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A Study of Serum Transaminases Levels in Type 2 Diabetes in Correlation With HbA1c

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Abstract
Background*: Liver is the central hub for metabolism. Liver dysfunction in diabetes mellitus is one of the major causes of morbidity and mortality. Periodical evaluation of transaminases helps in early diagnosis of liver dysfunction.*
Aim: *The objectives were to study the levels of serum transaminases and HBA1C levels in patients with Type 2 Diabetes and to correlate the levels with HBA1C.*
Materials & Methods: *Institutional cross-sectional observation study. Study was done in 100 known cases of T2DM. Age, Gender, SGOT, SGPT, HBA1C, FBS and PPBS were recorded, analysed and compared the values of SGOT and SGPT with HBA1C, FBS and PPBS.*
Results: *In 100 patients with Type 2 Diabetes, Abnormal SGOT & SGPT was seen in 65% and 9% of patients respectively. Mean and SD of SGOT and SGPT were 48.99±24.52 and 25.18±14.09 respectively. Correlation of HBA1C with SGOT was very low positive and was not statistically significant as P value was > 0.05 whereas with SGPT it was statistically significant as P value was < 0.05.*
Conclusion: *The results from our study showed high prevalence of elevated levels of Serum transaminases among Type 2 Diabetes patients which were in concordance with previous studies and these findings lend support to the practice of routine liver function monitoring in otherwise asymptomatic patients with Type 2 diabetes mellitus.*
Key Word: *Sgot,Sgpt,HbA1c,Type 2 Diabetes*

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I. Introduction

Diabetes Mellitus (DM) is a group of metabolic diseases characterized by hyperglycemia with disturbances of carbohydrates, fat and protein metabolism resulting from defects in insulin secretion, insulin action or both.[1]

Current prevalence of diabetes around the world – 537 million adults are living with diabetes in 2021, and this number is expected to rise to 643 million by 2030 and 784 million by 2045.[2] Prevalence in India as of 2021 – 7.4 crore people are suffering from diabetes.[3]

There exists an association between diabetes and liver injury. Several critical pathways have been identified as causing liver damage in diabetic patients. Insulin resistance, the main cause of hyperglycemia and compensatory hyperinsulinemia is the predominant causative factor.[4, 5] As a collection of insulin-sensitive tissues, the liver is among the primary organs susceptible to the effects of hyperglycemia-induced oxidative stress.[5]

This is followed by derangement of protein, carbohydrate and lipid metabolism, thereby leading to increased oxidative stress and further triggering the inflammatory cascade.[4]

In some cases, DM causes excessive accumulation of fat cells in the liver resulting in a fatty liver and consequently NAFLD. Subsequently, 2–3% of NAFLD patients experience hepatic inflammation, necrosis and fibrosis, which are features of a condition known as non-alcoholic steatohepatitis (NASH). Injured fibrotic livers will then become cirrhotic, form HCCs and eventually go into liver failure.[6]

Liver function tests (LFTs) are commonly used in clinical practice to screen for liver disease, monitor the progression of known disease. The most common LFTs include the serum aminotransferases, alkaline phosphatase, bilirubin, albumin and prothrombin time. Apart from kidney, eye, heart and blood vessels, liver is also indirectly affected with diabetes mellitus. Virtually the entire spectrum of liver disease is seen in patients with Type 2 diabetes.

This study was conducted to see the prevalence of abnormal liver function tests in patients with Type 2 diabetes mellitus and correlate them with glycemic control, so that we can detect them at early stage and prevent the long term morbidity and mortality.

II. Materials And Methods

Source of Data: The present study is conducted on patients detected with type 2 diabetes attending out patients and inpatients admitted in General Medicine Department, Basaveshwara Teaching and General Hospital attached to Mahadevappa Rampure Medical College, Kalaburagi.

Method of collection of Data (including sampling procedures if any):

- **Study design:** prospective observational study
- **Duration of study:** 1 st October 2019 to 31st March 2021(18 months)
- **Sample size:** 100
- **Sampling procedure:** Simple random sampling
- **Subjects:** Study subjects will be selected after applying inclusion-exclusion criteria. Information is collected through prepared Performa from each patient.

Inclusion Criteria

1. Patients diagnosed with Type 2 Diabetes Mellitus.
2. Patients with age more than 18 years.
3. Patients of both sex (male and female)

Exclusion Criteria

1. Patients with history of alcohol consumption for any duration of time.
2. Patients with previous history of jaundice, ascites and signs of liver cell failure, hepatitis.
3. Patients with history of intake of Methotrexate, Amiodarone, Glucocorticoids, Synthetic Estrogens.
4. Patients with history of major abdominal surgeries.

STATISTICAL ANALYSIS

All the patients data was collected in proforma and entered in excel sheet. The statistical data was analyzed using SPSS software version 2.0 operating on windows 10. Data was tabulated and summarized as mean, standard deviation, frequency and percentage. The summarized data was represented using tables, figures and bar diagram. The strength of association between the variables was analyzed using Pearson's correlation. $P<0.05$ was considered statistically significant.

III. Results

A total of 100 type 2 DM patients (male = 59pts and female =41pts) who met the inclusion criteria were studied during the study period.

Table-1: DISTRIBUTION OF STUDY PARTICIPANTS ACCORDING TO AGE & GENDER (n=100).

AGE and GENDER DISTRIBUTION OF TYPE 2 DIABETES					
Age in Years	**Male**	**Percentage**	**Female**	**Percentage**	**Total**
20 to 30	0	0%	1	2%	**1**
30 to 40	7	12%	2	5%	**9**
40 to 50	12	20%	2	5%	**14**
50 to 60	18	31%	9	22%	**27**
60 to 70	15	25%	14	34%	**29**
70 to 80	4	7%	11	27%	**15**
≥ 80	3	5%	2	5%	**5**
Total	**59**	**100%**	**41**	**100%**	**100**

In our study it was observed that, out of 100 study participants with Type 2 DM, 27% (n=27, Male:18, Female: 9) were belonging to the age group of 50 to 60 years and 29% (n=29, Male: 15, Female: 14) were in 60 to 70 years indicating Type 2 DM was more prevalent in 50-70years age group.

Table- 2: DISTRIBUTION OF STUDY PARTICIPANTS WITH TYPE 2 DM ACCORDING TO AGE IN COMPARISON WITH SERUM TRANSAMINASES- SGOT (n=100).

SERUM TRANSAMINASES- SGOT					
AGE	**NORMAL**		**ABNORMAL**		**TOTAL**
	Frequency	**Percentage**	**Frequency**	**Percentage**	

<30 years	0	0	1	1%	**1**
31-40 years	4	4%	7	7%	**11**
41-50 years	7	7%	18	18%	**25**
51-60 years	11	11%	9	9%	**20**
61-70 years	8	8%	17	17%	**25**
71-80 years	5	5%	11	11%	**16**
>80 years	0	0	2	2%	**2**
TOTAL	**35**	**35%**	**65**	**65%**	**100**

In our study it was observed that abnormal SGOT was seen in 18% of patients with Type 2 Diabetes in the age group of 41-50 years whereas 17% in 61-70 years.

Table- 3: DISTRIBUTION OF STUDY PARTICIPANTS WITH TYPE 2 DM ACCORDING TO GENDER IN COMPARISON WITH SERUM TRANSAMINASES- SGOT.

	SGOT	
Gender	**Abnormal**	**Normal**
Female	23	17
Male	42	18

The abnormal SGOT was seen in 23% of females and 42% of males.

Table 4: DISTRIBUTION OF STUDY PARTICIPANTS WITH TYPE 2 DM ACCORDING TO AGE IN COMPARISON WITH SERUM TRANSAMINASES- SGPT

SERUM TRANSAMINASES- SGPT					
AGE	**NORMAL**		**ABNORMAL**		**TOTAL**
	Frequency	**Percentage**	**Frequency**	**Percentage**	
<30 years	1	1%	0	0	**1**
31-40 years	11	11%	0	0	**11**
41-50 years	22	22%	3	3%	**25**
51-60 years	18	18%	3	3%	**21**
61-70 years	22	22%	2	2%	**24**
71-80 years	15	15%	1	1%	**16**
>80 years	2	2%	0	0	**2**
TOTAL	**91**	**91%**	**9**	**9%**	**100**

In our study it was observed that abnormal SGPT was seen in 3% of patients with Type 2 Diabetes in the age group of 41-60 years whereas 2% in 61-70 years.

Table- 5: DISTRIBUTION OF STUDY PARTICIPANTS WITH TYPE 2 DM ACCORDING TO GENDER IN COMPARISON WITH SERUM TRANSAMINASES- SGPT.

	SGPT	
Gender	**Abnormal**	**Normal**
Female	4	33
Male	5	58

The abnormal SGPT was seen in 4% of females and 5% of males.

TABLE 6: AGEWISE COMPARISON OF MEAN AND STANDARD DEVIATION OF SERUM TRANSAMINASES AMONG TYPE 2 DIABETES

Age in Years	SGOT		SGPT	
	Mean	S.D	Mean	S.D
Overall	48.99	24.52	25.18	14.09
31 to 40	52.70	24.10	**26.10**	14.01
41 to 50	**56.50**	20.88	23.93	6.67
51 to 60	50.30	**27.66**	28.41	15.59
61 to 70	43.86	24.62	23.86	15.41
71 to 80	46.93	24.74	23.93	**16.17**
≥ 80	49.40	18.60	20.80	6.98

In our study it was observed that Mean of SGOT was more than SGPT even with respect to different age group. Mean of SGOT was more among age group 40 to 50 years whereas Mean of SGPT was more among age group 28 to 40 years.

TABLE 7: AGEWISE COMPARISON OF MEAN AND STANDARD DEVIATION OF SERUM TRANSAMINASES AMONG TYPE 2 DIABETES.

Age in Years	SGOT	SGPT
	STANDARD DEVIATION	STANDARD DEVIATION
Overall	24.52	14.09
31 to 40	24.10	14.01
41 to 50	20.88	6.67
51 to 60	**27.66**	15.59
61 to 70	24.62	15.41
71 to 80	24.74	**16.17**
≥ 80	18.60	6.98

In our study it was observed that Standard Deviation was more among SGOT than SGPT even with respect to different age group.
Standard Deviation of SGOT was more among age group 50 to 60 years
Standard Deviation of SGPT was more among age group 70 to 80 years.

CORRELATION OF HBA1C WITH SGOT AND SGPT	
SGOT	SGPT
0.0948	0.2208
P-Value	P-Value
0.3481	**0.02727**

TABLE 8 : CORRELATION OF SERUM TRANSAMINASES IN TYPE 2 DIABETES WITH HBA1C**.**

In our study it was observed that, Correlation of HBA1C with SGOT was very low positive and was not statistically significant as P value was > 0.05 whereas Correlation of HBA1C with SGPT was statistically significant as P value was < 0.05.

IV. Discussion

The present study of Serum transaminases levels in patients with diabetes or newly diagnosed type 2 diabetes mellitus was carried out in the Department of General Medicine, Basaveshwara Teaching and General Hospital from 1st October 2019 to 31st March 2021(18 months) .

The purpose of this study was to study the serum transaminases levels and to know the association between serum transaminases and HbA1c levels in patients with Type 2 Diabetes Mellitus.

The main finding of our study was that high prevalence of abnormal serum transaminases levels were seen in both men and women with type 2 diabetes mellitus.

The present study shows that SGPT was elevated in 9 % of our Type 2 Diabetes patients (5% in males and 4% in females). Our results are consistent with the findings of Erbey et al.[7] who reported prevalence rates of 10.7% and 5.3% in type 2 diabetic men and women respectively. Furthermore, West et al.,[8] and Mathur S et al.[9] reported a higher rates of 12.1%, 20% and 19.5% respectively.

This study showed that Abnormal SGOT was seen in 65% of our Type 2 Diabetes patients (42% in males and 23% in females). Our results are consistent with the findings of Bhatia L et al.,[10] Prabhudeva N et al.,[11] Mathur S et al.,[9] Bora et al., [12] who reported prevalence rates of 38%, 29%, 56.1% & 32.5% in type 2 diabetic patients respectively.

This study showed that younger diabetic patients were more likely to have high SGPT values than the older patients. However the older patients showed elevated SGOT activity. Supported by earlier studies, this finding suggested that severe steatosis denoted by a higher release of the SGPT enzyme in response to hepatocytes derangement, tends to occur earlier in the disease process. As a marker of hepatocyte integrity the SGPT activity decreases as steatosis progresses whereas inversely a rise in the SGOT level has been noticed in the older patients. The latter observation can be attributed to the fact that the clearance of this enzyme is mainly accomplished by the liver sinusoidal cells. While there is no effect from the necro-inflammatory activity on SGOT level, advancing fibrosis which injures the sinusoidal cells leads to the relative increase in serum SGOT.

In our study statistically significant correlation was found between abnormal serum transaminases and glycemic control of the patients. It was observed that, Abnormal SGOT was seen in 55 patients of Type 2 Diabetes with FBS >125mg/dl, 58 patients with PPBS >200mg/dl and 64 patients with HBA1C of >6.5 whereas Abnormal SGPT was seen in 14 patients of Type 2 Diabetes with FBS >125mg/dl, 15 patients with PPBS >200mg/dl and 12 patients with HBA1C >6.5. Mean and Standard Deviation values of Abnormal serum transaminases were compared with HBA1C. In our study mean values of SGOT were 48.99 ± 24.52 in poor glycemic control patients (HBA1C >6.5). and 30.30 ± 7.29 in good glycemic control patients (HBA1C). The difference is found to be is statistically highly significant (p value <0.001). This is in concordance with study conducted by Prabhudeva N et al[74] in which mean values of SGOT were 40.8 ± 12.7 in poor glycemic control patients and 33.8 ± 8.6 in good glycemic control patients and difference was found to be is statistically significant (p value 0.002). In our study mean values of SGPT are 25.18 ± 14.09 in poor glycemic control patients and 20.16 ± 8.63 in good glycemic control patients. The difference is found to be is statistically significant (p value 0.014). This is in concordance with study conducted by Prabhudeva N et al,[11] in which mean values of SGPT were 41.0 ± 13.6 in poor glycemic control patients and 33.5 ± 8.6 in good glycemic control patients and difference was found to be is statistically highly significant (p value 0.001).

The present study showed statistically significant correlation between increasing BMI and LFT derangements (p value 0.031). In the study 33 out of 60 with BMI of 25-30 kg/m^2, 11 out 19 with BMI of 30-35 kg/m^2, 6 out of 7 with BMI of 35-40 kg/m^2 showed deranged LFTs as compared to 3 out of 14 patients with BMI of 18-25 kg/m^2 . This observation is supported by study conducted by Forlani G et al[13] and Ni H et al.[14]

Findings from this study support to the promising effect of insulin resistance in the pathogenesis of liver disease. In the study, we found a positive correlation of HbA1c with serum transaminases especially with SGOT. Similarly, study conducted by Prabhudeva N et al.,[9] Bhatia L et al.,[10] Rajeswari et al.[15] reported AST and ALT having significant correlation with HbA1c in diabetic population. To the flip side, AST was not significantly correlated with HbA1c in a study conducted by AL-Jameil et al.[16]

Our study has limitations. First, its cross-sectional design precludes the establishment of causal or temporal relations between Type 2 Diabetes and elevated liver transaminase levels. Secondly, it was time framed study, conducted during the period of 18 months in a tertiary care hospital Kalaburagi, which limits the relatively larger sample size to establish causality of this descriptive cross-sectional study. This study also could not rule out all possible risk factors associated with hepatic complications in patients with Type 2 Diabetes.

V. Conclusions

- The present study unmasked some important and relevant information about the impact of Type 2 Diabetes on the liver.

- The study is in concordance with the previous studies, which reported high prevalence rates of abnormal serum transaminases levels in patients with Type 2 diabetes mellitus and also show a positive correlation with poor glycemic control.

Although there are currently no consensus guidelines or recommendations regarding LFT screening in patients with Type 2 diabetes mellitus, these findings lend support to the practice of routine liver function monitoring in otherwise asymptomatic patients with Type 2 diabetes mellitus.

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