

## Correlation between Serum Cholinesterase Activity and Serum Lipid Profile in Type 2 Diabetes Mellitus

Dr. Umamaheswari.V<sup>1</sup>, Dr. Cactus Lily Jeyaraj<sup>2\*</sup>, Dr. Abirami.A<sup>3</sup>

<sup>1</sup>Associate Professor, Department of Biochemistry, Tirunelveli Medical College, Tirunelveli, Tamil Nadu, India

<sup>2</sup>Assistant Professor, Department of Biochemistry, Tirunelveli Medical College, Tirunelveli, Tamil Nadu, India

<sup>3</sup>Post Graduate Student, Department of Biochemistry, Tirunelveli Medical College, Tirunelveli, Tamil Nadu, India

\*Corresponding author: Dr. Cactus Lily Jeyaraj | Received: 15.02.2019 | Accepted: 25.02.2019 | Published: 28.02.2019

DOI: [10.21276/sjams.2019.7.2.67](https://doi.org/10.21276/sjams.2019.7.2.67)

### Abstract

### Original Research Article

Type 2 Diabetes Mellitus (DM) is emerging as a serious metabolic disease throughout the world. Type 2 DM is associated with characteristic dyslipidemia like elevated Total Cholesterol, Triglycerides, LDL levels and low HDL levels. Serum Butyrylcholinesterase (Pseudocholinesterase) is a non-specific esterase that hydrolyses choline esters. Pseudocholinesterase activity has been shown to be elevated in Diabetes Mellitus. It may be due to an increase in the hepatic synthesis of the enzyme in response to elevated insulin and free fatty acid levels in Diabetes Mellitus. To evaluate Serum Cholinesterase activity in Type 2 DM patients and to find out any correlation between Serum Cholinesterase activity, Fasting Plasma Glucose (FPG), Body Mass Index (BMI) and Serum Lipid profile in these patients. A case-control study was conducted in Tirunelveli Medical College Hospital, Tirunelveli. 50 Type 2 Diabetic Mellitus patients and 50 age and sex matched apparently healthy subjects were taken. Serum Cholinesterase activity, FPG and Serum Lipid profile was measured in all the study subjects. The correlation between Serum Cholinesterase activity and other parameters was done by Pearson correlation method. Mean Serum Cholinesterase activity in the Diabetic cases ( $9470 \pm 962$  IU/L) were higher than that of the control group ( $6493 \pm 831$  IU/L) with statistical significance ( $p < 0.001$ ). A significant correlation was also observed in the Diabetic cases between the Serum Cholinesterase activity and FPG, BMI, Total Cholesterol, TGL, HDL with  $p < 0.001$  and LDL with  $p < 0.05$ . From our study it is shown that Serum Cholinesterase activity is elevated in Type 2 Diabetes Mellitus patients and a significant correlation has been found between the Serum Cholinesterase activity and the lipid alterations found in DM. Thus, Diabetes Mellitus is associated with elevated Serum Cholinesterase activity probably due to abnormal lipid metabolism.

**Keywords:** Diabetes Mellitus, Serum Cholinesterase, Serum lipid profile.

**Copyright © 2019:** This is an open-access article distributed under the terms of the Creative Commons Attribution license which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use (NonCommercial, or CC-BY-NC) provided the original author and source are credited.

## INTRODUCTION

India reported 72 million Type 2 Diabetes Mellitus (DM) cases in 2017 [1]. Several studies show that diabetes mellitus is associated with characteristic dyslipidemia like elevated Total Cholesterol, Triglycerides, LDL levels and low HDL levels [2,3,4]. Butyrylcholinesterase (BChE) is a non-specific cholinesterase synthesized by the liver. BChE activity has been shown to be elevated in Diabetes Mellitus [5]. It may be due to an increase in the hepatic synthesis of the enzyme in response to insulin resistance and elevated free fatty acid levels in Type 2 DM [2].

The aim of this study was to compare the serum cholinesterase activity in Type 2 DM patients and control group and to find out the correlation between Serum Cholinesterase activity and Fasting

Plasma Glucose (FPG), Body Mass Index (BMI) and Serum lipid profile in Type 2 DM patients.

## MATERIALS & METHODS

A case control study was conducted in Tirunelveli Medical College Hospital. 50 Type 2 DM patients and 50 age and sex matched apparently healthy subjects were taken for the study. Exclusion criteria: Patients with Liver disease, renal disease, Essential hypertension, neoplastic diseases, Familial dyslipidemia, Thyroid dysfunction, Pregnant and Lactating mothers. 5 ml of fasting venous blood was collected and FPG and serum lipid profile were estimated in Central Biochemistry laboratory. Serum Cholinesterase activity was estimated by enzymatic method using butyrylthiocholine substrate. Student's "t-test" was used for the comparison of the Mean and

Standard Deviation (S.D.) of the continuous variables. Pearson correlation was used to find the correlation between serum cholinesterase and serum lipid profile, FPG, and BMI.  $p < 0.05$  was taken as statistically significant.

## RESULTS

Mean age group of the Diabetic cases was 55.4 years while that of the controls was 52.1 years. Out of the 50 Diabetic cases studied, 29 were male and 21

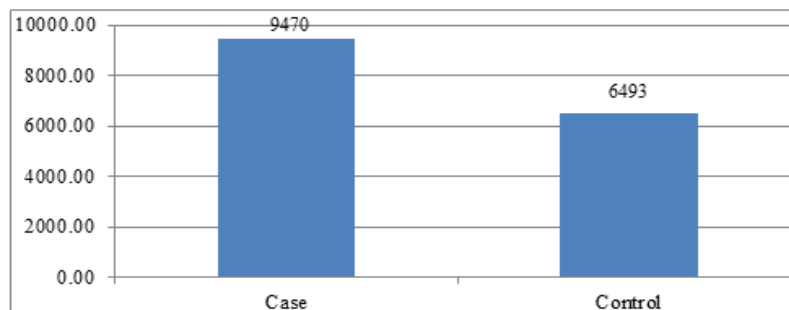
were female. Mean FPG level in the Diabetic group was 167.76 mg/dl and that of the controls was 93.26 mg/dl. Mean Serum Cholinesterase activity in the Diabetic cases ( $9470 \pm 962$  IU/L) were higher than that of the control group ( $6493 \pm 831$  IU /L) with statistical significance ( $p < 0.01$ ). A very significant correlation was observed between the serum cholinesterase activity and the lipid alterations seen in the Diabetic cases (Table 1).

**Table-1: Correlation between Serum Cholinesterase activity and lipid profile in Type 2 DM cases**

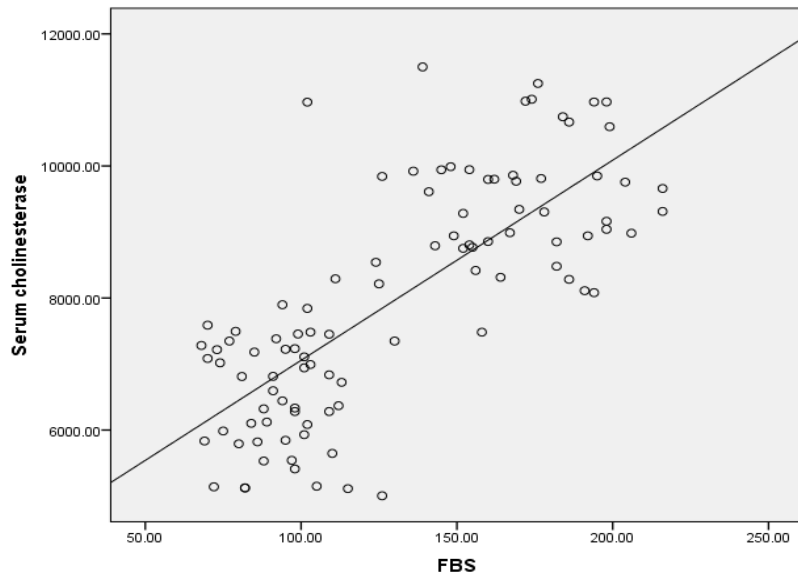
		TC	TGL	HDL	VLDL	LDL
Serum cholinesterase	Pearson Correlation, r value	0.733	0.733	-0.247	0.700	0.289
	p value	<0.01	<0.01	<0.01	<0.01	.004

**Table-2: Cholesterol, TGL, HDL-C, LDL-C, VLDL-C in cases and control groups**

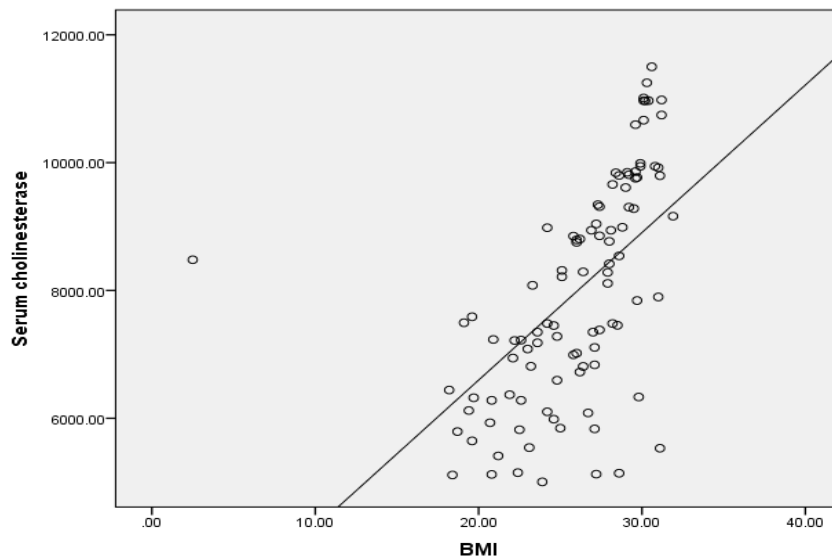
Group		Case	Control	P value
Total Cholesterol (mg/dl)	Mean	209.72	134.58	<0.0001
	S.D.	38.42	30.61	
TGL (mg/dl)	Mean	187.10	118.74	<0.0001
	S.D.	33.16	22.02	
HDL (mg/dl)	Mean	35.36	42.02	0.015
	S.D.	7.66	17.44	
VLDL (mg/dl)	Mean	37.46	24.58	<0.0001
	S.D.	6.70	5.62	
LDL ( mg/dl)	Mean	96.28	68.80	<0.0001
	S.D.	28.36	23.59	



**Fig-1: Comparison of Cholinesterase activity in Cases and control group**



**Fig-2: Correlation between Fasting Plasma Glucose and Serum Cholinesterase activity**



**Fig-3: Correlation between BMI and Serum Cholinesterase activity**

## DISCUSSION

Type 2 DM is characterized by variable degrees of insulin resistance resulting in elevated blood glucose levels. BChE is a non-specific esterase that hydrolyses choline and non-choline esters. In recent years it has been shown that BChE may be involved in lipid metabolism since high levels of its activity was reported in patients with DM, obesity, hyperlipidemias [7,8]. Clitherow J.W. et al., showed that this may be due to the formation of choline intermediates like butyrylcholine, succinylcholine etc. during fatty acid metabolism [9]. In Type 2 DM, insulin resistance causes lipolysis and increased free fatty acid levels which results in lipid abnormalities like elevated Total Cholesterol (TC), TGL, LDL-C and low HDL-C levels. Lunkes *et al.*, by means of in vitro studies showed the stimulatory effect of serum glucose and insulin on Serum Cholinesterase activity. In our study also, a

significant positive correlation was found between the Serum Cholinesterase activity and Fasting Plasma Glucose (Fig.2).

Furthermore, there was a significant positive correlation between serum cholinesterase activity with BMI (Fig.3) and the lipid alterations seen in DM cases. These results suggest that the increase in serum cholinesterase activity is due to the abnormal lipid metabolism found in Type 2 DM [10].

## CONCLUSION

From this study, it is shown that serum cholinesterase activity is elevated in Type 2 Diabetes Mellitus patients and it correlates well with the lipid alterations seen in DM. Thus, serum cholinesterase activity may be used in predicting the dyslipidemia and

thereby, the associated cardiovascular risk in Type 2 DM.

## REFERENCES

1. International Diabetes Federation - Prevalence of Diabetes in India. 2018.
2. Howard BV. Diabetes and plasma lipoproteins in Native Americans. *Studies of the Pima Indians. Diabetes care* 1993; 16:284-291.
3. Moghadam RH, Latiffah A. Investigation of lipid profiles and lipid peroxidation in patients with type 2 diabetes. *European journal of Scientific Research.* 2009;28(1):6-13.
4. Taskinen MR. Quantitative and qualitative lipoprotein abnormalities in diabetes mellitus. *Diabetes.* 1992;41: Suppl 2:12-7.
5. Alcântara VM, Chautard-Freire-Maia EA, Scartezin M, Cerci MS, Braun-Prado K, Picheth G. Butyrylcholinesterase activity and risk factors for coronary artery disease. *Scand J Clin Lab Invest.* 2002;62(5):399-404.
6. Gilberto Inacio Lunkes, Franciele Stefanello, Daniele Sausen Lunkes. Serum cholinesterase activity in diabetes and associated pathologies. *Diabetes Research and Clinical Practice.* 2006, 72,28-32.
7. Abbott CA, Mackness MI, Kumar S, Olukoga AO, Gordon C, Arrol S et al. Relationships between serum butyrylcholinesterase activity, hypertriglyceridaemia and insulin sensitivity in diabetes mellitus. *Clin Sci.* 1993;85:77-81.
8. Iwasaki T, Yoneda M, Nakajima A, Terauchi Y. Serum butyrylcholinesterase is strongly associated with adiposity, the serum lipid profile and insulin resistance. *Internal Medicine.* 2007;46(19):1633-9.
9. Clitherow JW, Mitchard M, Harper NJ. The possible biological function of pseudocholinesterase. *Nature.* 1963 Sep;199(4897):1000.
10. Awad NA, Yasser OM, Jewad AM. Evaluation of Serum Cholinesterase Activity, Lipid Peroxidation and Lipids Profile in Type 2 Diabetes Mellitus. *Iraqi National Journal of Chemistry.* 2011(42):261- 82.