.5 Obesity: Obesity is important in patient with cardiac disease of any type because the demands on the heart are increased. (Defined by a body mass index of more than 30 kg/m², or alternatively by waist circumference or waist-hip ratio) Obesity is associated with increased prevalence of cardiovascular risk factors, such as hypertension, diabetes mellitus. It is an important risk factor of coronary heart disease **[Islam N, Khan M, 1983]**.



[Fig: 2. Obesity due to food intake]

Obese adolescents have the same risk of premature death in adulthood as people who smoke more than 10 cigarettes a day, while those who are overweight have the same risk as less heavy smokers.

Children who watch too much television, drink sweet beverages, and skip breakfast are more likely to be overweight or obese. Eliminating TV advisement for unhealthy foods could drastically reduce prevalence of childhood obesity; from 17.8% to 15.2% for boys and from 15.9% to 13.5% for girls [**Professor Joseph O.M. Pobe, 1974**].

1.2.2.5 Treatment of Myocardial Infarction:

1.2.2.5.1 Aspirin:

Aspirin, glyceryl trinitrate (nitroglycerin) and analgesia, usually morphine, although experts often argue this point, hence the popular *morphine, oxygen, nitro, aspirin* are usually administered as soon as possible. In many areas, first responders are trained to administer these prior to arrival at the hospital. Morphine is classically used if nitroglycerin is not effective due to its ability to dilate blood vessels, which may aid in blood flow to the heart as well as the pain relief it provides. Morphine may also

1.2.2.5.3 Cocaine:

Cocaine associated myocardial infarction should be managed in a manner similar to other patients with acute coronary syndrome except beta blockers should not be used and benzodiazepines should be administered early [McCord J, 2008].

1.3 Cholesterol:

Cholesterol is a lipidic, waxy steroid found in the cell membranes and transported in the blood plasma of all animals. It is an essential component of mammalian cell membranes where it is required to establish proper membrane permeability and fluidity. In addition, cholesterol is an important precursor molecule for the biosynthesis of bile acids, steroid hormones, and several fat soluble vitamins. Cholesterol is the principal sterol synthesized by animals, but small quantities are synthesized in other eukaryotes, such as plants and fungi. It is almost completely absent among prokaryotes, which include bacteria.

The National Heart, Lung and Blood Institute issued the Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults in May 2001.

The ATP III report presented the NCEP's updated clinical Guidelines for cholesterol and triglyceride testing:

Table 3: Cholesterol range:

Test	Optimal	NeverOptimal /Above Optimal	Borderline High	High	Very High
Total Cholesterol(mg/dl)	<200		200-239	>240	
HDL-Cholesterol(mg/dl)	<40-Low ≥60-High				
LDL-Cholesterol(mg/dl)	<100	100-129	130-159	160-189	≥190
Triglyceride(fasting)(mg/dl)	<150		150-199	200-499	≥500

Serum cholesterol are mainly two type:

- **LDL(Low density Lipoprotein)**
- **HDL(High Density Lipoprotein)**



1.3.1 LDL(Low density Lipoprotien):

Elevated low-density lipoprotein cholesterol (LDL-C) is a well-established independent risk factor for coronary artery disease (CAD). A number of primary and secondary trials have demonstrated that lowering of LDL-C decreases the incidence of CAD. A reductase (statins), fibrates, niacin, and bile acid sequestrants [James O. Mudd, 2007].

High serum levels of low-density lipoprotein cholesterol (LDL-c) constitute a major risk factor for premature development of coronary heart disease (CHD). Complementing the clinical and epidemiological studies assessing the role of LDL-c, it was subsequently demonstrated that decreasing LDL-c levels with statin has a major impact on cardiovascular disease. The so-called lower-the-better hypothesis is no longer valid as a recent meta analysis convincingly demonstrated that achieving low LDL-c brings additional benefit for patient at high cardiovascular risk [E. Bruckert, 2007].

1.3.1.1 Management of Low High Density Lipoprotein Levels:

A low HDL level (< 40 mg/dl) is recognized as an independent major risk factor for CHD and is considered a feature of the metabolic syndrome. Accordingly, ATP III addresses general management of this dyslipidemia as a component of treatment rendering "benefit beyond LDL lowering." The ATP III guidelines do not specify an HDL goal level owing to lack of clinical evidence; however, the guidelines recognize a beneficial risk reduction secondary to increasing an HDL level that is less than 40 mg/dl and offer suggestions for improvements.

First, ATP III reiterates that the primary goal of therapy is to achieve the patient's predetermined LDL goal level, which is based on one's CHD risk status and baseline LDL level. The initial approach is the implementation of therapeutic lifestyle changes including weight control, smoking cessation, restricted fat and cholesterol intake, and increased aerobic physical activity. These lifestyle changes have a positive effect on all cholesterol concentrations (including HDL) and should be tried either before or in conjunction with drug therapy. Weight management may be facilitated by following a special dietary regimen designed to lower the overall intake of cholesterol and fats

consumed in a typical Western diet. If changes in lifestyle do not suffice at increasing HDL levels, pharmacologic interventions may be implemented as adjunctive therapy.

If a patient has concomitantly high serum triglyceride levels, ATP III suggests targeting a non-HDL goal (non-HDL is defined as the difference between total cholesterol level and HDL level) 30 mg/dl higher than the specified LDL goal. Statins are the most efficacious cholesterol- and LDL-lowering agents and are generally given as first-line therapy for decreasing LDL levels. The HDL level is increased an average of 5-15% [Jim Koeller, 2002].

1.3.2 HDL(High Density Lipoprotien):

An HDL level of 60 mg/dl or greater is a negative CHD risk factor because it has been shown to protect against the development of CHD, and if the HDL level is 60 mg/dl or greater, one risk factor may be subtracted. On average, increases of 1 mg/dl of HDL are associated with a 2-3% decreased risk of CHD. The role of hypertriglyceridemia is less clear [Jim Koeller, 2002].

1.3.3 Cholesterol Mechanism:

Cholesterol is a naturally occurring, lipophilic substance in the body that is synthesized by the liver and obtained from the diet. It is transported in the plasma as complexes of phospholipids, triglycerides, and apolipoproteins called lipoproteins. The endogenous lipoprotein system may be divided into two major classes: the apolipoprotein B-100 system (very low-density lipoprotein cholesterol [VLDL], intermediate lipoprotein, and LDL) and the apolipoprotein A1 system (which transports HDL). The exogenous pathway or dietary pathway involves cholesterol and triglyceride transport across the gut wall by means of chylomicron formation (which are mostly triglycerides) and lipolysis by means of lipoprotein lipase to chylomicron

remnants, which are taken up in the liver by the lipoprotein remnant receptor and the LDL receptor. Nascent HDL particles are synthesized by the liver and intestine. Lecithin-cholesterol acyltransferase removes a fatty acid from lecithin and transfers it to cholesterol, producing cholesteryl ester and lysolecithin. The esterified cholesterol moves into the core of HDL making it possible for it to accept another free cholesterol molecule. Cholesterol esters are transported back to the liver (reverse cholesterol transport) or to other lipoproteins. Removal of excess cellular cholesterol by means of reverse cholesterol transport is thought to play a crucial role in minimizing cholesterol accumulation in the artery wall. The adenosine 5'-triphosphate binding cassette A1 (ABC-A1) transporter protein system is thought to be the major apolipoprotein A1-mediated pathway for the efflux of cellular cholesterol from vascular beds such as the coronary arteries. Mutations in the ABC-A1 gene are recognized as one cause of low HDL concentrations. The macrophage scavenger receptor B1 plays an integral role in HDL catabolism, and results of animal studies suggest that up regulation of this receptor reduces atherosclerosis. The scavenger receptor B1 seems to be a docking site for cholesterol ester removal, allowing HDL to recycle and pick up more cholesterol for reverse cholesterol transport. Phospholipid transfer protein also may play an important role in HDL-macrophage interactions to produce mature HDL [Jim Koeller, 2002].

1.4 Mechanism of serum cholesterol reduction:

Specific mechanisms involved in serum cholesterol reductions observed with increased fiber intake remain somewhat inconclusive. Recent research provides evidence that viscous polysaccharides act in the gastrointestinal tract to reduce blood cholesterol by decreasing absorption of cholesterol or fatty acids and decreasing absorption of biliary cholesterol or bile acids [Marlett JA, 1984].

Fiber may also cause altered serum concentration of hormones or short-chain fatty acids that affect lipid metabolism. β -Glucan, the water-soluble fiber prevalent in oats and barley, has been shown in animal models to be the active agent causing the altered cholesterol metabolism [Shinnick F, 1991].

The influence of α -tocotrienols and compounds that have vitamin E activity and produce hepatic HMG-CoA (hydroxymethylglutaryl coenzyme A) reductase inhibition in animal models, but this has yet to be conclusively documented. It has been further suggested that the amino acid content of oats and the arginine-lysine ratio may also promote the hypocholesterolemic response [Davidson MH, 1991].

Further studies in humans are needed to delineate and quantify these mechanisms across different fiber sources and under different biological conditions.

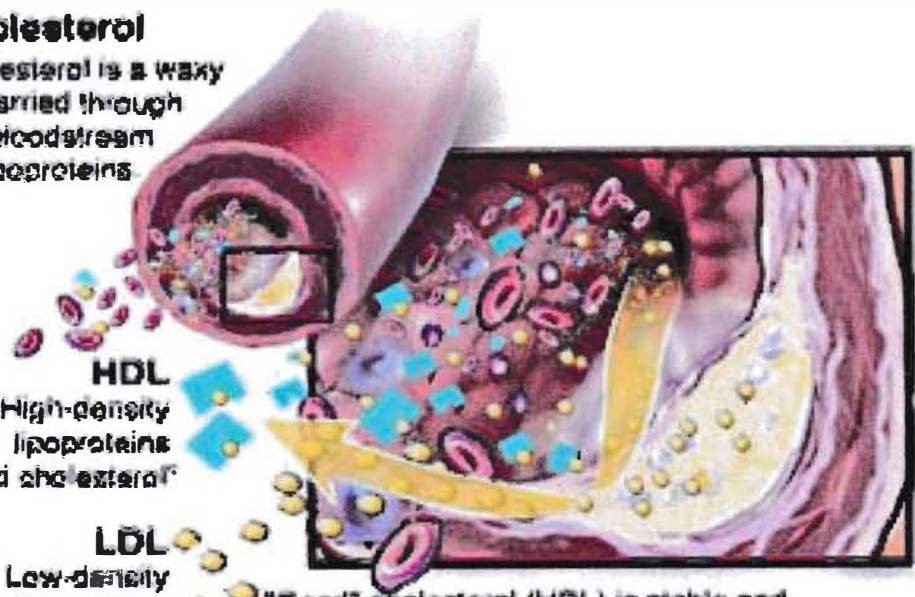
Cholesterol

Cholesterol is a waxy fat carried through the bloodstream by lipoproteins.

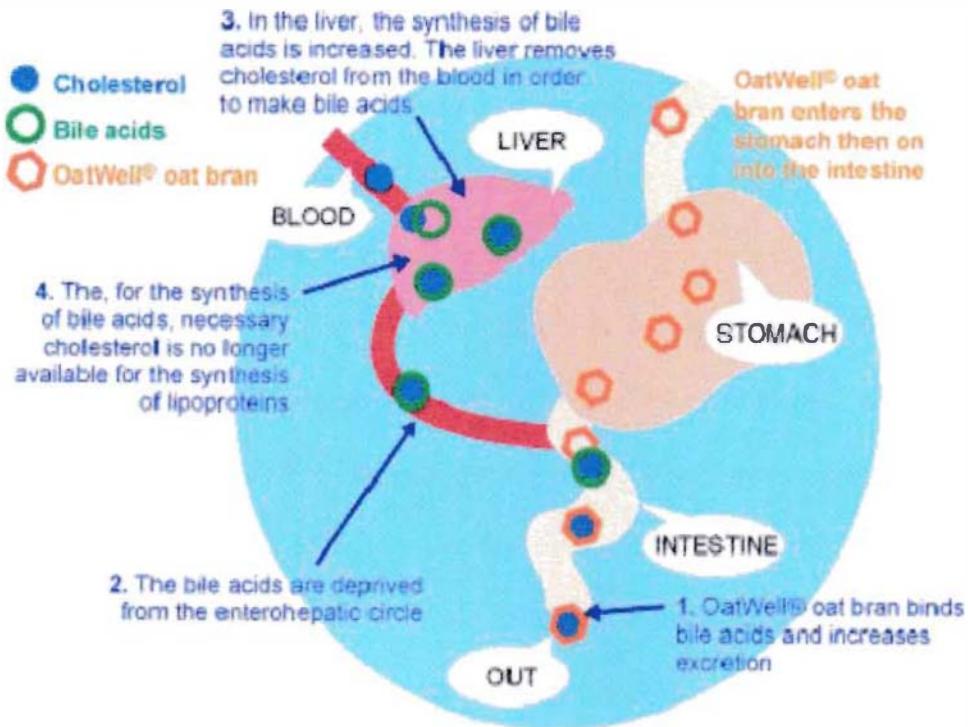
HDL
High-density lipoproteins
"Good cholesterol"

LDL
Low-density lipoproteins
"Bad cholesterol"

"Good" cholesterol (HDL) is stable and carries "bad" cholesterol (LDL) away from the arteries. "Bad" cholesterol (LDL) sticks to artery walls and contributes to plaque build-up.



[Fig: 3. Mechanism of serum Cholesterol]



[Fig: 4. Mechanism of serum Cholesterol]



1.5 Hypercholesterolemia:

Hypercholesterolemia is a known risk factor for coronary artery disease (CAD) and CAD mortality, and hypercholesterolemia is a risk factor for the development of heart failure (HF) in the Framingham study. Lipid-lowering therapy with statins has been shown to reduce the risk of developing HF in patients with CAD. However, in patients with chronic, established HF, hypercholesterolemia has not been associated with increased risk of mortality. Several studies have demonstrated that higher levels of total cholesterol (TC), low-density lipoprotein cholesterol (LDL), high-density lipoprotein cholesterol (HDL), and triglycerides are associated with significantly improved outcomes in chronic HF of both ischemic and non-ischemic etiologies. In light of the association between high cholesterol and improved survival in HF, the role of lipid-lowering therapy in chronic HF remains controversial; a recent trial of Rosuvastatin in patients with ischemic HF demonstrated no effect of Rosuvastatin on mortality with modest beneficial effects of Rosuvastatin on reducing cardiovascular hospitalizations.

The association between high cholesterol and improved clinical outcomes has been observed in various chronic disease states including HF, end-stage renal disease on hemodialysis, and chronic obstructive pulmonary disease, as well as in the elderly; these paradoxical associations between traditional cardiovascular risk factors and clinical outcomes have often been referred to as "reverse epidemiology." The mechanisms underlying reverse epidemiology are not fully understood but may include the presence of malnutrition and inflammation in these disease states. It is not known whether the inverse relationship between cholesterol levels and mortality in chronic HF applies to patients admitted to the hospital with short-term HF exacerbations.

A better understanding of the prognostic factors involved in acute HF, a disease state with high morbidity and mortality, may help improve and refine strategies for clinical management. Thus, we aimed to investigate the association of cholesterol level with outcomes in acute HF, by examining a large cohort of patients hospitalized with HF using the Get with the Guidelines-Heart Failure (GWTG-HF) registry database

[Tamara B, 2009].

Familial hypercholesterolemia (FH) is an autosomal dominant disease. Cholesterol levels eventually reach 350-500 mg/dl (9-13 mol/l) in many patients. FH is associated with premature cardiovascular events, which usually appear in men by the fourth or fifth decade of life and about 10 years later in women. Of those with CHD and heterozygous FH 50% of men and 15% of women will die before the age of 60. The few available observational studies report that FH in its heterozygous form affects one out of 500 people in Northern Europe and the USA. In a historical family tree mortality study in The Netherlands reported that in the 19th century, mortality seemed lower than in the general population, but it rose after 1915, reached a maximum during the 1950s, and decreased thereafter. During the decades with excess mortality, survival in the branches of the pedigree differed significantly, ranging from normal life expectancy to severe excess mortality. The underlying defect is a series of mutations in the gene for the LDL receptor and in heterozygous FH only about 50% of those receptors function. Despite its hereditary nature, FH shows great variability in phenotypic expression and is dependent on environmental and genetic factors. Also, considerable variations in the severity of atherosclerotic complications among families with FH have been recognized, world-wide. Longitudinal studies regarding the predictors for cardiovascular events in these high-risk patients are lacking, especially, in Mediterranean populations.

[Demosthenes B. Panagiotakos, 2003].

1.5.1 Relation between MI and hypercholesterolemia:

Hypercholesterolemia is a relatively common condition that has been associated with the development of atherosclerosis and cardiovascular disease. More than half of all deaths in developed countries are related to atherosclerotic cardiovascular diseases, but recent studies have indicated that drug treatment of high-risk individuals can reduce heart attacks by one third and related deaths by nearly 40%. Around twenty specialists participated today in a consultation convened by the World Health Organization (WHO) to begin review selected country progress reports following the conclusions and recommendations adopted at a previous meeting which took place last year in Paris.

It is estimated that more than 10 Million people world-wide have familial hypercholesterolemia. They constitute a unique population at high risk for the premature development of coronary heart disease. Studies conducted prior to the availability of effective cholesterol lowering drugs have indicated that without treatment, the mean age of onset of coronary heart diseases in men with this genetic disorder is around the age of 40 whereas it occurs 10-15 years later in women. The risk of a man with familial hypercholesterolemia suffering a myocardial infarction is 5% below the age of 30, 50% by the age of 50 and 85% by the age of 60. Corresponding values for women are less than 1% before age 30, 15% by age 50 and 50% by age 60.

At their previous meeting, the specialists noted that the potential to prevent or even reverse atherosclerosis in patients with high level of cholesterol is better now than it has ever been, due to advances in both the recognition and treatment of this disorder. The major challenge for health care provider's remains, they stressed the

identification and effective treatment of those patients who currently remain undiagnosed or inadequately treated. They therefore recommended education campaigns to improve public and health care professional awareness of familial cholesterolemia. They also emphasized the need to establish in all countries a registry of patients suffering of this disorder, of their affected and at risk relatives and of the associated physicians, in order to assist in case detection through family screening, education of patients and their physicians, and long term follow-up. Because of their extreme risk, the patients with familial hypercholesterolemia should be contacted at least annually to insure their continued treatment and compliance, they noted [WHO, 1998].

Objective:

Myocardial infarction is the most common problem in Bangladesh. It generally affects Middle aged person, so it causes economical problem for a family due to un-timely death of victim. Hypercholesterolemia influences the risk of Myocardial Infarction. This study was conducted to find out the Cholesterol level and other life style risk factors those are related to Myocardial Infarction.



CHAPTER- 2

Significance of the study:

Coronary heart disease is an important cause of morbidity and mortality in most industrialized nation and is gaining importance as a major disease in developing countries as well.

Coronary heart disease (CHD) is usually caused by a condition called atherosclerosis, which occurs when fatty material and a substance called plaque builds up on the walls of arteries. The walls of the arteries get narrow. As the coronary arteries narrow, blood flow to the heart can slow down or stop, causing chest pain (stable angina), shortness of breath, heart attack, and other related symptoms.

Hypercholesterolemia is a known risk factor for coronary artery disease (CAD) and CAD mortality. Hypercholesterolemia is a risk factor for the development of heart failure as well.

The prevalence of the disease is increasing day by day in Bangladesh. Hypercholesterolemia patients have a higher prevalence of Myocardial infarction compared to the normal population. The presence of increased LDL and decreased HDL are the risk factors of Myocardial infarction.

The inverse relations between serum high-density lipoprotein (HDL) cholesterol levels and coronary artery disease events have been established in many epidemiological studies. However, correction of the dyslipidemia characterized by raised levels of low-density lipoprotein (LDL) cholesterol has been regarded as the traditional goal of therapy. High serum levels of low-density lipoprotein cholesterol (LDL-c) constitute a major risk factor for premature development of coronary heart disease.

This study is expected to provide important information to better understand the relationship between the hypercholesterolemia and myocardial infarction. Thus, the result of the study is expected to improve management of hypercholesterolemia

patients with myocardial infarction which ultimately will help to improve the disease management process.

Globally, non- communicable diseases are increasingly recognized as a major cause of morbidity and mortality. Coronary Heart Disease is one of the non communicable diseases. Myocardial Infarction is one kind of coronary heart disease. Hypercholesterolemia is the major risk factor of Myocardial Infarction among other risk factors which can modify, treat or control by changing lifestyle or taking medicine.

This study will help to increase the awareness among people who are at a risk of MI by taking immediate treatment, such as, by taking medicine, or changing food habit and increasing physical activity etc.



CHAPTER- 3

Materials and Method

3.1 Type of study:

This study attempted to establish relationship between Myocardial Infarction and hypercholesterolemia and also relationship between the life style risk factors of Myocardial Infarction.

3.2 Place of study:

The study was being conducted in National Institute of Cardiovascular Diseases & Hospital (NICVD). This hospital is the largest and the pioneer cardiac hospital in Bangladesh .It was established in 1981, situated at the heart of the Dhaka city composed of 400 beds, offering 24 hours of services. This institute comprises of Outdoor, Emergency, highly specialized Coronary care unite, Post coronary care unit Intensive care unite and has a full fledged indoor. A good number of Doctors and medical specialists and other supporting staffs are providing cardiac medical and surgical care services to all categories of patients from different parts of the country- including referred patients from other medical college hospitals & district hospitals.

3.3 Study population:

All admitted patient of MI diagnosed by the hospital physicians

3.3.1 Inclusion Criteria of the cases:

- I). Patient of diagnosed MI ages 30-75 yr.
- II) Both sexes irrespective of religion and occupation.

3.3.2 Exclusion Criteria of the cases:

- I) Patients of cardiac disease other than Myocardial Infarction.

II) Post operative patient

III) Any other chronic diseases.

3.4 Sample size:

The objective of the study is to find out the relationship of hypercholesterolemia and myocardial infarction. The required sample size was 60 patients.

3.5 Research Equipments:

The following equipments were used in this study,

- Interview schedule
- Measuring Tape.
- Weighing machine (Bathroom Scale)
- Sphygmomanometer. (Aneroid type)
- Stethoscope.

3.6 Sampling Technique:

In this study, purposive sampling technique was followed. All the cases fulfilling the above mentioned selection criteria were included, 60 cases were achieved.

3.7 Research Approach:

After getting the approval of the research proposal from the honorable faculty members, formal permission was obtained from the competent authorities of NICVD Hospital for DATA collection. The data for the cases were collected from the wards 3, 4, 5, 6, and 7, (Medicine Ward). The data for the control group was collected from all the medical wards of NICVD hospital.

3.8 Data collection method:

After explaining the purpose of the study to the respondents and obtaining their verbal consent, the researcher interviewed all the respondents by asking question in Bengali and using a thoroughly pre –tested questionnaires. The questionnaires consist of three parts. Part-1 consisting general information of the respondents, part-2 behavioral characteristics and Part-3 consists the Physical examination, e.g. recording blood pressure.

3.9 Diagnosis of Myocardial Infarction of the patients:

This study was performed on 60 consecutive patients suffering from acute Myocardial Infarction (ACUTE MYOCARDIAL INFARCTION) admitted to the Department of cardiology, NICVD, for treatment. These patients were selected irrespective of age and sex. All patients of acute anterior, inferior both anterior and inferior, and right ventricular infarction with inferior were included in the study. Patients were diagnosed on the basis of following criteria:

1. Chest pains that characteristic of ACUTE MYOCARDIAL INFARCTION.
2. Increased level of cardiac enzymes in serum. Creatine kinase (CK), Membrane bound (CKMB), and Creatine phosphokinase (CPK).

3.9.1 Treatment:

- ❖ Bed Rest
- ❖ Antihypertensive
- ❖ Anti-anginal
- ❖ Anti-arrhythmic
- ❖ Anti-platelet
- ❖ Sedative Drug

- ❖ Aspirin
- ❖ Nitroglycerin
- ❖ Morphine

3.10 Study period:

Study period was one year commencing from February 2008 to June 2009. To complete the study in time a work schedule was prepared depending on different task of the study .The four months were spent for literature review, selection of topic, development of the protocol. Subsequent months spent on official correspondence, data collection, data analysis, report writing and submission of report.

3.10.1 Data Processing:

Appropriate template was prepared basing on the variables and data were entered. After the entry the collected data were analyzed by using statistical package for Windows version 12.0.

3.10.2 Data analysis:

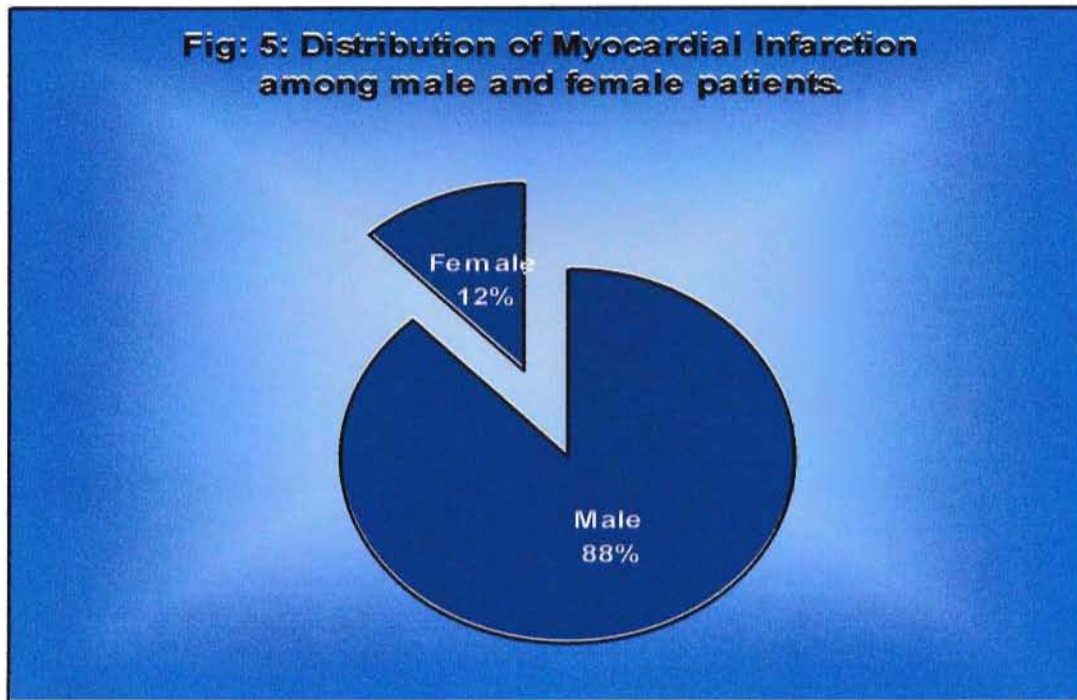
All the data were checked after collection. The different risk factors (%) of MI were calculated in Microsoft Excel. The results were shown by Pie Chart, Bar Chart.

CHAPTER-4

RESULTS

This study was a case study; cases were selected from admitted patients suffering from MI at NICVD. A total of 60 patients were included in the study. In our study, the number of male patients was 53 (88%) and female patients (12%) were 7.

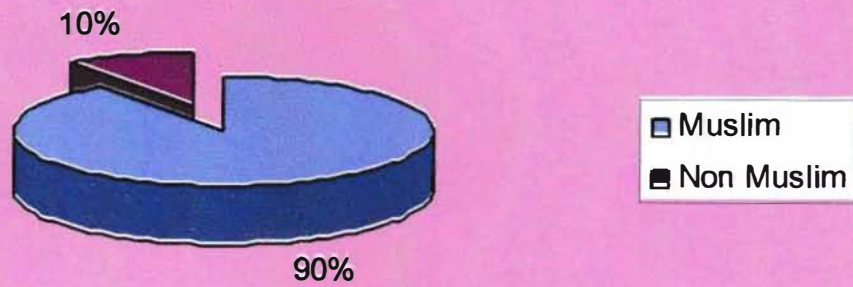
4.1 Distribution of myocardial infarction among male and female patients:



Distribution of patients by sex shows that out of 60 cases fifty three (88%) male and seven (12%) female patients have myocardial infarction.

4.2. Distribution of myocardial infarction among different religions:

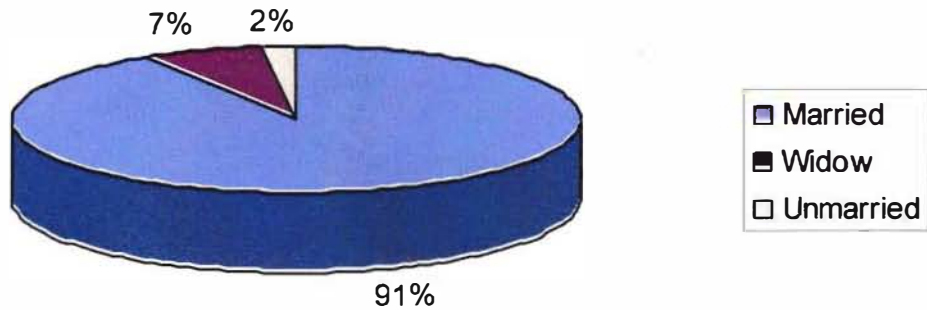
Fig: 6: Distribution of Myocardial Infarction among different religion.



Fifty four (90%) patients were Muslim, and six (10%) were Non Muslims.

4.3. Distribution of myocardial infarction among different marital status (%):

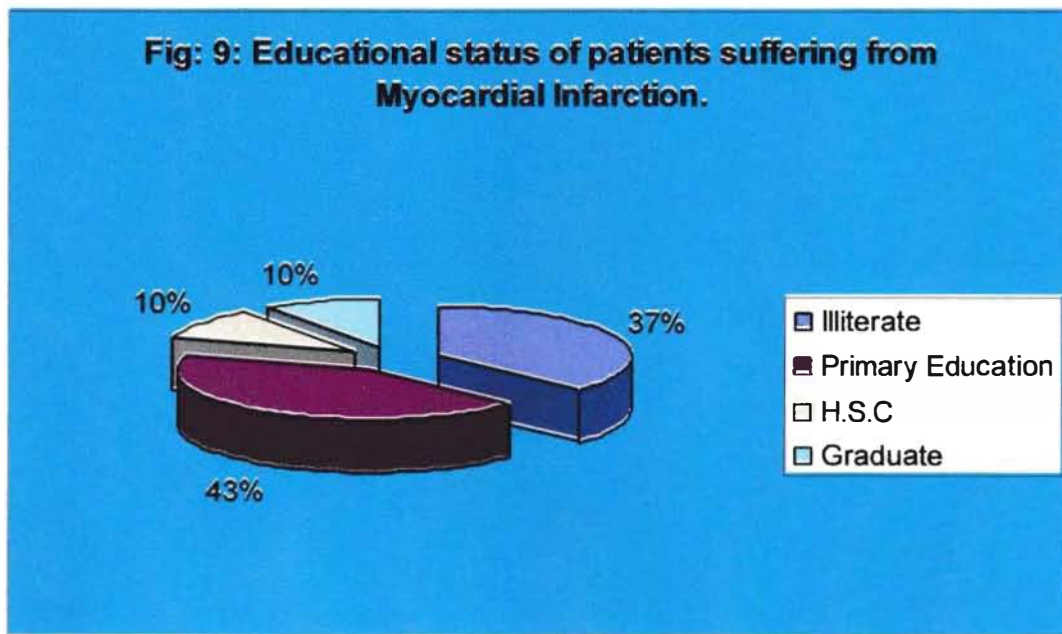
Fig: 7: Distribution of Myocardial Infarction among different Marital Status (%).



Patients were grouped according to marital status. About fifty five (91%) patients were married, four (7%) were widows, one (2%) were unmarried.

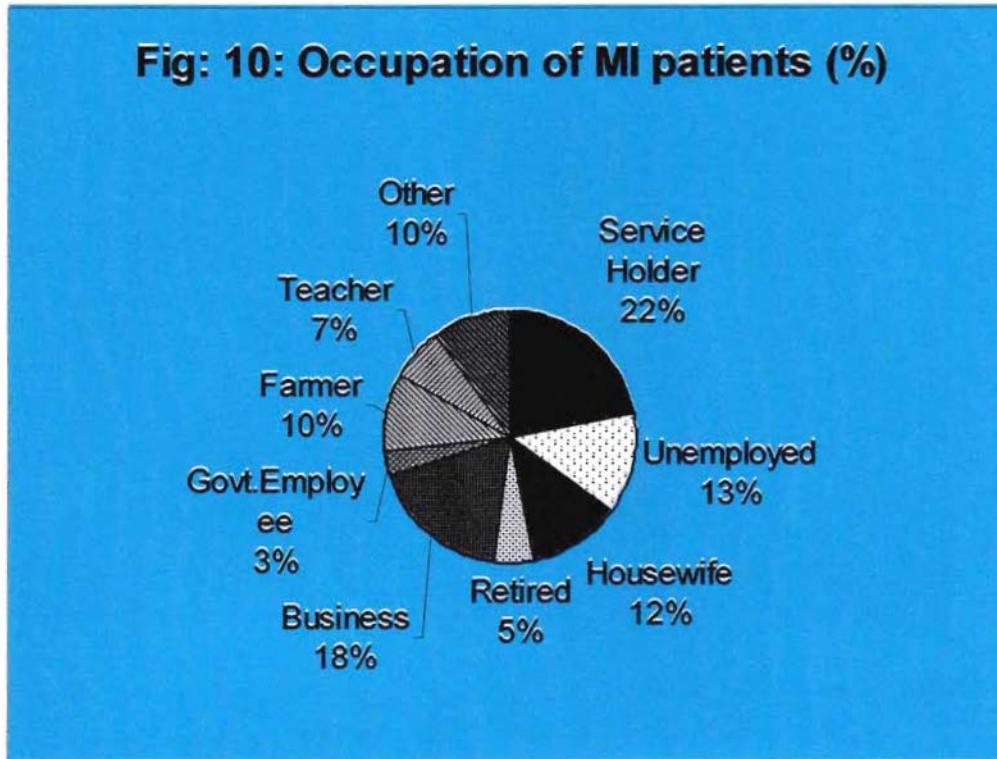


4.5 Educational status of patient suffering from Myocardial Infarction:



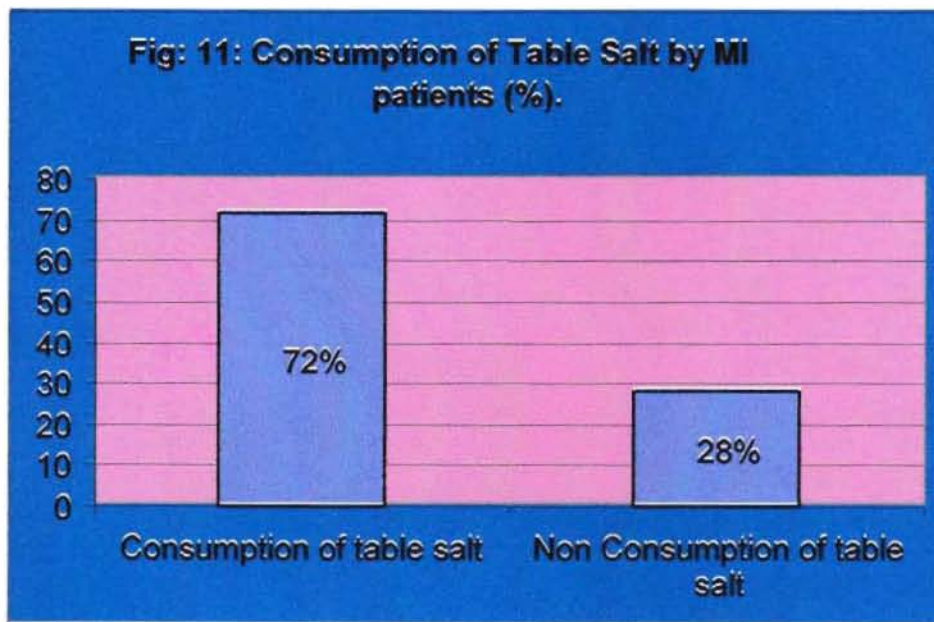
Patient's educational status was divided into four groups. Thirty seven percent (37%) patients did not receive any education. 43% received primary education, 10% patient passed H.S.C., and 10% patients were graduate.

4.6 Occupation of MI Patient (%):



Majority of the MI patients were service holder (22%). Next prevalent groups were unemployed (13%), housewife were 12%, 5% retired, 18% businessman , 3% government employee, 10% farmer, 7% teacher, and 10% were involved in other occupations.

4.7 Consumption of Table Salt by MI patients (%):

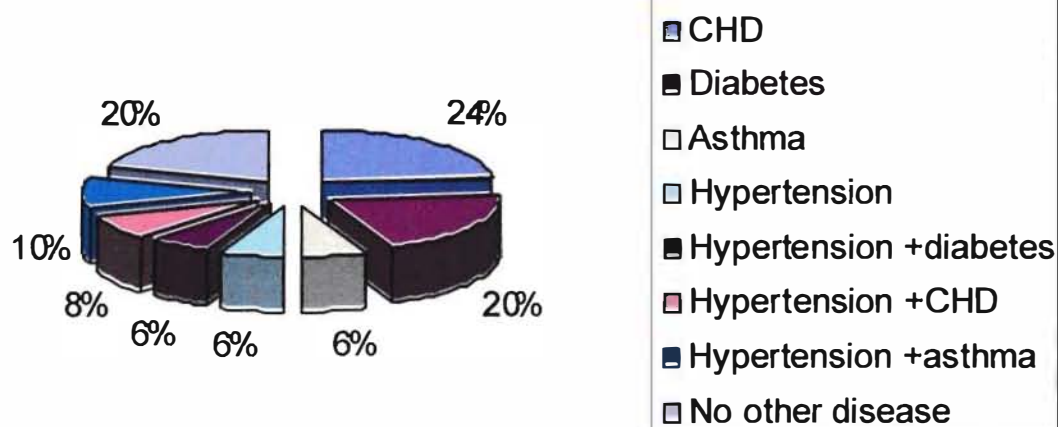


Percentage of consuming table salt was 72 and percentage of not consuming of table salt was 28 of the total number of patients



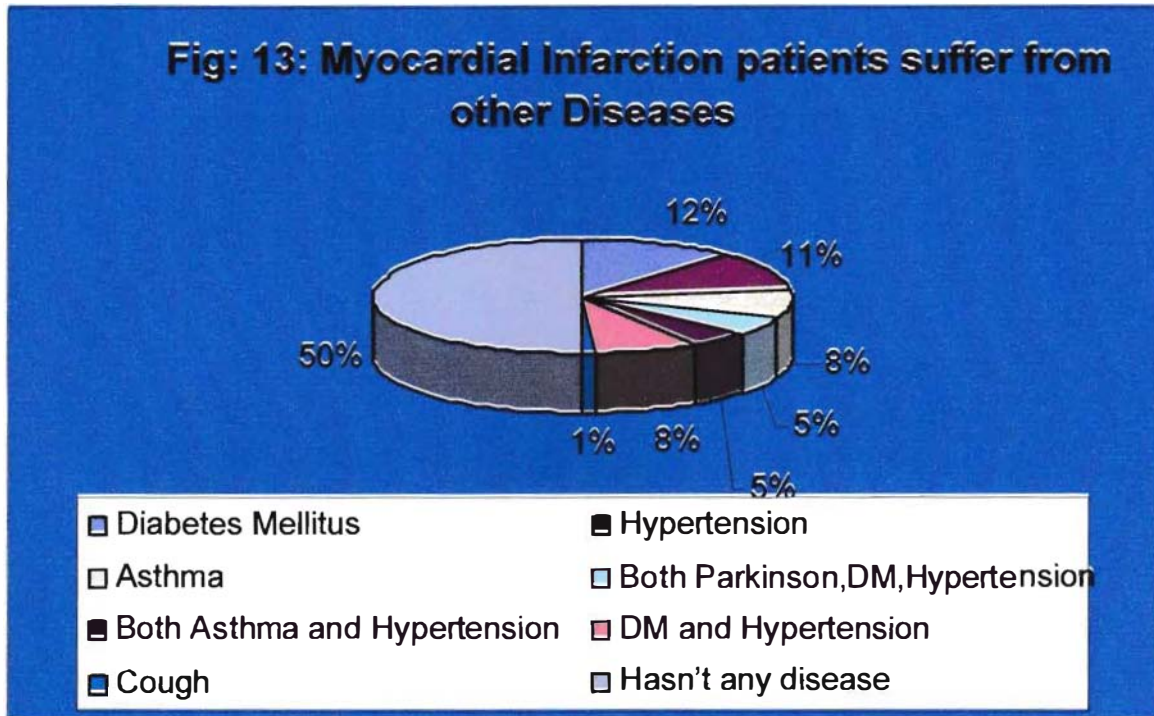
4.8 Family History of the Patients:

Fig: 12: Family History of the Patients



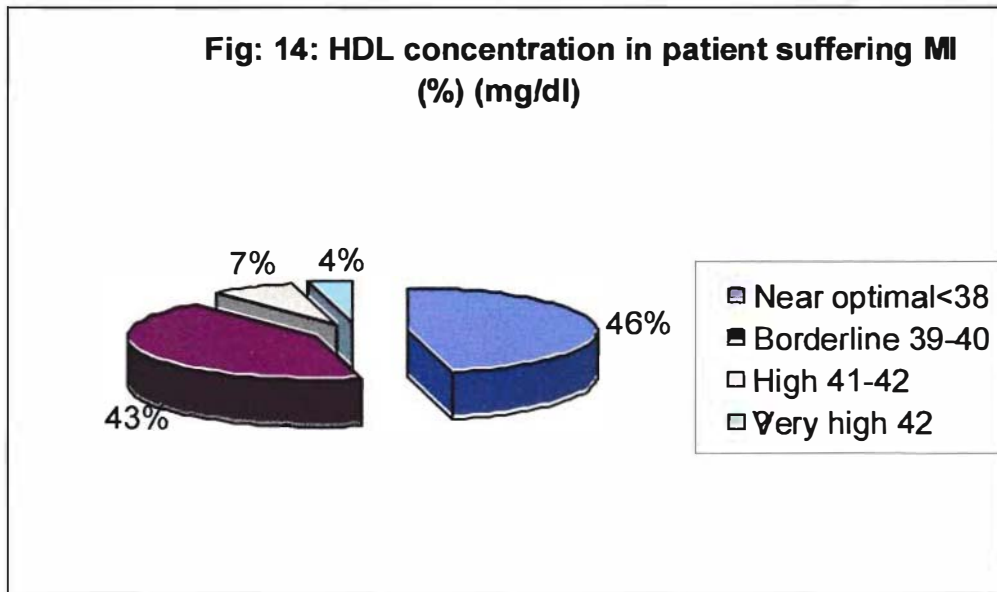
Patient's family history was divided into eight groups. Family history of Coronary Heart Diseases (CHD) was 12 (24%) which was the major case of MI. Diabetes were present in 10 patients (20%), asthma were present in 3 patients (6%), hypertension was present in 3 patients (6%), both hypertension & diabetes were present in 3 patients (6%), both CHD & hypertension were present in 4 patients (8%), both asthma & hypertension were present in 5 patients (10%). Ten patients (20%) had no other disease in their family.

4.9. Myocardial Infarction patients suffer from other Diseases:



There were many patients who suffer from other diseases. Among them 12% patients had Diabetes mellitus (DM), 11% had Hypertension, 8% had Asthma. Five percent patients suffered from Parkinson, DM & Hypertension. Both Asthma & Hypertension were present in 5% patients; both DM & Hypertension were present in 8% patients. Cough was found in 1% patients. Fifty percent (50%) patients did not suffer from any other diseases.

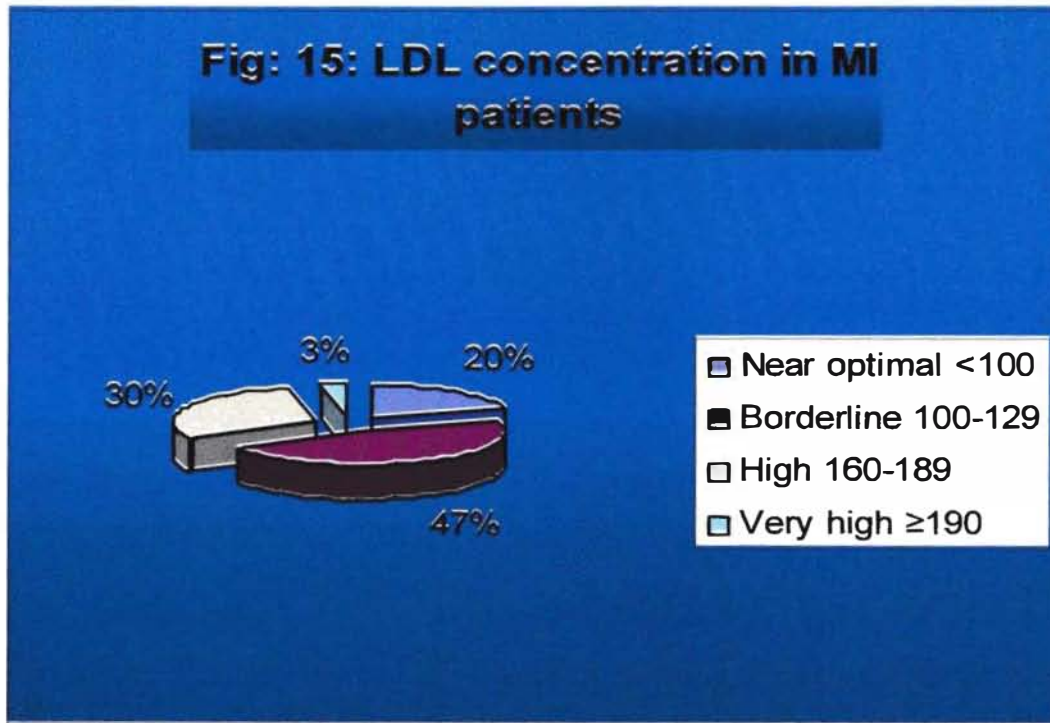
4.10. High Density Lipoprotein (HDL) concentration in patient suffering Myocardial Infarction (%) (mg /dl):



The case study was conducted among 60 patients of both sexes. HDL concentrations of 28 patients (46%) were near optimal level, 26 patients (43%) were in borderline level, 4 patients (7%) were at high risk level and two patients (4%) were at very high risk level.

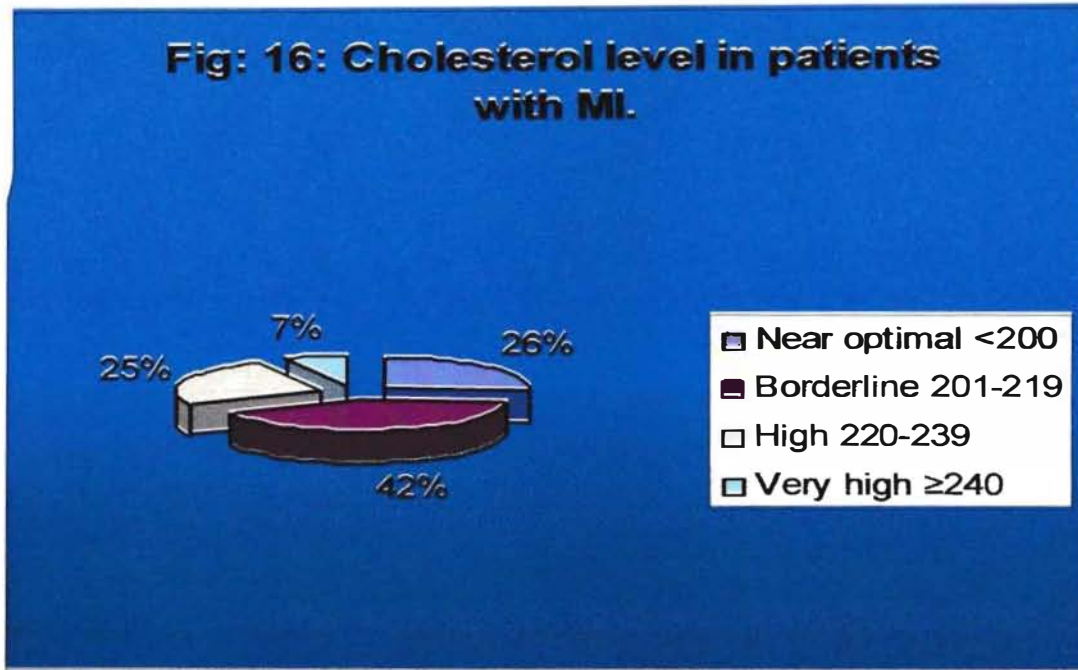
4.11 Low Density Lipoprotein (LDL) concentration in patients with Myocardial

Infarction:



LDL concentration in 12 patients (20%) was near optimal level, 28 (47%) patients were in borderline level and 18 (30%) patients were at high risk. Two (3%) patients were at very high risk level.

4.12. Total Cholesterol level (mg/dl) in patients (%) with Myocardial Infarction:



Total Cholesterol level of 16 (26%) patients was at optimal level. Twenty five (42%) patients were in borderline level in terms of their total cholesterol. Total cholesterol level of fifteen (25%) patients was at high risk level and only 4 (7%) patients were at very high risk level.

CHAPTER-5



DISCUSSION & CONCLUSION:

Three focuses have been made in this study. There were HDL concentration, LDL level and total cholesterol level.

Among 60 patients LDL concentrations in 12 patients (20%) were near optimal level. LDL concentrations in 28 (47%) patients were in borderline. Eighteen patients (30%) were at high risk level in terms of their LDL concentration. Two (3%) patients were at very high risk level. HDL concentrations of 28 patients (46%) were near optimal level, 26 patients (43%) were in borderline level, 4 (7%) were at high risk level and two (4%) were at very high risk level. Total Cholesterol level of 16 (26%) patients was at optimal level. Twenty five (42%) patients were in borderline level in terms of their total cholesterol. Total cholesterol level of fifteen (25%) patients was at high risk level and only 4 (7%) patients were at very high risk level.

The most important observation of the study was the age group of the patients ranged from 56-60 years. These patients had the highest prevalence of MI. In this age group 30% patients were sufferer of MI.

Age is important because women's risk of heart disease starts to rise during middle age, because of the drop in estrogen levels that comes with menopause.

Except for age and family history, the risk factors can be prevented or controlled by changing lifestyle and having medication. Sometimes special procedures, such as bypass surgery and angioplasty, were used to treat heart disease. Heart disease and its risk factors must be controlled to prevent MI [**American Heart Association, 2000**].

In this study eighty nine (89%) patients were male and twelve (12%) were female. As a result male had more chance of MI than female. Majority of the females included in

the study belonged to age group of over 50 years. This indicates that sex hormone protects females from getting on MI at an earlier age.

Percentage of consumption of table salt per day was 72% and percentage of not consumption of table salt was 28% of the total number of patients. Those people took table salt with their food; they had increasing chance of MI.

With industrialization and development, like other developing countries, there are more cases on myocardial infarction in Bangladesh. It was reported that coronary heart disease ranks third among the cardiovascular disease in Bangladesh. An important observation among hospitalized patients in the country is that as many as 32% of the patients belong to 41 and 50 years of age. This indicates premature occurrence of the disease. Male to female ratio is 8:1, which is higher as compared to that in other country. [**Rhashid AKMH, 1997**].

In this study, we got male is more prevalent of MI than female. On the study which was published in 1998 they also showed that male is more prevalent than female [**Wilson PW, 1998**]. Women who use combined oral contraceptive pills have a modestly increased risk of myocardial infarction [**Khader YS, 2003**].

Many of the risk factors of MI are modifiable; so many heart attacks can be prevented by maintaining a healthier lifestyle. Physical activity, for example, is associated with a lower risk profile. Non-modifiable risk factors include age, sex, and family history of an early heart attack (before the age of 60), which is thought of as reflecting a genetic predisposition [**Wilson PW, 1998**].

Family history of MI is positively associated with the risk of early MI in women. While the association with parental history of MI is mediated through the clustering of other common risk factors, the association of sibling history of MI with early-onset

MI in young women is only partially explained by the clustering of established and newly-identified risk factors [**Atherosclerosis Volume 156, Issue 1, May 2001**].

Socioeconomic factors such as a shorter education and lower income (particularly in women), and unmarried cohabitation may also contribute to the risk of Myocardial Infarction. To understand epidemiological study results, it's important to note that many factors associated with MI mediate their risk via other factors. For example, the effect of education is partially based on its effect on income and marital status [**Nyboe J, 1989**]. Our findings also showed that the socioeconomic factors such as earning (income) and education level are related to MI.

There were different types of risk factors that can influence the MI. In Bangladesh Myocardial Infarction disease was rapidly increased day by day. Our study found out the relationship between hypercholesterolemia and MI, where hypercholesterolemia is most important risk factor of MI.

The main objective of the study was to find out the relationship between MI and Cholesterol. In this socio-demographic study it was found that age, educational status, occupations were significantly associated with coronary heart disease. Among life style risk factors, like smoking, type of smoking, betel nut chewing, and tobacco consumption all were significantly associated with development of MI.

Myocardial infarction is becoming a serious public health problem in Bangladesh. It generally affects Middle aged person in Bangladesh. Acute myocardial infarction is the leading cause of mortality and morbidity and also emerging as a major health problem in Bangladesh.

Cardiovascular disease (CVD) is currently a substantial cause of death and disability in many low- and Middle-income countries, and this burden will be higher in the

future. Three factors will determine the increase in death and disability from this disease.

First, as population's age, more people will reach ages at which CVD becomes common. Second, older populations will be more exposed to risk factors including consumption of tobacco, high blood pressure, diets high in saturated fat, obesity, and a sedentary life-style. Third, populations may change their use of preventive and curative health services.

This study will be helpful to increase the awareness between people health by taking immediate treatment, by taking drug, or by controlling blood sugar level, food habit, and increasing physical activity to avoid myocardial infarction.

So, the people should be aware of the danger of lipid and should keep the lipid profile with in the normal range.

The outcome of this study may provide important information for future in depth study as well as may help in providing ideas for policy maker to formulate proper investigation strategies among the people regarding hypercholesterolemia and risk factors responsible for development of Myocardial Infarction.

CHAPTER-6



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