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ORIGINAL ARTICLE

Assessment of association between homocysteine and cardiovascular diseases in children

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ABSTRACT:

Background: Elevated homocysteine levels are thought to contribute to the development and progression of CVD through multiple mechanisms, including endothelial dysfunction, inflammation, oxidative stress, and promotion of atherogenesis. The present study was conducted to assess association between homocysteine and CVD. **Materials & Methods:**76 apparently healthy children aged 10 – 19 years of both genders were selected. Parameters such as residence (urban/rural), religion), birth weight, socioeconomic status and lifestyle factors, family history of vascular diseases, diet, serum triglycerides, serum cholesterol and serum high density lipoprotein (HDL) levels were recorded. **Results:** Out of 76 patients, males were 46 and females were 30. In subjects with Hyperhomocysteinemia and normal, residence was urban in 18 and 13 and rural in 22 and 25. Education was 0-5 years in 30 and 14 and >5 years in 10 and 23. Socioeconomic status was lower in 17and 5, middle in 13 and 8 and upper in 10 and 24 respectively. Type of diet was vegetarian in 25 and 9, non- vegetarian in 15 and 28. Diet folic acid (µgm/day) was <100 in 22 and 17 and >100 in 18 and 20. S. Triglyceride (mg %) <150 was seen in 16 and 15 and >150 in 24 and 22. S. Cholesterol (mg %) was <200 in 14 and 11 and >200 in 26 and 26. S. HDL <40 was seen in 8 and 22 and >40 in 32 and 15. Energy (Kcal)/day <RDA was seen in 27 and 12 and >RDA in 13 and 25. Protein (gm)/day was <RDA in 29 and 13 and >RDA in 11and 24 subjects respectively. The difference was significant (P< 0.05). **Conclusion:** An association between hyperhomocysteinemia and low serum HDL levels and hypertriglyceridemia was found which are conventional risk factors for CVDs.

Keywords: Homocysteine, Triglyceride, cardiovascular diseases

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INTRODUCTION

Homocysteine is an amino acid derivative that is produced during the metabolism of methionine, an essential amino acid obtained from dietary sources. Elevated levels of homocysteine in the blood, known as hyperhomocysteinemia, have been associated with an increased risk of cardiovascular disease (CVD).

Elevated homocysteine levels are thought to contribute to the development and progression of CVD through multiple mechanisms, including endothelial dysfunction, inflammation, oxidative stress, and promotion of atherogenesis (the formation of fatty deposits in the arteries).Homocysteine can damage the endothelial lining of blood vessels, impairing their function and promoting the development of atherosclerosis.Additionally, homocysteine can promote thrombosis (blood clot formation) by impairing the function of anticoagulant factors and promoting the activation of procoagulant factors.

Hyperhomocysteinemia is considered an independent risk factor for CVD, meaning that it contributes to the risk of developing CVD beyond traditional risk factors such as hypertension, dyslipidemia, smoking, and diabetes.Epidemiological studies have shown that individuals with elevated homocysteine levels have an increased risk of coronary artery disease (CAD), stroke, peripheral arterial disease (PAD), and venous thromboembolism.Lifestyle modifications, including a healthy diet rich in fruits, vegetables, and whole grains, regular physical activity, and avoidance of tobacco use, can help lower homocysteine levels.The present study was conducted to assess association between homocysteine and CVD.

MATERIALS & METHODS

The present study consisted of 76 apparently healthychildren aged 10 – 19 years of both genders. All gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. Parameters such as residence (urban/rural), religion), birth weight, socioeconomic status and lifestyle factors, family history of vascular diseases, diet and biochemical parameters like serum triglycerides, serum cholesterol and serum high density lipoprotein (HDL) levels. Lifestyle factors considered were the level of physical activity, frequency of fast food consumed and number of sleeping hours. Dietary assessment of energy, protein, vitamin B12 and folic acid was done using Food Frequency Questionnaire (FFQ). Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Total- 76		
Gender	**Male**	**Female**
Number	46	30

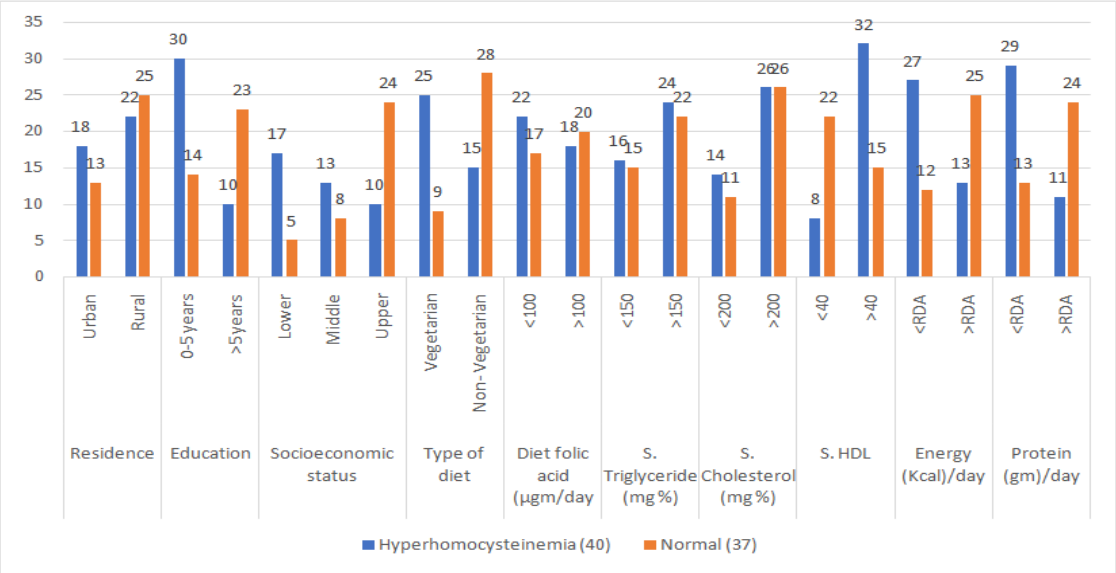
Table I shows that out of 76 patients, males were 46 and females were 30.

Table II Comparison of baseline characteristics in subjects with hyperhomocysteinemia

Parameters	Variables	Hyperhomocysteinemia (40)	Normal (37)	P value
Residence	Urban	18	13	0.01
	Rural	22	25	
Education	0-5 years	30	14	0.05
	>5 years	10	23	
Socioeconomic status	Lower	17	5	0.03
	Middle	13	8	
	Upper	10	24	
Type of diet	Vegetarian	25	9	0.05
	Non- Vegetarian	15	28	
Diet folic acid (µgm/day	<100	22	17	0.04
	>100	18	20	
S. Triglyceride (mg %)	<150	16	15	0.04
	>150	24	22	
S. Cholesterol (mg %)	<200	14	11	0.01
	>200	26	26	
S. HDL	<40	8	22	0.05
	>40	32	15	
Energy (Kcal)/day	<RDA	27	12	0.04
	>RDA	13	25	
Protein (gm)/day	<RDA	29	13	0.02
	>RDA	11	24	

Table II, graph I shows that in subjects with Hyperhomocysteinemia and normal, residence was urban in 18 and 13 and rural in 22 and 25. Education was 0-5 years in 30 and 14 and >5 years in 10 and 23. Socioeconomic status was lower in 17 and 5, middle in 13 and 8 and upper in 10 and 24 respectively. Type of diet was vegetarian in 25 and 9, non- vegetarian in 15 and 28. Diet folic acid (µgm/day) was <100 in 22 and 17 and >100 in 18 and 20. S. Triglyceride (mg %)<150 was seen in 16 and 15 and >150 in 24 and 22. S. Cholesterol (mg %) was <200 in 14 and 11 and >200 in 26 and 26. S. HDL<40 was seen in 8 and 22 and >40 in 32 and 15. Energy (Kcal)/day<RDA was seen in 27 and 12 and >RDA in 13 and 25. Protein (gm)/day was <RDAin 29 and 13 and >RDA in 11and 24 subjects respectively. The difference was significant (P< 0.05).

Graph I Comparison of baseline characteristics in subjects with hyperhomocysteinemia



DISCUSSION

In India, the risk of cardiovascular disease (CVD) among urban populations has increased from 4% to 11% over the last five decades. CVD is a leading cause of morbidity and mortality worldwide. There is growing evidence that a number of novel risk factors, in addition to the traditional ones including obesity, hypertension, dyslipidemia, diabetes, poor diet, and smoking, may also play a role in cardiovascular disease.

We found that out of 76 patients, males were 46 and females were 30. In subjects with Hyperhomocysteinemia and normal, residence was urban in 18 and 13 and rural in 22 and 25. Anand et al[12] assessed serum homocysteine levels and examine its association with conventional risk factors for cardiovascular disease (CVD) in Indian adolescents. In 103 subjects, 36.87 % females, mean serum homocysteine level was 11.649 ±0.416µmol/L. Hyperhomocysteinemia was present in 46 (44.6%, 95% CI: 34.965-54.75) subjects. Dietary deficiency of vitamin B12 and folic acid, body mass index (BMI) > 84th percentile and altered lipid profile were associated with hyperhomocysteinemia on univariate analysis. After multivariate adjustment for BMI and vegetarian diet, low serum HDL (OR: 23.81, 95% CI: 2.86-200; p =0.003) and serum hypertriglyceridemia (OR: 4.17, 95% CI: 1.51 – 13.51; p = 0.022) had independent association with hyperhomocysteinemia.

We observed that education was 0-5 years in 30 and 14 and >5 years in 10 and 23. Socioeconomic status was lower in 17 and 5, middle in 13 and 8 and upper in 10 and 24 respectively. Type of diet was vegetarian in 25 and 9, non- vegetarian in 15 and 28. Diet folic acid (µgm/day) was <100 in 22 and 17 and >100 in 18 and 20. S. Triglyceride (mg %) <150 was seen in 16 and 15 and >150 in 24 and 22. Frauser et al[13]determined plasma homocysteine and homocysteic acid levels after oral low dose homocysteine thiolactone administration to rats for a period of six weeks. Plasma levels of homocysteine and triglycerides were significantly elevated in the group fed homocysteine thiolactone. GC/MS determination of ketone body formation showed that the underlying mechanism for the increase of triglycerides seems to be inhibition of fatty acid oxidation. Homocysteic acid was detected in the experimental group exclusively. The present study showing a homocysteine correlated increase of plasma triglycerides by the inhibition of fatty acid oxidation may well propose an additional role of triglycerides for vascular pathology.

We found that S. Cholesterol (mg %) was <200 in 14 and 11 and >200 in 26 and 26. S. HDL <40 was seen in 8 and 22 and >40 in 32 and 15. Energy (Kcal)/day <RDA was seen in 27 and 12 and >RDA in 13 and 25. Protein (gm)/day was <RDA in 29 and 13 and >RDA in 11 and 24 subjects respectively. Deepa et al[14] evaluated he association of serum homocysteine levels with coronary artery disease.Four groups of patients were studied: Group 1 consisted of healthy nondiabetic subjects without coronary artery disease (n=18): Group 2 consisted of nondiabetic subjects with coronary artery disease (n=21); Group 3 consisted of type 2 diabetic patients without coronary artery disease (n=18) and Group 4 consisted of type 2 diabetic patients with coronary artery disease (n=20). The mean homocysteine value was 12.4+/-3.4 micromol/L in Group 1; 12.6+/-4.6 micromol/L in Group 2; 10.1+/-4.4 micromol/L in Group 3; and 10.4+/-3.9 micromol/ L in Group 4. There was no significant difference in the homocysteine levels between the groups studied. The prevalence of hyperhomocysteinemia, defined as a level of 17.1 micromol/L (the 95th percentile for serum homocysteine in the control group) was not significantly different among the groups.

The limitation of the study is the small sample size.

CONCLUSION

Authors found that there was an association between hyperhomocysteinemia and low serum HDL levels and hypertriglyceridemia was found which are conventional risk factors for CVDs.

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