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RESEARCH ARTICLE

IS PSEUDOCHOLINESTERASE RELATED TO LIPID METABOLISM IN CORONARY ARTERY DISEASE?

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ABSTRACT

Background: Pseudocholinesterase is a serum esterase synthesized by liver. The physiological function of Pseudocholinesterase is not known. It has been proposed that it plays a role in lipid metabolism. Altered lipid metabolism is found in coronary artery disease. **Aims and Objectives:** To evaluate the association of serum pseudocholinesterase activity with lipid profile in coronary artery disease. **Materials and Methods:** This cross sectional study comprised 60 subjects, which included equal number of healthy volunteers and myocardial infarction cases. Serum pseudocholinesterase activity and lipid profile was estimated. The data was statistically analyzed. **Results:** The serum pseudocholinesterase activity, cholesterol, triglycerides and low density lipoprotein were increased in myocardial infarction patients. Serum pseudocholinesterase correlated with the lipid parameters in cases. **Conclusion:** Increased pseudocholinesterase activity may alter lipid metabolism in coronary artery disease.

Keywords: Pseudocholinesterase; Lipid metabolism; Lipid profile; Coronary artery disease.

INTRODUCTION:

The enzyme cholinesterases are a group of serine hydrolases present in all mammals[1]. Two classes of cholinesterases have been identified – acetyl cholinesterase and butryl cholinesterase. Acetyl cholinesterase is present in central nervous system, platelets and erythrocyte membrane while butryl cholinesterase is present in serum[2,3]. Acetyl cholinesterase splits acetylcholine to choline and acetic acid, which is important for neurotransmission. The real substrate for pseudocholinesterase is not known[4]. Butrylcholinesterase is also known as pseudocholinesterase and plasma cholinesterase . Pseudocholinesterase (EC 3.2) is a tetramer with 4-sub units, each sub-unit consisting of 574 amino acids. It is a glycoprotein which is synthesized by liver and released into blood[4]. Small amounts of pseudocholinesterase are also found in small intestine, smooth muscle, adipose tissue and brain[5]. It cleaves hydrophilic and hydrophobic choline esters including butrylcholine, butryl thiocholine, propionyl thiocholine etc. It has no known biological substrate in mammalian organisms [6]. Its pharmacological functions is due to the ability of enzyme to hydrolyze various drugs like muscle relaxants, local anesthetics and analgesics[6]. Clinically it is used for diagnosis of poisoning by organophosphates and carbamates. Assay of plasma pseudocholinesterase can serve as liver function test and indicator of nutritional status. Even though the enzyme was discovered 70 years ago, its physiological (biological) function is not known[8]. A review has described several possible role of it in health and disease[9].

It has been proposed that pseudocholinesterase has role in lipid metabolism[10,11,12]. The pseudocholinesterase activity has been positively correlated with serum lipids and lipoprotein levels[13-14]. It has been shown that the pseudocholinesterase activity is higher in coronary artery disease, hypertension, diabetes mellitus, obesity, hyperlipidemia, inflammation. The enzymes activity has been strongly associated with coronary artery disease and its risk factors[15-18]. Hyperlipidemia is an important risk factor for coronary artery disease.

Laboratory diagnostics of disturbances in lipid metabolism employ a wide range of biochemical indicators[19]. Lipid profile consists of a group of biochemical tests often used for predicting, diagnosing and treating lipid related disorders including

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atherosclerosis[20]. It usually consists of total cholesterol, triglyceride, low density lipoprotein and high density lipoprotein estimation[21]. Adverse lipid profile have been recognized as independent risk factor for coronary artery disease[23,24]. The atherogenic lipid profile is characterized by increased total cholesterol, triglyceride, low density lipoprotein and decreased high density lipoprotein[25]. Abnormalities in lipid profile are major risk factors for coronary artery disease[22,23].

We hypothesize that serum pseudocholinesterase activity may play a significant role in lipid metabolism in subjects suffering from coronary artery disease.This study was taken up to assess the relation of serum butrylcholinestearse activity with serum lipids and lipoproteins . The objectives of this study are:

1. To compare the serum pseudocholinesterase activity and lipid profile in healthy volunteers and myocardial infarction patients.
2. To correlate serum pseudocholinesterase activity with lipid profile in healthy volunteers and myocardial infarction patients.

MATERIALS AND METHODS:

STUDY DESIGN , PLACE AND PERIOD :

The research protocol was approved by M.R.Medical College's Ethical Committee. This analytical observational cross sectional study was carried out at Basaveshwar Teaching & General Hospital, Gulbarga, Karnataka for a period of one year from 01.11.2011 to 31.10.2011.

STUDY SUBJECTS :

The study subjects were selected by simple random sampling. They comprised of 60 subjects divided into 2 groups – cases and controls. The case group included myocardial infarction patients and healthy volunteers were included in control group. The study subjects were selected by the following inclusion and exclusion criteria. The patients between 30 to 60 years of age both sex and myocardial infarction were included for the study. Patients with history of cardiac risk factors any systemic illness, recent surgery or trauma, endocrinal and nutritional disorders, pregnant women, drugs affecting lipid metabolism were excluded.

MATERIALS :

The equipment used for the study are BD vacutainers, syringes, Biohit Micropipettes, Remi Centrifuge and Erba Chem 7 Semi-auto analyzer. The reagent kits for biochemical estimations were obtained from Agappe Diagnostics. The material used for this study consists of well structured questionnaire and blood samples.

METHODS :

Before participation, the volunteers were explained about the nature and purpose of the study. A voluntarily signed written consent was obtained from them .A detailed history was obtained by the physicians and a complete physical examination was done with special emphasis on cardiovascular disease. Diagnosis of myocardial infarction was done based on ECG changes or rise in cardiac biomarkers. 2 ml of fasting blood sample was collected aseptically from median cubital vein of each individual with a disposable plastic syringe with needle gauge No. 20 into a plain vacutainer. Blood was allowed to clot and then centrifuged at 4000 RPM for 15 minutes to obtain serum. The serum sample was subjected to the following biochemical estimations,

Pseudocholinesterase activity by DGKC method
CKMB by immunological UV-assay
Troponin I by immunochromatography card method
Total cholesterol by CHOD-PAP method
Triglycerides by GPO PAP ESPAS method
HDL by turbidometric immunoassay
LDL by enzyme selective precipitation method

The reference ranges of above parameters were ,

Pseudocholinesterase	4659-14443 IU/L
Total cholesterol	150-200 mg/dL
Triglycerides	50-150 mg/dL
HDL	35-70 mg/dL
LDL	80-130 mg/dL
CKMB	0-24 IU/L

The descriptive analysis of the data was done by mean and standard deviation. The comparison of parameters between cases and controls were done by unpaired 2-tailed t-test. $p<0.05$ was considered statistically significant. The association between pseudocholinesterase and lipid variables was analyzed by Pearson correlation coefficient test. Statistical analysis of the data by using SPSS Version-17 statistical data analysis software.

RESULTS:

The data from the above analysis were compiled into two tables i.e., Table-1 and Table-2.

Table-1 compares the mean value of the variables in healthy volunteers and myocardial infarction patients. The difference for age and sex were not statistically significant. Statistically significant differences were seen for pseudocholinesterase activity, cholesterol, triglycerides and lipoproteins values.

Table 1: Comparison of Pseudocholinesterase and Lipid Profile in Controls and Cases

Parameters (units)	Mean±SD		t-value	p-value	Significance
	Controls (n=30)	Cases (n=30)			
Age (years)	46.82±8.62	51.62±4.68	1.76	>0.05	NS
Sex					
Male	40	44	0.52	>0.05	NS
Female	20	16	0.52	>0.05	NS
Pseudo-cholinesterase (IU/L)	7981.96±697.99	9661.15±2654.81	3.16	<0.001	VHS
TC (mg/dL)	151.29±14.41	167.61±28.23	2.78	<0.05	S
TG (mg/dL)	95.48±9.8	125.52±28.59	2.68	<0.05	S
VLDL (mg/dL)	19.10±1.96	25.10±5.72	3.45	<0.001	S
LDL (mg/dL)	79.48±16.54	105.46±17.78		<0.001	S
HDL (mg/dL)	44.84±8.21	34.38±2.49	6.116	<0.001	VHS

S=Significant; NS=Not significant; VHS=Very highly significant .

Table-2 shows the association of serum pseudocholinesterase activity with cholindex. The enzyme activity showed statistically significant correlation with the atherogenic lipids.

Table 2: Correlation of Pseudocholinesterase activity with Lipid Parameters

Lipid parameters	r-value		Significance
	Controls (n=30)	Cases (n=30)	
TC (mg/dL)	0.215	0.692	Significant
TG (mg/dL)	0.387	0.863	Highly significant
VLDL (mg/dL)	0.415	0.704	Highly significant
LDL (mg/dL)	0.427	0.826	Highly significant
HDL (mg/dL)	0.410	0.840	Highly significant

Figure-1: Comparison of Cholinesterase activity

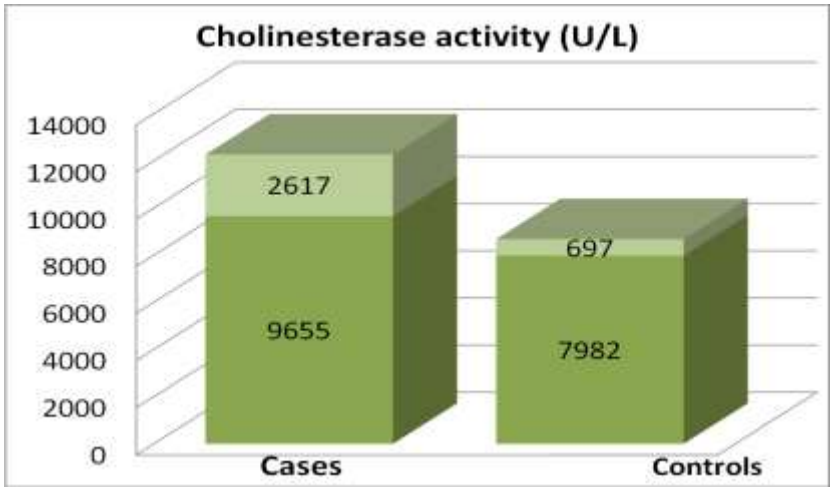


Figure 2: Correlation of Pseudocholinesterase with Cholesterol

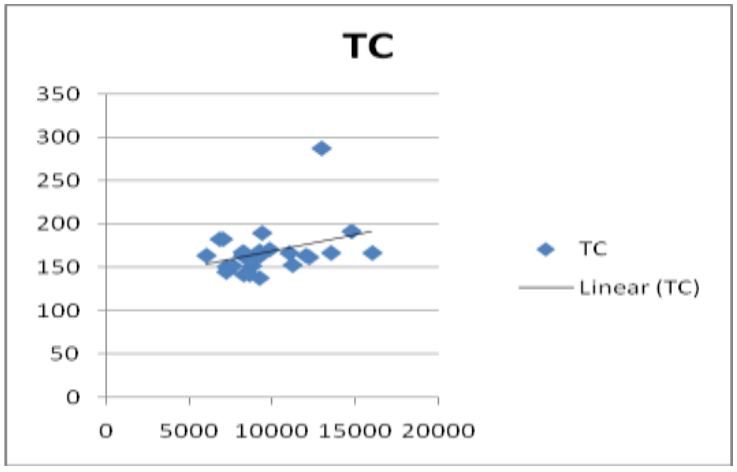
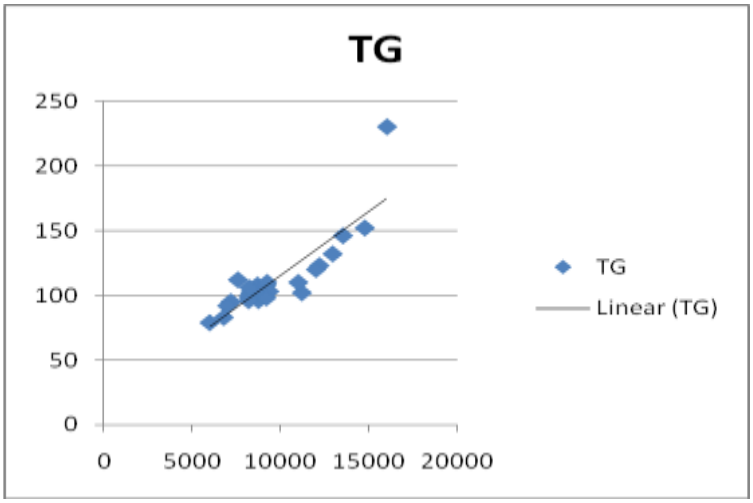


Figure 3: Correlation of Pseudocholinesterase with Triglycerides



DISCUSSION:

The study was done to evaluate the relationship of serum pseudocholinesterase activity with lipid profile in coronary heart disease.

In the present study, we have compared the values of butrylcholinesterase activity and lipid profile in healthy subjects and myocardial infarction patients. Also we correlated the pseudocholinesterase activity with lipid profile. We found increase in pseudocholinesterase, cholesterol, triglycerides in myocardial infarction

patients. Pseudocholinesterase activity was associated with the lipid components.

Increased butrylcholinesterase increases triglyceride synthesis increasing total cholesterol, LDL in blood[24,25]. Increase in triglycerides decreases HDL levels. Increased low density lipoprotein and triglycerides cause atherosclerosis. The findings of our study were similar to other studies done[26-28].

The strength of the work lies in standardized protocol, examination by experienced cardiologist and biochemist.

The limitations of the study, where the cross sectional study design, small sample size, subjects not sex matched, single measurements. The demographic and clinical data are lacking. Enzymes and other metabolites of lipid metabolism not estimated.

CONCLUSION:

Pseudocholinesterase is associated with lipid profile in coronary artery disease. Elevation in pseudocholinesterase activity alters lipid metabolism. Research can be done to study the effects of pseudocholinesterase inhibitors on lipid metabolism in coronary artery disease.

No conflict of interest was declared. All authors contributed in designing of study, collection, analysis, interpretation of study and manuscript preparation. We would like to thank the Dean, Medical Superintendent, Cardiologist, Biochemists and Technicians, patients and volunteers of Basveshvar Hospital for their cooperation in carrying out the study.

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