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Study of Homocysteine Level in Myocardial Infarction in Rural Background of Jharkhand

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Abstract: ***Cardiovascular disease (CVD) is the main cause of death worldwide.Among several cause ofcardiovascularrisk factors, such as age, food habits, smoking and hyperlipidaemia, hyperhomocysteinemia has emerged as important factor in increasing risk of CVD. However, the clear relationship between the level of homocysteine and increasing risk of CVD remain poorly understood. The aim of the study is to evaluate the associationbetween homocysteine in serum and increasing risk of CVDin patients with acute myocardial infraction in the rural Garhwa, Jharkhand. In addition, correlation of age, smoking, body weight, food habit withhomocysteine level in myocardial infraction patients were studied. This association might act as a surrogate marker to identify early case to diagnose patients with myocardial infraction.***

Keywords: hyperhomocysteinemia, myocardial infarction, rural background

1. Introduction

Atherosclerotic coronary artery disease (CAD) remains a major cause of death worldwide. Finding an effective way or strategies in reducing the risk of CAD can be key to reduce the rate of mortality and morbidity (Ahmadi et al., 2011). Myocardial infraction (MI) is the manifestation of coronary artery disease. MI is defect in the coronary artery, which caused due rupture of plaque resulting in thrombosis (atherothrombosis) and stroke(Davies, 1996).The reasons for the development of CAD and MI are not completely understood. However, numbers of factors have been identified in the patients with myocardial infraction, like abnormal level of circulatory cholesterol with elevated levels of Low Density Lipoprotein (LDL) and reduced level of High density Lipoprotein (HDL), increase in total level of creatine kinase-myocardial band (CK-MB), aspartate aminotransferase (AST) and lactate dehydrogenase (LDH) (Mythili and Malathi, 2015).

Homocysteine is a sulfur containing amino acid formed of methionine. Hyperhomocysteinemiahas been identified as a new risk factor or diagnostic factor for the MI. Increase inblood level of homocysteine can be cause by many factors, such as deficiency of nutritional cofactors or genetic defects in enzymesrequired for the metabolism of homocysteine methionine, in which folate and vitamins B12, B6 and B2 play a key role (Zylberstein et al., 2004). There are evidence that homocysteine can act as a causative agent for the MI by promotingendothelial cell injuries, stimulatessmooth muscle cell proliferation in the vessels which results in inflammation and plaque formation. In this study we have analysed the association between elevated level of homocysteine and MI in Garhwa, Jharkhand.

2. Method and materials

The serum homocysteine, CK-MB and serum LDH were analysed in 30 control healthy normal and 50 patients of clinically diagnosed case of acute myocardial infraction of 40-70 years age. 3ml of venous blood samples were collectedfrom antecubital vein by all antiseptic precautions. Serum was collected after 30 minutes followed by centrifugation at 2000 rpm for 7 minutes. We analysed homocysteine level using Gen X homocysteine enzymatic method by proton company kit as suggested by manufacturer. Likewise, we have used immunoihibion/mod. IFCC method from Crest Biosystemto analyse CK-MB level. LDL level was analysed using UV kinetic method from AccurexBiomediaclPVT. LTD (Kit) using semi-autoanalyser.

3. Results and Discussion

This work has been done inrural Garhwa, Jharkhand-India, where we have included 30 control and 50 case of myocardialinfarction which includes age groups from 40-70 years **(Figure 1)** that belongs to both genders **(Figure 2)**. Both the control and study group were further categorised on the basis of age, food habit, alcohol intake, body weight and smoking habit. We analysed different parameter in the control and study groups.

The mean level of homocysteine in the healthy control group was 11.61±4.81 µmol/L with a range of 3.8-4.0 µmol/L. This range for the homocysteine is accordance with the reported literature(Deepa et al., 2001). We also observed that males (6.8-24.06 µmol/L with mean of 11.38±1.77 µmol/L) have higher level of homocysteine than females (3.8-18.4 µmol/L with the mean of 9.67±1.77 µmol/L) but this difference was found to be non-significant (p value=0.532)**(Figure 3)**. This difference in homocysteine level between males and females could be due to difference in sex hormone, and difference in live style(Mayer et al., 1999).There was age associated increase in homocysteine observed **(Figure 4)**. This increased homocysteine level with age could be due to decline in kidney function and impaired glucose tolerance(Brattström et al., 1994; Norlund et al., 1998).In other group, we have observed higher homocysteine level

Figure 1: Sample size

Age group	Control	%	Case	%
40-50	7	23.33	10	20
51-60	13	43.33	24	48
61-70	10	33.33	16	32
Total	30	100	50	100

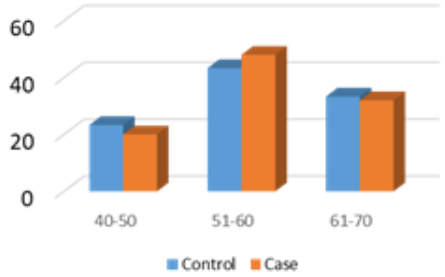


Figure 2: Gender wise distribution

Gender	Control	%	Case	%
Male	20	66.7	32	64
Female	10	33.3	18	36

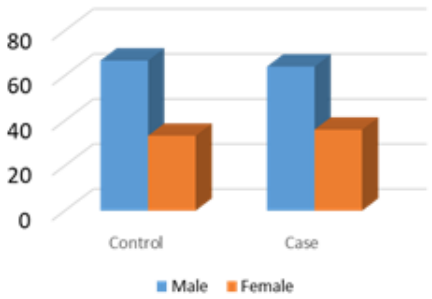
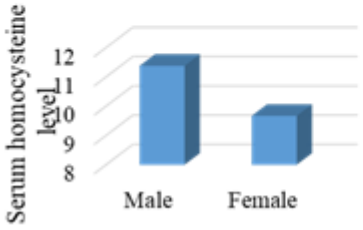


Figure 3: Homocysteine level in different gender

Figure 4: Homocysteine level in different age group

Gender	No. of sub	Serum homocysteine level in µMol/L Range	Mean	±SD
Male	20	6.8-24.0	11.38	3.87
Female	10	3.8-18.4	9.67	1.77



Age group	No. of sub	Serum homocysteine level in µMol/L Range	Mean	±SD
40-50	7	8.6-16.1	9.71	3.68
50-60	13	3.8-18.4	12.84	2.44
60-70	10	6.4-24.0	18.55	3.5

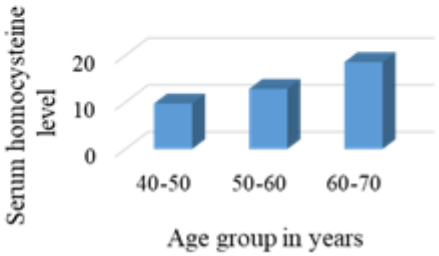
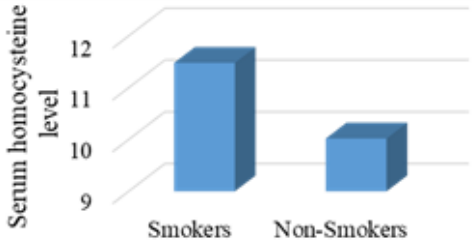


Figure 5: Homocysteine level in smoker and non-smoker

Figure 6: Homocysteine level in alcoholic vs non-alcoholic patient

Smoking habbit	No. of sub	Serum homocysteine level in µMol/L Range	Mean	±SD
Smokers	13	6.1-24.0	11.48	3.81
Non-Smokers	17	3.8-18.02	10.02	3.46



Alcoholic/No. Alcoholic	No. of sub	Serum homocysteine level in µMol/L Range	Mean	±SD
Alcoholic	14	3.8-18.4	11.21	3.16
No. Alcoholic	16	6.1-24.0	9.12	2.16

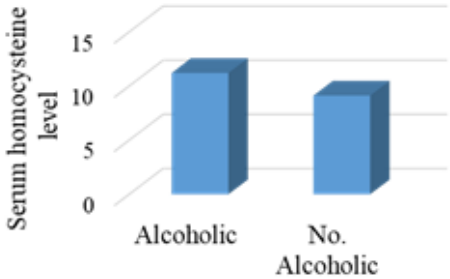
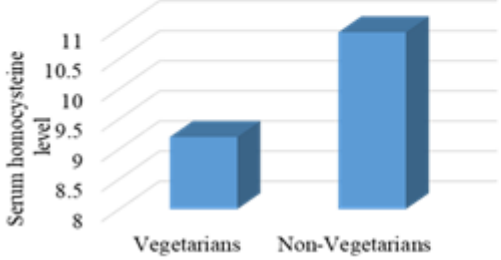


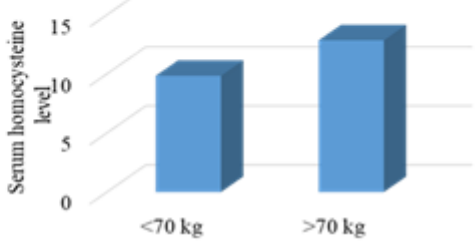
Figure 7: Homocysteine level in vegetarian vs non-vegetarian

Figure 8: Homocysteine level in different body weight

Vegetarians/Non-vegetarians	No. of sub	Serum homocysteine level in µMol/L Range	Mean	±SD
Vegetarians	12	6.4-17.6	9.2	1.94
Non-Vegetarians	18	3.8-24.0	10.94	3.36



Body weight	No. of sub	Serum homocysteine level in µMol/L Range	Mean	±SD
<70 kg	13	3.8-18.4	9.84	3.18
>70 kg	17	8.3-24.0	12.84	2.99



in smoker with respect to non-smoker of the control group**(Figure 5)**. This increased homocysteine level in smoker could be due to decrease vitamin B12 levels which could be leading cause for increase in cardiovascular disease risk(O'callaghan et al., 2002). We have also included the drinking behaviour of the control and case, where we observed higher value of homocysteine in the alcoholic (3.8-18.4 µmol/L with a mean of 11.2 ±3.16 µmol/L) with respect to non-alcoholic (6.1-24.0 µmol/L with a mean of 6.1±2.16 µmol/L) **(Figure 6)**. This was again in line with the previously reported case study, where authors have observed vitamin B_{12} and folate deficiency along with increase in the serum homocysteine (Gibson et al., 2008).Next, we access the homocysteine level in vegetarian and non-vegetarian, and observed higher in non-vegetarian **(Figure 7)**. This may be due to less intake of fresh fruits and vegetables which are rich source of folate(Krajčovičová-Kudláčková et al., 2000).We also observed higher homocysteine level in the control with body weight of more than 70 kg **(Figure 8)**, this could be again due to non-healthy life style and decreased level of vitamin B12. Other parameter, like CK-MB level and LDL level were analysed in the control and found to be increased with the age (**Figure 9** and **10**, respectively).

Figure 9: Age wise CK-MB level in control groups

Age group (in years)	No. of sub	Serum CK-MB level in IU/L Range	Mean	±SD
40-50	7	10.6-20.4	12.42	2.87
50-60	13	10.8-21.8	13.3	3.02
60-70	10	11.2-19.8	15.8	1.98

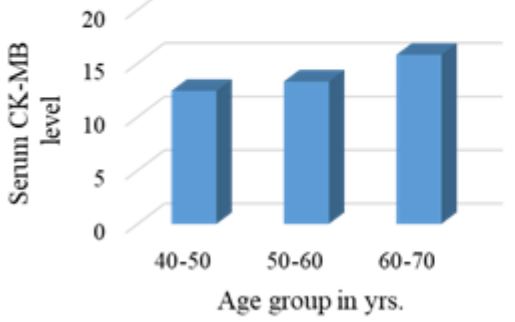
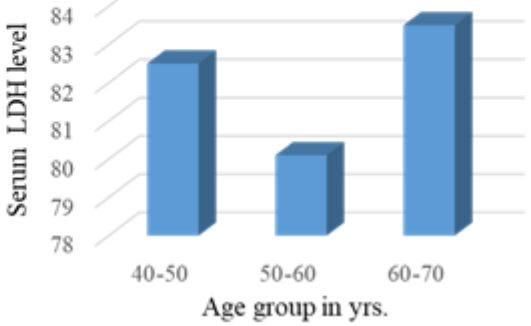


Figure 10: Age wise LDL level in control groups

Age group (in years)	No. of sub	Serum LDH level in IU/L Range	Mean	±SD
40-50	7	80.63-90.2	82.5	2.23
50-60	13	78.7-91.2	80.1	1.11
60-70	10	79.6-89.7	83.5	2.04



After analysis of CK-MB, LDL, and homocysteine in the control group, we sought to compare these value with the patientsof acute myocardial infarction.We observed significant increase in the level of CK-MB (range 71.8-94.3 IU/L with mean of 14.68±5.77 IU/L)**(Figure 11)**, LDL (450.6-500.2 IU/L with mean 478.46±12.56 IU/L)**(Figure 12)** and homocysteine (3.61-48.2 µmol/L with mean 29.76±8.26 µmol/L)**(Figure 13)** in the case group with respect to the control CK-MB (range 10.6-21.8 IU/L with mean 14.68±3.2 IU/L), LDL (87.7-91.2 IU/L with mean 83.5±3.46 IU/L) and homocysteine (range 3.8-24 µmol/L with mean 11.61±4.18 µmol/L) **(Figure 14)**.

Figure 11: Serum CK-MB level in case and control group

Group	No. of sub	Serum CK-MB level in IU/L Range	Mean	±SD
Control	30	10.6-21.8	14.68	3.2
Case	50	71.8-94.3	80.88	5.77

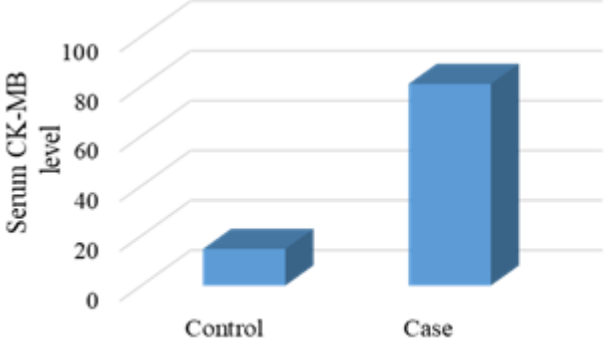


Figure 12: Serum lactate dehydrogenase level in case and control group

Group	No. of sub	Serum LDH level in IU/L Range	Mean	±SD
Control	30	87.7-91.2	14.68	3.46
Case	50	450.6-500.2	478.46	12.56

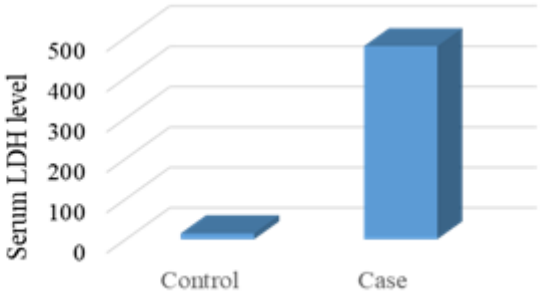


Figure 13: Serum homocysteine level in case and control group

Group	No. of sub	Serum homocysteine level in µMol/L Range	Mean	±SD
Control	30	3.8-24.0	11.61	4.18
Case	50	14.3-48.2	29.76	8.26

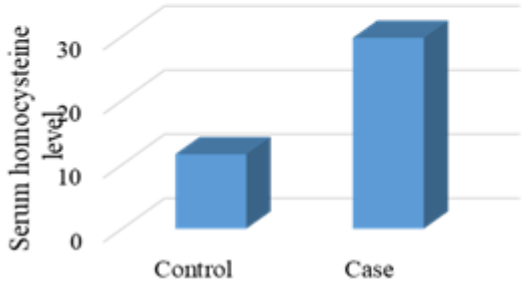
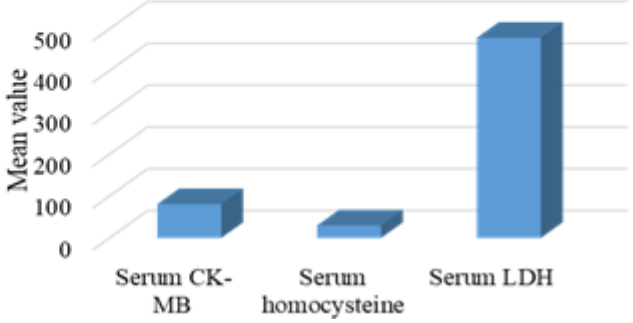


Figure 14: Comparison of serum CK-MB, homocysteine, LDH in case of myocardial infarction

Test parameter	No. of sub	Serum LDH level in IU/L Range	Mean	±SD
Serum CK-MB	50	71.8-94.3	80.88	5.7
Serum homocysteine	50	3.61-48.2	29.76	8.26
Serum LDH	50	450.6-500.2	478.46	12.56



Analysis of the serum level homocysteine along with CK-MB and LDL level will be handy to determine or identify severity of myocardial infraction.This study also present a conclusive evidence for other reports who have used homocysteine level to determine the severity of MI. However, such study needs to be performed on the larger population for strong co-relation and robust outcome.

4. Conclusion

Myocardial infraction is leading cause of sudden cardiac arrest and followed by death. The present study shows association between elevated homocysteine level and myocardial infarction.Compare to other traditional factors, person with elevated homocysteine level have greater chance of developing myocardial infarction. Thus, homocysteine can act as better prognostic marker for the myocardial infraction.

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