



## **ASSOCIATION BETWEEN ALANINE AMINOTRANSFERASE LEVEL AND LIVER DYSFUNCTION IN PATIENTS WITH TYPE 2 DIABETES MELLITUS” – One-year cross sectional study**

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### **ABSTRACT :**

#### **Background:**

Diabetes mellitus, primarily due to insulin insufficiency or resistance, impairs glucose metabolism, resulting in chronic hyperglycaemia. Type 2 diabetes mellitus (T2DM) is the most prevalent form and continues to rise globally due to sedentary lifestyles. Insulin resistance in T2DM is associated with liver dysfunction, often indicated by elevated ALT levels.

#### **Objective:**

To estimate serum Alanine Aminotransferase (ALT) levels in patients with T2DM.

#### **Methods:**

This cross-sectional study was conducted over one year in the Endocrinology Department at KLE's Dr. Prabhakar Kore Charitable Hospital, Belagavi. A total of 110 T2DM patients aged 30–65 was selected through simple random sampling. After informed consent, 3–5 mL of venous blood was collected, processed within two hours, and analysed using the Erba Chem 5 Plus analyser. ALT levels were measured using the kinetic method, and data were analysed using SPSS.

#### **Results:**

Among 110 participants (49.1% males, 50.9% females; mean age 55.84 years), ALT levels were slightly higher in males ( $p < 0.05$ ). Fasting blood sugar showed a positive correlation with both enzymes. Enzyme levels increased with longer diabetes duration, and Positive correlation between AST and ALT.

#### **Conclusion:**

T2DM is associated with elevated liver enzymes, especially in males and those with longer disease duration. Regular liver function monitoring is essential in diabetic care.

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**Keywords:** Type 2 Diabetes Mellitus, ALT

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### **Introduction-**

Diabetes Mellitus is a chronic metabolic disorder that results from either insufficient insulin production or insensitivity to insulin. <sup>[1]</sup> Insulin resistance, a hallmark of Type 2 Diabetes Mellitus (T2DM), occurs when the body cells fail to respond effectively to insulin metabolic actions, such as glucose uptake, glycogen synthesis, and fat breakdown suppression. <sup>[2]</sup> The global prevalence of T2DM is rising due to genetic predisposition, environmental factors, and lifestyle changes, particularly the increase in obesity. It is projected that by 2030, around 366 million people will be affected, with incidence rates rising from 2.8% in 2000 to 4.4%. <sup>[3]</sup> This widespread prevalence has made diabetes a major public health concern, contributing to chronic hyperglycemia and severe complications that affect multiple organ systems with approximately 90% of diagnosed diabetes cases being Type 2. <sup>[4]</sup>

Among its complications, T2DM significantly impacts liver health as the liver plays a crucial role in metabolic processes, including carbohydrate, protein, and fat metabolism. <sup>[6]</sup> The condition is strongly associated with non-alcoholic fatty liver disease (NAFLD) and increased liver enzyme levels, particularly

Aspartate Aminotransferase (AST) and Alanine Aminotransferase (ALT).<sup>[7,8]</sup> These enzymes serve as biomarkers of liver injury, and their elevated activity correlates with insulin resistance and metabolic syndrome. Liver damage in diabetes may result from glycogen accumulation in hepatocytes, leading to mild to moderate elevation in AST and ALT.<sup>[9]</sup> ALT is primarily found in the liver, making it a more specific marker for liver damage.<sup>[14]</sup>

## MATERIALS AND METHODS-

This cross-sectional study was conducted 2023 in the Endocrinology department of KLE's Dr. Prabhakar Kore Charitable Hospital, Belagavi, followed a cross-sectional design. A total of 110 Type 2 Diabetes Mellitus patients between the ages of 30 and 65 were randomly selected. Informed consent was obtained, and venous blood samples (3-5 mL) were collected, processed within two hours, and analysed using the Erba Chem 5 Plus analyser. The AST and ALT levels were determined through the kinetic method, ensuring accurate calibration and instrument setup. The obtained data were then analysed using SPSS software (version 29.0)

## RESULTS-

This study includes 110 patients with DM Type 2 was done to estimate serum aminotransferases (AST and ALT) as a marker for liver disease. Research includes 49.1% of male and 50.9% of female participants shown in table 1 and graph 1. Table 2 and graph 2 shows males had higher aminotransferase levels compare to females among T2DM patients. Table 3 and graph 3 shows higher the duration of T2DM had slightly higher levels of aminotransferases. Graph 4 and graph 5 shows the positive correlation between FBS and AST level, FBS and ALT level respectively. Graph 6 and 7 indicating negative correlation between age and aminotransferase levels. Graph 8 illustrates the strong positive relationship between AST and ALT.

**TABLE 1. Gender distribution of participants**

SEX	n (%)
Male	54 (49.1)
Female	56 (50.9)

**TABLE 2. Serum Aminotransferase Levels in Patients with Type 2 Diabetes: Gender-Based Comparison**

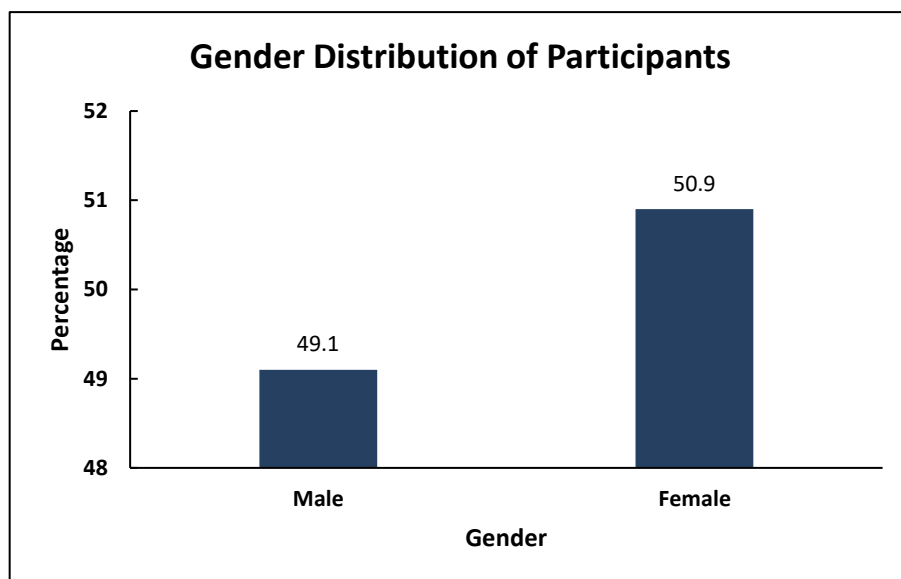
	SEX		p-value
	Male (n=54)	Female (n=56)	
	Mean $\pm$ SD	Mean $\pm$ SD	
AST (5 - 40IU/L)	25.94 $\pm$ 7.75	24.18 $\pm$ 10.95	<0.05*
ALT (5 - 45IU/L)	26.2 $\pm$ 8.75	23.96 $\pm$ 11.24	<0.05*

**TABLE 3. Serum Aminotransferase Levels Across Different Durations of Type 2 Diabetes**

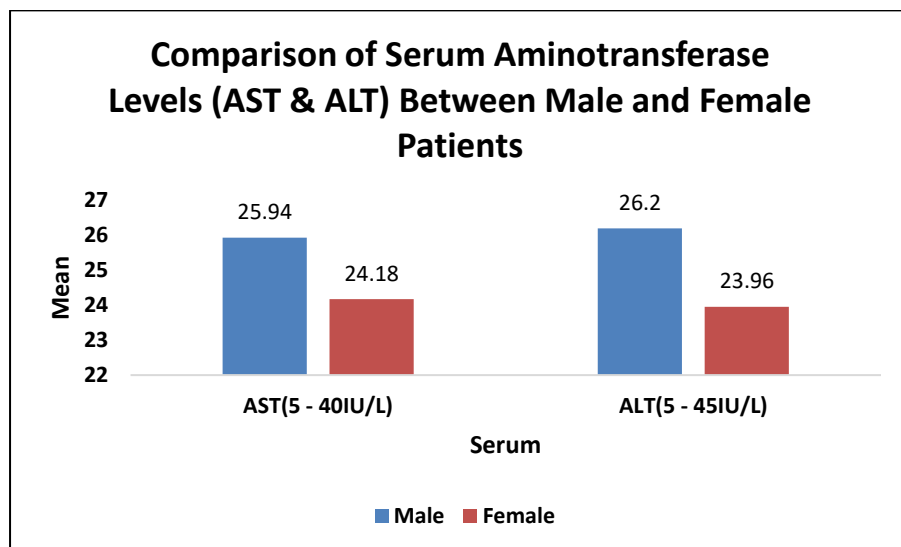
	Duration		p-value
	5-10 (n=74)	15-20 (n=36)	
	Mean $\pm$ SD	Mean $\pm$ SD	
AST (5 - 40IU/L)	24.64 $\pm$ 9.14	25.89 $\pm$ 10.3	0.431
ALT (5 - 45IU/L)	24.62 $\pm$ 9.99	26.39 $\pm$ 10.37	0.263

## GRAPHS

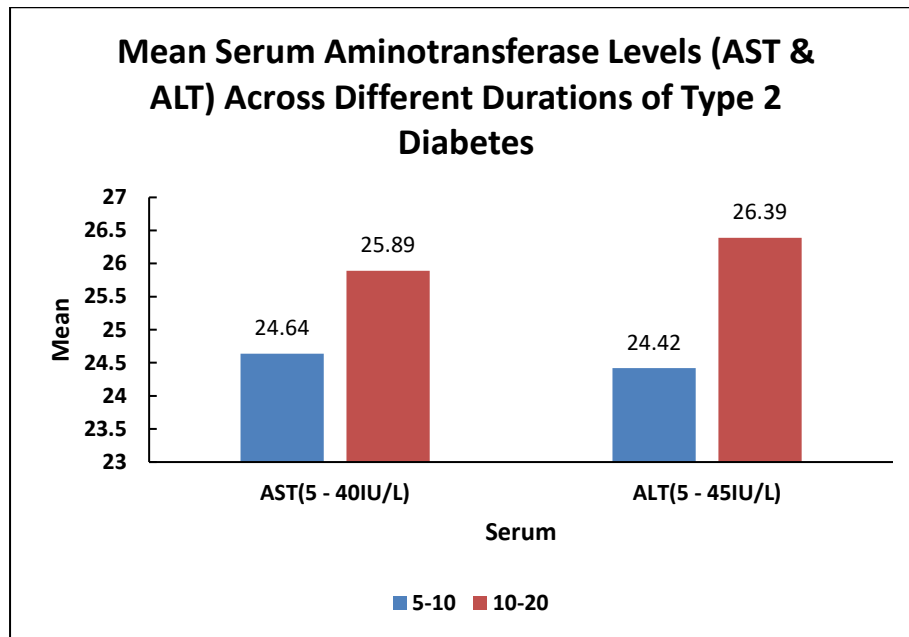
GRAPH 1. Gender distribution of participants



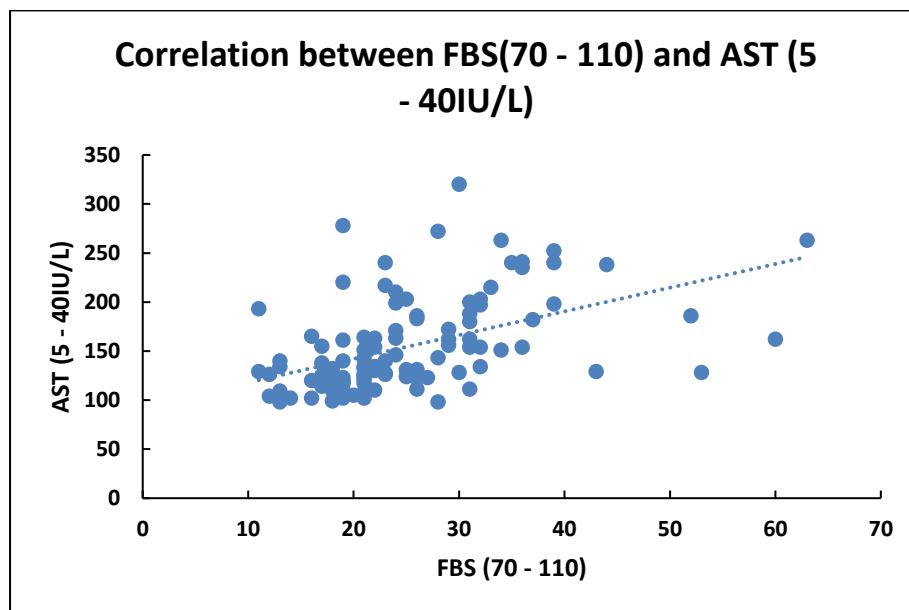
GRAPH 2. Comparison of Serum Aminotransferase Levels (AST and ALT) Between Male and Female Patients



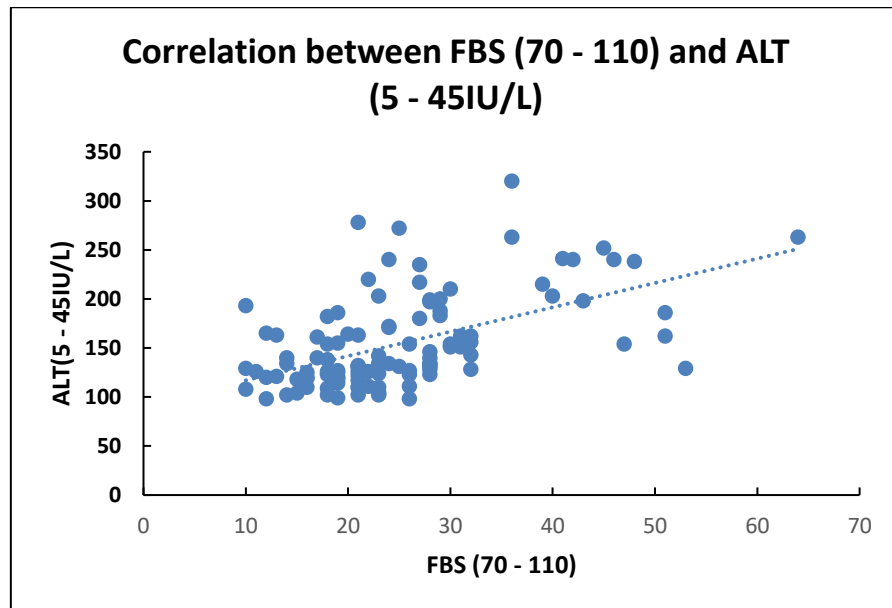
GRAPH 3. Mean Serum Aminotransferase Levels (AST and ALT) Across Different Durations of Type 2 Diabetes



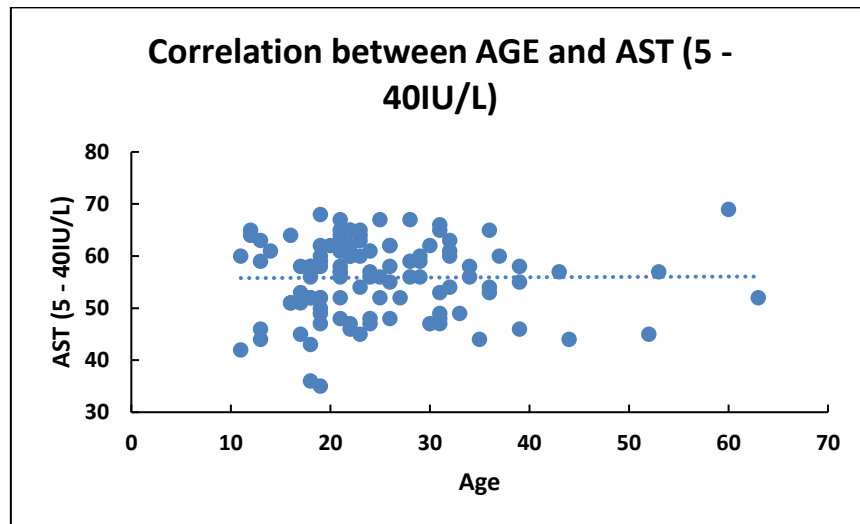
GRAPH 4. Correlation between FBS (70 – 110) and AST (5 – 40IU/L)



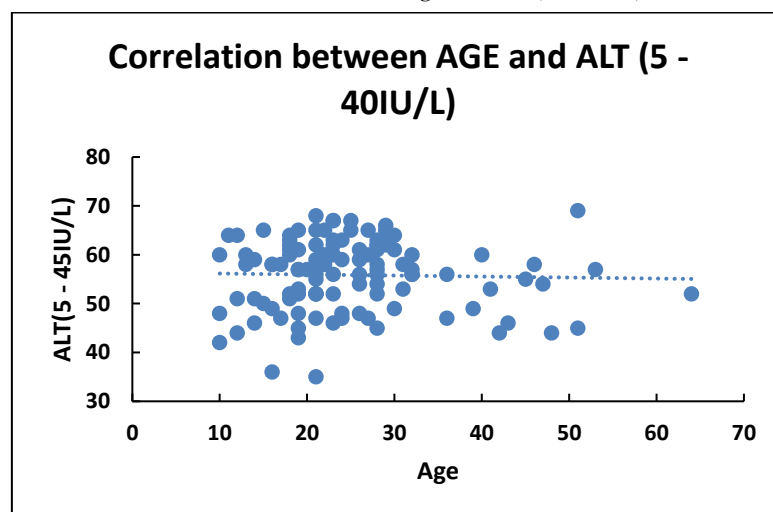
GRAPH 5. Correlation between FBS (70 - 110) and ALT (5 - 45IU/L)



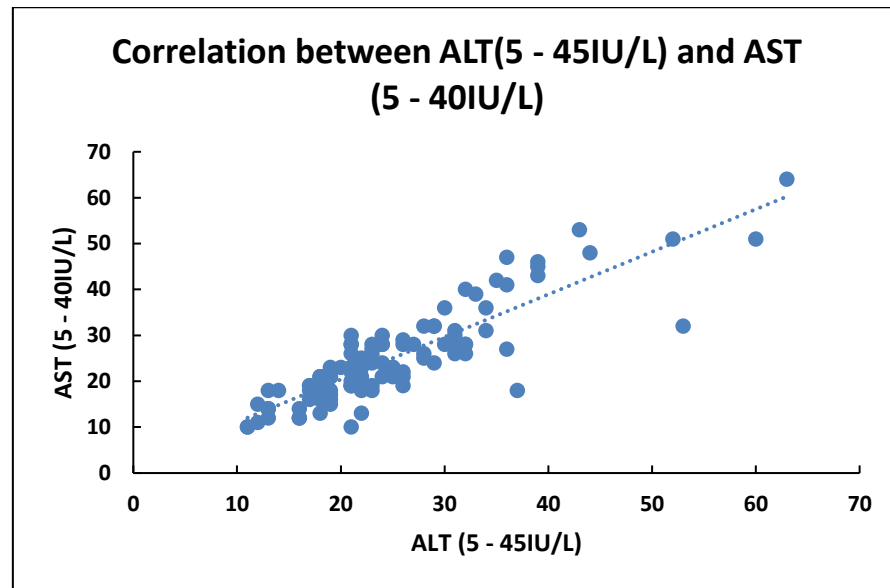
GRAPH 6. Correlation between Age and AST (5 – 40IU/L)



GRAPH 7. Correlation between Age and ALT (5 - 40IU/L)



GRAPH 8. Correlation between ALT (5 – 45IU/L) and AST (5 – 40IU/L)



## Discussion

Our study highlights the impact of gender, age, and diabetes duration on enzyme levels. Males show higher ALT and AST levels than females, aligning with studies done by Chen S, Guo X, Chen Y, Dong S, Sun Y in China though an Algerian study done by Belkacemi L, Belalia M reported higher ALT and AST levels in females than males. These variations may stem from genetic, hormonal, or lifestyle factors affecting liver function. <sup>[10,11]</sup>

Our study highlights that prolonged diabetic duration (10–20 years) was associated with elevated liver enzyme (AST and ALT) levels. These findings are consistent with studies conducted in Soudi Arabia by Alzahrani SH, Baig M. <sup>[12]</sup>

Our study shows a positive correlation between FBS and AST/ALT levels, consistent with Jha S.K. et al., linking metabolic dysfunction to liver injury. <sup>[2]</sup> Additionally, aminotransferase levels are higher in diabetic patients, aligning with findings by Adiga U. et al. <sup>[5]</sup>

Our study shows a strong positive correlation between ALT and AST levels, consistent with Hua Niu and Yinghua Zhou's findings in China, indicating liver dysfunction in diabetic patients. This rise may reflect metabolic stress, which may highlight the AST/ALT ratio as a predictive marker for diabetes-related complications. <sup>[13]</sup>

## 4. Limitation-

- Sample size is not large enough
- Mono center study and no control group

## Conclusion-

Our study reinforces the significant relationship between diabetes mellitus and liver enzyme alterations, particularly AST and ALT levels. We observed that gender, age, and diabetes duration play crucial roles in influencing these enzyme levels. Males exhibited higher AST and ALT levels compared to females, aligning with global studies, although regional variations exist. Age also emerged as a key factor, with individuals aged 46–65 years showing elevated AST levels, likely due to progressive liver dysfunction over time. Additionally, prolonged diabetes duration (10–20 years) correlated with increased liver enzyme levels, reflecting the cumulative impact of chronic hyperglycemia and insulin resistance on liver health. However, the lack of statistical significance in enzyme variations beyond 15–20 years suggests that other factors, such as medication, metabolic control, and genetic predisposition, may influence liver function. These findings underscore the need for regular liver function monitoring in diabetic patients to prevent potential complications and improve overall disease management.

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