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Aspartate and alanine transaminases (ALT and AST) and their relation to type 2 diabetes

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Abstract

Among the disorders that occur in the body of type 2 diabetic patients are elevated liver enzyme levels. in the blood, caused by chronic elevated glucose in the blood, without control, causing damage in liver cells, then the function of it, Through a research conducted in the diabetes clinic at Al-Bayda city, the samples of blood were drawn from two groups of donors, the non-diabetic group (50 males and 50 female diabetic group (50 males and 50 female), .Standard procedures were used to analyze blood samples, and through statistical analysis, the following was identified: the men age of the non-diabetes group was 69± 1.1 years, whereas among the diabetic group was 67.12± 1.1 years. mean of fasting blood glucose (FBG), ALT, and AST of the men in the non-diabetic group , were 93.32 ± 1.9, 12.88 ± 1.1, and 18.76 ± 0.72. In the diabetic group, mean of fasting blood glucose (FBG), ALT, and AST were 208.3 ± 12, 16., 52 ± 1.7, and 21.08 ± 1.8. Compared to non-diabetics, diabetics had considerably higher fasting blood glucose levels; However The two groups did not differ from one another, related to ALT and AST levels mean significantly. In the non-diabetic group of females, mean of fasting blood glucose (FBG), ALT and AST were 93.3 ± 2,.1, 22,.12 ± 0.88, and 17.96 ± 0.82. In the diabetic group, mean fasting blood glucose (FBG), ALT, and AST levels were 192.0 ± 12, 19.64 ± 1.7, and 23.56 ± 1.6. .Compared to non-diabetics, diabetics exhibited noticeably higher fasting blood glucose, ALT, and AST values. The patient must improve his lifestyle by eating right, exercising, taking proper medication, and other good lifestyle methods to avoid such disorders.

Keywords: ALT, AST, type 2 diabetes

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أسبارتات والألانين ترانساميناز ALT وAST وعلاقتهما بمرض السكري من النوع الثاني

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الملخص

من بين الاضطرابات التي تحدث في جسم مريض السكري من النوع الثاني ارتفاع مستويات انزيمات الكبد في الدم، ومن خلال دراسة أجريت في قسم السكري بمستشفى الثورة بمدينة البيضاء تم سحب عينات الدم من مجموعتين من المتبرعين: المجموعة غير المصابة بالسكري (50 ذكر و50 أنثى) والمجموعة المصابة بالسكري (50 ذكر و50 أنثى).واستخدمت إجراءات قياسية للحصول عل عينات الدم وتحليلها، ومن خلال التحليل الإحصائي تم تحديد ما يلي كان عمر الرجال في المجموعة غير المصابة بالسكري 69.14 ± 1.1 سنة، بينما كان في المجموعة المصابة بالسكري 67.12 ± 1.1 سنة. في المجموعة غير المصابة بالسكري من الرجال، كان متوسط مستويات جلوكوز الدم الصائ م(FBG) وALT و1.9 ± 93.32 AST و12.88 ± 1.1 و18.76 ± 0.72. في المجموعة المصابة بالسكري، كان متوسط مستويات جلوكوز الدم الصائم (FBG) وALT و12 ± 208.3 AST و16.52 ± 1.7 و21.08 ± 1.8. ارتفعت مستويات جلوكوز الدم الصائم بشكل ملحوظ لدى مرضى السكري مقارنة بغير المصابين بالسكري؛ ولم تكن مستويات ALT وAST مختلفة بشكل ملحوظ لدى مرضى السكري مقارنة بغير المصابين بالسكري. ،في المجموعة غير المصابة بالسكري من الإناث، كان متوسط مستويات جلوكوز الدم الصائم (FBG) وALT و 93.3 AST ± 2،122.،12 ± 0.88، و17.96 ± 0.82. في المجموعة المصابة بالسكري، كان متوسط مستويات جلوكوز الدم الصائم (FBG) وALT و12 ± 192.0 AST، و19.64 ± 1.7، و23.56 ± 1.6. وقد زادت مستويات جلوكوز الدم الصائم وALT وAST بشكل ملحوظ لدى مرضى السكري مقارنة بغير المصابين بالسكري.

الكلمات المفتاحية: إنزيم ألانين ترانس أمينـاز (ALT)، إنـزيم أسـبارتات تـرانس أميناز (AST)، مرض السكري من النوع 2

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Introduction :

Persons who have type 2 diabetes have elevated levels of liver enzymes, which are caused by disorders of metabolism that occur in the body, hepatocellular metabolism including them; Hepatocellular injury is strongly indicated by high levels of the enzymes alanine transferase (ALT) and aspartate aminotransferase (AST), The most precise marker is ALT, because this enzyme is only found in this organ (Lee DH et al.,2004), Since AST is present in other organs, it is a less accurate indicator of liver function (Lee DH et al., 2003), Insulin resistance in this case leads to directly inhibiting hepatic glucose production and glycogen metabolism in the liver, which is the cause of the rise in hepatic glycogen production.(Michael MD et al., 2000), leading to a rise in the liver's fat buildup and fatty liver inflammation; this can cause cirrhosis of the liver's cells if left untreated (Han HS et al., 2016; Adeva MM et al., 2016), elevated glucose levels in the blood, with no regulation, cause this damage in the liver. AST and ALT are released from cells when they are damaged. and increased blood levels of these enzymes (Huang X-J et al., 2006), many factors are linked to enzymes of liver in people with type 2 diabetes including age, concentration of glucose in blood, measure of mass , injury of the liver or pancreas, intake of medicine for antidepression (Islam S et al., 2020).The purpose of this research was to determine how diabetes affected blood levels of ALT and AST.

Note: The normal range of fasting blood glucose (FBG) is 70-99 mg/dl, alanine transferase (ALT) is 10-40 mg/dl in men and 7-35 mg/dl in women, and aspartate aminotransferase (AST) is 10-40 mg/dl in men and 9-32 mg/dl in women

Materials and methods:

These studies were conducted between March 2023 and August 2024. The donors in this study were 100;, all donors received the same care, whether medically or nutritionally. The non-diabetes group was 50 (25 males, 25 females), and the diabetes group was 50 (25 males, 25 females); their ages ranged between 50 and 90 years. Blood was taken from the donors and collected in standard pipes for analysis; the serum was separated to check levels of FBG, ALT, and AST, and Abbott Architect analyzer equipment was used to analyze ALT and AST levels

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statistical analysis :

At P < 0.05 level of significance, Minitab 17 was used,The difference between the two samples was demonstrated using the t-test technique.

Results:

Table 1 data: 100 donors, 50 donors (25 male and 25 female), were in the group that is not diabetic. the group with diabetes consists of 50 donors (25 males and 25 females),the mean age of the non-diabetic group was 69.14 +1.1 years,while in the diabetic group, it was 67.12 ± 1.1 years.

Table 1: Data of the diabetic and non-diabetic groups

Parameters	Non diabetic (n=50)	diabetic (n=50)
Male	n=25	n=25
Female	n=25	n=25
Age (50-90) years	69.14 ±1.1	67.12 ± 1.1

Male results subjects were presented in (Table 2). In the non-diabetic group, mean of fasting blood glucose (FBG), ALT, and AST were 93.32 ± 1.9, 12.88 ± 1.1, and 18.76 ± 0.72. In the diabetic group, mean of fasting blood glucose (FBG), ALT, AST were 208.3 ± 12, 16.52 ± 1.7, and 21.08 ± 1.8 .ALT and AST levels do not significantly differ between the diabetic and non-diabetic groups, although the diabetic group's fasting blood glucose levels are significantly higher than those of the non-diabetic group.

Table 2: Fasting blood glucose (FBC), ALT, and AST levels in group s of non-diabetic and diabetic male

	Non diabetic (n=25)	diabetic (n=25)	P – value	Significant level
(FBG) (mg/dl)	93.32 ±1.9	208.3 ±12	0.000	P < 0.05 significant
ALT(mg/dl)	12.88±1.1	16.52±1.7	0.077	P > 0.05 non significant
AST(mg/dl)	18.76 ±0.72	21.08 ±1.8	0.245	P > 0.05 non Significant

Female results subjects were presented in Table 3: in the non-diabetic group, mean of fasting blood glucose (FBG), ALT, AST were 93.3±2

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11, 11.12±0.86, 17.96±0.82, in the diabetes group, mean fasting blood glucose (FBG), ALT, AST were 192.0±12, 19.64±1.7, 23.56±1.6; FBG, ALT, AST were considerably higher in the diabetic group than in the non-diabetic group .

Table 3:Fasting blood glucose (FBC), ALT, and AST levels in groups of non-diabetic and diabetic female

	Non diabetic(25)	Diabetic(25)	P – value	Significant level
(FBG) (mg/dl)	93.3 ±2.	192.0±12	0.000	P < 0.05 significant
ALT(mg/dl)	11 .12±0.86	19.64±1.7	0.000	P < 0.05 significant
AST(mg/dl)	17.96 ±0.82	23.56± 1.6	0.004	P < 0.05 significant

Discussion

Blood samples of donors with type 2 diabetes at the diabetes clinic of Al-Bayda City were compared with blood samples of healthy people to know the relationship between type 2 diabetes and blood levels of ALT and AST.The study's findings demonstrate that mean serum FBC levels in the male groups with diabetes were noticeably greater than those in the group without diabetes.In contrast to the group non diabetes, ALT and AST levels in the male group with diabetes, were not noticeably greater.The female diabetes group had noticeably greater levels of FBG, ALT, and AST compared to the group without diabetes. The gender difference in elevated liver enzymes may be the cause of changes in body fat distribution and metabolism (Islam S et al., 2020),results of previous research are similar to results of our study. (Ahn et al., 2014), indicates that diabetes people had considerably great serum ALT concentrations than the healthy control group, although neither sex's serum AST concentrations were noticeably higher in the group of diabetes contract to group of control , .(Alzahrani et al., 2019) , shows that levels of ALT and AST were great in T2DM patients who were male and female, but no relationship between higher enzyme levels and age, gender, smoking, or hypertension was found. ,(Niu et al., 2021) , the data points to a nonlinear correlation that links ALT/AST to a decreased of type 2 diabetes risk in two sexes,(Zhang., (2024),.indicates that male diabetic groups with NAFLD had significantly elevated AST and ALT values, female

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diabetic group with NAFLD, not have significantly elevated in AST and ALT .(Choi et al., (2014), imply that the AST and ALT levels are increased in males with a higher BMI compared to females, especially in younger males, (Mandal et al., 2018) , *indicate that compared to the healthy control group, the mean blood levels of ALT were noticeably higher in the male and female patient groups. When compared to the healthy control group, AST in the male patient group, mean of AST was not substantially different related to group of control , AST mean in the group of female patient were noticeably greater,* (Yao, etal.,(2024), suggesting of previous study was that there are positive relations between body mass, hypertension, ALT, ASL in either sex. ,

Conclusion :

In patients with type 2 diabetes, it is essential to regularly monitor ALT and AST levels, as elevated ALT may serve as an early indicator of insulin resistance. Evaluating liver enzyme patterns helps in detecting non-alcoholic fatty liver disease (NAFLD), and using the ALT/AST ratio supports the assessment of metabolic liver alterations. Lifestyle interventions should be implemented for individuals with elevated liver enzymes, including encouraging weight loss and physical activity to enhance liver function. Before initiating hepatotoxic diabetes medications, liver function should be assessed. Routine diabetic health checkups should incorporate liver enzyme testing, and persistent elevations in ALT/AST must be investigated for potential hepatic complications. Lastly, patients should be educated about the critical connection between liver health and glucose metabolism

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