Original Research Article

Correlation of homocysteine and lipid profile parameters with ischemic heart disease

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Abstract

Background: An inverse association between homocystine and lipoproteins, especially high-density lipoprotein cholesterol, has been well described in humans. Elevated homocysteine levels in serum or plasma is a strong and independent risk factor for occlusive arterial disease, and of venous thrombosis. **Aim:** To investigate the association of homocystine level and lipid profiles with ischemic heart disease. **Material and Methods:** Hundred Ischemic Heart Disease patients were included as cases and 150 normal healthy populations was selected as controls. Quantitative determination of total L-homocysteine in human serum or plasma was done by using Chemiluminescent Microparticle Immunoassay (CIMA) technology and Cholesterol, HDL, Triglycerides were measured enzymatically using specific reagents. **Results:** The number of individuals with high homocysteine levels was 75 out of 100 in patient group and 79 out of 150 in control group (p-value <0.05). No significant difference between lipid parameter levels among the cases and controls found. **Conclusion:** The homocysteine levels were not significantly affected by the presence or absence of deranged lipid profile. Thus, we found that homocysteine is an independent risk factor for IHD.

Key Words: Ischemic heart disease, homocysteine, cholesterol, triglyceride

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INTRODUCTION

The discovery of homocysteine as a risk factor in vascular diseases diverted the attention of medical practitioners and researchers from conventional risk factors.[1] There are studies which have shown correlation between elevated homocysteine as the risk factor for atherosclerotic vascular disease.[2]During the last 15 years it has been thoroughly documented that also moderately elevated homocysteine levels in serum or plasma is a strong and independent risk factor for occlusive arterial disease, and of venous thrombosis.[3,4] As many as 50% of patients with stroke, and other atherothrombotic disease have high homocysteine levels (over 15µmol/L).[5]An inverse association between homocystine and lipoproteins, especially high-density lipoprotein cholesterol, has been well described in humans and various animal models of hyperhomocystinemia.[6] There are limited epidemic data about the relationship between hyperhomocystinemia and lipid profiles. The present study was conducted with an aim to investigate the association of homocystine level and lipid profiles with ischemic heart disease.

MATERIAL AND METHODS

This prospective case control study was conducted over a period of two years in a tertiary care hospital. Patients of Ischemic Heart Disease (IHD) admitted in Department of Medicine were included. The data for the study was collected from the inpatients and outpatients of the hospital, who fulfilled the inclusion and exclusion criteria. Normal healthy population was selected from people who came for routine health checkup and staff members of the hospital.

All included individuals were grouped into cases and controls as follows:

Group I (Cases): 100 cases of ischemic Heart disease
Group II (Controls): 150 normal healthy people

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Inclusion criteria (Group I-cases)

- 100 randomly selected patients who came to OPD / IPD of our hospital and diagnosed as Ischemic Heart Disease.

Exclusion criteria (Group I-cases)

- Patients < 12 years
- Patients on Haemodialysis
- Patients with renal transplant
- Patients on drugs such as methotrexate, theophylline, metformin and niacin
- Patients with other renal, liver or major systemic disorder.

Inclusion criteria (Group II-controls)

- Lab staff of our hospital
- People who came for routine health check-up in our hospital
- Resident doctors and consultants of our hospital

Exclusion criteria (Group II-controls)

- DM/HTN
- vitamin supplement
- Any apparent disease

After obtaining informed consent they were evaluated through a structured proforma designed especially for this study. For every patient detailed history including personal and family history were taken. Each patient was subjected to thorough general examination and systemic examination. The lab investigations done in each patient were Serum B12, Homocysteine, Lipid profile and fasting (F) and postprandial (PP) blood sugar level (BSL).

Definitions

1. Patients having BP >140/90 on 2 occasions and those who were already on antihypertensive medication were considered to be hypertensive.
2. Homocysteine levels </=15µmol/l were considered normal and >15µmol/l were considered high.
3. Normal values of - i. cholesterol <200mg/dl; ii. TG <150 mg/dl; iii. HDL <40mg/dl in males and <50mg/dl in females; iv. LDL < 100mg/dl.
4. Patients with Fasting BSL>126mg/dl and Postprandial BSL>200mg/dl and those who were already on anti-diabetic treatment were considered diabetic.
5. People who consumed non-vegetarian diet at least thrice a week were considered non-vegetarians.

Homocysteine estimation

Homocysteine assay is a one-step immunoassay for the quantitative determination of total L-homocysteine in human serum or plasma using Chemiluminescent Microparticle Immunoassay (CIMA) technology, with flexible assay protocols, referred to as Chemiflex. It was estimated by using Architect i1000 Sr instrument.

Lipid profile estimation

Cholesterol, HDL, Triglycerides were measured enzymatically using specific reagents. Vitros 5.1 FS, dry chemistry was used for estimation of lipid profile.

Statistical analysis

SPSS for windows (version 21.0, SPSS Inc., Chicago, IL, USA) was employed for data analysis. P < 0.05 was considered as significant. Fisher's exact test was used to determine if there are nonrandom associations between two categorical variables.

RESULTS

The number of individuals with high homocysteine levels was 75 out of 100 in patient group and 79 out of 150 in control group. By using chi-square test p-value <0.05, therefore there is a significant difference between homocysteine levels of cases and controls. Thus we found that higher homocysteine levels were significantly associated with IHD in our study.

Table 2: Distribution of patients with respect to homocysteine in group 1 and 2

Homocysteine level	Groups		p-value
	Group 1 (cases)	Group 2 (controls)	
≤ 15	25 (25.00%)	71 (47.33%)	< 0.001
> 15	75 (75.00%)	79 (52.67%)	
Total	100	150	

By using chi-square test p-value >0.05, there is no significant difference between cholesterol levels among the cases and controls. Thus we did not find a strong association between hypercholesterolemia and IHD.

Table 2: Distribution of patients with respect to cholesterol in group 1 and group 2

Cholesterol level	Group		p-value
	Group 1 (cases)	Group 2 (controls)	
< 200	74 (74.00%)	103 (68.67%)	0.396
≥ 200	26 (26.00%)	47 (31.33%)	
Total	100	150	

By using chi-square test p-value >0.05, there is no significant difference between triglyceride levels among the cases and controls.

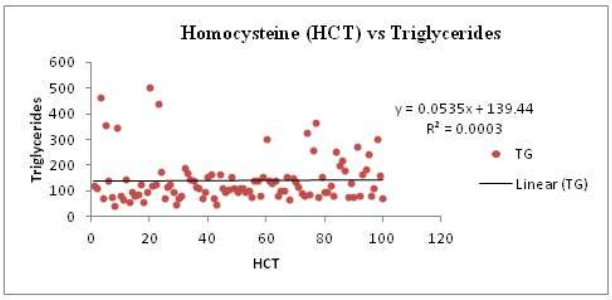
Table 3: Distribution of patients with respect to triglycerides in Group 1 and Group 2

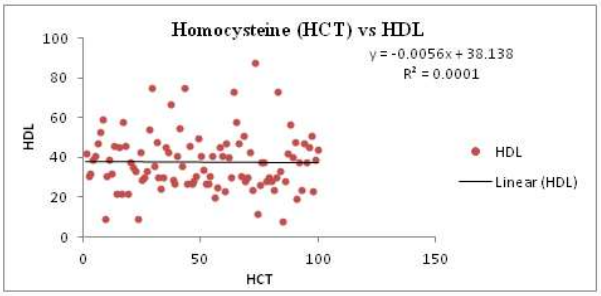
Triglycerides level	Group		p-value
	Group 1 (cases)	Group 2 (controls)	
< 150	70 (70.00%)	102 (68.00%)	0.782
≥ 150	30 (30.00%)	48 (32.00%)	
Total	100	150	

By using chi-square test p-value > 0.05, there is no significant difference between HDL levels among the cases and controls.

Table 4: Distribution of patients with respect to HDL in Group 1 and Group 2

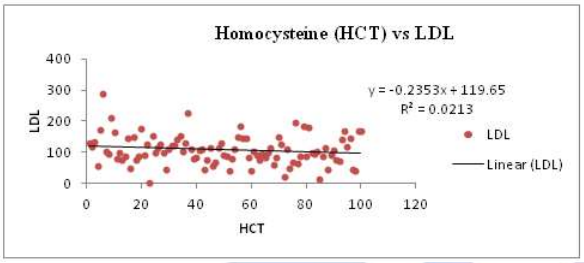
HDL	Group		p-value
	Group 1 (cases)	Group 2 (controls)	
Normal	76 (77.55%)	99 (66.00%)	0.064
Abnormal	22 (22.45%)	51 (34.00%)	
Total	**98**	**150**	

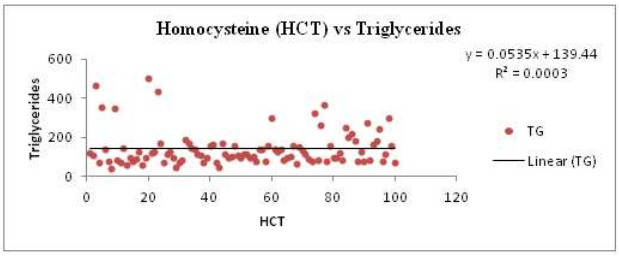




Graph 1: Correlation between Homocysteine and Triglycerides in Cases (Group 1); **Graph 2:** Correlation between Homocysteine and HDL in Cases (Group 1)

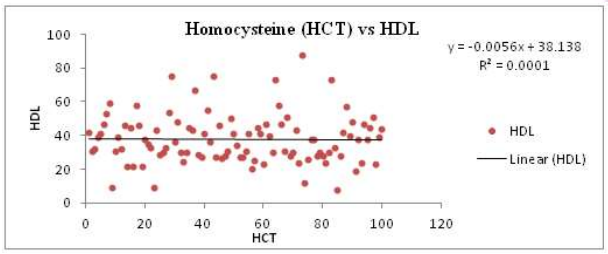
Correlation coefficient (r) = -0.026, p-value = 0.797(Graph 1)
Correlation coefficient (r) = 0.051, p-value = 0.615(Graph 2)

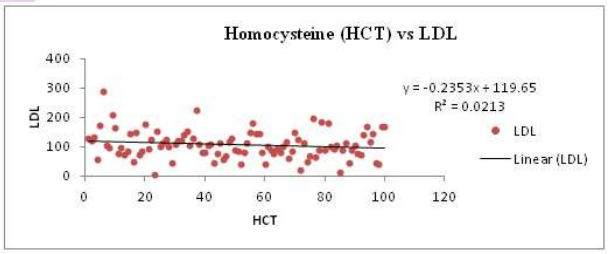




Graph 3: Correlation between Homocysteine and LDL in Cases (Group 1); **Graph 4:** Correlation between Homocysteine and triglyceride in controls (Group 2)

Correlation coefficient (r) = 0.046, p-value = 0.656(Graph 3)
Correlation coefficient (r) = 0.049, p-value = 0.548(Graph 4)





Graph 5: Correlation between Homocysteine and HDL in controls (Group 2); **Graph 6:** Correlation between Homocysteine and LDL in controls (Group 2)

Correlation coefficient (r) = -0.215, p-value = 0.008(Graph 5)
Correlation coefficient (r) = 0.089, p-value = 0.28(Graph 6)

DISCUSSION

Many researchers tested the interaction between lipids and homocystine metabolism in several animal models for hyperhomocystinemia, hypercholesterolemia, or both.[7-11] There are also few clinical observations that demonstrate the possible link between homocystine and lipid metabolism pathways. In our study, we did not find a significant difference in cholesterol, triglycerides, HDL levels between the cases and controls (p values-0.396, 0.782, 0.064 respectively). This could be because high

cholesterol, TG and low HDL levels were found in apparently healthy control group as well and a prospective study would be required to study the occurrence of IHD in patients of this group. Also most of the patients in the cases with IHD were on lipid lowering drugs like statins. We found that there is no correlation between the lipid profile and homocysteine levels in our study. These findings were similar to the study of Wasilewska *et al*.[12] Mahalle N *et al* studied 300 Indian subjects with proven coronary heart disease. Homocysteine was found to be positively associated with TG and VLDL-C, and negatively with HDL-C in their study.[13] Yadav reported that there was no significant correlation between plasma homocysteine and TC, HDL-C, and TG in 60 ischemic heart disease patients.1 A study by de Luis DA *et al* that enrolled 155 diabetes patients and found no significant association between homocysteine and lipids either.[14] The lack of correlation between the levels of lipid parameters and homocysteine and statistically significant increase in homocysteine in cases indicates that homocysteine is a risk factor for atherosclerosis independent of lipid profile.

CONCLUSION

The homocysteine levels were not significantly affected by the presence or absence of conventional risk factor like deranged lipid profile. Thus, in our study we found that homocysteine is an independent risk factor for IHD.

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