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Original Research Article

COMPARISON OF ALT LEVELS IN TYPE 2 DIABETIC PATIENTS WITH NON-ALCOHOLIC FATTY LIVER DISEASE ACCORDING TO THEIR GLYCEMIC CONTROL

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ABSTRACT

Background: *Non-alcoholic fatty liver disease (NAFLD) is a common comorbidity in patients with type 2 diabetes mellitus (T2DM) and is often associated with elevated alanine aminotransferase (ALT) levels, reflecting hepatic inflammation. Poor glycemic control has been linked to worsening liver pathology, but the relationship between glycemic control and liver enzyme elevation in NAFLD remains to be clarified.* ***Objective:*** *To assess the differences in elevated ALT levels between well-controlled and poorly controlled type 2 diabetic patients with NAFLD.* ***Study Design:*** *Descriptive cross-sectional study.* ***Setting:*** *Department of Medicine at Khyber Teaching Hospital in Peshawar.* ***Duration of Study:*** *The study was conducted over six months from 11 February 2024* to 11 August 2024. ***Methods:*** *98 patients aged 30 to 70 years with confirmed T2DM and NAFLD were enrolled and divided into groups based on glycemic control: Group A (well-controlled diabetes) and Group B (poorly controlled diabetes). ALT levels were measured, with values >40 IU/L considered elevated. Data were analyzed using SPSS version 24. Independent t-tests were applied to compare mean ALT levels between the two groups, with a p-value ≤ 0.05 considered statistically significant.* ***Results:*** *The mean age in Group A was 48.94 ± 12.70 years, while Group B was 47.61 ± 12.19 years. Group A had significantly lower mean ALT levels (17.78 ± 11.09 IU/L) compared to Group B (27.43 ± 13.57 IU/L), with the difference being statistically significant (p = 0.0001).* ***Conclusion:*** *Well-controlled type 2 diabetic patients with NAFLD exhibited significantly lower ALT levels compared to those with poorly controlled diabetes. These findings underscore the importance of maintaining optimal glycemic control to mitigate hepatic injury in diabetic patients with NAFLD.*

Keywords: Type 2 Diabetes, Non-Alcoholic Fatty Liver Disease, Glycemic Control, Alanine Aminotransferase

INTRODUCTION

The worldwide incidence of Type 2 diabetes is on the upward trajectory. The most recent report indicates that 10.5% of the worldwide adult population is impacted by diabetes. If these trends persist, it is expected that one in eight adults will be diagnosed with diabetes by 2045 (1). In a similar vein, non-alcoholic fatty liver disease (NAFLD) influences approximately one-quarter of the global population (2). NAFLD encompasses an array of hepatic conditions, from isolated hepatic steatosis to non-alcoholic steatohepatitis (NASH), cirrhosis, advanced fibrosis (AF), the emergence of hepatocellular carcinoma (HCC), as well as liver-related mortality (3). Obesity, insulin resistance, and type 2 diabetes are the primary factors contributing to the advancement of NAFLD (4, 5). A study revealed that the incidence of NAFLD among patients with diabetes is over twice that of the overall population, approaching nearly 60%, with NASH occurring in one-third of these individuals (6). In addition, in the cohort that received liver biopsy, 17% were found to have AF, a significant factor affecting overall mortality as well as adverse liver-related outcomes across the different stages of NAFLD (7, 8). Consequently, due to an obesogenic lifestyle and a growing incidence of type 2 diabetes, it is anticipated that by the year 2030, there will be a substantial rise of 137% in NASH-related HCC as well as 178% in liver deaths, accordingly (9).

The majority of people with NAFLD do not exhibit symptoms and are usually diagnosed when abnormal liver function tests become apparent or when an ultrasound is performed for another reason. Elevated levels of alanine aminotransferase (ALT) and aspartate aminotransferase (AST) are observed in liver function tests. Liver enzymes frequently remain within the normal range in many cases of NAFLD, including in the more advanced stages. Consequently, the levels of AST may not reliably predict the extent of inflammation and cirrhosis (10, 11).

Based on the significance of optimal glycemic control on the progression of NAFLD, this study will aim to compare ALT levels in poorly and well-controlled Type 2 diabetic patients with non-alcoholic fatty liver disease.

METHODOLOGY

The study was conducted as a cross-sectional analysis in the Department of Medicine at Khyber Teaching Hospital in Peshawar from 11 February 2024 to 11 August 2024 after securing ethical clearance from the institute. Using non-probability consecutive sampling, we enrolled 98 patients based on raised ALT levels in T2DM patients, 19% (12), margin of error 8%, and confidence interval 95%.

Patients aged 30 and 70 years diagnosed with T2DM (HbA1c ≥48 mmol/mol) and NAFLD based on specific ultrasonographic criteria. Patients with Type 1 diabetes, having a history of alcohol consumption, positive hepatitis B or C, or having a history of drug-induced hepatic injury were not enrolled. Once the consent form was obtained, we obtained demographic details from our patients. We divided patients into two cohorts according to glycemic control. We kept the threshold at < 58 mmol/mol for well-managed glycemic control and poorly managed ≥ 58 mmol/mol. Five mL of venous blood was drawn from each patient, which was then sent to the hospital laboratory for ALT level measurement. ALT level was considered elevated if higher than 40 IU/L.

SPSS 26 was used to analyze the obtained data. Age and laboratory parameters were calculated using mean and SD, while for gender and ALT elevation status, we used frequencies and percentages. An independent t-test was then used to compare the ALT levels and stratify age groups and gender. We kept the P value notable at ≤ 0.05.

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RESULTS

This study was conducted on 98 diabetic patients divided into two groups, well-controlled and poorly controlled glycemic. The mean age in well-controlled patients was 48.94±12.70 years, while it was 47.61±12.19 years in poorly controlled glycemic patients. The mean duration of diabetes and NAFLD in both groups can be seen in Table 1. Gender distribution can be seen in Figure 1. In well-controlled groups, 3 (6.1%) patients had raised ALT levels, while in the poorly controlled group, 10 (20.4%) patients had raised ALT levels (Table 2). The mean ALT level in the well-controlled group was notably lower, 17.78±11.09 IU/L, than that of the poorly controlled 27.43±13.57 IU/L (P = 0.0001) (Table 3). Stratifications of gender and age groups are presented in Table 4.

Table 1: Descriptive statistics

Glycemic control		Age (Years)	Duration of diabetes (Years)	Duration of NAFLD (Years)
Well controlled	Mean	48.94	6.76	3.02
	N	49	49	49
	Std. Deviation	12.706	1.888	1.377
Poorly controlled	Mean	47.61	6.55	2.92
	N	49	49	49
	Std. Deviation	12.198	1.757	1.320

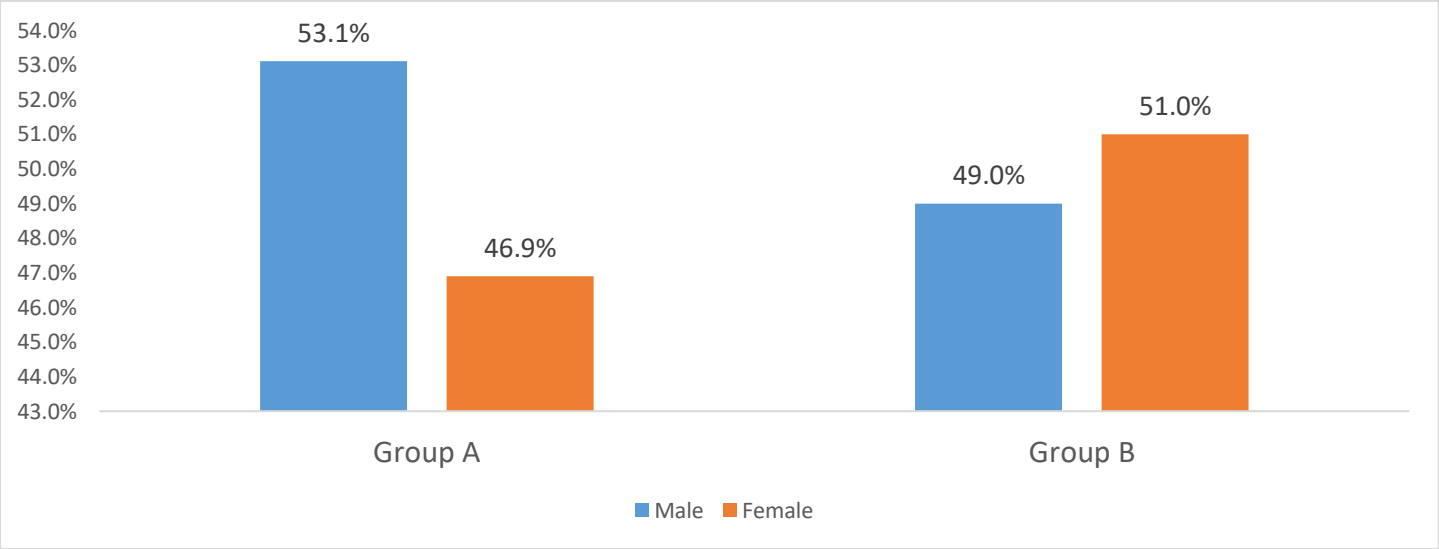

Figure 1: Gender distribution

Table 2: Comparison of raised ALT levels between both groups

		Raised ALT		Total
		Yes	No	
Glycemic control	Well controlled	3	46	49
		6.1%	93.9%	100.0%
	Poorly controlled	10	39	49
		20.4%	79.6%	100.0%
Total		13	85	98
		13.3%	86.7%	100.0%

Table 3: Comparison of ALT levels between both groups

	Glycemic control	N	Mean	Std. Deviation	P value
ALT level (IU/L)	Well controlled	49	17.78	11.097	0.0001
	Poorly controlled	49	27.43	13.574	

Table 4: Stratification of gender and age groups between the two groups with ALT levels

Gender		Glycemic control	N	Mean	Std. Deviation	P value
Male	ALT level (IU/L)	Well controlled	26	17.62	9.839	0.03
		Poorly controlled	24	24.92	13.468	
Female	ALT level (IU/L)	Well controlled	23	17.96	12.593	0.003
		Poorly controlled	25	29.84	13.502	
Age distribution (Years)		Glycemic control	N	Mean	Std. Deviation	P value
30 to 50	ALT level (IU/L)	Well controlled	24	20.17	13.091	0.008
		Poorly controlled	28	30.29	13.035	
51 to 70	ALT level (IU/L)	Well controlled	25	15.48	8.417	0.01
		Poorly controlled	21	23.62	13.644	

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DISCUSSION

In our study, we observed that the ALT levels in patients with well-controlled glycemia averaged 17.78±11.097 IU/L, which was notably lower than the levels in the poorly controlled group, where the mean ALT was 27.43±13.574 IU/L (p=0.0001). This finding sits well with other research, which suggests poor glycemic control is closely associated with liver dysfunction, particularly in patients with NAFLD. Islam et al. demonstrated that in around 19% of patients with type 2 DM, the ALT levels were raised compared to healthy cohorts (12). A survey by Malik et al. found that patients with elevated blood sugar had higher ALT levels than those with normal levels (13). Similarly, Miyake et al. demonstrated that higher HbA1c levels were linked to advanced liver fibrosis which is often leads to raised ALT levels (14).

Our results align with these findings underscoring the importance of maintaining a good glycemic control not only to manage diabetes but also to mitigate the advancement of liver disease in DM patients. Specifically in our study gender differences were obvious. We observed that male patients in the well-controlled group had a lower ALT when compared to those patients in the poorly controlled group (p=0.03). Likewise, the female patients in the well-controlled group had lower ALT levels when compared to the poorly controlled (p=0.003). These differences are in line with Akhtar et al. they reported that higher HbA1c levels were positively interrelated with elevated ALT levels in both male and female patients with NAFLD (15).

The age distribution in our study also showed notable association with raised ALT level. Patients aged 30 to 50 years with well-controlled diabetes exhibited a lower ALT level than those who had poorly controlled diabetes (p=0.008), this trend was also observed in patients aged 51 to 70 years as well, we observed similar findings where the poorly controlled diabetic patients had higher ALT level than their well-managed counterparts (p=0.01). These results are consistent with Kinoshita et al. which showed that improved glycemic control was related with improved liver function in patients with Type 2 diabetes and NAFLD (16).

Our study supports the idea that glycemic control is very important for the management of liver function in diabetic patients. Elevated HbA1c levels have been related to both increased ALT levels and the progression of liver fibrosis. HbA1c's role as a prognostic marker for liver dysfunction especially in the context of NAFLD is well-documented. Mahran et al. showed that higher ALT levels in diabetics were positively associated with insulin resistance and other metabolic risk factors which are common in those with poorly controlled diabetes (17).

From the above discussion it is evident that controlling blood glucose levels is not only important for managing diabetes but it is also important for preventing or slowing down the progression of NAFLD. Poor glycemic control worsens liver damage as indicated by the higher ALT levels in the poorly controlled group in our study. Our results suggest that better management of blood glucose possibly through lifestyle changes or pharmacological treatments that target both diabetes and NAFLD could notably improve liver function in diabetic patients.

CONCLUSION

We conclude that in well controlled type2 diabetic patients with NAFLD had notably lower elevated ALT levels as compared to poorly controlled type 2 diabetic patients with NAFLD. We suggest that clinicians should prioritize glycemic control in Type 2 diabetic patients especially those with NAFLD for further preventing damage to the liver.

DECLARATIONS

Data Availability Statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department Concerned. (IREB-38/DME/KMC)

Consent for publication

Approved

Funding

Not applicable

CONFLICT OF INTEREST

The authors declared an absence of conflict of interest.

AUTHOR CONTRIBUTION

ZAKIR KHAN (Post Graduate Resident)

Conception of Study, Data Collection, Development of Research Methodology Design, Study Design, Review of manuscript, final approval of manuscript, Data entry, Drafting article, Manuscript revisions, critical input.

INAM ULLAH KHAN (Associate Professor)

Conception of Study, Final approval of manuscript.

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