Study of serum Amylase levels in type 2 Diabetes Mellitus

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Abstract: Introduction*: Pancreas is a mixed function gland with both Exocrine and endocrine portions. . Due to close proximity of the two portions disease of one part may have effect on the other part.Our study was conducted to find a possible correlation between the exocrine and endocrine functions of the pancreas by comparing serum Amylase levels in cases of Type 2 Diabetes mellitus and age matched healthy controls.* ***Materials and Methods:****The study was conducted in 75 cases of established diabetes divided into two groups Ia and Ib based on duration of diabetes $\leq$5 yrs and >5 to 10 yrs respectively. 50 age matched healthy individuals formed the control group. In both study and control groups fasting venous sample was collected and serum Amylase, Fasting Blood glucose, Serum Cholesterol and serum Triglycerides were analysed on automated analyser. Statistical analysis was done by student t test and pearsonscorrelation .****Results:*** *There is a significant decrease in Serum amylase levels in study group I when compared to control group (p<0.001). Mean Serum Amylase levels are significantly decreased in both Group I a(56.23$\pm$6.3) and Group Ib (48.30$\pm$7.24) when compared to control group , but the decrease is more significant in Group Ib (p< 0.001) when compared to Group Ia (< 0.05).Comparison of Serum Cholesterol Between Group Ia and Group Ib showed no statistically significant alteration (p>0.05).Comparison of Serum Triglycerides between Groups Ia & Ib showed Statistical significance of higher values in Group Ib (<0.05). There is a significant Negative correlation between the S.Amylase and FBS in the Diabetic Patients (r= -0.176).This shows that poorly controlled Diabetes with high FBS had lower S.Amylase as compared to ones with a good control of Diabetes.The correlation of the S.Amylase with S. Triglycerides and S.Cholesterol in the study group was not found to be significant. (r= -0.104, r=-0.089 respectively).* ***Conclusion:*** *Low S.Amylase levels are associated with Type 2 Diabetes Mellitus which clearly illustrates an impairment of pancreatic exocrine function in type 2 Diabetes Mellitus .Measurement of S.Amylase can be an additional informative parameter for the assessment of chronicity and progress of the illness as well as the response to therapy.*

Keywords: *Type 2 Diabetes Mellitus, Serum Amylase*

I.   Introduction

Pancreas is a mixed function gland with both Exocrine and endocrine portions. Exocrine portion makes the major part (84%) formed by acinar cells and endocrine portion accounts for 2% of volume formed by islets. Due to close proximity of the two portions disease of one part may have effect on the other part. (1,2)

The blood circulates by a common islet acinar portal system anatomically (2). Endocrine hormone Insulin secreted by beta cells of islet cells of Langerhans has a trophic effect on the acinar cells. (2). Amylase enzyme is released by the pancreatic acinar cells . Insulin deficiency or insulin resistance seen in cases of Diabetes Mellitus causes a progressive damage to the pancreatic acinar cells , resulting in fibrosis of pancreatic exocrine tissue and hence reduced response to the hormonal stimulation.(2). In type 2 Diabetes Mellitus there is dysfunctional Insulino-acinar -ductal- incretin Gut hormonal axis (3) . Due to defect in insulin secretion and signalling , the Amylase synthesis and release are affected (4). Autonomic Neuropathy and microvascular complications of Diabetes disturbs the secretion of pancreatic juice which is under the control of Gut hormones (1). The duration of Diabetes Mellitus is going to have a major impact on exocrine function of Pancreas as there is progressive damage of acinar cells.

Our study was conducted to find a possible correlation between the exocrine and endocrine functions of the pancreas by comparing serum Amylase levels in cases of Type 2 Diabetes mellitus and age matched healthy controls and to find the correlation between serum Amylase and Fasting Blood glucose among cases of diabetes. The study is also intended to compare the Serum Amylse levels in Type 2 diabetics of different durations.

II. Materials And Methods

This study was conducted in Gandhi General Hospital for a period of 1 year. The study includes 75 cases of established diabetes based on ADA (American Diabetes Association) guidelines attending the Out patient Department of medicine of the institute. This forms the study group I. Inclusion criteria : 1) Both males and females in the age group 35 yrs to 65 yrs . 2) Known cases of Diabetes Mellitus diagnosed based on fasting Blood Glucose (FBS) and are on oral hypoglycemic drugs.

Exclusion criteria: 1) Individuals with history of peptic ulcer, Pancreatitis, Gall stones, Liver diseases and Renal diseases 2) Patients taking Insulin. Study group I is further divided based on duration of Diabetes after the diagnosis into two groups , Group I a (n=40) includes diabetics of $\leq$5yrs duration and Group Ib (n=35) includes diabetics of>5 to 10 yrs duration.

A group of 50 normal healthy individuals of both gender in the age group of 35 to 65 yrs formed the control group. In both Study and control groups after taking due consent Fasting Venous Blood Sample is collected and the following parameters were measured on a fully automated analyser(Erba) . Fasting Blood Glucose is estimated by Hexokinase method. Serum Amylase by Photometric Enzymatic method. Total serum cholesterol is measured by Cholesterol oxidase /Peroxidase method and Serum Triglycerides by coupled enzymaticmethod.

Statistics : The results were analysed on ssps statistical software . All estimates were presented as Mean$\pm$SD and statistical treatment of data were performed using student t test and Pearsons correlation coefficients. P values $\leq$ 0.05 were considered as statistically significant .

III. Results

75 cases of known Diabetes Mellitus formed the study group (Group I) . Study group I is divided into 2 groups depending on the duration of Diabetes into Group Ia (n=40) with $\leq$5 yrs duration of Diabetes and into Group Ib(n=35) with >5yrs to 10 yrs duration of Diabetes. 50 healthy non diabetic volunteers formed the control group. Both the groups are age matched (35 to 65yrs) and includes both males and females.

Fasting Blood Glucose, Serum Amylase , Serum Cholesterol and Serum Triglycerides are measured in all the study and control groups and results studied statistically.

Mean FBS in Study group I (n=75) is 156.28$\pm$8.86 which is statistically higher than mean FBS in control group (n=50) 83.66$\pm$16.03 [p<0.00001]. Table-1 ,Fig 1.Mean FBS of Control group is compared with Group Ia and Group Ib Separately . Mean FBS levels in controls is statistically less than that of FBS levels in Group Ia [p<0.05) and Group Ib [p<0.05].Table2,Fig 2

Parameter	Control group (n=50)	Study group I (n=75)	P value
FBS (mg/dl)	83.66$\pm$16.03	156.28$\pm$8.86	<0.001
S.Amylase (U/L)	79.32$\pm$11.08	52.32$\pm$6.99	<0.001
S.Cholesterol (mg/dl)	154.2$\pm$12.3	180.2$\pm$26.2	<0.05
S.Triglycerides (mg/dl)	92.5$\pm$23.8	173.4$\pm$52.15	<0.001

Table:1 Comparison of FBS, S.Amylase, S.Cholesterol and S. Triglyceride levels in Study and control groups
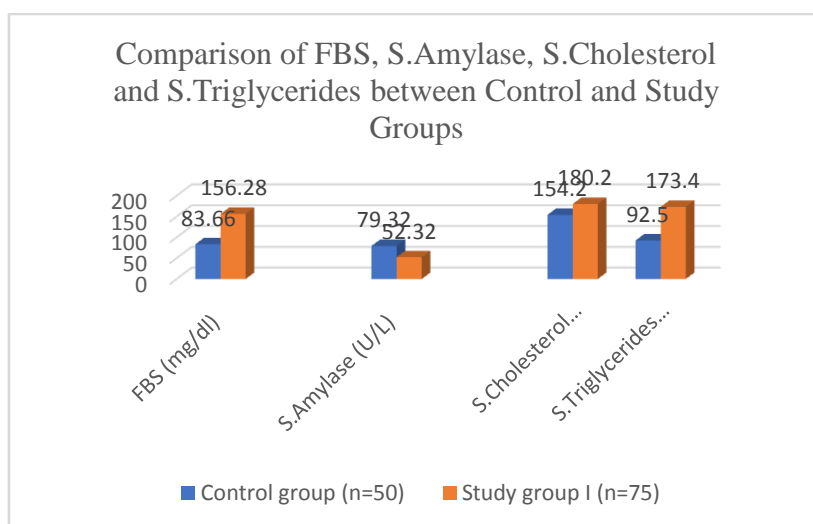
Fig.1

Serum Amylase is compared between control group and study groups I, Ia, Ib . There is a significant decrease in Serum amylase levels in study group I (52.32 ± 6.99) when compared to control group (79.32 ± 11.08) [p <0.001)]. Table 1

Parameter	Control group (n=50)	Study Group Ia (n=40)	Study Group Ib (n=35)
FBS (mg/dl)	83.66$\pm$16.03	140.23$\pm$11.2*	172.2$\pm$25.**
S.Amylase (U/L)	79.32$\pm$11.08	56.23$\pm$6.3*	48.30$\pm$7.24***
S.Cholesterol (mg/dl)	154.2$\pm$12.3	178.3$\pm$13.1*	182.01$\pm$ 4.2*
S.Triglycerides (mg/dl)	92.5$\pm$23.8	160.3$\pm$3.12*	186.21$\pm$2.2*

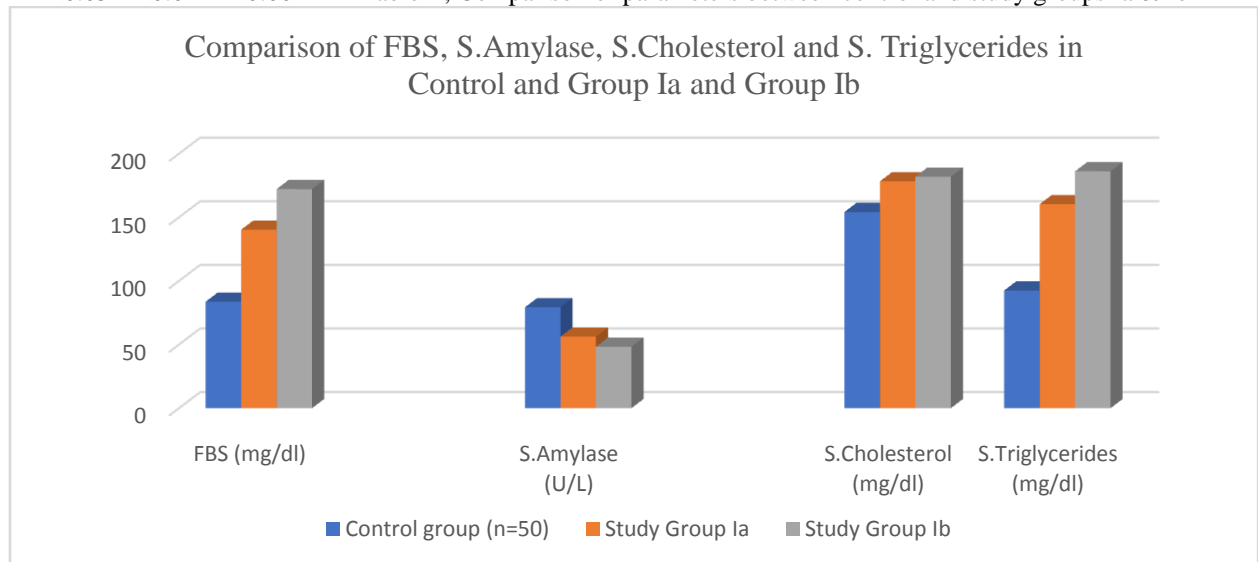P<0.05 * <0.01** <0.001*** Table-2; Comparison of parameters between control and study groups Ia & Ib

Fig.2

Serum Amylase levels are significantly decreased in both Group I a(56.23 ± 6.3) and Group Ib (48.30 ± 7.24) when compared to control group , but the decrease is more significant in Group Ib (p< 0.001) when compared to Group Ia (< 0.05). Table 2, Fig 2. Serum amylase is compared in Group Ia and Group Ib ,Where there is significant decrease in amylase levels in Group I b (p<0.05)table 3, fig 3
Table 3

Table 3: Comparison of parameters between study groups Ia and Ib

Parameter	Study Group Ia (n=40)	Study Group Ib (n=35)	P value
FBS (mg/dl)	140.23$\pm$11.2	172.2$\pm$25.	<0.01
S.Amylase (U/L)	56.23$\pm$6.3	48.30$\pm$7.2	<0.01
S.Cholesterol (mg/dl)	178.3$\pm$13.1	182.01$\pm$ 4.2	NS
S.Triglycerides (mg/dl)	160.3$\pm$3.12	186.21$\pm$2.2	<0.05

Comparison of FBS, S.Amylase, S.Cholesterol and S.Triglycerides between Study groups I a and Ib
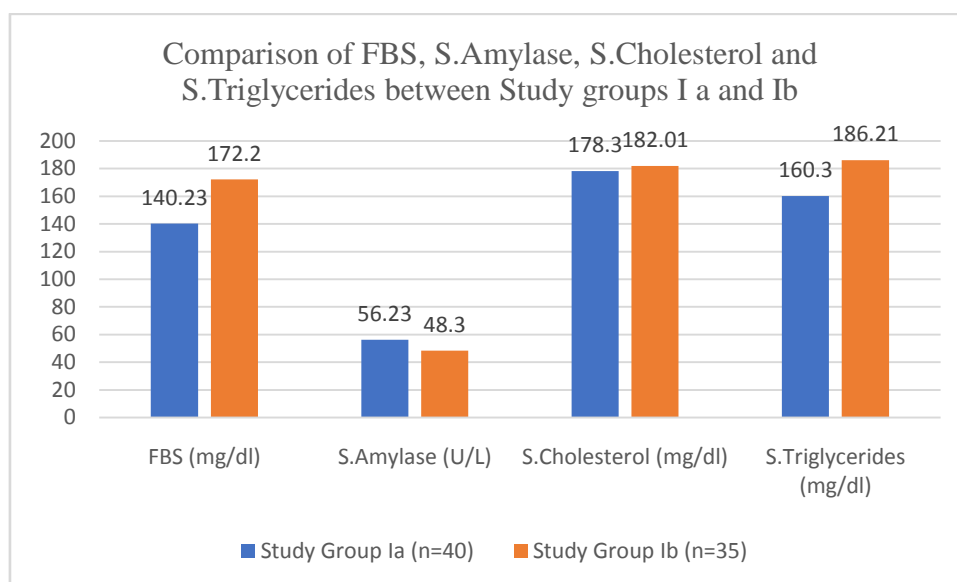
Fig.3

On comparing Serum Cholesterol and Serum Triglycerides among the study and control groups it was found that there is significantly higher levels in study group Ia & Ib as compared to those in control group (p<0.05 and p<0.01 respectively)(Table2,Fig2) . Comparison of Serum Cholesterol Between Group Ia and Group Ib showed no statistically significant alteration (p>0.05). Comparison of Serum Triglycerides between Groups Ia & Ib showed Statistical significance of higher values in Group Ib (<0.05) (Table 3, Fig-3))

Correlation coefficients were studied between S. Amylase and FBS, S.Cholesterol, S.Triglycerides (Table 4)

Correlation of S.Amylase with	Pearson's Correlation coefficient	P value
FBS	-0.176	<0.05
S. Cholesterol	-0.104	NS
S.Triglycerides	-0.089	NS

Table-4

There is a significant Negative correlation between the S.Amylase and FBS in the Diabetic Patients (r= -0.176) [p<0.05]. This shows that poorly controlled Diabetes with high FBS had lower S.Amylase as compared to ones with a good control of Diabetes.

The correlation of the S.Amylase with S. Triglycerides and S.Cholesterol in the study group was not found to be significant. (r= -0.104, r=-0.089 respectively)

IV. Discussion

In our study there was a significant lowering of S.Amylase in Diabetic cases when compared to controls. The low S.Amylase levels in Diabetes Mellitus may reflect the impaired exocrine -endocrine interactions of the Pancreas. Pancreatic hormones Insulin and Glucagon have influence on the enzyme synthesis and release in the exocrine pancreas. Insulin has a trophic effect on the pancreatic acinar cells and Glucagon has inhibitory effect . Hence the glucagon excess, insulin deficiency in Diabetes decreases the pancreatic exocrine secretion and also amylase secretion (2).

Studies indicate that 50% of diabetics have pancreatic fibrosis ,atrophy, fatty infiltration and loss of the exocrine acinar cells (5-9). Diabetic neuropathy leads to impaired enteropancreatic reflexes and exocrine dysfunction (10).Previous studies showed that elevated Glucagon, Somatostatin suppresses the exocrine function of pancreas (11-15). Recent studies indicate that cytokines like TGF beta and TGF alpha impair both exocrine and endocrine functions (16-18).

In our study there was a significant correlation between S.Amylase and FBS in study group indicating the possible interrelationship between exocrine and endocrine dysfunction of pancreas. There is negative correlation between S.Amylase , S. Cholesterol and S.Triglycerides in cases but there was no statistical significance. Indicating that the metabolic defects associated with Diabetes like hypercholesterolemia and hypertriglyceridemia are related largely to the degree of diabetic control or endocrine function of pancreas (19)

The reduction in S.Amylase in type 2 Diabetes mellitus was higher in patients with longer duration of Diabetes (>5 to 10Yrs Group Ib) when compared to patients with shorter duration of diabetes (≤5yrs- Group I a) indicate that measuring S.Amylase levels in diabetics may be used for understanding the progress of diabetes

V. Conclusion

Low S.Amylase levels are associated with Type 2 Diabetes Mellitus which clearly illustrates an impairment of pancreatic exocrine function in type 2 Diabetes Mellitus .

Measurement of S.Amylase can be an additional informative parameter for the assessment of chronicity and progress of the illness as well as the response to therapy.

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