

Association between Type 2 Diabetes and Elevaton of Liver Enzymes

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ABSTRACT

Millions of people throughout the world are impacted by T2DM, often known as type 2 diabetes mellitus. This study looked at the relationship between elevated liver enzyme levels and the prevalence of T2DM in certain Iraqis. Only a small amount of research has been done on the connection between liver enzymes and T2DM.

Methods: In all, 80 people (40 with diabetes and 40 without) participated in the study. Blood serum was examined to determine the activity of alanine and aspartate aminotransferases (ALT, AST), -Glutamyl transpeptidase (GGT), and alkaline phosphatase (ALP). Fasting blood glucose (FBG) of less than 126 mg/dL or self-reported recent usage of insulin or anti-diabetic drugs were used to define T2DM.

Results: When compared to the non-diabetes group, the diabetic group's AST and ALP levels were considerably ($P < 0.05$) higher. In contrast, there was no difference in ALT ($P > 0.05$). However, AST and ALT data based on gender revealed no statistically significant difference ($P > 0.05$) between any of the groups for either enzyme. However, as compared to the non-diabetes male and female groups, the ALP enzyme findings showed that there was a significant increase ($p < 0.05$) in the diabetes male group.

Conclusions: T2DM patients frequently have increased liver enzyme levels.

KEYWORDS: Type 2 Diabetes, Elevaton, Liver Enzymes

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INTRODUCTION

A crucial organ in the body, the liver carries out numerous functions such as digestion, immunity, metabolism, detoxification, and vitamin storage. Almost all of the organ systems in the body involve it. By interacting with the endocrine and gastrointestinal systems, it aids in digestion and metabolism. The liver is where cholesterol homeostasis is maintained and fat-soluble vitamins are stored. It safeguards copper and iron.

It facilitates the production of protein and clotting factor in hemology. Prior to conjugation, the liver turns heme into unconjugated bilirubin. It creates carrier proteins that are essential for growth and reproduction and takes involvement in the metabolism of sex hormones [1].

The most accurate indicator of liver pathology is a substance called alanine aminotransferase (ALT), which is exclusively present in the cytoplasm of hepatocytes. Because it can only be found in the liver, ALT is a very accurate sign of hepatocellular damage [2]. Hepatocytes' cytoplasm and mitochondria contain AST as well. Leukocytes, erythrocytes,

renal, brain, pulmonary, and pancreatic tissue, as well as other tissues including cardiac muscle, can also contain it.

Although less precise measures of liver function, AST is a sensitive sign of hepatic damage [3]. -Glutamyl transpeptidase, often known as GGT, is present in many different tissues. Its serum activity rises in hepatobiliary disease, pancreatic disease (even in the absence of biliary blockage), pulmonary illness, diabetes, neuromuscular illnesses, and pancreatic disease, while it also rises after a myocardial infarction [4].

According to [5-8] studies, type 2 diabetes is associated with elevated liver enzymes. In the past, several studies from different parts of the world were conducted to evaluate the association between liver enzymes and T2DM, and they revealed altered liver parameters in diabetic subjects [9-13]. The present study was designed to assess the prevalence of increased liver enzymes among Iraqi patients with Type 2 diabetes mellitus as compared to the non-diabetic healthy people because there aren't any recent studies of this kind in the population of that country.

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METHODS

In total, 80 people between the ages of 45 and 74 were employed in the study, 40 of whom had diabetes and 40 of whom did not. Fasting blood glucose (FBG) of less than 126 mg/dL or self-reported recent usage of insulin or anti-diabetic drugs were used to define T2DM . The venous blood was drawn using single-use syringes to get about 3 mL. The serum sample was divided and put away for later analysis. Kinetic techniques were used to measure the levels of enzyme activity (ALT, AST,ALP, and GGT) in the serum.

Statistical analysis

The data were statistically analysed using SPSS, which stands for Statistical Package for Social Science. The information

was presented as arithmetical mean values and standard error. A separate sample t test was carried out.

RESULTS

Table 1 shows that there were no statistically significant differences in the average values of the liver enzymes (U/L) ALT, AST, ALP, and GGT between the non-diabetic male group and the non-diabetic female group when the non-diabetic and diabetic groups were compared by gender. The average levels of ALT, AST, and GGT between the diabetic male group and the diabetic female group did not differ in a statistically significant way either. The table also demonstrates that, when compared to the diabetic female group, the ALP level in the diabetic male group significantly rose ($P>0.05$).

Table 1. Liver enzymes levels in the non-diabetic and diabetic groups by gender.

Variables	Male Nondiabetic	Female Nondiabetic	P-value	Male diabetic	Female diabetic	P-value
ALT (U/L)	6.34 ± 1.04	6.29 ± 0.87	0.97	9.71 ± 1.38	7.65 ± 0.65	0.18
AST (U/L)	3.89 ± 2.82	3.97 ± 0.69	0.95	6.50 ± 1.18	7.43 ± 1.26	0.59
ALP (U/L)	295.07 ± 35.87	269.80± 35.13	0.62	434.99 ± 33.10	324.83± 31.452517	0.02*
GGT (U/L)	23.10 ± 0.64	22.80 ± 0.75	0.76	44.60 ± 1.01	42.30 ± 2.06	0.44

Note: P-values are obtained from (independent) sample *t* test in comparison between nondiabetes and diabetes groups by gender.

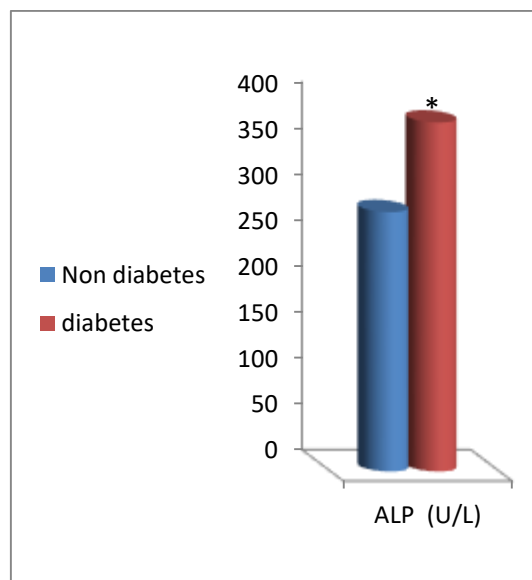
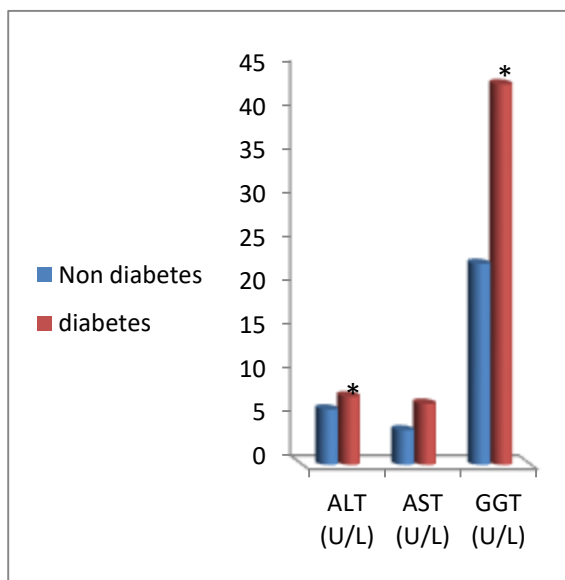


Figure 1. shows a comparison of female diabetics with non-diabetics and diabetics. Refers to the fact that there are substantial differences between groupings.

The findings in figure (1) showed that the concentrations of ALP, GGT, and ALT were significantly higher in the diabetic groups than in the nondiabetic groups ($P>0.05$).

DISCUSSION

The results of the current investigation showed a significant rise ($P0.05$) of the liver enzymes (GGT, ALP, and ALT) in the diabetic groups compared to the nondiabetic groups, which is in line with the notion that the liver is engaged in managing glycemic homeostasis through glycogenesis and gluconeogenesis [14]. Elevated liver enzyme concentrations,

which are also markedly greater in person with syndrome than in the general population, may point to the presence of metabolic syndrome or high blood glucose levels [15]. Hepatitis or excessive alcohol intake are not necessarily indicated by elevated liver enzyme values.

Rising liver enzyme levels could be caused by an abundance of glycogen being deposited in hepatocytes, which is linked

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to poorly controlled diabetes and a considerable response to glycemic control [16]. The current findings agree with those of [7,10,17] who discovered that aberrant liver enzyme levels are more common in diabetics than in healthy people.

When comparing diabetic males to diabetic females, the ALP enzyme findings showed a significant increase (p 0.05). This finding may confirm the work of [18,19]. The additional fat that is being deposited in the liver may be the reason of the elevated serum ALP. Hepatic insulin resistance is hypothesised to be brought on by fatty liver. As a result, according to [20], ALP may act as a marker of the aetiology of diabetes. The intestine, placenta, germinal tissue, liver, bone, and kidney all contain alkaline phosphatases as well [21].

REFERENCES

- I. Kalra, A., Yetiskul, E., Wehrle, C.J., and Tuma,F.(2021). .Physiology, Liver.. In: StatPearls [Internet]. Treasure Island (FL).
- II. Lee ,D.H., Ha, M.H., Kim ,J.H., Christiani, D.C., Gross ,M.D., Steffes, M., Blomhoff, R., Jacobs, D.R. (2003). : Gamma-glutamyltransferase and diabetes-a 4 year follow-up study. *Diabetologia.* ; 46: 359-364.
- III. Lee, D.H., Silventoinen, K., Jacobs ,D.R., Jousilahti, P. and Tuomileto, J. (2004). : Gamma-Glutamyltransferase, obesity, and the risk of type 2 diabetes: observational cohort study among 20,158 middle-aged men and women. *J Clin Endocrinol Metab*; 89: 5410-5414.
- IV. Berk, P., & Korenblat, K. (2011). Approach to the Patient with Jaundice or Abnormal Liver Tests. In *Goldman's Cecil Medicine: Twenty Fourth Edition (Vol. 1, pp. 956-966). Elsevier Inc..* <https://doi.org/10.1016/B978-1-4377-1604-7.00149-4>.
- V. Ahn, H.R., Shin, M.H., Nam, H.S. , Park, K.S. , Lee, Y.H., Jeong, S.K., Choi ,J.S. and Kweon,S.S. (2014). The association between liver enzymes and risk of type 2 diabetes: the Namwon study. *Diabetol Metab Syndr*; 6(14) .
- VI. Wang ,Y., Koh ,W., Yuan, J. and Pan, A. (2016). Association between liver enzymes and incident type 2 diabetes in Singapore Chinese men and women ;*BMJ Open Diabetes Research and Care* 2016;4:e000296.
- VII. Islam, S., Rahman, S., Haque, T., Sumon, A. H., Ahmed, A. M., & Ali, N. (2020). Prevalence of elevated liver enzymes and its association with type 2 diabetes: A cross-sectional study in Bangladeshi adults. *Endocrinology, diabetes & metabolism*, 3(2), e00116.
- VIII. Noroozi Karimabad, M., Khalili, P., Ayoobi, F., Esmaeili-Nadimi, A., La Vecchia, C., & Jamali, Z. (2022). Serum liver enzymes and diabetes from the Rafsanjan cohort study. *BMC endocrine disorders*, 22(1), 127.
- IX. Jha,S.K. , Yadav,N.K. and Rizal,S. (2021). Prevalence of elevated liver enzymes and its association with type 2 diabetes: A Descriptive Cross-Sectional Study among Nepalese Adults from Biratnagar, Nepal. *Asian Journal of Medical Sciences* ; 12(6) :50-55.
- X. Alam, S., Raghav, A., Reyaz, A., Ahsan, A., Ahirwar, A. K., Jain, V., Agarwal, S., & Tripathi, P. (2021). Prevalence of elevated liver enzymes and its relationship with type 2 diabetes mellitus in North Indian adults. *Metabolism open*, 12, 100130.
- XI. Meyhöfer ,S. , Eckert,A.J. Hummel ,M., Laimer ,M.,Roden ,M.,Kress ,S., Seufert ,J.,Meyhöfer ,S.M., Holl ,R.W.(2021). Elevated liver enzymes and comorbidities in type 2 diabetes: A multicentre analysis of 51 645 patients from the Diabetes Prospective Follow-up (DPV) database. *Diabetes, Obesity and Metabolism: A Journal of Pharmacology and Therapeutics*;24 (4) : 727-732.
- XII. Wan, J.Y., Yang, L.Z. (2022). Liver Enzymes are Associated with Hyperglycemia in Diabetes: A Three-Year Retrospective Study. *Diabetes Metab Syndr Obes.*;15:545-555. <https://doi.org/10.2147/DMSO.S350426>.
- XIII. Eltayeb, A. , Faisal, S., Abdorabo, A., Ahmed, S., Gurashi, R., & Modawe, G. (2022). Evaluation of Liver Enzymes Activities among Type 2 Diabetic Patients, Attending Alribat University Hospital, Khartoum State: Evaluation of Liver Enzymes Activities among Type 2 Diabetic Patients. *Iraqi National Journal of Medicine*, 4(2), 251–259. <https://doi.org/10.37319/inqjm.4.2.9>
- XIV. Han, H. S., Kang, G., Kim, J. S., Choi, B. H., & Koo, S. H. (2016). Regulation of glucose metabolism from a liver-centric perspective. *Experimental & molecular medicine*, 48(3), e218. <https://doi.org/10.1038/emm.2015.122>.
- XV. Zhang, L., Ma, X., Jiang, Z., Zhang, K., Zhang, M., Li, Y., Zhao, X., & Xiong, H. (2015). Liver enzymes and metabolic syndrome: a large-scale case-control study. *Oncotarget*, 6(29), 26782–26788.
- XVI. Al-Judaibi ,B. , Bain ,V.G., Sis,B. (2013). An Unusual Cause of Elevated Liver Enzymes in a Diabetic Patient. *Clinical Challenges And Images In Gi*; 144(7) :1578. <https://doi.org/10.1053/j.gastro.2013.01.061>.
- XVII. Belkacemi,L., and Belalia,M. (2016).Cross-sectional pilot study about the liver enzymes profile in type 2 diabetic patients from an Algerian west region: Wilaya of Mostaganem,*Diabetes & Metabolic Syndrome: Clinical Research & Reviews*; 10(1) ,:S147-S150.
- XVIII. Chen, S.CC., Tsai, S.P., Jhao, JY., Jiang, WK., Tsao,C.K. & Chang,LY. (2017). Liver Fat, Hepatic Enzymes, Alkaline Phosphatase and the Risk of Incident Type 2 Diabetes: A Prospective Study of 132,377 Adults. *Sci Rep* 7, 4649. <https://doi.org/10.1038/s41598-017-04631-7>.

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- XIX. Moshtaghie , A. A., Taher, M. , Urogi , H., Emami , A., Amini , M. , Pourmoghadas , H., Taherian, A. , Facori , M. (2000). Interrelationship Between Blood Glucose Level And Incidence Of Bone Disease In Diabetes. *Medical Journal of Islamic Academy of Sciences* 13:3, 119-124.
- XX. Deepika ,G., Veeraiah, N., Naveed, S., Ramana, M.V.(2016). Serum alkaline phosphatase and high sensitivity C-reactive protein in type II diabetes mellitus: a risk of cardio vascular disease in South Indian population. *Int J Res Med Sci*;4: 1107- 14.
- XXI. Sharma, U., Pal, D., & Prasad, R. (2014). Alkaline phosphatase: an overview. *Indian journal of clinical biochemistry : IJCB*, 29(3), 269–278.
<https://doi.org/10.1007/s12291-013-0408-y>