

SERUM COPPER WITH CORONARY ARTERY DISEASE IN MALE AND ITS RELATION WITH LIPID PROFILE

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ABSTRACT

The study was designed to explore serum copper as a risk factor for coronary artery disease (CAD). In this case-control study 30 healthy controls and 60 diagnosed cases of acute myocardial infarction (AMI) were enrolled. Serum copper concentration and serum lipid profile were measured in all study subjects. Serum copper level was significantly higher in AMI as compared to controls. The concentrations of serum TC, TG, LDL-C level were found to be significantly higher in cases as compared to controls. The concentration serum HDL-C was found to be significantly lower in cases as compared to controls. CAD leads to raised serum copper level and it has positive correlation with TC, TG and LDL-C but negative correlation with HDL-C in males.

Keywords: Coronary artery disease, serum copper, acute myocardial infarction, total cholesterol, triglyceride, low density lipoprotein cholesterol.

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INTRODUCTION

The term coronary artery disease (CAD) covers a group of clinical syndrome that include angina, myocardial infarction and chronic ischemic heart disease which is stratified by different investigation such as electrocardiography (ECG), echocardiography (Echo), exercise tolerance test (ETT), coronary angiography (CAG) and biochemical markers¹. The morbidity and mortality from CAD is alarming². In England and Wales, 30% women die as a result CAD³. The death rate from CAD in the United Kingdom is among the highest in the world⁴. According to one survey, prevalence rate of CAD in Bangladesh is 3.3 per thousand and the incidence is increasing at a rate of 0.5% per year⁵. Various works had been done on CAD and its risk factors. An exhaustive list of 246 coronary risk factors which included every possible coronary risk factor was proposed⁶.

Excess serum copper as a risk factor for CAD is a relatively newer concept. Copper is an essential trace element that is a constituent of certain metalloenzymes and protein. It is required for the haemoglobin synthesis by helping iron absorption and is a constituent of cytochrome-oxidase, tyrosinase, monoamine-oxidase, ascorbic acid oxidase, uricase and galactose oxidase⁷. So this transition metal is an essential micronutrient for enzyme that catalyzes oxidation reduction reaction⁸. Oxidation is now thought to play an important role in the pathogenesis of CAD through oxidation of LDL-C and free radical formation and it has been suggested that the oxidation of LDL-C increases atherogenesis⁹.

An imbalance in copper metabolism has been reported to predispose to CAD in western population, but there is little data for other racial group. Serum copper concentration appears to be variable according to age and sex and female has higher copper concentration as compare to male¹⁰.

Therefore, the present work has been designed to evaluate the association of serum copper with CAD in male and also to find out the relation among serum copper with other common risk factors of CAD like raised TC, TG, LDL-C & decreased HDL-C.

MATERIALS AND METHODS

A case-control study was conducted in the Department of Biochemistry, BSMMU, in cooperation with the department of Cardiology of BSMMU and Coronary Care Unit (CCU) of National Institute of Cardiovascular Disease (NICVD), Dhaka from July 2007 to June 2008. A total of 90 male subjects were included in the study. Out of them 30 were healthy controls and 60 were diagnosed cases of AMI based on history, characteristic ECG changes and evidence of elevated enzyme level. Ethical clearance was taken from the Institutional Ethical Committee of BSMMU and informed written consent was taken from all study subjects preserving their rights, privileges & freedom. Serum copper concentration was estimated by Atomic Absorption Spectrophotometer and serum TC, Tg, LDL-C & HDL-C was measured enzymatically by CHOD- PAP by micro flow cell photometer.

Statistical analysis

All data were recorded systematically in a preformed data sheet. Statistical analysis was performed by using

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SPSS for windows version 12.0. Correlation coefficient test and unpaired t test were done as tests of significance. 95% confidence limit ($p < 0.05$) was taken as level of significance.

RESULTS AND DISCUSSION

In this case control study attempt was made to evaluate the role of copper in CAD. Serum copper concentration was compared between 60 diagnosed cases of CAD and 30 matched controls. Total cholesterol, triglyceride, low density lipoprotein cholesterol & high density lipoprotein cholesterol were measured and compared between two groups. Correlation test was also done in cases between serum copper with lipid profile.

Table-I

Serum copper concentration in both cases and controls

Parameter	Case (n = 60)	Control (n = 30)	t- value	p- value
Serum copper (ugm/dl)	185.90 ± 23.75	166.67 ± 36.88	2.60	<0.5
Mean ± SD				

Table II

Comparison of serum lipid profile between case & control

Parameter	Case (n=60)	Control (n=30)	t- value	p- value
TC (mg/dl)	227.12±	203.23±	4.229	<0.01
mean±SD	34.69	18.85		
TG(mg/dl)	171.52±	152.27±	5.208	< 0.001
mean±SD	20.86	13.87		
LDL-C (mg/dl)	161.11±	132.53±	5.401	<0.001
mean±SD	33.04	17.14		
HDL-C (mg/dl)	31.97±	39.87±	-7.410	<0.001
mean±SD	5.71	4.21		

Table III

Correlation of serum copper with lipid profile in cases

Variable	"r" value	"P" value
Copper TC	0.17	>0.05
TG	0.63	>0.05
LDL-C	0.19	>0.05
HDL-C	-0.13	>0.05

Serum copper concentration in cases was found to be significantly ($p < 0.5$) higher than that of controls (Table I) and this finding is similar to that of the studies done by Salonen et al (1991)¹¹ and Jukka et al. (1991)¹².

Raised TC, TG, LDL-C & lower HDL-C concentration was found in both the study group. The concentration of TC, TG, LDL-C was significantly higher & the concentration of HDL-C was significantly lower in cases than that of control (Table II). These findings are partially similar to Jukka et al. (1991)¹², who found that serum copper concentration correlated positively with LDL-C. These conflicting findings regarding different components of lipid profile may be due to different dietary habit, life style, and ethnicity of our study subjects than that of the studies done abroad.

Present study showed significantly higher serum copper concentration and TC, TG, LDL-C & lower concentration of HDL-C in cases as compared to controls and also revealed positive correlation between serum copper with total cholesterol, triglyceride, and low density lipoprotein cholesterol.

From the present work it may be suggested that high serum copper concentration with other major risk factors like elevated TC, TGL, LDL-C & decreased HDL-C may be responsible for coronary artery disease in male. Estimation of serum progesterone, testosterone and serum corticosteroid level might be responsible for increased serum copper. Therefore, further prospective study involving a larger sample size after controlling the confounders may be carried out to draw a definite conclusion.

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