

Original Article

FREQUENCY OF TYPE 2 DIABETES MELLITUS AND COMPARISON OF THE MEAN ALT AND AST LEVELS BETWEEN THE TYPE 2 DIABETIC AND NON-DIABETIC PATIENTS

M.Saeed-uz-Zaman, Imran Taqi, M.Yousuf Jamal, Rozina Mustafa and Momna Ijaz

Objective: To determine the frequency of Type 2 diabetes mellitus and comparison of the mean ALT and AST levels between Type 2 diabetic patients and non-diabetic patients.

Methods: The study was conducted in Department of Medicine, Services Hospital Lahore. Randomly 300 patients were enrolled from outpatient department of medicine. Sample size of 300 cases was calculated with 95% confidence level and 3% margin of error taking expected frequency of diabetics to be 7.6%.² Patients were selected with Non probability, consecutive sampling technique. Patients were investigated by performing Fasting blood glucose level, oral glucose tolerance test and Glycated HemoglobinA1c (HbA1c) level and diagnosed as diabetics as per American diabetic association criteria⁴. Newly diagnosed diabetics were segregated as type 1 and type 2 on the basis of clinical criteria⁴ i.e. age of onset, body mass index (BMI), insulin requirement as initial therapy, previous history of diabetic ketoacidosis and associated autoimmune disorders.

Results: Frequency distribution of patients with Type 2 diabetes mellitus showed that among 300 patients, 19%(n=57) had Type 2 diabetes mellitus. Mean ALT levels were deranged more in Type 2 diabetics (38.2 ± 13.4) as compared to non diabetic patients (29.7 ± 12.6). Mean AST levels were also deranged more in Type 2 diabetics (39.7 ± 12.7) as compared to non diabetics (32.6 ± 14.1).

Conclusions: Mean AST and ALT values in patients with type 2 diabetes mellitus were deranged more than that of non diabetic patients.

Keywords: Type 2 diabetes mellitus, Alanine aminotransferase, Aspartate aminotransferase.

Introduction

Globally the number of diabetic patients has emerged as a challenge because of a significant increase in patients over past few decades.¹ Incidence of Type 2 diabetes mellitus for the South Asia region was observed to be 7.47% in 2005, and raised to 7.60% in 2010.² The frequency of Type 2 diabetes mellitus is rising in Pakistan because of our social and sedentary life style.³ As Non insulin dependent diabetes is associated with liver insult including fat infiltration/steatosis and steatohepatitis,⁹ So, deranged alanine transaminase (ALT) and Aspartate transaminase (AST) are commonly seen in these patients. Aspartate transaminase (AST) and alanine transaminase (ALT) are the enzymes that are used to predict liver damage in several conditions like viral hepatitis,⁵ autoimmune hepatitis, pregnancy, Drugs, Alcoholic and in nonalcoholic Fatty liver disease.⁶⁻⁷ Elmahi et al. in 2014 in a randomized controlled trial showed that ALT and AST were significantly raised in diabetic patients than in non-diabetics ALT (23 ± 17 in diabetics vs. 15 ± 4.0 in non-diabetics) and AST (34 ± 15 in diabetics vs. 25 ± 5.0

in non-diabetics).⁸ Few studies have been observed in context with deranged liver transaminases in type 2 diabetics up till now in Pakistan. Therefore need exist to conduct this study in our population to assess the deranged liver enzymes with reference to diabetes. This will help us to see the progression of the disease in terms of early detection of liver disorders, associated with Type 2 diabetes mellitus; and timely management regarding poor glycemic control including life style modification of Type 2 diabetes mellitus.

Methods

The study was conducted in Department of Medicine, Services Hospital Lahore. This study was a cross sectional survey in which 300 patients were enrolled from outpatient department of medicine. Sample size of 300 cases was calculated with 95% confidence level and 3% margin of error taking expected frequency of diabetics to be 7.6%.² Patients were selected with Non probability, consecutive sampling technique. Patients of both sex groups with ages in the range of 20-70 years and who sign written informed consent to participate in the study were

enrolled. Patients who were already known patients of Diabetes mellitus, history of fever associated with deranged serum transaminases in past four weeks, drug history regarding steroids/Hakeem medications/alcohol intake, pregnant patients, having hepatitis B and C (on viral serology) as per history and clinical record were excluded from study.

Written informed consent, detailed history and examination were done for each patient. Patients were investigated by performing Fasting blood glucose level, oral glucose tolerance test and Glycated HemoglobinA1c (HbA1c) level and diagnosed as diabetics as per American diabetic association criteria⁴. Newly diagnosed diabetics were segregated as type 1 and type 2 on the basis of clinical criteria⁴ i.e. age of onset, body mass index (BMI) ,insulin requirement as initial therapy ,previous history of diabetic ketoacidosis and associated autoimmune disorders. Both Type 2 diabetics and non diabetics were evaluated for their transaminase levels to make a comparison between the two groups. Data collected was entered and analysed into SPSS version 23.0. Numerical variables i.e. age, alanine transaminase level, aspartate transaminase level, fasting blood glucose and BMI were presented by Mean±S.D. Categorical variables i.e. gender and Type 2 diabetic were presented as frequency and percentage. Mean ALT and AST levels were compared between the Type 2 diabetics and non-diabetics. Independent sample t-test was applied for comparison of mean alanine transaminase level and aspartate transaminase level between the two groups taking p-value of ≤0.05 as statistically significant. Data were stratified for age and gender to address effect modifiers. Post stratification independent sample t-test was applied taking p-value of ≤0.05 as statistically significant.

Results

A total of 300 patients fulfilling the inclusion /exclusion criteria were enrolled in the study. Age distribution of patients was done and three groups were made. group I (age 20 -34 years), group II(age 35-49 years) and group III(age>50years).Age distribution of patients showed that 87 patients were in age group I ,90 were in age group II and 123 were in age group III.

Gender distribution of patients was done which showed that 62.7% were males while 37.3% were females. Frequency distribution of patients with Type 2 diabetes mellitus showed that among 300 patients, 57(19.0%) had Type 2 diabetes mellitus. Mean ALT levels were compared between Type 2

diabetics and non diabetic patients which showed that Mean ALT levels in Type 2 diabetic patients was 38.2±13.4 and in non diabetics was 29.7±12.6 with a p-value of p=0.000, which is statistically significant. Mean AST levels were compared between Type 2 diabetics and non diabetics which showed that Mean AST levels in diabetic patients were 39.7±12.7 and in non diabetics 32.6±14.1 with a p-value of p=0.001, which is statistically significant as well. Stratification with respect to gender for comparison of ALT levels in both groups was done which showed that it is significant for both males and females with P values 0.001 and 0.002 respectively which is significant. Stratification with respect to gender for comparison of AST levels in both groups was done which showed that it is significant in female gender with a p value =0.007 but insignificant in male gender with p value=0.020.

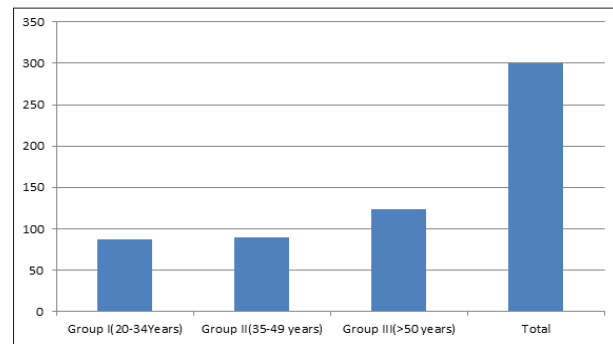


Fig-1: Distribution of age groups.

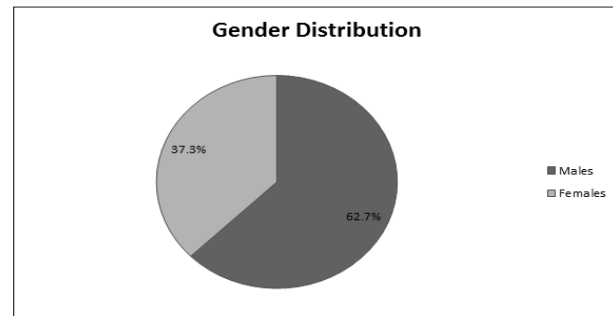


Fig-1: Distribution of age groups.

Table-1: Frequency distribution of Type 2 diabetes mellitus.

Type-2 diabetes mellitus	Frequency	Percentage
Yes	57	19.0
No	243	81.0
Total	300	100.0

Table-2: Comparison of ALT levels in both groups.

Type-2 diabetes mellitus	N	Mean	Std. Deviation	P-value
ALT Levels Yes	57	38.2	13.4	0.000
ALT Levels No	243	29.7	12.6	

Table-3: Comparison of Mean AST levels in both groups.

	Type-2 diabetes mellitus	N	Mean	Std. Deviation	P-value
AST Levels	Yes	57	39.7	12.7	0.001
	No	243	32.6	14.1	

Table-4: Stratification with respect to gender for comparison of ALT levels in both groups

	Gender	Type-2 diabetes mellitus	N	Mean	Std. Deviation	P-value
ALT Levels	Male	Yes	38	36.4	13.0	0.001
		No	150	29.2	12.1	
ALT Levels	Female	Yes	19	41.8	14.0	0.002
		No	93	30.5	13.7	

Table-5: Stratification with respect to gender for comparison of AST levels in both groups

	Gender	Type-2 diabetes mellitus	N	Mean	Std. Deviation	P-value
AST Levels	Male	Yes	38	37.9	12.1	0.020
		No	150	32.0	14.1	
AST Levels	Female	Yes	19	43.3	13.6	0.007
		No	93	33.5	14.3	

Discussion

Deranged Liver function tests have been reported in association with type 2 diabetic patients, higher ALT levels being most prime finding.¹¹

In our study, the means of serum transaminases i.e. ALT/AST were within the normal values in non diabetic patients but significantly raised mean values in Type 2 diabetic patients. In a study on Mexican American patients, more deranged liver function tests were observed in diabetic patients as compared to non diabetic patients.¹⁵ Serum transaminase measurements of type 2 diabetes patients were more elevated when compared with non diabetic patients which was observed in study done in Sudan by Hind M. Elmahi et al.; 2014,⁸

which was also supportive in the background of our study.

Some studies on type 2 diabetics in India have reported abnormal Liver function tests with a prevalence of 50-70%^{16,17,18,19}. This is higher prevalence as compared to studies in Europe and United States where raised LFT in diabetics have been observed at a frequency of 7.822.9%.²⁰ The higher occurrence of these values in indian studies may be due to inclusion of patients with coexisting illnesses like non alcoholic steatohepatitis, alcoholic liver disease and other causes of chronic liver disease. In our study we observed genderwise variability of deranged liver functions tests. In female type 2 diabetics, mean ALT/AST values were more raised when compared with male type 2 diabetics. But in other studies data is deficient for variability of LFT in diabetics on basis of gender. Our study emphasizes the monitoring of diabetic patients for Liver function tests and further required workup. Hepatic dysfunction is usually not assessed in diabetic patients as compared to systemic evaluation for cardiac, renal and neurological examination including eye assessment for diabetic changes. This is very common practice in primary care physicians, who manage a large number of diabetic patients.²¹ Early detection of deranged ALT/AST levels in type 2 diabetics will result in better patient care and lead to good prognosis and clinical outcome in these patients.^{22,23}

Conclusion

Mean AST and ALT values in patients with type 2 diabetes mellitus were deranged more than that of non diabetic patients. So, liver function tests monitoring is highly suggested for Type 2 diabetic patients.

*Department of Medicine
SIMS/ Services Hospital, Labore
www.esculapio.pk*

References

- Chen L, Magliano DJ, Zimmet PZ. The worldwide epidemiology of type 2 diabetes mellitus-- present and future perspectives. *Nat Rev Endocrinol* 2011;8(4):228-36.
- Cheema A, Adeloje D, Sidhu S, Sridhar D, Chan KY. Urbanization and prevalence of type 2 diabetes in Southern Asia: A systematic analysis. *J Glob Health* 2014;4(1):010404.
- Meo SA, Zia I, Bukhari IA, Arain SA. *J Pak Med Assoc.* 2016 Dec;66(12):1637-1642.
- Classification and Diagnosis of Diabetes: Standards of Medical Care in Diabetes 2018 American Diabetes Association: *Diabetes Care* 2018 Jan; 41 (Supplement 1): S13-S27 Available from http://care.diabetesjournals.org/content/41/Supplement_1/S13.Fulltext.pdf
- Botros M, Sikaris KA. The De Ritis Ratio: The Test of Time. *Clin Biochem Rev* 2013;34(3):11730.
- Goh GB, Pagadala MR, Dasarathy J, Unalp-Arida A, Pai RK, Yerian L, et al. Age impacts ability of aspartate-alanine aminotransferase ratio to predict advanced fibrosis in nonalcoholic Fatty liver disease.

- Dig Dis Sci 2015;60(6):1825-31.
7. Song SH1, Kwon CI, Jin SM, Park HJ, Chung CW, Kwon SW, et al. Clinical characteristics of acute cholecystitis with elevated liver enzymes not associated with choledocholithiasis. *Eur J Gastroenterol Hepatol* 2014;26(4):452-7.
 8. Elmahi HM, Abdrabo AA. Determinants of abnormal liver function tests in diabetes type 2 patients in Sudan. *J Scien* 2014;14(1):45-9.
 9. Ahmadi H, Azar ST. Liver disease and diabetes: association, pathophysiology, and management. *Diabetes Res Clin Pract* 2014;104(1):53-62.
 10. Chatila R, West AB. Hepatomegaly and abnormal liver tests due to glycogenosis in adults with diabetes. *Med.* 1996;75(6):327-33.
 11. Gonem S, Wall A, De P. Prevalence of abnormal liver function tests in patients with diabetes mellitus. 2007;13:157.
 12. Harrison SA. Liver disease in patients with diabetes mellitus. *J Clin Gastroenterol*. 2006;40(1):68-76.
 13. Ni H, Soe HH, Htet A. Determinants of abnormal liver function tests in diabetes patients in Myanmar. *Int J Diabet Resear.* 2012;1(3):36-41.
 14. Nannipieri M, Gonzales C, Baldi S, Posadas R, Williams K, Haffner SM, Stern MP, Ferrannini E. Liver enzymes, the metabolic syndrome, and incident diabetes: the Mexico City diabetes study. *Diabetes care.* 2005;28(7):1757-62.
 15. Meltzer AA, Everhart JE. Association between diabetes and elevated serum alanine aminotransferase activity among Mexican Americans. *American J Epidemiol.* 2015;146(7):565-71.
 16. Prabhudeva N, Pasha G, Mounika K. Hepatic dysfunction in diabetes mellitus: Biochemical and ultrasonological study. *J Acad Ind Res.* 2014;3:1647.
 17. Chitkara E. Alarming high levels of transaminases in non-insulin dependent diabetes mellitus. *Indian J Basic Appl Med Res.* 2014;3:5448.
 18. Patra TK, Paul R, Mandal SK, Mandal L, Mandal J, Banerjee AK, et al. Liver function tests in type 2 diabetes mellitus patients with and without oral hypoglycemic agents and statin intake. *Indian Med Gaz.* 2012;10:38893.
 19. Takhelmayum R, Thanpari C, Singh TP. Liver dysfunction in diabetes patients admitted in referral hospital. *Bali Med J.* 2014;3:1224.
 20. Harris EH. Elevated liver function tests in type 2 diabetes. *Clin Diabetes.* 2005;23:1159
 21. Saudek CD. The role of primary care professionals in managing diabetes. *Clin Diabetes.* 2002;20:656
 22. Ahmadi H, Azar ST. Liver disease and diabetes: Association, pathophysiology, and management. *Diabetes Res Clin Pract.* 2014;104:5362. [PubMed]
 23. Jaafar J, de Kalbermatten B, Philippe J, Scheen A, Jornayvaz FR. Chronic liver diseases and diabetes. *Rev Med Suisse.* 2014;10:1254, 125660. [PubMed]