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Original Article

Study of Serum Homocysteine levels In Acute Myocardial Infarction And The First Degree Relative In A Rural Medical Centre

Vasubabu N, Lakshmaiah V, Raghavendra Prasad BN

Department of Generel Medicine,Sri Devaraj Urs Medical College, Kolar

ABSTRACT

Objectives: *This study was conducted to know the association between homocysteine levels in acute myocardial infarction patients and to compare with the first degree relative of the patients and controls attending R. L. Jalappa Hospital, affiliated to Sri Devaraj Urs Medical College, Kolar.*

Methodology: *The study included 50 acute myocardial infarction patients, 50 first degree relative of the patients and 50 healthy controls. Serum homocysteine levels were measured in all the groups and the levels were studied and compared among the groups. Serum homocysteine was assayed by chemiluminescence microparticle immunoassay.*

Results: *The mean Homocysteine levels in the patient group were 25.2±14.7µmol/l and in the first degree relative of the patient, it was 14.1±3.4 µmol/l and in controls was 11.7±2.9µ mol/l .The levels were higher in patients when compared to the other two groups. Homocysteine levels were elevated in 64% of the patients, and 32% of the first degree relative and 18% of controls. Hyperhomocysteinemia without any risk factors was present in 18% of the patients.*

Conclustion: *Homocysteine emerged as an independent risk factor in acute myocardial infarction. Therefore it should be evaluated in all patients with acute myocardial Infarction.*

Key Words: *Homocysteine, Acute myocardial infarction*

INTRODUCTION

Homocysteine is a non essential, sulphur containing amino acid and it is an intermediate from the metabolic demethylation of dietary methionine.[1] Elevated homocysteine levels play a potential role in the pathogenisis of atherosclerosis, thromboembolism and vascular endothelial damage.[1] The prevalence of coronary artery disease is four-fold higher in urban India and two-fold higher in rural India than in the United States.[2] Hyperhomocysteinemia is risk factor of cardiovascular events in patients with coronary artery disease and the risk of sudden acute myocardial infarction is increased in hyperhomocysteimic patients.[3]

Recent epidemiological data have shown that hyperhomocysteinemia can be detected in 20 and 40% of patients with coronary artery disease and cerebrovascular disease, respectively.[4] Patients with angiographically determined coronary artery disease have been reported to experience a concentration dependent increase in risk of death with

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Corresponding Author:

Dr. V. Lakshmaiah

Prof. of General Medicine,
Sri Devaraj Urs Medical College,
Kolar, Karnataka.

increased homocysteine concentration.[5] Prospective studies found an increased risk of myocardial infarction among patients with moderate hyperhomocysteinemia.[6] The risk of any coronary heart disease event increased approximately 20% for each increase of 5 micro mol of homocysteine.[7] The higher total homocysteine in young offspring of parents with coronary heart disease suggests that elevated total homocysteine precedes manifestation of coronary heart disease.[8] Morris et al found a significant relation between homocysteine and heart attack or stroke, especially in postmenopausal women, in the United states third national health and examination survey(NHANES III) study.[9]

MATERIALS AND METHODS

The present study was done on 50 acute myocardial infarction patients who were diagnosed clinically, biochemically and electrocardiographically and were selected on the basis of simple random sampling method and 50 of their first degree relative and 50 age and sex matched healthy controls.

Patients with Myocardial infarction (MI) who were on anti-convulsants, bronchodilators, methotrexate and cyclosporine and patients with MI who were suspected of having hypothyroidism, malignancy, renal disorder and liver disorder were excluded from the study. A detailed history and thorough clinical examination was done as per the proforma and were investigated further.

The levels of homocysteine were measured in acute myocardial infarction patient and any of his first degree relative and selected age and sex matched healthy controls. The levels were analysed and compared between different groups.

The following investigations were done on admission of patients complete haemogram, urine routine, ECG, serum homocysteine levels, CK-MB or cardiac troponin ,blood urea, serum creatinine, liver function tests, thyroid stimulating hormone. Fasting blood was collected from all the patients, and their first degree relative and the healthy controls.

All the subjects gave their informed consent.

Serum was separated and quantitative analysis of serum homocysteine was performed using chemiluminescence microparticle immunoassay (CMIA) on the ARCHITECT i System.

The values were considered normal when below 15µmol/L.

STATISTICAL ANALYSIS

The results were analysed by calculating percentages, the mean values, the standard deviation, standard error, independent student t test.

The observed values were compared with the table values at 0.05 p level of significance for the corresponding degrees freedom

$P<0.05$ was significant

$P>0.05$ was not significant.

SPSS version 14 software was used for statistical analysis.

OBSERVATION AND RESULTS

In this study, 50 patients with evidence of acute myocardial infarction, the first degree relatives of the patients and 50 controls were recruited. Homocysteine levels were studied in all the groups (table 1). Majority of the cases were between 41-50 yrs, controls were between 41-50 yrs and the first degree relatives of the patients were less than 30 yrs.

Chest pain was the most common symptom present in all patients (100%), followed by sweating (58%), and dyspnoea (34%). vomiting was present in 10% and palpitation in 5%.

In this study, smoking (52%) was the most common risk factor followed by Hypertension (46%). Dyslipidemia was present in 40% of the patients and diabetes in 30 % (table 2).

The mean homocysteine level in the cases was 25.2±14.74 µmol/l and in controls it was 11.7 ±2.93 µmol/l and in the first degree relatives of the patient it was 14.1±3.39 µmol/l

The mean homocysteine level in vegetarians was 32.189±14.56 µmol/l and in non vegetarians, it was 19.327±12.29 µmol/l which was statistically significant (p value=0.001)(table 3).

The mean serum homocysteine level (31.1±16.2) µmol/l was higher among smokers when compared to non smokers (18.9±2.0) µmol/l which was statistically significant (p value=0.003).

The mean serum homocysteine levels (32.9±16.7) µmol/l was high among hypertensives when compared to normotensives (18.7±8.9) µmol/l which was statistically significant(p value-<0.001) (table 4).

The mean serum homocysteine levels was higher in diabetics (35.0±18.8 µmol/l) when compared to non diabetics (21.1±10.4 µmol/l) which was statistically significant(p value=0.001)(table 5).

The mean serum homocysteine levels among dyslipidemics (37.6±14.1 µmol/l) was higher compared to normolipidemics(17.0±7.8 µmol/l) which was statistically significant(p value-<0.001).

The mean serum homocysteine levels in cases (25.2 µmol/l) was greater compared to the first degree relative (14.1 µmol/l) which was statistically significant (p value-<0.001).

The mean homocysteine levels in cases (25.2 µmol/l) was more than controls (11.7 µmol/l) which was statistically significant (p value-<0.001)

The mean homocysteine levels in the first degree relative of the patient (14.1 µmol/l) was greater than that of controls (11.7 µmol/l) which was statistically significant (p value-<0.001).

DISCUSSION

Fifty cases of acute myocardial infarction, fifty cases of their first degree relatives and fifty controls were taken for the study and compared. The mean ages of cases (53.86 years), relatives (30 years), controls (53.86 years) were comparable to other studies. Most of the cases were between 41-50 years (34%) and the first degree relative of the patient was less than 30 years (58%) and controls were between 41-50 years (36%).

The minimum age at which acute myocardial infarction that had occurred in this study was 25 years. The study consisted of predominantly males, and was comparable with other studies. This may be attributed to the protective effects of oestrogen in premenopausal age.

In this study chest pain was the most

Table 1: - Characteristics and laboratory data of the study subjects

Parameters	Cases	Controls	First degree relative
Mean age	53.86	53.86	30
Sex(M/F)	42/8	42/8	36/14
Serum Homocysteine (μ mol/l)	25.2±14.74	11.7 ±2.93	14.1±3.39

Table 2 : Risk factors in cases

Risk factors	No of cases	Percentage (%)
Smoking	26	52
Hypertension	23	46
Diabetes	15	30
Dyslipidemia	20	40

Table 3: Comparison of mean homocysteine levels between vegetarians and non vegetarians in cases

	Vegetarian	Non-vegetarian	t value	p value
Serum Homocysteine (μ mol/l)	32.189±14.56	19.327±12.29	3.42	0.001

Table 4: Comparison of mean homocysteine levels between hypertensives and normotensives in cases

	Hypertensive	Normotensives	t value	p value
Serum Homocysteine (μ mol/l)	32.9 ±16.7	18.7 ± 8.9	3.83	<0.001

Table 5: Comparison of mean homocysteine levels between diabetics and non diabetics in cases

	Diabetics	Non diabetics	t value	p value
Serum Homocysteine (μ mol/l)	35.0 ± 18.8	21.1 ± 10.4	3.38	0.001

common symptom and was present in all patients (100%). Sweating was also present in most of the patients (58%). Dyspnoea was also present in significant number of patients (34%). Vomiting was present in 10% of the patients and palpitation was present in 4% of the patients.

The mean homocysteine levels of cases were 25.2±14.17 μmol/l and in controls it was 11.7±2.9 μmol/l. There was moderate hyperhomocysteinemia (15-30μ mol/L) in cases.

In controls, the mean homocysteine levels were within normal range (<15μ mol/L). The levels of homocysteine in cases were twice that of controls. This was correlating with Angeline et al study where levels in cases were also twice that of controls. In Joshanghani et al and Saleh et al study, the mean homocysteine levels were more in cases than controls. In this study, the levels were also high in cases when compared to controls.[10,11] Hyperhomocysteinemia(>15μ mol/L) was present in 64% of the cases in this study and it was present in 18% of the patients without any risk factor. Hyperhomocysteinemia (>15 μmol/l) was also present in 32% of the first degree relative and 18% of controls.

The mean homocysteine levels in male first degree relative were 14.4 μmol/l and in female first degree relative were 13.3 μmol/l and when compared with Kark et al study, similar results were found.[8] The mean homocysteine level in vegetarian patients (32.189±14.56 μmol/l) was higher as compared to non-vegetarian patients (19.327±12.29 μmol/l) and it correlated with the results of Jayantee et al study.[12] Vegetarian patients showed higher homocysteine levels compared to non vegetarians in this study.

In this study smoking was the most common risk factor and was present in 52% of the patients, diabetes mellitus was present in 30% of the patients and hypertension was present in 46% of patients. The study by Saleh et al showed that smoking was present in 54% of patients and diabetes mellitus in 44% of patients and hypertension in 30% of patients.[11]

Among cases, the levels of homocysteine in smokers in our study were elevated and it was around 31.1±16.2 μmol/l when compared to 18.9±2.0 μmol/l in non-smokers. This was comparable with the study done by Shahid et al.[13]

Among the cases the levels of homocysteine in diabetics were elevated and it was around 35.0±18.8 μmol/l when compared to 21.1±10.4 μmol/l in non diabetics .This elevation of levels were also seen in the other study by Arshad et al.[14] Among cases, the levels of homocysteine in hypertensives were elevated and it was around 32.9±16.7 μmol/l compared to 18.7±8.9 μmol/l in non hypertensives. This elevation was also seen in other study by Vyssoulis et al.[15]

The mean levels of Total Cholesterol (181.16 mg/dl), LDL (97.68 mg/dl), Triglyceride(147.96 mg/dl), HDL(39.86 mg/dl) were less in this study when compared to other study by Saleh et al.[11] The mean homocysteine Levels in dyslipidemics (37.6±14 μmol/l) were more compared to normolipidemics(17.0±7.8 μmol/l).

The mean levels of homocysteine in cases were 25.24μmol/l and in the first degree relative of the patient, mean homocysteine levels were 14.10μmol/l. When their mean levels were compared by independent student t-test, there was statistical significance with a p value of <0.001. The mean levels of homocysteine in cases were 25.24μmol/l and in controls, it was 11.73 μmol/l. When their mean levels were compared by independent student t-test, there was statistical significance with a p value of <0.001.

The mean levels of homocysteine in controls were 11.7 μmol/l and in the first degree relative of the patient, it was 14.1 μmol/l. When their mean levels were compared by independent student t-test, there was statistical significance with a p value of <0.001. The mean homocysteine levels were compared between the three groups and there was significant difference with a p value of<0.001.

CONCLUSION

Homocysteine levels were elevated in patients with acute myocardial infarction. Hyperhomocysteinemia (>15 μmol) was present in 64% (n=32) of the patients, 32% (n=16) of the first degree relative and 18% of controls (n=9) in this study. Hyperhomocysteinemia without any risk factor was present in 18 % (n=9) of the patients in this study.

The first degree relative of the patients has a higher mean homocysteine levels when compared to the controls. Significantly higher levels of homocysteine were present in smokers, hypertensive patients, diabetic patients and dyslipidemic patients when compared to non smokers, normotensives, non Diabetics and normo lipidemics respectively. Hyperhomocysteinemia has emerged as a strong and independent risk factor for acute myocardial infarction.

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