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Study of Lipid Profile in Patients of Ischemic Heart Diseases in Tertiary Care Hospital, Barabanki

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Abstract: ***Background**: The impact of lipid profile factors on the prognosis of CHD patients remains debatable, despite the established role of these factors in the etiology of CVD. Therefore, it is crucial to comprehend the correlation between abnormal lipid profiles and ischemic heart disease patients in order to close the knowledge gap regarding the link between dyslipidemia and this population. **Objectives**: To study the lipid profile changes in patients of ischemic heart disease. **Methods**: This was 18 month hospital based cross sectional study conducted by Dept. of Medicine; Dr. KNS Memorial Institute of Medical Science, barabanki. The patients of ischemic heart disease (Group1) and Normal patients without ischemic heart disease (Group 2), who visited to medicine OPD of Dr KNS Memorial Institute of Medical Sciences, Barabanki were enrolled in our study. Lipid profile estimation was performed using a semi - auto mated biochemistry analyzer Total cholesterol, triglycerides and HDL cholesterol was estimated. LDL cholesterol and VLDL cholesterol was calculated using Friedewald's formula. For qualitative data analysis Chi square test was applied, and for quantitative data analysis t - test and ANOVA tests was applied for significance. If P value <0.05, it was considered significant. **Results**: A total of 120 participants were enrolled based on eligibility criteria. Among them 60 participants were the patients of ischemic heart disease (IHD). and 60 participants were age and sex matched healthy control. Among 60 cases; 40% were diagnosed with acute coronary syndrome; 31.67% were diagnosed with congestive heart failure; and 28.33% were diagnosed with chronic stable angina. Among 60 cases of IHD - most of them complained about chest pain (34.70%) and sweating (35.30%) followed by breathlessness (30%); palpitation (26%); headache (28.70%); dizziness (25.30%); restlessness (26%); and others (14.70%).13.33% cases were asymptomatic. On applying multiple logistic regression analysis; it was found that hypertension (78.33% v/s 28.33%; p<0.001); diabetes (63.33% v/s 30%; p<0.001); family h/o AMI (55% v/s 21.67%; p<0.001) and h/o smoking (63.33% v/s 20%; p<0.001) increase the odds of occurring IHD. But the h/o alcohol was not associated as risk of IHD (29.30% v/s 26.70%; p=0.716). The mean value of total cholesterol (167.30 v/s 149.93; p=0.032); triglyceride (159.49 v/s 129.19; p=0.026); LDL (108.95 v/s 91.02; p=0.04) was significantly higher in IHD patients as compared to Controls. But mean VLDL (27.22 v/s 28.93; p=0.463) and HDL (39.49 v/s 38.44; p=0.729) were found comparable between the groups. **Conclusion**: Persons with IHD had aberrant lipid profile levels, such as higher total cholesterol, LDL cholesterol, and triglyceride levels, in comparison to the control group. The study concluded that even during follow - up, it is vital to evaluate the lipid profile and their ratio for these individuals since these parameters lead to the development of atherogenic myocardial infarction and other coronary issues.*

Keywords: Lipid Profile, Acute Coronary Syndrome, Atherogensis

1. Introduction

Myocardial ischemia, or an imbalance between the supply and demand of oxygen to the myocardium, is a hallmark of a number of clinical disorders collectively known as ischemic heart disease (IHD). IHD goes by a few other names, including coronary heart disease (CHD) and coronary artery disease (CAD).

According to the World Health Organization (WHO), cardiovascular disease (CVD) accounts for around 30% of all fatalities globally and is the top cause of morbidity and mortality overall. According to the World Health Organization, 17.3 million people died from cardiovascular diseases in 2016, and by 2030, that figure might rise to 23.3 million. (1) In the secondary prevention of CVD, pharmacological therapy such as ACE/ARB inhibitors, beta - blockers, lipid - lowering medications, and antiplatelet medicines are currently pivotal. (2–4) There is still a residual CVD risk, though, and that requires additional treatment.

Multiple studies have shown that lipid profiles play a part in the development of CVD. Cardiovascular disease (CVD) risk is strongly associated with elevated triglyceride (TG) and total cholesterol (TC) levels, which may influence the narrowing and widening of coronary arteries. (5) Additionally, arteriosclerosis can be caused by an increase in low - density lipoprotein cholesterol (LDL - C) levels, which can lead to thrombocytopoiesis as a result of LDL - C buildup in the intima - media of the artery. (6) Higher levels of high - density lipoprotein cholesterol (HDL - C) may, however, lower the risk of cardiovascular disease (CVD). As a result, people who have a high HDL - C and a low non - HDL - C may have a reduced risk of cardiovascular disease.

Using statin therapy intensity as a treatment goal, the ACC/AHA guideline suggests using the highest effective dose of statins without causing unwanted side effects. (7) The ESC/EAS Guidelines recommended a target level of 70 mg/dL for individuals at very high risk, 100 mg/dL for those at high risk, and 115 mg/dL for those at low to moderate risk in order to prevent cardiovascular disease. (8) The goal

levels of lipid profiles for secondary prevention of coronary artery diseases, according to the Japan Atherosclerosis Society Guidelines for high risk group are less than 100 mg/dL or less than 70 mg/dL of LDL - C, less than 130 mg/dL or less than 100 mg/dL of non - HDL - C, less than 150 mg/dL of TG, and more than 40 mg/dL of HDL - C. (9) The effect of lipid profile variables on the prognosis of patients with coronary heart disease (CHD) is still up for debate, despite the fact that their possible functions in the development of CVD have been proven. As a result, filling the information gap on the relationship between ischemic heart disease patients and dyslipidemia necessitates understanding the association of aberrant lipid profiles with these patients in the research domain.

Objectives of the study

To study the lipid profile changes in patients of ischemic heart disease**.**

2. Material and Methods

The study conducted at Dr KNS Memorial Institute of Medical Sciences, Barabanki involved patients of ischemic heart disease (Group1) and normal patients without ischemic heart disease (Group 2) who visited to medicine OPD. The research was a cross sectional study that lasted from August 2022 to February 2024, with a sample size of 120 (60 cases and 60 controls). The sample size calculation was based on a formula involving the statistic corresponding to the level of confidence, expected prevalence, and precision.

It was a hospital based cross sectional study. Patients satisfying the inclusion and exclusion criteria was enrolled in this study after taking informed consent.

Lipid profile estimation was performed using a semi - auto mated biochemistry analyzer. Total cholesterol was estimated by an enzymatic method (Cholesterol oxidase - Peroxidase), triglycerides by an enzymatic method (Glycerol phosphate oxidase - Peroxidase). HDL cholesterol was estimated by the phosphor tungstic acid precipitation method. LDL cholesterol and VLDL cholesterol was calculated using Friedewald's formula.

A pre - structured proforma was used to collect detail about the history. All relevant investigation was done for the participants.

Following investigations was done to my study participants: CBC, LIPID PROFILE, FASTING BLOOD SUGAR, 2 HOUR POST PRANDIAL BLOOD SUGAR, TROP T, CKMB, ECG.

Inclusion Criteria:

1) Patients of ischemic heart disease who was ready to give consent to be included in study.
2) Patient with ischemic heart diseases.

Exclusion Criteria:

1) Patients who were not ready to give consent.
2) Patients age less than18 years and more than70 years
3) Patients with pre existing liver disease in the form of Cirrhosis or Hepato - cellular carcinoma, Chronic kidney disease, Acute illness, Mentally unstable, Gestational diabetes, Pregnancy, Lactation, on treatment with drugs interfering with thyroid dysfunction.

Statistical Analysis

The data was entered in an MS - Excel 2013 worksheet. Data analysis was performed using IBM SPSS Stats 21.0 version. Chi - square test and Independent samples 't' - test were used to compare the data. A 'p' value less than 0.05 was considered as statistically significant.

3. Results

A total of 120 participants were enrolled based on eligibility criteria. Among them 60 participants were the patients of ischemic heart disease (IHD). and 60 participants were age and sex matched healthy control. The overall age of participants was 47.35±6.83 years. The mean age of patients of IHD was 46.70±7.01 years and mean age of control was 48.00±6.63 years. There was no significant difference in the mean age between the groups (p=0.623). In our study, 58.33% male participants of IHD and 51.67% male belonged to control. There was no significant difference in gender wise distribution between the groups (p=0.988). In our study; among IHD patients - 58.33% belonged to rural and in control arm - 63.33% were belonged to rural area. There were no significant differences in area wise distribution between the groups (p=0.232). Among 60 IHD cases - 36.67% were belonged to lower middle; 30% belonged to upper lower, 25% belonged to upper middle and 8.33% belonged to lower SES status.

Among 60 control participants - 41.67% belonged to lower middle; 25% belonged to upper middle; 21.67% belonged to upper lower and 11.67% belonged to lower SES status. There was no significant difference in SES between the groups (p=0.547).

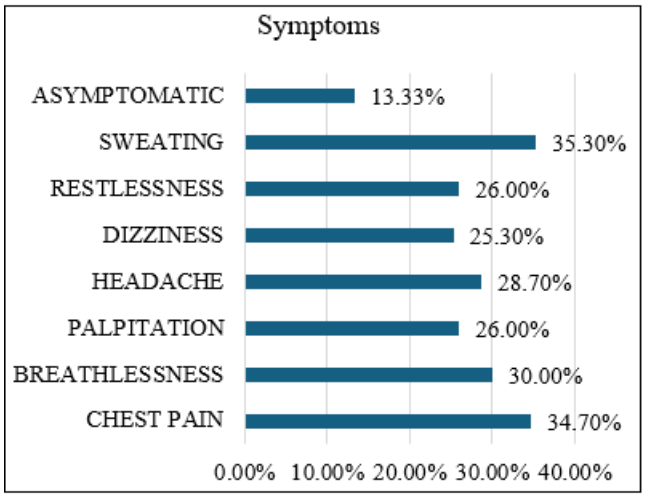

Figure 1: Bar diagram showing symptoms of IHD cases

Among 60 cases of IHD - most of them complained about chest pain (34.70%) and sweating (35.30%) followed by breathlessness (30%); palpitation (26%); headache (28.70%); dizziness (25.30%); restlessness (26%); and others (14.70%).13.33% cases were asymptomatic.

Table 1: Association of risk factors with IHD

		Groups				p - value
		IHD		Control		
		Count	Column N %	Count	Column N %	
Hypertension	No	13	21.67%	43	71.67%	<0.001
	Yes	47	78.33%	17	28.33%	
Diabetes	No	22	36.67%	42	70.00%	<0.001
	Yes	38	63.33%	18	30.00%	
Family H/O AMI	No	27	45.00%	47	78.33%	<0.001
	Yes	33	55.00%	13	21.67%	
H/O Smoking	No	22	36.67%	48	80.00%	0.001
	Yes	38	63.33%	12	20.00%	
H/O Alcohol Intake	No	53	70.70%	55	73.30%	0.716
	Yes	22	29.30%	20	26.70%	

On applying multiple logistic regression analysis; it was found that hypertension (78.33% v/s 28.33%; p<0.001); diabetes (63.33% v/s 30%; p<0.001); family h/o AMI (55% v/s 21.67%; p<0.001) and h/o smoking (63.33% v/s 20%; p<0.001) increase the odds of occurring IHD. But the h/o alcohol was not associated as risk of IHD (29.30% v/s 26.70%; p=0.716).

Table 2: Correlation of anthropometric characteristics with IHD

Groups		BMI	Waist Circumference	Hip Circumference	Waist/ Hip Ratio
IHD	N	60	60	75	75
	Mean	34.54	84.61	94.40	0.92
	SD	2.68	6.37	6.53	0.056
Control	N	60	60	60	75
	Mean	24.97	68.4800	89.02	0.72
	SD	2.68	6.65635	6.24970	0.053
p - value (Independent t - test)		0.001	<0.001	0.001	0.001
Significance		S	S	S	S

It was found that the mean value of BMI (34.54 v/s 24.97; p=0.001); waist circumference (84.61 v/s 68.48; p<0.001); hip circumference (94.40 v/s 89.02; p=0.001) and waist/Hip ratio (0.92 v/s 0.72; p=0.001) were significantly higher in IHD patients as compared to control.

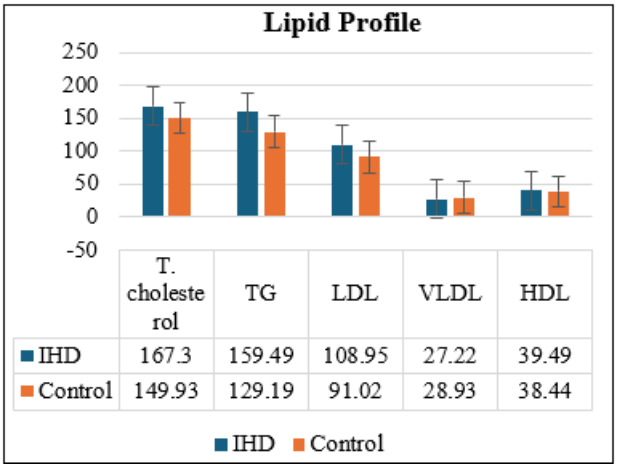

Figure 2: Bar diagram showing comparison of lipid profile between the groups

In this study; the mean value of total cholesterol (167.30 v/s 149.93; p=0.032); triglyceride (159.49 v/s 129.19; p=0.026); LDL (108.95 v/s 91.02; p=0.04) was significantly higher in IHD patients as compared to Controls. But mean VLDL (27.22 v/s 28.93; p=0.463) and HDL (39.49 v/s 38.44; p=0.729) were found comparable between the groups. Among 60 cases; 40% were diagnosed with acute coronary syndrome; 31.67% were diagnosed with congestive heart failure; and 28.33% were diagnosed with chronic stable angina.

4. Discussion

One of the main reasons why coronary artery disease (CAD) occurs is because of dyslipidaemia. Traditional risk factors in individuals with myocardial infarction include elevated total cholesterol (TC), triglycerides (TG), low - density lipoprotein - cholesterol (LDL - C), and decreased high - density lipoprotein - cholesterol (HDL - C). (10) It is well - documented that coronary artery disease is more common and deadly in the Indian population compared to the Western population. (11)

Serum cholesterol levels above 200 mg/dL with normal serum triglyceride levels (≤200 mg/dL) were considered to indicate isolated hypercholesterolemia; similarly, serum triglyceride levels above 200 mg/dL with normal serum cholesterol levels (≤200 mg/dL) were considered to indicate isolated hyper - triglyceridemia. If serum triglyceride levels were normal and the isolated low - density lipoprotein was less than 35 mg/dL, it was considered an isolated case. When serum triglyceride levels are normal, isolated low - density lipoprotein cholesterol is defined as more than 150 mg/dL. Blood lipid levels were considered normal when total cholesterol and triglyceride levels were 200 mg/dL or lower, HDL was 35 mg/dL or higher, and LDL was 150 mg/dL or higher. (12)

A lipid - reducing consensus development conference at the National Institutes of Health has suggested lowering cholesterol levels to 200 mg/dl for everyone. (13) In women, lipid concentrations can be impacted by genetic factors, dietary fat and cholesterol, total caloric intake, alcohol use, cigarette smoking, and physical exercise. (14)

Studies that have looked at the link between total cholesterol and coronary heart disease in women have consistently found that women have lower rates of coronary heart disease than men do at the same cholesterol levels. Additionally, it is only at relatively high total cholesterol levels (greater than 260 mg/dL) that there is a clearly elevated risk for coronary heart disease in women. An additional age effect is seen, with total cholesterol concentrations being a better predictor in women of advanced maternal age compared to younger women. The American Heart Association and the American College of Cardiology have issued guidelines that stress the importance of maintaining a healthy weight and engaging in regular physical exercise. (14)

A higher risk of cardiovascular disease is connected with an excess of saturated fatty acids in the diet, which is caused by a decrease in cereals, fruit, and vegetables. This alters the lipid profile. Major risk factors for coronary events include a lipoprotein presence and an elevated total/HDL cholesterol ratio. Conversely, women are thought to benefit from having high levels of HDL cholesterol (>45 mg/dl). (15) Having

diabetes makes the other risk factors more harmful and changes the preventive impact of estrogens.

Anthropometric characteristics with ischemic heart disease

Encouraging a body mass index below 24.9 kg/m^2 and a waist circumference below 80 cm will help reduce the chances of developing menopausal insulin - resistance syndrome.[5] Sedentary lifestyles are associated with an increased risk of cardiovascular disease and death from any cause in men. (15)

A number of risk factors are common to both sexes, including but not limited to: smoking, high blood pressure, diabetes, obesity, advanced age, and an unhealthy, sedentary lifestyle (as shown in certain studies). Oral contraceptives (OCs), hormonal replacement medication, menopause (natural or surgical), and high blood triglyceride levels are some variables that may disproportionately impact women. Men have higher average total and LDL cholesterol levels than women do before menopause, but after menopause, women's levels grow to the point where they surpass men's eventually. (16)

Reducing cholesterol lowers the risk of atherosclerotic lesions and increased cardiovascular risk in men, according to multiple studies. These lesions are associated with relatively low levels of HDL cholesterol and high levels of total and LDL cholesterol in the blood. (16)

Multiple studies have shown that taking estrogens by themselves after menopause lowers LDL and raises HDL levels.6 Levels of low density lipoprotein cholesterol tend to increase as people get older, regardless of gender. After menopause, HDL levels start to drop. Factors unique to women's coronary risk include hypertriglyceridemia, HDL, and diabetes, which play a more significant influence. (17)
The goal of medical treatment is to lower LDL cholesterol levels to 160 mg/dl or below, preferably to less than 130 mg/dl, through changes in diet or the use of medications that lower cholesterol, including niacin. (17) A regimen that preserves the good effects of estrogen in circulating lipoproteins while maintaining the positive impact of the estrogen - progestin combination on uterine mucosa is being sought after by researchers. . (17) The purpose of this case - control study was to characterize the lipid profile in patients with coronary heart disease who are receiving treatment and who attend follow - up appointments. The main findings of my study is discussed below:

Age and Gender

In my study, the mean age was 46.70±7.01 years and most of the participants belonged to middle age group. Among 60 cases of IHD; 58.33% male and 41.67% were female. The average age was determined by Limbu et al. to be 42.8±15.5 years. (18) Out of 200 patients evaluated, 126 (or 63% of the total) were men and 74 (or 37% of the total) were females, according to Ullewar et. al. This shows more prevalence of coronary heart disease in males than females. (18) Out of a total of 599 patients, 317 were male and 282 were female, according to Adak et al. (10)

Risk factors of Ischemic heart disease

In my study; we found hypertension; diabetes; family h/o of AMI and h/o smoking increase the odds of occurring IHD. Apart from these - high BMI; increased waist circumference; increased hip circumference and increased waist/hip ratio also significantly associated with IHD.

The main risk factor for coronary artery disease, according to James et. al., is dyslipidemia, diabetes, or impaired glucose tolerance, regardless of gender. Since hypertension and smoking were only present in a small percentage of the study population, researchers did not consider them to be significant risk factors for coronary artery disease. Coronary artery disease ran in 57% of the people who participated in the research. (19)

According to Calvin et. al., hypertension raises the risk of IHD by a factor of six to eight (OR 5.9, 99% CI 5.6 - 6.2). Having diabetes doubles your chances of dying from IHD (1.9, 1.7 - 2.0) and increases your odds of dying from a stroke (1.6, 1.4 - 1.7). The population - attributable fractions (PAF) of mortality from IHD increased due to hypertension, but the PAF of mortality from stroke decreased due to hypertension. Having diabetes was linked to decreased PAFs and fluctuating patterns over time. (20)

The pace of atherosclerosis in the coronary arteries is accelerated in these patients due to hyperinsulinimia. Diabetes is the second leading cause of death in India, after coronary artery disease. The number of individuals living with diabetes in India has risen from 32 million in the previous decade to 50 million, and experts predict the figure might reach 87 million by 2030. (21) High coronary risk in South Asians was related to hyperinsulinemia, insulin resistance, and the increased frequency of metabolic syndrome in persons with type 2 diabetes. (22, 23) The prevalence rates for coronary artery disease (CAD) were 9.1% in normal persons and 21.4% in those with type 2 diabetes in an urban population research conducted in Chennai (formerly Madras), India. In the Inter - heart study, the attributed risk of myocardial infarction related to diabetes was 9.9%. (24)

Almost half of the participants in my study had a positive history of coronary artery disease in their family. A person's family tree is a window into their inherited vulnerabilities as well as the complex interplay of hereditary, environmental, cultural, and behavioral variables. A younger onset of illness is observed in those who have a hereditary predisposition. Modifying risk factors may be easier if these people are diagnosed with CAD early. Coronary calcium scoring and other non - invasive techniques may aid in the prediction of CAD in these individuals. Humans with a positive family history of endothelium - dependent coronary blood flow regulation are more likely to have this condition, according to some research. (25)

The odds of myocardial infarction increasing to eight times higher for persons who smoked more than 25 cigarettes per day compared to never smokers, according to research by Khaled et. al., which demonstrated a dose - effect response between smoking and IHD. Former smokers had a risk estimate that was comparable to nonsmokers. (26) The

excess risk of death is reduced by an astounding 90% when one stops smoking before the age of 40. Recent studies have shown a causal relationship between smoking and CVDs, and there are many health benefits to quitting. We provide these findings in this review. (27)

Lipid profile in ischemic heart disease

My study found that the mean value of total cholesterol (167.30 v/s 149.93; p=0.032); triglyceride (159.49 v/s 129.19; p=0.026); LDL (108.95 v/s 91.02; p=0.04) was significantly higher in IHD patients as compared to Controls. But mean VLDL (27.22 v/s 28.93; p=0.463) and HDL (39.49 v/s 38.44; p=0.729) were found comparable between the groups.

Goel et al found that in subjects with coronary artery disease and normal coronary arteries, the levels of mean total cholesterol recorded were 178.5±42.1 mg/dl v/s154.1±40.2 mg/dl (p<0.001), high - density lipoprotein cholesterol 30.6±9 mg/dl v/s 27.3±6.8 mg/dl (p<0.001), low - density lipoprotein cholesterol 109.8±35.4 mg/dl v/s 93.6±33.9 mg/dl (p<0.001), and triglyceride 190.7±95.4 mg/dl v/s 157.6±73.5 mg/dl (p<0.001), respectively. The subgroup analysis by age revealed that the group of people with coronary artery disease who were younger (≤40 years) had significantly higher levels of total and low - density lipoprotein cholesterol (194.6±51.4 mg/dl vs.176.3±40.2 mg/dl, p<0.001), and 118.3±39.6 mg/dl vs.108.7±36.1 mg/dl, p=0.001. Neither subgroup had significantly different triglyceride levels (211.7±105.1 mg/dl vs.187.8±93.6 mg/dl, p=ns). Similarly, high - density lipoprotein cholesterol levels were different, but the difference was small, being equally low in both groups (32.7±9.5 mg/dl vs.30.3±9.0 mg/dl, p=ns). (11)

According to Rajmohan, compared to normolipidemic individuals (2.8%), patients with isolated hypercholesterolemia (4.1%; p<0.001), isolated high - density lipoprotein (4.5%; p<0.001), and isolated low - high - density lipoprotein (3.9%; p=0.005) were more likely to have coronary artery disease, but this was not the case for patients with isolated hypertriglyceridemia (3.4%). There was a statistically significant increase in the odds ratios for coronary artery disease in the last quartile (p<0.05) for total cholesterol to high - density lipoprotein ratio, isolated low - density lipoprotein cholesterol, and each quartile of isolated cholesterol. (12)

In people younger than 50 years old, Castelli discovered that total cholesterol level was a great predictor of coronary heart disease. Serum lipoprotein measures, including low - density lipoproteins, very - low - density lipoprotein triglycerides, high - density lipoproteins, and very - low - density lipoproteins, were more reliable predictors of coronary heart disease risk in those aged 50 and up. Coronary heart disease is linearly associated with both low - density and very - low density lipoproteins. (13)

According to Haddad et al., the average plasma cholesterol level for coronary artery disease is 231.43±57.99 mg/dl, which is significantly higher than the control group's 202.8±36.58 mg/dl (p<0.0003). Compared to 44.43±8.34, high density lipoprotein was 35.98±9.37 (p=0.00011). The low density lipoprotein level was 146.75±50.93 (p=0.003), while the high density lipoprotein level was 118.97±45.9. The amount of triglycerides was 246.95±142.1 mg/l compared to 164 mg/l±93.78 (p=0.0002). Low HDL - C was found in 48.4% of people, high triglycerides in 68.3%, high LDL - C in 63.5%, and high plasma cholesterol in 60.9%. (28)

Research conducted by Alam et. al. revealed that individuals with coronary heart disease (CHD) exhibited noticeably elevated levels of total cholesterol, triglycerides, HDL cholesterol, and LDL cholesterol. (29)

Both low and high TC levels were associated with an elevated risk of CVD, according to Dong et. al., who postulated a non - linear relationship between the two. A lower TG level was linked to an increased risk of all - cause mortality, but higher ApoAI and lower ApoB levels were related with an increased risk of CVD. Optimal cholesterol management would aid in preventing CVD and lowering mortality, even though the underlying process was not completely understood.

5. Conclusion

Coronary heart disease is more common in men than in women, according to my research. People in the intermediate age bracket, between the ages of 40 and 60, were the hardest hit. Increasing the risk of IHD are hypertension, diabetes, a personal or family history of coronary artery disease, and smoking. Compared to the control group, individuals with IHD had abnormal lipid profile levels, including elevated levels of total cholesterol, LDL cholesterol, and triglycerides. The study found that evaluating the lipid profile and their ratio is important even during follow - up for these patients, since these parameters contribute to the development of atherogenic myocardial infarction and other coronary problems.

The findings point to the necessity of a multifaceted strategy in public health promotion campaigns aimed at reducing blood cholesterol levels and other risk factors.

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