



Homocysteine and Lipid Profile in Patients with Coronary Artery Disease

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Abstract

Aim of the study: To find out whether there is any significant correlation between concentrations of homocysteine level, hypercholesterolemia, diabetes mellitus, smoking and hypertension in coronary artery disease.

Background: Cardiovascular diseases are the major cause of morbidity and mortality worldwide. Diabetes mellitus, obesity, hypercholesterolemia, smoking and hypertension have been recognized as major risk factors for cardiovascular diseases. A new class of emerging risk factor is elevated plasma homocysteine level. This study aims to determine whether there is any significant association between homocysteine lipid profile and other parameters in acute coronary artery disease.

Objectives: 1. To determine the relation between homocysteine and coronary artery disease.

2. To study the lipid profile and other parameters in patients with coronary artery disease in our population.

Settings and Design: Case control study in a tertiary care hospital, Kozhikode, Kerala.

Materials and Methods: Patients in the age group of 20 to 60 years with first attack of acute coronary artery disease of both sexes are included in this study. Sample size was 30 cases and 60 controls. Study period was one year. Levels of homocysteine, fasting lipid profile and other parameters are assessed.

Results: The levels of serum homocysteine, total cholesterol, LDL and fasting blood sugar showed significant increase in cases than in the controls. Triglycerides and HDL levels did not show any associated increase in patients with CAD.

Conclusion: The study reveals homocysteine, diabetes mellitus, hyperlipidemia, hypertension, obesity and smoking has definite role in the generation of coronary artery disease in the patients belonging to the District of Kozhikode.

Key Words: Homocysteine, fasting Lipid profile, coronary artery disease.

Introduction

Cardiovascular diseases are the major cause of morbidity and mortality worldwide¹. It is apparently more common in South Asia despite

low incidence of several classic coronary risk factors². Diabetes mellitus, obesity, hypercholesterolemia, smoking and hypertension have been recognized as major risk factors for cardiovascular

diseases; however, they do not fully explain the pathogenesis and causality of these diseases. A new class of emerging risk factor for cardiovascular disease is plasma homocysteine level³. This elevated level of homocysteine, a non lipid risk factor for coronary events, acts by promoting thrombosis⁴. Very high levels of this aminoacid is seen in genetically inherited enzyme defects of homocysteine metabolism, which are known to be associated with premature and aggressive vascular disease^{5,6}. Plasma homocysteine level exceeding 15 μ mol/L is termed as hyperhomocysteinemia.

Some studies have shown that up to 10% of coronary events can be attributed to the increase in homocysteine levels⁷. Additional studies have shown a negative correlation between homocysteine levels and plasma levels of folic acid, vitamin B12 and B6^{8,9}. Thus, hyperhomocysteinemia is a new emerging cardiovascular risk factor that could be modified by reducing homocysteine intake or by supplementing the diet with vitamin B12 or B6¹⁰.

Atherosclerosis account nearly all coronary artery disease and some proportion of the ischemic strokes. Although the role of cholesterol sub fractions in acute coronary syndromes is well documented, it is still unclear whether the lipid profile plays an important etiologic role in coronary artery disease. Three decades of research in this topic have yielded inconsistent results^{11,12}.

Cigarette smokers are more likely than nonsmokers to develop large vessel atherosclerosis as well as small-vessel disease¹³. Diabetic subjects have two or more fold higher risk for CAD compared to non-diabetic population. The prevalence of CAD increased with age and duration of diabetes and nearly 40% of the subjects with diabetes duration more than 20 years had CAD. Indeed the risk for CAD seemed to increase even at the stage of impaired glucose tolerance¹⁴.

Heart disease is the most common cause of death in hypertensive patients. Hypertensive heart disease is the result of structural and functional

adaptations leading to left ventricular hypertrophy, diastolic dysfunction, CHF, abnormalities of blood flow due to atherosclerotic coronary artery disease and microvascular disease, and cardiac arrhythmias. Individuals with left ventricular hypertrophy are at increased risk for CHD, stroke, CHF, and sudden death.

Obesity also raises blood pressure and blood cholesterol and triglyceride levels, and lowers HDL ("good") cholesterol levels. When increased blood pressure coexists with other risk factors like obesity, smoking, hypercholesterolemia or diabetes, then the risk of heart attack or stroke increases several times. It is in this context we have decided to conduct this study.

Aim of Study

To determine whether there is any significant association between homocysteine, lipid profile and other parameters in acute coronary artery disease among patients admitted in tertiary care hospital.

Materials and Methods

Study Design: Case control study

Study Setting: Referral tertiary care hospital, Department of Biochemistry.

Cases: Patients in the age group of 20 to 60 years with first attack of acute coronary artery disease of both sexes, admitted in tertiary care hospital, Kozhikode, Kerala.

Controls: Age and sex matched control without any history of coronary artery disease

Patients in the age group of 20 to 60 years with first attack of acute coronary artery disease of both sexes are included in this study. Sample size was 30 cases and 60 controls. Study period was one year. Levels of Homocysteine, fasting Lipid profile and fasting blood sugar and other parameters are assessed.

Inclusion Criteria

- 1) Patients of both sexes in the age group of 20 to 60 years with first attack of acute coronary artery disease admitted in medical wards of Tertiary care hospital.

- 2) Those are willing to be included in the study.
- 3) Patients not on treatment for hypercholestrolemia.

Exclusion Criteria

- 1) Patients with repeated attack of coronary artery disease.
- 2) Patients below 20 and above 60 years.
- 3) Patients on treatment for Homocystinuria
- 4) Patients on treatment for hypercholesterolemia

Study Variables

- 1) Plasma Homocysteine
- 2) Fasting Lipid profile
 - Total cholesterol
 - Triglycerides
 - HDL
 - LDL
- Total cholesterol / HDL ratio
- 3) Fasting blood sugar

Statistical Analysis

Results were analyzed using SPSS 16 version. T tests are used to analyze the data.

Results

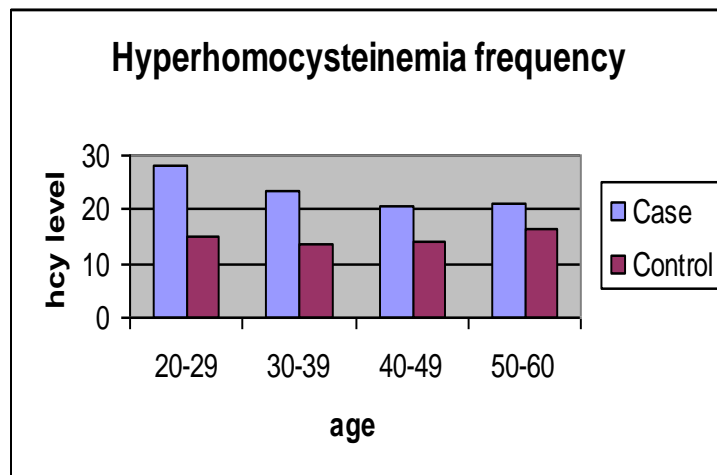
1. Plasma Homocysteine

The main factor estimated was serum homocysteine, which showed significant increase in cases than in the controls, (p = 0.001).The details of mean and standard deviation are shown below.

Table -1. Homocysteine

	Mean (std deviation) Case n=28	Mean (std deviation) Control n=50
Age	44.04 (9.597)	41.04 (9.611)
Homocysteine	21.93 (10.505)	14.34 (4.796)

Hyperhomocysteinemia frequency - The mean homocysteine level in relation with age group is shown in the chart below. There is an increased homocysteine level in the younger age group.



In this study, a statistically significant association was present between coronary artery disease and plasma homocysteine, total cholesterol, LDL, hypertension and waist hip ratio. The association of coronary artery disease with homocysteine and other significant risk factors are shown in the tables below.

2. Other parameters

The parameters include FBS, total cholesterol, LDL, blood pressure and waist hip ratio.

	Mean (std deviation) Case n=28	Mean (std deviation) Control n=50	p value
FBS	107.82 (33.450)	89.02 (20.078)	0.003
Total Cholesterol	234.43 (35.517)	205.04 (40.644)	0.001
LDL	166.64 (26.157)	126.26 (28.210)	0.001
Systolic BP	155.79 (14.970)	132.80 (20.777)	0.001
Diastolic BP	88.79 (9.953)	82.88 (10.578)	0.018
WHR	0.98 (0.063)	0.91 (0.060)	0.001

variables	Case n=28 Number (%)	Control n=50 Number (%)
Homocysteine	20 (70)	23(46)
FBS	9 (37)	6 (12)
Total Cholesterol	24 (86)	28 (56)
LDL	26 (93)	40 (80)
Hypertension	21 (75)	19 (38)
Obesity-W/H Ratio	20 (71)	10 (20)

Discussion

The result obtained from this study reveals that hyperhomocysteinemia has definite role in the generation of cardiovascular diseases. The study also reveals that the presence of diabetes and

hyperlipidemia also is significant in the development of cardiovascular diseases. The p value obtained for homocysteine was 0.001 and for total cholesterol, LDL and fasting blood sugar were less than 0.05. The results of the present study are consistent with many case control and prospective studies done earlier.

The quantitative variables like plasma homocysteine, lipid profile and FBS were analyzed by using T test. In this study the mean value of homocysteine in the cases was 21.93 with a standard deviation of 10.505 and p value was 0.001. The mean value of homocysteine in the controls was 14.34 with a standard deviation of 4.796. Out of the total 28 cases studied, 20 cases (71%) had hyperhomocysteinemia. Out of the 50 controls studied only 23 cases (43%) had hyperhomocysteinemia. So this study proves that homocysteine has a significant association with coronary artery disease in the population studied.

Fasting blood sugar was significantly higher in cases than controls. The mean value of blood sugar in the cases was 107.82 with a standard deviation of 33.450 and p value was 0.003. The mean value of blood sugar in the controls was 89.02 with a standard deviation of 20.078.

Out of the total 28 cases studied, 9 cases (37%) had increased blood sugar levels. Out of the 50 controls studied only 6 cases (12%) had increased blood sugar levels. So this shows that blood sugar has a significant association with coronary artery disease.

In this study total cholesterol was significantly higher in cases than controls. The mean value of total cholesterol in the cases were 234.43 with a standard deviation of 35.517 and p value was 0.001. The mean value of total cholesterol in the controls was 205.04 with a standard deviation of 41.683.

Out of the total 28 cases studied, 24 cases (86%) had increased cholesterol levels. Out of the 50 controls studied only 28 cases (56%) had increased cholesterol levels. So this shows that total cholesterol has a significant association with coronary artery disease.

The mean value of LDL in the cases was 166.64 with a standard deviation of 26.157 and p value was 0.001. The mean value of LDL in the controls was 126.26 with a standard deviation of 28.210. Out of the total 28 cases studied, 26 cases (93%) had elevated LDL level and out of the 50 controls studied only 40 cases (80%) had elevated LDL level. So this study proves that LDL has a significant association with coronary artery disease.

In this study of the 28 cases, 15 (54%) were smokers and in the controls, 8 (16%) subjects out of 50 were smokers, and the p value was 0.001. So smoking too had a significant association with coronary artery disease in this study.

Thus the present study observes a positive statistical association of the risk factors like homocysteine, diabetes, smoking and hyperlipidemia with coronary artery disease.

Conclusion

Hyperhomocysteinemia has got a definite independent role in coronary artery disease. The diabetes, and hyperlipidemia also plays a great role in the generation of coronary artery disease in the patients belonging to the District of Kozhikode.

Limitations

- 1) This was a hospital based study which did not represent the entire population.
- 2) Homocysteine levels were compared to controls but a prospective cohort would have been ideal.
- 3) The correlation of etiological factors like low levels of folates and vitamin B12 in plasma with hyperhomocysteinemia has not come under the inclusion criteria of the present study.
- 4) The ELISA method was used to estimate homocysteine levels, while high performance liquid chromatography is known to be superior to the above method.

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