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Frequency of Anxiety and Depression among Diabetic Patients and Their Association with Hepatorenal Biomarkers

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Abstract: In patients with diabetes, the prevalence of anxiety and depression disorders may be up to two times higher. The aspartate aminotransferase/alanine aminotransferase (AST/ALT) ratio has been used to assess the severity of several chronic liver diseases. This study aimed to analyze the frequency of anxiety and depression among patients with diabetes and evaluate its association with hepatorenal biomarkers. This cross-sectional study was conducted at the Diabetes Center of Akhuwat Health Services, Lahore. The sample size, considering the dropout and exclusion criteria, was 203. Data collection tools were questionnaires containing demographic information and an anxiety and depression index scale. Measures included the patient's random blood glucose level, HbA1c, ALT, and AST. Data processing used SPSS version 27.0. Statistical analysis used the independent sample t-test. The mean age of participants was 50.51 ± 12.63 . 139 (68.5%) of participants were male, and 64 (31.5%) were female. 8 (3.9%) participants had no anxious depression, 56 (27.5%) had subclinical anxiety, 122 (60.0%) had minor anxious depression, and 17 (8.3%) had severe one. The mean anxiety depression score of females was 10.85 ± 5.22 . The mean anxiety depression score of males was 9.56 ± 5.13 with a p-value of 0.106. The majority of participants, 125 (61.57%), were in the score range of 8-17 (minor anxious depression), in which 110 participants had normal ALT and 15 had high ALT. Similarly, the majority of participants, 125 (61.57%), were in the score range of 8-17 (minor anxious depression), in which 109 participants had normal ALT and 16 had high AST. The findings are consistent with those of other studies that show a significant frequency of anxiety among patients with diabetes.

Keywords: anxiety, aminotransferase, alanine aminotransferase, diabetes, depression, hepatorenal biomarkers.

糖尿病患者焦慮和憂鬱的頻率及其與肝腎生物標記的關係

摘要：在糖尿病患者中，焦慮症和憂鬱症的盛行率可能高出兩倍。天門冬胺酸轉氨酶/丙胺酸轉氨酶比率已用於評估多種慢性肝病的嚴重程度。本研究旨在分析糖尿病患者焦慮和憂鬱的頻率，並評估其與肝腎生物標記的關聯。這項橫斷面研究是在拉合爾阿庫瓦特健康服務糖尿病中心進行的。考慮到退出和排除標準，樣本量為 203。資料收集工具是包含人口統計資訊和憂鬱和焦慮指數量表的問卷。測量指標包括患者的隨機血糖值、糖化血紅蛋白、丙胺酸轉氨酶和天門冬胺酸轉氨酶。資料處理採用統計軟件 27.0 版本。統計分析採用獨立樣本 t 檢定。參與者的平均年齡為 50.51 ± 12.63 歲。139 名參與者 (68.5%) 為男性，64 名參與者 (31.5%) 為女性。8 位 (3.9%) 參與者沒有焦慮憂鬱，56 位 (27.5%) 參與者有亞臨床焦慮，122 位 (60.0%) 參與者有輕微焦慮憂鬱，17 位 (8.3%) 有嚴重焦慮憂鬱。女性焦慮憂鬱平均得分為 10.85 ± 5.22 。男性的平均焦慮憂鬱分數為 9.56 ± 5.13 ，p 值為 0.106。大多數參與者 (125 名) (61.57%) 的得分範圍在 8-17 分 (輕度焦慮憂鬱)，其中 110 名參與者的丙胺酸轉氨酶正常，15 名參與者的丙胺酸轉氨酶較高。同樣，大多數參與者 (125 名 (61.57%)) 的得分範圍在 8-17 分 (輕度焦慮抑鬱)，其中 109 名參與者的丙胺酸轉氨酶正常，16 名參與者的天門冬胺酸轉氨酶較高。研究結果與其他研究結果一致，這些研究顯示糖尿病患者焦慮的頻率很高。

关键词：焦虑、转氨酶、丙氨酸转氨酶、糖尿病、抑郁症、肝肾生物标志物。

1. Introduction

Diabetes mellitus is a diverse condition that can cause severe morbidity and have a significant emotional toll. According to estimates from the International Diabetes Federation (IDF), 629 million adults between the ages of 2 and 79 had diabetes in 2017; this figure can rise to 425 million by 2045 [1]. Diabetes is a global health emergency, but it is spreading more quickly in low- and middle-income nations [2]. The comorbidities of diabetes mellitus and mental health have received much attention recently. In patients with diabetes, the prevalence of anxiety and depression disorders might be up to two times higher.

These mental disorders have been associated with harmful behavior, high HbA1c levels, poor metabolic indicators, and inadequate diabetic self-care [3–7]. There is evidence that diabetes mellitus and anxiety and depression disorders relate in both directions. Patients who exhibit signs of worry may be more likely to develop type 2 diabetes and vice versa. In individuals with diabetes, several factors, including personal and family history, stressful life events, substance use, and physical illness, may play a role in the development of anxiety disorders [7].

Diabetes and depression may have related or concomitant etiologies or the presence of one condition may make the other more prevalent (8). Personal and

family history, stressful life events, domestic violence, physical disorders, and clinical variables are potential risk factors that could lead to the development of depression in patients with diabetes [8–11]. Numerous experts have examined the risk factors for diabetes that increase the likelihood of developing depression. Insulin-dependent individuals have a higher frequency of depression than non-insulin-dependent individuals in patients with type 2 diabetes [6], which assumes that insulin-dependent people have more advanced disease and a greater need for treatment. The prevalence of depression in people continues to increase as the disease develops and consequences from diabetes develop, including severe peripheral neuropathy and sexual dysfunction [7]. The best predictors of depression among all diabetic sequelae are neuropathy and nephropathy [12, 13]. Clinicians face a profound dilemma when depression and diabetes mellitus co-exist because both diseases increase each other's effects. Combining DM with depression lowers life expectancy, impairs diabetes self-management, lowers overall quality of life, and increases the risk of diabetic complications [14]. Patients with diabetes with concurrent depression had higher HbA1c and more blood sugar dysregulation [13].

Clinical risk factors typically identify individuals who are more likely to develop T2DM. These risk

factors include high-density lipoprotein cholesterol (HDL-c), triglycerides, fasting blood glucose, alanine aminotransferase (ALT), aspartate aminotransferase (AST), and glycosylated hemoglobin (HbA1c) [15]. AST and ALT have various physiological activities and are indicators of liver damage. Since its introduction in 1957, the AST/ALT ratio has been used to assess the severity of several chronic liver diseases, including hyperinsulinemia, cardiovascular disease (CVD), metabolic syndrome, nonalcoholic fatty liver disease (NAFLD), and insulin resistance [16]. However, it is still unclear if the AST/ALT ratio has any clinical value in determining how likely T2DM may develop in the future. The multifaceted approach to managing diabetes mellitus should identify those who are at risk of developing the severe illness of depression and consider their mental health to maintain an appropriate quality of life.

2. Methods/Materials

2.1. Study Design

This was a cross-sectional study conducted at the Diabetes Center of Akhuwat Health Services, Lahore. The sample size calculation used the following formula:

$$n_1 = \frac{(z_{1-\frac{\alpha}{2}} + z_{1-\beta})^2 \left[\sigma_1^2 + \frac{\sigma_2^2}{r} \right]}{\Delta^2}$$

$$r = \frac{n_2}{n_1}, \Delta = \mu_1 - \mu_2$$

Non-probability purposive sampling was used for sampling. Fig. 1 shows a schematic representation of the study.

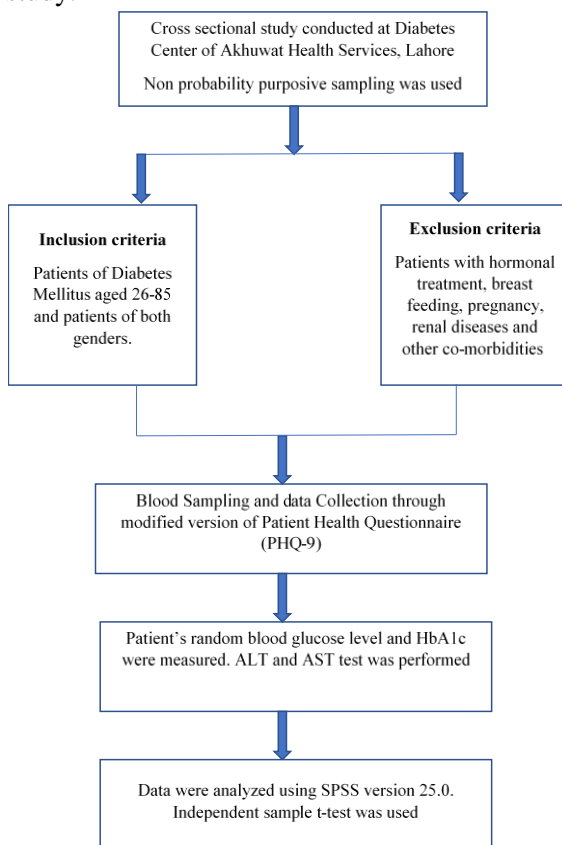


Fig. 1 Schematic representation of the study

2.2. Eligibility Criteria

The inclusion criteria were patients with diabetes mellitus aged 26–85 of both genders. The exclusion criteria were any hormonal treatment, breast feeding, pregnancy, renal diseases, and other co-morbidities.

2.3. Data Collection Tools

The sample size after dropouts and exclusion criteria was 203. Blood samples were collected from patients in fasting condition, and serum was separated. Data collection tools included a questionnaire containing demographic information and a modified version of the patient health questionnaire (PHQ-9). Patients' random blood glucose levels and HbA1c were measured. ALT and AST tests were performed on a fully automated photometer analyzer. It uses the principle of a detector and a light source, where the detector converts the light absorbed through the sample to a measurable signal.

2.4. HbA1C, ALT and AST Measurement

For HbA1c, 50 μ L of serum sample was combined with 10 μ L of EDTA to determine HbA1c. It was combined and warmed for 2 min and 30 s before being measured after 3–4 min. For AST measurement, 100 μ L of sample was mixed with 1000 μ L of calibrator. After incubating the mixture for approximately 5 min, 250 around 5 minutes, 250 μ L of reagent was added. The photometer parameters were set at 340 nm wavelength, 1 cm optical path, and 37°C. The absorbance was measured after 1 min. In males, the typical range of AST is 10–40 U/L. The typical range of AST in women is 7–35 U/L. For ALT, 6.0 U/L of sample was combined with 80U/L of reagent 1 and 20 U/L of reagent 2. The photometer was calibrated to 340 nm wavelength and 37°C. The absorbance was measured after 1 min. In cycles 25 and 42, absorbances 1 and 2 were measured. The typical range of ALT in males is 10–40 U/L and 7–35 U/L in females.

2.5. Statistical Analysis

Data were entered, stored, and analyzed using SPSS version 25.0. The independent sample t-test was used for statistical analysis. Numeric data are presented in the form of Mean \pm SD. Categorical data were presented in the form of percent frequencies. A P-value \leq 0.05 was considered significant.

2.6. Ethical Considerations

The Institutional Review Board of The University of Lahore approved this study (IRB number: IRB-UOL-FAHS/760/2020). Written informed consent was obtained from all participants. All information and data collection were kept confidential. Participants remained anonymous throughout the study.

3. Results

Table 1 represents the descriptive characteristics of participants. The mean age of participants was 50.51±12.63. 139 (68.5%) of participants were male and 64 (31.5%) – female.

| | | |
|-------------|--------|-------------|
| 50.51±12.63 | Male | 139 (68.5%) |
| | Female | 64 (31.5%) |

Table 1 Age and gender distribution of participants (Developed by the authors)

| Age, mean ± SD | Gender | Number (%) |
|----------------|--------|------------|
|----------------|--------|------------|

Fig. 2 shows the anxiety and depression index among participants. The 8 (3.9%) participants had no anxious depression, 56 (27.5) had subclinical anxiety, 122 (60.0) had minor anxious depression, and 17 (8.3) had major anxious depression.

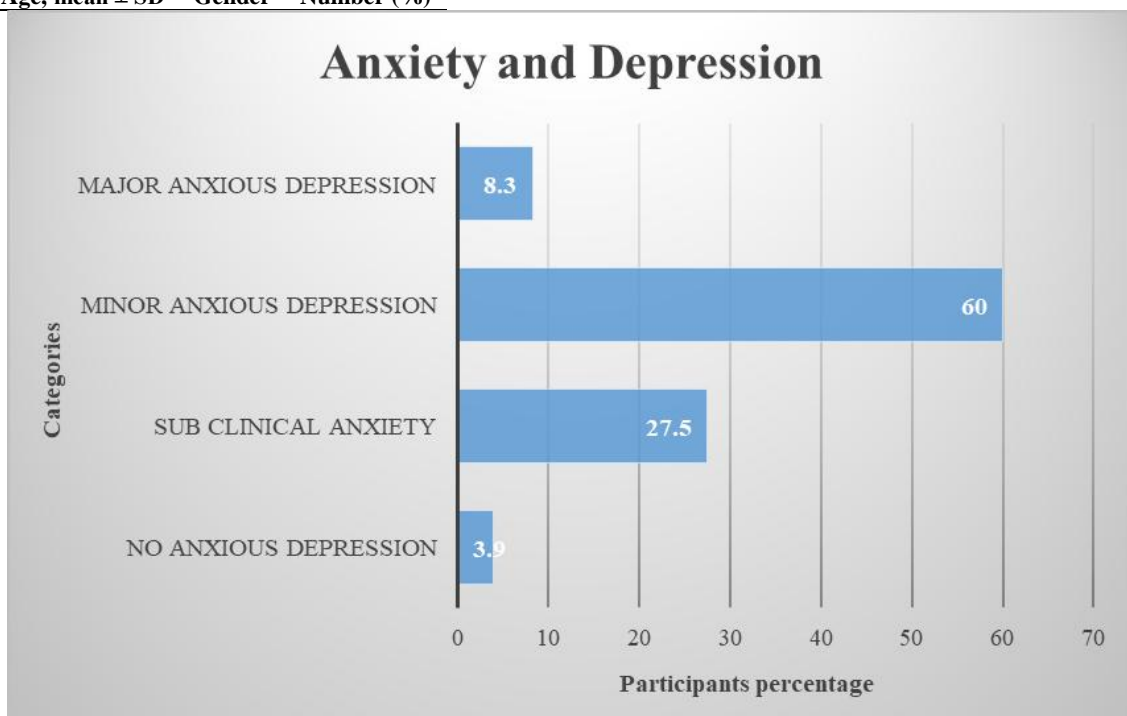


Fig. 2 Anxiety and depression index among patients (Developed by the authors)

Table 2 shows the gender-based difference among anxiety and depression scores. The mean anxiety depression score of females was 10.85±5.22. The mean anxiety depression score of males was 9.56±5.13. P-value was 0.106 (insignificant).

Table 2 Gender-based differences among anxiety and depression scores (Developed by the authors)

| Variables | Gender | Mean ± SD | p-value |
|--------------------------|--------|------------|---------|
| Anxiety depression score | Female | 10.85±5.22 | 0.106 |
| | Male | 9.56±5.13 | |

Table 3 shows the score range of anxiety and depression. There were four scores for depression and anxiety. 0 indicates not at all, 1 – several days, 2 – more than half days, and 3 indicates nearly every day. A score range of 0–2 indicates no anxious depression, 3–7 – subclinical anxiety, 8–17 – minor anxious depression, and 18–39 indicates major anxious depression.

Table 3 Scoring of anxiety (Developed by the authors)

| Anxiety and depression | Score range |
|--------------------------|-------------|
| No anxious depression | 0-2 |
| Subclinical anxiety | 3-7 |
| Minor anxiety depression | 8-17 |
| Major anxious depression | 18-39 |
| Not at all | 0 |

| | |
|----------------------|---|
| Several days | 1 |
| More than half a day | 2 |
| Nearly every day | 3 |

Table 4 shows the normal values of HbA1c: below 4% – low, 4.0–6.0% – normal, and above 6% – high.

Table 4 Normal values of HbA1c (Developed by the authors)

| HbA1c | Normal values |
|--------|---------------|
| Low | Below 4 |
| Normal | 4-6 |
| High | Above 6 |

Table 5 shows the prevalence of anxiety and depression in patients with diabetes in relation to HbA1c levels. In the age group 26–45, no males and females had low HbA1c, 1 male had normal HbA1c, and 1 male and 1 female had high HbA1c in the score range of 0–2. In the score range 3–7, no males and females had low HbA1c, 3 males and 1 female had normal HbA1c, and 9 males and 11 females had high HbA1c. In the score range 8–17, no males and females had low HbA1c, 4 males and 10 females had normal HbA1c, and 7 males and 24 females had high HbA1c. In the score range 18–39, no males and females had low HbA1c, no male females had normal HbA1c, and one male and 1 female had high HbA1c. In the age group 46–65, no males and females had low HbA1c, no

males and females had normal HbA1c, and 1 male and 4 females had high HbA1c in the score range of 0–2. In the score range 3–7, no males and females had low HbA1c, no males and females had normal HbA1c, and 6 males and 21 females had high HbA1c. In the score range 8–17, no males and females had low HbA1c, 4 males and 9 females had normal HbA1c, and 18 males and 36 females had high HbA1c. In the score range 18–39, no males and females had low HbA1c, 2 males and 6 females had normal HbA1c, and 0 males and 4 females had high HbA1c. In age group 66–85, no males and females had low HbA1c, no males and

females had normal HbA1c, and no males and females had high HbA1c in the score range of 0–2. In the score range 3–7, no males and females had low HbA1c, no males and females had normal HbA1c, and two males and 3 females had high HbA1c. In the score range 8–17, no males and females had low HbA1c, 1 male and 1 female had normal HbA1c, and 3 males and 5 females had high HbA1c. In the score range 18–39, no males and females had low HbA1c, no males and females had normal HbA1c, and one male and 2 females had high HbA1c.

Table 5 Prevalence of anxiety and depression in patients with diabetes in relation to HbA1c levels (Developed by the authors)

| Anxiety score | HbA1c (No. of patients) | | | | | | | | | | | | | | | | | | Total patients |
|----------------|-------------------------|---|---------|---|---------|---|---------|----|---------|----|---------|---|---------|----|---------|----|---------|----|----------------|
| | Low | | | | | | Normal | | | | | | High | | | | | | |
| | 26-45 Y | | 46-65 Y | | 66-85 Y | | 26-45 Y | | 46-65 Y | | 66-85 Y | | 26-45 Y | | 46-65 Y | | 66-85 Y | | |
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | |
| 0-2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 4 | 0 | 0 | 8 |
| 3-7 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 0 | 0 | 0 | 0 | 9 | 11 | 6 | 21 | 2 | 3 | 56 |
| 8-17 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 10 | 4 | 9 | 1 | 1 | 7 | 24 | 18 | 36 | 3 | 5 | 122 |
| 18-39 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 6 | 0 | 0 | 1 | 1 | 0 | 4 | 1 | 2 | 17 |
| Total patients | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 11 | 6 | 15 | 1 | 1 | 18 | 37 | 25 | 65 | 6 | 10 | 203 |
| | 0 | | 0 | | 0 | | 19 | | 21 | | 2 | | 55 | | 90 | | 16 | | |
| | 0 | | | | | | 42 | | | | | | 161 | | | | | | |

Table 6 shows the prevalence of anxiety and depression in patients with diabetes in relation to ALT. The normal range of ALT was 5–42 U/L. In the age group 26–45, no males and females had low ALT, 2 males and 1 female had normal ALT, and 0 males and 0 female had high ALT in the score range of 0–2. In the score range 3–7, no males and females had low ALT, 8 males and 10 females had normal ALT, and 2 males and 2 females had high ALT. In the score range 8–17, no males and females had low ALT, 12 males and 30 females had normal ALT, and 1 male and 4 females had high ALT. In the score range 18–39, no males and females had low ALT, 1 male and 1 female had normal ALT, and 0 male and 0 female had high ALT. In the age group 46–65, no males and females had low ALT, 0 males and 3 females had normal ALT, and 1 male and 1 female had high ALT in the score range of 0–2. In the score range 3–7, no males and females had low ALT, 6 males and 19 females had normal ALT, and 0 males and 2 females had high ALT.

In the score range 8–17, no males and females had low ALT, 21 males and 40 females had normal ALT, and 1 male and 6 females had high ALT. In the score range 18–39, no males and females had low ALT, 1 male and 7 females had normal ALT, and 1 male and 3 females had high ALT. In age group 66-85, no males and females had low ALT, no males and females had normal ALT, and no males and females had high ALT in the score range of 0–2. In the score range 3–7, no males and females had low ALT, 2 males and 2 females had normal ALT, and 0 males and 0 females had high ALT. In the score range 8–17, no males and females had low ALT, 2 males and 5 females had normal ALT, and 2 males and 1 female had high ALT. In the score range 18–39, no males and females had low ALT, 1 male and 2 females had normal ALT, and no male and female had high ALT. The majority of participants 125 (61.57%) were in the score range of 8-17 (minor anxious depression), in which 110 participants had normal ALT and 15 had high ALT.

Table 6 Prevalence of anxiety and depression in patients with diabetes in relation to ALT levels (Developed by the authors)

| Anxiety score | ALT (No. of patients) | | | | | | | | | | | | | | | | | | Total patients |
|----------------|-----------------------|---|---------|---|---------|---|---------|----|---------|----|---------|---|---------|---|---------|----|---------|---|----------------|
| | Low | | | | | | Normal | | | | | | High | | | | | | |
| | 26-45 Y | | 46-65 Y | | 66-85 Y | | 26-45 Y | | 46-65 Y | | 66-85 Y | | 26-45 Y | | 46-65 Y | | 66-85 Y | | |
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | |
| 0-2 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 3 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 8 |
| 3-7 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 10 | 6 | 19 | 2 | 2 | 2 | 2 | 0 | 2 | 0 | 0 | 53 |
| 8-17 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 30 | 21 | 40 | 2 | 5 | 1 | 4 | 1 | 6 | 2 | 1 | 125 |
| 18-39 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 7 | 1 | 2 | 0 | 0 | 1 | 3 | 0 | 0 | 17 |
| Total patients | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 42 | 28 | 69 | 5 | 9 | 3 | 6 | 3 | 12 | 2 | 1 | 203 |
| | 0 | | 0 | | 0 | | 65 | | 97 | | 14 | | 9 | | 15 | | 3 | | |
| | 0 | | | | | | 176 | | | | | | 27 | | | | | | |

Table 7 shows the prevalence of anxiety and depression in patients with diabetes in relation to AST.

The normal range of AST was 5–40 U/L. In the age group 26–45, no males and females had low AST, 2

males and 1 female had normal AST, and 0 males and 0 female had high AST in the score range of 0-2. In the score range 3-7, no males and females had low AST, 9 males and 10 females had normal AST, and 1 male and 2 females had high AST. In the score range 8-17, no males and females had low AST, 12 males and 30 females had normal AST, and 1 male and 4 females had high AST. In the score range 18-39, no males and females had low AST, 1 male and 1 female had normal AST, and 0 male and 0 female had high AST. In the age group 46-65, no males and females had low AST, 0 males and 3 females had normal AST, and 1 male and 1 female had high AST in the score range of 0-2. In the score range 3-7, no males and females had low AST, 5 males and 18 females had normal AST, and 1 male and 3 females had high AST. In the score range 8-17, no males and females had low AST, 20 males and 39 females had normal AST, and 2 males and 7

females had high AST. In the score range 18-39, no males and females had low AST, 2 males and 6 females had normal AST, and 0 males and 4 females had high AST. In age group 66-85, no males and females had low AST, no males and females had normal AST, and no males and females had high AST in the score range of 0-2. In the score range 3-7, no males and females had low AST, 2 males and 2 females had normal AST, and 0 males and 0 females had high AST. In the score range 8-17, no males and females had low AST, 2 males and 6 females had normal AST, and 2 males and 0 females had high AST. In the score range 18-39, no males and females had low AST, 1 male and 2 females had normal AST, and no male and female had high AST. The majority of participants 125 (61.57%) were in the score range of 8-17 (minor anxious depression), in which 109 participants had normal AST and 16 had high AST.

Table 7 Prevalence of anxiety and depression in patients with diabetes in relation to AST (Developed by the authors)

| Anxiety score | AST (No. of patients) | | | | | | | | | | | | | | | | | | Total patients |
|----------------|-----------------------|---|---------|---|---------|---|---------|----|---------|----|---------|----|---------|---|---------|----|---------|---|----------------|
| | Low | | | | | | Normal | | | | | | High | | | | | | |
| | 26-45 Y | | 46-65 Y | | 66-85 Y | | 26-45 Y | | 46-65 Y | | 66-85 Y | | 26-45 Y | | 46-65 Y | | 66-85 Y | | |
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | |
| 0-2 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 3 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 8 |
| 3-7 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 10 | 5 | 18 | 2 | 2 | 1 | 2 | 1 | 3 | 0 | 0 | 53 |
| 8-17 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 30 | 20 | 39 | 2 | 6 | 1 | 4 | 2 | 7 | 2 | 0 | 125 |
| 18-39 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 6 | 1 | 2 | 0 | 0 | 0 | 4 | 0 | 0 | 17 |
| Total patients | 0 | 0 | 0 | 0 | 0 | 0 | 24 | 42 | 27 | 66 | 5 | 10 | 2 | 6 | 4 | 15 | 2 | 0 | 203 |
| | 0 | | 0 | | 0 | | 66 | 93 | | 15 | 8 | | 19 | 2 | | | | | |
| | 0 | | | | | | 174 | | | 29 | | | | | | | | | |

4. Discussion

The purpose of this study was to examine the prevalence of anxiety and depression among patients with diabetes in Lahore, Pakistan. The demographic features of the study participants are shown in Table 1. Our participants had a mean age of 50.51±12.63, with 68.5% being male and 31.5% being female. This demographic information helps us understand the prevalence of anxiety and depression in our sample.

Fig. 2 and Table 2 show the distribution of anxiety and depression scores among the participants. Notably, 60% of the individuals suffered from light anxious depression, whereas 8.3% suffered from serious anxious depression. These data indicate a significant frequency of anxiety and depression symptoms among our patients with diabetes.

In our sample, there was no statistically significant difference in anxiety and depression ratings between men and women (Table 2). This is consistent with prior studies, which indicate that anxiety and sadness impact both genders equally in patients with diabetes. However, possible gender-specific variables that may contribute to these mental health outcomes must be considered.

Table 3 shows a straightforward grading method for anxiety and depression levels. This categorization is critical for evaluating the degree of anxiety and depression symptoms in our study. It enables a more

sophisticated evaluation of patients with diabetes' mental health state.

Table 5 investigates the association between HbA1c levels and the incidence of anxiety and depression in various age groups. Our data reveal that when anxiety and depression levels rise, so does the tendency toward greater HbA1c levels. This implies a relationship between worse glycemic management and increased anxiety and depression symptoms. Further study is required to determine the direction of this link.

Tables 6 and 7 investigate the relationship between ALT and AST levels and anxiety and depression levels. The majority of patients with slight anxious depression had normal ALT and AST values, which was notable. This indicates that liver enzymes may not be directly related to these mental health issues in diabetics. Further study is required to better understand the variables that contribute to anxiety and depression in this group.

The study findings indicated a high frequency of anxiety and depression among patients with diabetes in Lahore, Pakistan. According to the anxiety and depression index, a significant number of individuals had anxiety and depression symptoms. 3.9% had no anxious depression, 27.5% had subclinical anxiety, 60.0% had light anxious depression, and 8.3% had serious anxious depression. The current study's anxiety and depression prevalence rates are consistent with

previous research on the comorbidity of mental health disorders with diabetes. Numerous studies conducted worldwide have consistently found that people with diabetes have greater rates of anxiety and depression than the general population. For example, a study conducted in a different urban location of Pakistan [18] found similar prevalence rates of anxiety and depression among diabetes patients. According to their findings, approximately 65% of diabetics reported anxiety symptoms, whereas approximately 45% had depression symptoms. [17] observed equal rates of sadness and anxiety in a diverse sample of patients with South American diabetes, that approximately 30% of diabetics experienced anxiety symptoms, and 40% had depressive symptoms. These findings suggest that the frequency of anxiety and depression among patients with diabetes varies by geography and community, emphasizing the need to consider local features and cultural circumstances. A noteworthy aspect of the study was the evaluation of gender differences in anxiety and depression ratings. There was no statistically significant difference in anxiety and depression levels between men and women, according to the study (p-value of 0.106). This finding is consistent with a previous study, which discovered no significant gender differences in the prevalence of anxiety and depression in patients with diabetes [17, 18]. However, other studies have shown inconclusive results, with some indicating a higher incidence of anxiety and depression in females [19], while others claim higher rates in males [20]. The disparity in study findings highlights the intricacies of the interplay between gender, diabetes, anxiety, and depression, as well as the need for more research to understand this association. This study also examined the association between anxiety and depression and HbA1c levels although there was no clear pattern across age groups or genders. A previous study yielded similar mixed findings. For example, [21] reported a substantial relationship between anxiety and elevated HbA1c levels in patients with diabetes in a Taiwanese study [21]. In contrast, [22] observed no significant association between anxiety, depression, and glycemic control in another study conducted in Pakistan [22]. In our study, the majority of participants 125 (61.57%) were in the score range of 8-17 (minor anxious depression), in which 110 participants had normal ALT and 15 had high ALT. Similarly, majority of participants 125 (61.57%) were in the score range of 8-17 (minor anxious depression), in which 109 participants had normal AST and 16 had high AST. Similar results found [23] that the prevalence rates of anxiety and depression were not significantly different in patients with nonalcoholic fatty acid liver disease. These disparities assume that the relationship between psychological qualities and glycemic control in diabetes is complicated and may be influenced by several individual, cultural, and environmental

variables.

5. Conclusion

In conclusion, this study examined the incidence of anxiety and depression in diabetes patients in Lahore, Pakistan. The findings indicated that the individuals experienced a high frequency of anxiety and depression symptoms, with large proportions having subclinical anxiety, moderate anxious sadness, and severe anxious depression. The study of gender differences in anxiety and depression levels found no statistically significant difference between men and women, which is consistent with previous research. The findings emphasize the necessity of including mental health in diabetes treatment and the need for individualized therapies that address the distinct requirements of individuals in various cultural and geographical situations.

However, it is critical to recognize the numerous limitations of our research. For instance, our study was limited to a single geographical and cultural setting, namely Lahore, Pakistan, which may restrict the generalizability of our results to other countries or people. Furthermore, because our research is cross-sectional, we can demonstrate causality or follow changes over time. Longitudinal study may be helpful in this case. Looking forward, our results highlight the significance of including mental health issues in diabetes treatment efforts. Individuals with diabetes are clearly at a higher risk of anxiety and depression, which may hurt their general well-being and diabetes management. To address this, individualized treatments that consider the particular needs of people in varied cultural and geographical settings are required.

Statement of Informed Consent

Informed consent was obtained from all participants.

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