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Evidence based prevalence of diabetes related depression in Kohat, Pakistan: a cross-sectional study

Madiha Fatima[1,2], Zhao Wang[1,3], Zia Ud Din[4], Liao Juan[3], Cheng Ke[1,2]* and Peng Xie[2]*

Abstract

Background Patients suffering from chronic health conditions such as pulmonary diseases, cancer, cardiovascular problems, and diabetes mellitus (DM) are facing psychological disturbance while struggling to handle their physical illnesses. Among all chronic health conditions, DM Type II is one of the main reasons for depression across the population.

Objectives The study aimed to investigate the prevalence of depression among the diabetic population and to determine the relationship between depression severity and diabetic duration.

Methods We designed a questionnaire-based study to identify the prevalence of depression in the diabetic population visited tertiary care hospital in Kohat, Khyber Pakhtunkhwa, Pakistan. Patients aged above 15 were included, and their health condition was evaluated according to the Patient Health Questionnaire 9 (PHQ-9) score. We investigated 1573 diabetic individuals, including 831 males and 742 females, for depression symptoms. Data was analyzed by the Chi-square test to obtain the association between diabetes and depression. The statistical significance between variables was determined by calculating *the p*-value.

Results Among the patients who suffered from DM Type II, 32.8% of patients showed minimal depression, and 7.9% were found severely depressed. As diabetic duration prolongs, depression severity also rises, and among patients who have been suffering from DM type II for more than 13 years, most patients were suffering from moderately severe and severe depression. Moreover, depression severity was high in the patients aged over 60 years.

Conclusion The overall results showed that more than half of the total diabetic population was facing mild to severe depression. Based on our results, we suggest including a psychological and mental health investigation during the evaluation of diabetes in the patients. The study might help healthcare workers assess the psychological complications of diabetic patients.

Keywords Diabetes mellitus type 2, Depression, Patient health questionnaire 9 (PHQ-9)

*Correspondence:
Cheng Ke
jackchengke@163.com
Peng Xie
xiepeng@cqmu.edu.cn
[1]Department of Neurology, The Affiliated Yongchuan Hospital of Chongqing Medical University, Chongqing 402160, China

[2]Department of Neurology, NHC Key Laboratory of Diagnosis and Treatment on Brain Functional Diseases, The First Affiliated Hospital of Chongqing Medical University, Chongqing 402160, China
[3]Central Laboratory of Yongchuan Hospital, The Affiliated Yongchuan Hospital of Chongqing Medical University, Chongqing 402160, China
[4]District Head Quarter (DHQ) Hospital Kohat, Kohat Development Authority (KDA), Kohat, Khyber Pakhtunkhwa 26000, Pakistan

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Introduction

Diabetes mellitus type II (T2DM) has emerged in recent times as the most common non-communicable disease across the world [1]. According to the World Health Organization (WHO), in 2019, T2DM was the highest cause of mortality and accounted for 1.5 million lives [2]. As specified by the International Diabetes Federation (IDF) Atlas 2021, among the adult global population (20–79 years of age), 10.5% are suffering from diabetes. As per their prediction, by 2045, the total diabetic population will rise to 783 million, and approximately one in eight adults will be living with diabetes [3]. The impact of T2DM on the economy is growing; in 2010, it was 12% of global health expenditure, accounting for $376 billion, and is expected to reach $490 billion in 2030 [4].

In Asia, T2DM is the fastest-rising public health issue, which is associated with lifestyle, economic conditions, globalization, and urbanization [5]. In South Asia, Pakistan is a low-income country and is the 5th most populous in the world. The total population of Pakistan is 235 million, and among them, 33 million are suffering from diabetes. As per the IDF Atlas 2021, Pakistan has 3rd third-largest diabetic population. According to the second National Diabetes Survey (NDSP, 2016–2017), the prevalence of diabetes was 26.3% (28.3% in urban areas and 25.3% in rural areas), and 14.4% of the total population had pre-diabetes, which is alarmingly very high [6, 7]. Furthermore, approximately 8.9 million diabetic patients remain undiagnosed and 11 million adults have impaired glucose tolerance. The high prevalence can be linked to many factors like unhealthy diet, tobacco consumption, lack of exercise, and obesity. These conditions pose a major health challenge [8].

Depression is one of the main psychiatric disorders, which is more prevalent in individuals with diabetes compared to the general population [9–11]. About 300 years ago, Thomas Willis a British physician, identified the association of diabetes with depression. He predicted that diabetes could be the result of sadness and long sorrow [12]. The major symptoms of depression are dullness, non-energetic, anorexia, difficulty in concentrating, guilty feelings, suicidal thoughts, impaired sleeping clock, loss of interest, and functional abilities [13]. Many studies reported that depression has a negative impact on quality of living, self-care, treatment follow-ups, and glycemic control [14–17]. Depression also increases mortality in diabetic patients by 2-fold compared to non-depressed individuals [18]. In 2013, a meta-analysis study reported 1.5 times higher mortality in individuals suffering from diabetes and depression than those who do not have depression symptoms [19]. The development of depression in diabetic patients could be the result of high morbidity, poor control of blood glucose, complications risks, and high healthcare costs [20–22].

The current study aims to determine the prevalence of depression among the diabetic population and to investigate the relationship of depression severity with diabetic duration. The Importance of the current work is this study uniquely provides the prevalence of depression among diabetic patients in Kohat, Pakistan. There is no prior research available in the region, and by highlighting the mental health condition of diabetic patients, it addresses critical gaps in the health care of the underserved population. Understanding the relationship between depression and diabetes is indispensable to improving timely detection and integration of mental health facilities into diabetes care. The finding aims to reveal evidence-based data for the identification of high-risk populations and provides a basis for the development of strategies to reduce the diabetic-associated depression burden.

Methodology

Study design

The current cross-sectional study was conducted the prevalence and severity of depression among diabetic patients who visited a tertiary care hospital for checkup, in Kohat, Khyber Pakhtunkhwa, Pakistan. The data was collected from patients who visited the District Headquarters Hospital (DHQ) Kohat in 2024. The study was conducted according to ethical standards stated by the Declaration of Helsinki, informed consent was obtained, and confidentiality was maintained throughout the study. For the participants aged 15–17 years the planned protocol was obtaining written ascent from the adolescent along informed consent from parents or guardians. In Pakistan, diabetes prevalence is rising across all age populations, and especially the underage population is notably understudied. By including this population, we aimed to provide more inclusive data about depression in the diabetic population that could help make more effective strategies for diabetic health care. All participants were informed about the objectives and measures of the study. The study design provides a structured approach to investigate the relationship between depression and diabetes.

Study population

In this study, populations from all age groups and genders were included. A total of 1573 diabetic patients (831 males and 742 females) were screened for depression occurrence. The inclusion criteria were the patient's age over 15 years, willingness to participate, ability to answer the questions, and diagnosed with diabetes. The patient's history was examined from their medical reports they presented in the hospital, and individuals with any other pre-existing severe diseases or psychiatric conditions, like bipolar and schizophrenia, etc., were excluded. We

also exclude patients under 15 years of age, as they could not answer the PHQ-9 questions properly.

Data collection tools

Data was collected by face-to-face interviews of diabetic patients using a designed data collection form that includes socio-demographic data and Patient Health Questionnaire-9 (PHQ-9) for depression analysis [23]. The socio-demographic section includes the gender, age, and diabetic duration of the patients. Patients were asked about depressive symptoms that happened to them in the last 2 weeks, and the responses were marked in range from 0 (not) to 3- (nearly every day). The patient's depression level was analyzed according to the PHQ-9 score. The PHQ-9 score ranged from 0 to 27, the patient is non-depressive by securing (0–4 score), mild depressive (5–9 score), moderate depressive (10–14 score), moderately severe depressive (15–19 score), and severe depressive (20–27 score) [23]. This questionnaire has been authenticated for use in primary care [24].

Data analysis

SPSS 26.0 was used to analyze the data. The depression level was assessed based on the PHQ-9 score. The relationship between diabetes and depression was established based on factors including PHQ-9 score level, gender, age, and diabetes duration. Chi-square tests were performed to obtain the association between depression and diabetes. A *P*-value was calculated to determine statistical significance between variables. The *p-value* ≤ 0.05 was considered significant.

Results

Prevalence of depression among diabetic patients

The data collected were analyzed based on gender, age-wise distribution, diabetes duration, and PHQ-9 scores (severity of depression). A total of 1573 DM type II patients, including both genders, male and female, from all age groups, were investigated in the study. All patients were categorized into two main groups: male, 831(52.8%), and female, 742 (47.2%). Most of the patients fell within the 31–60 age group (60.8%), followed by ≥ 61 (36.6%) and 15–30 (2.5%) age categories. Regarding diabetes duration, the participants with diabetes duration of ≤ 4 years accounted for 45.3%, 5–8 years, 9–12 years, and ≥ 13 years were 21.2%, 12.5%, and 21.0%, respectively (Table 1). The severity of depression was investigated which is 32.8% of individuals showed no depression (PHQ-9 score, 0–4), while 24.7% had mild (5–9), 20.2% moderate (10–14), 14.4% moderately severe (15–19), and 7.9% severe depression (20–27) (Table 1; Fig. 1). The outcomes of our analysis have suggested that depression is prevalent among individuals with diabetes and with potential variations across different genders, age groups,

and diabetic durations. The results provide the basis for establishing an association between depression and diabetes.

Prevalence of depression among diabetic patients with different diabetic durations

Further, to identify whether the prevalence and severity of depression are linked to specifically diabetes we analyzed our data and found that there is no statistically significant relationship between gender and depression severity (χ^2= 6.687, $p = 0.153$). The analyzed proportion of depressed males was slightly higher compared to females, but these differences were not statistically significant (Table 2; Fig. 2A).

A significant association was analyzed between age and depression severity (χ^2/F = 98.102, $p < 0.001$). The mean age increased as depression severity worsened, ranging from 49.2 ± 11.9 years in the no-depression group to 64.5 ± 8.4 years in the severe depression group. Furthermore, there was a significant trend in the categorical age group analysis (χ^2/F = 234.953, $p < 0.001$). All younger individuals (15–30 years) were observed with no-depression category. Across all depression levels, the percentage of people aged ≥ 61 increases, going from 17.4% in a group without depression to 65.6% in the group with severe depression (Table 2; Fig. 2B). This implies that a major contributing factor to greater depression intensity is advanced age.

The length of diabetes and the intensity of depression were strongly correlated (χ^2/F = 668.957, $p < 0.001$). Across the non-depressed diabetic population, 77.3% were suffering from diabetes for ≤ 4 years, while across the severely depressed populations, only 4.8% were from

Table 1 Clinical characteristics of patients with diabetes

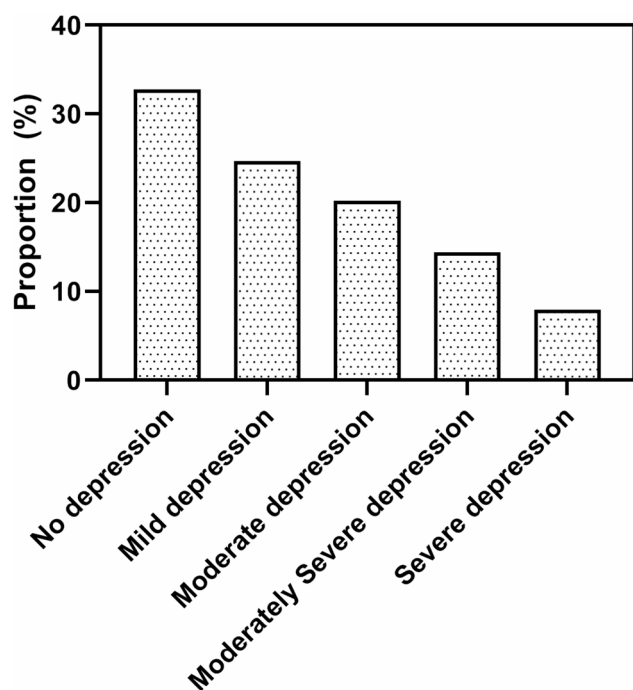| Variable	Frequency	Proportion (%)
Gender		
Female	742	47.2
Male	831	52.8
Age (years)		
15–30	40	2.5
31–60	957	60.8
≥ 61	576	36.6
Diabetic duration (years)		
≤ 4	713	45.3
5–8	334	21.2
9–12	196	12.5
≥ 13	330	21.0
Depression severity (PHQ-9 score)		
No depression (0–4)	516	32.8
Mild depression (5–9)	389	24.7
Moderate depression (10–14)	317	20.2
Moderately severe depression1(5–19)	226	14.4
Severe depression (20–27)	125	7.9

Fig. 1 Prevalence of depression across diabetic population. This figure illustrates the prevalence of depression across diabetic population in Pakistan. The severity of depression was investigated using the PHQ-9 scale. The X-axis categorizes severity of the disease., while the Y-axis represents the percentage of individuals affected by depression, which demonstrates that 32.8% of individuals showed no depression (PHQ-9 score, 0–4), while 24.7% had mild (5–9), 20.2% moderate (10–14), 14.4% moderately severe (15–19), and 7.9% severe depression (20–27)

this diabetic duration group. However, people who had diabetes for more than 13 years made up 67.2% of the group with severe depression and only 3.3% were without depression. It showed that a strong pattern with more severe depression is linked to longer diabetes duration (Table 2; Fig. 2C).

These results demonstrated that gender does not seem to have a major effect on depression intensity, while it is substantially connected with older age and longer duration of diabetes. These findings showed a strong correlation between the severity of depression and clinical and demographic traits and suggested that older age and longer diabetic duration are significant risk factors for severe depression in this population.

Age-wise distribution of diabetic patients across diabetic duration groups

Furthermore, we divided patients into 3 age groups, 15–30 years, 31–60 years, and 61 plus. Patients with ages less than 15 years were not included because they could not answer the questions of PHQ-9 properly. A significant association was observed between gender and age groups (χ^2 = 22.265, $p < 0.001$). Our analysis showed that in the youngest age of 15–30 years and the oldest age groups, the females were more (62.5%) and (53.8%) as compared to males (37.5%) and (46.2%) respectively. In the middle age group of 31–60 years, male numbers were higher (57.5%) than females (42.5%) (Table 3).

Diabetes duration also varied significantly across age groups (χ^2 = 174.013, $p < 0.001$). In the group aged 15–30 years, most patients (97.5%) had diabetes for the shortest duration of 1–4 years, whereas those in the 61 + group had a longer history of the disease, with a greater proportion having diabetes for more than 9 years.

Furthermore, depression severity was strongly associated with age (χ^2 = 234.953, $p < 0.001$). Most individuals aged 15–30 had no depression (87.5%), while depression severity increased with age, with the highest prevalence of moderate to severe depression in the 61 + group (26.7%) and (22.7%) respectively. In all other diabetic duration groups, no patients were below 30 years. In the 5–8 years duration group, 22.5% were between 31 and 60

Table 2 Demographic and gender base distribution across diabetic patients based on the severity of the disease

Variable (Depression severity)	No depression, (*n*=516)	Mild depression, (*n*=389)	Moderate depression, (*n*=317)	Moderately Severe depression, (*n*=226)	Severe depression, (*n*=125)	χ2/F	*P*
Gender						6.687	0.153
Female	258 (50.0)	172 (44.2)	160 (50.5)	96 (42.5)	56 (44.8)		
Male	258 (50.0)	217 (55.8)	157 (49.5)	130 (57.5)	69 (55.2)		
Age	49.2 ± 11.9	54.2 ± 11.2	59.7 ± 11.0	62.1 ± 9.0	64.5 ± 8.4	98.102	< 0.001
Age (years)						234.953	< 0.001
15–30	35 (6.8)	4 (1.0)	1 (0.3)	0	0		
31–60	391 (75.8)	266 (68.4)	162 (51.1)	95 (42.0)	43 (34.4)		
≥ 61	90 (17.4)	119 (30.6)	154 (48.6)	131 (58.0)	82 (65.6)		
Diabetic duration (years)						668.957	< 0.001
≤ 4	399 (77.3)	197 (50.6)	98 (30.9)	13 (5.8)	6 (4.8)		
5–8	81 (15.7)	103 (26.5)	96 (30.3)	43 (19.0)	11 (8.8)		
9–12	19 (3.7)	43 (11.1)	45 (14.2)	65 (28.8)	24 (19.2)		
≥ 13	17 (3.3)	46 (11.8)	78 (24.6)	105 (46.5)	84 (67.2)		

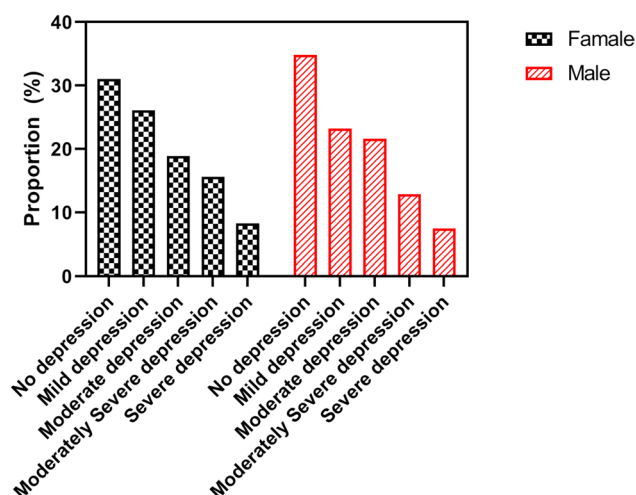Fatima *et al. BMC Public Health*   (2025) 25:1938

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Fig. 2A Prevalence of depression across diabetic male and female patients and measurement of diabetic severity. This figure illustrates the prevalence of depression across males and females' diabetic patients. The X-axis represents the percentage of individuals affected by depression, while the Y-axis categorizes the severity of the disease. The graph denoted that the proportion of depressed males was slightly higher compared to females, but these differences were not statistically significant
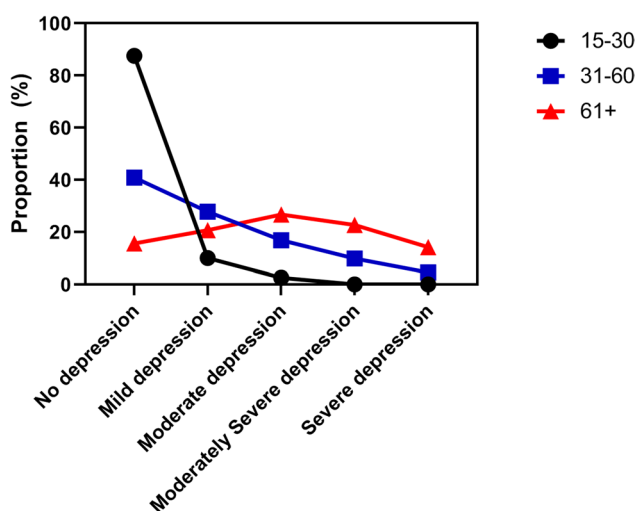

Fig. 2B Depression across diabetic patients within different age groups. This figure illustrates the prevalence of depression within different age groups of diabetic patients. All younger individuals (15–30 years) were observed with no-depression category. Across all depression levels, the percentage of people aged ≥ 61 increases

years and 20.2% age were more than 60 years. Similarly, in the 9–12 years duration group, 11.4% and 15.1% were included in 31–60 years and 60-plus years respectively. In the longest diabetic duration group 4.5% of individuals were 31–60 years of age and 14.2% were over 60 years of age. Overall, no patients were diagnosed with severe depression in less than 30 years of group age, 4.5% were 31–60 years and 14.2% were more than 60 years old were confirmed (Table 3). The results collectively suggest that diabetic duration along with age might play a stronger
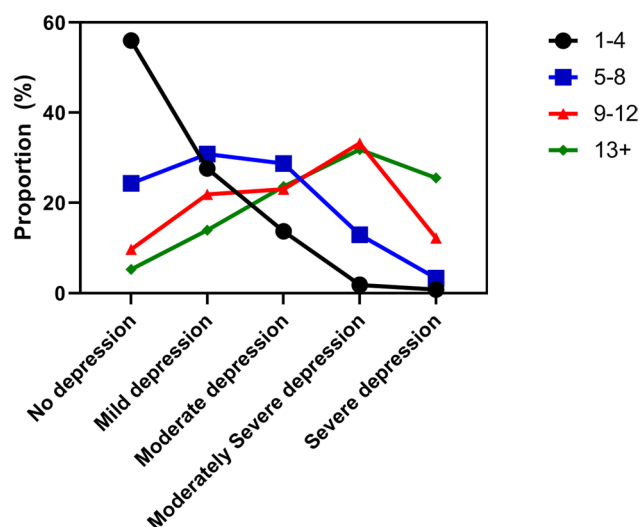

Fig. 2C Depression across diabetic patients with different diabetic durations. This figure illustrates the prevalence of depression with different time-duration of diabetic patients. The length of diabetes and the intensity of depression were strongly correlated. The graph showed that the non-depressed diabetic population was in ≤ 4 years, while moderate and severely moderate were in 5–8 and 9–12 years. People with more than 13 years made up a higher ratio of the group with severe depression

role in depression occurrence in the population suffering from DM type II.

Diabetic duration distribution across different demographic variables

All collected data were analyzed to check the level of depression based on diabetic duration. The results indicated a significant connection between demographic factors such as age, and diabetic duration with variable groups (≤ 4, 5–8, 9–12, ≥ 13) years. The data were also analyzed separately on a gender basis. Approximately a similar ratio of both females (50.5%) and males (49.5%) was observed in the shortest diabetic duration group (≤ 4 years). However, in the longest diabetic duration group (≥ 13 years), the ratio of males (57%) was high as compared to females (43%). The distribution of males and females across diabetic duration groups were statistically significant with values of ($\chi 2 = 9.940$, $P = 0.019$).

The age factor is also a major contributor to depression analysis. Age distribution showed that individuals between 15 and 30 years old are in the shortest duration, while the proportion of older adults over 60 years age group increases significantly in the longest duration group, from 23.7% in the ≤ 4 to 61.2% in those over 13 plus age group with significant values ($\chi 2 = 174.013$, $P < 0.001$). Depression severity follows a striking trend, with those without depression decreasing drastically from 56.0% in the ≤ 4 to just 5.2% in the over 13 plus age group, while severe depression rises from 0.8 to 25.5% as the category increases ($\chi 2 = 234.953$, $P < 0.001$) (Table 4).

Table 3 Age-wise distribution across diabetic patients based on severity of the disease

Variable (Age)	15–30 years (n=40)	31–60 years (n=957)	≥61 years (n=576)	χ2	P
Gender				22.265	<0.001
Female	25(62.5)	407(42.5)	310 (53.8)		
Male	15(37.5)	550(57.5)	266 (46.2)		
Diabetic duration (years)				174.013	<0.001
≤4	39(97.5)	505(52.8)	169 (29.3)		
5–8	1(2.5)	215(22.5)	118 (20.5)		
9–12	0	109(11.4)	87 (15.1)		
≥13	0	128(13.4)	87(15.1)		
Depression severity				234.953	<0.001
No depression	35(87.5)	391(40.9)	90(15.6)		
Mild depression	4(10.0)	266(27.8)	119(20.7)		
Moderate depression	1(2.5)	162(16.9)	154(26.7)		
Moderately severe depression	0	95(9.9)	131(22.7)		
Severe depression	0	43(4.5)	82(14.2)		

These findings showed that with an increase in diabetic duration the severity of depression also increases significantly.

Discussion

The current study was conducted on the population living in the Kohat region of Khyber Pakhtunkhwa, Pakistan, to determine the prevalence and severity of depression among patients suffering from DM type II. Our findings provide significant insights into depression prevalence across the diabetic population. The data highlighted the high burden and risk of depression in these individuals and underscored the importance of addressing mental health issues.

In the study, both gender males and females of all ages over 15 years were included. According to our analysis, depression in males was slightly high as compared to females. According to the PHQ-9 score, we found that 32.8% of patients were not depressed. Similar findings were also published by Işık et al. in 2021, they reported that 33.5% of diabetic patients did not suffer from depression according to their survey [25]. Mild depression was prevalent in 24.7% of individuals. A study published by Thour et al.. also reported 27% mild depression among DM type II patients [26]. Furthermore, moderate depression in our study was prevalent in 20.2% of individuals, which is approximately like the findings reported by Mukrim et al., [27]. A total of 14.4% of patients were suffering from moderately severe depression and 7.9% from severe depression. In 2023 Mussa et al. also reported 12% moderate depression and 8% severe depression among diabetic patients [28]. Though in our study the number of male patients was more than females, the analysis didn't show any significant differences in depression prevalence between both genders. Both genders were approximately equally affected by depression across all age groups and diabetic duration.

Table 4 Diabetic patient distribution based on diabetic duration

Variable	≤4 (n=40)	5–8 (n=957)	9–12 (n=576)	≥13	χ2/F	P
Gender					9.940	0.019
Female	360(50.5)	162(48.5)	78(39.8)	142(43.0)		
Male	353(49.5)	172(51.5)	118(60.2)	188(57.0)		
Age (years)					174.013	<0.001
15–30	39(5.5)	1(0.3)	0	0		
31–60	505(70.8)	215(64.4)	109(55.6)	128(38.8)		
61+	169(23.7)	118(35.3)	87(44.4)	202(61.2)		
Depression severity					234.953	<0.001
No depression	399(56.0)	81(24.3)	19(9.7)	17(5.2)		
Mild depression	197(27.6)	103(30.8)	43(21.9)	46(13.9)		
Moderate depression	98(13.7)	96(28.7)	45(23.0)	78(23.6)		
Moderately severe depression	13(1.8)	43(12.9)	65(33.2)	105(31.8)		
Severe depression	6(0.8)	11(3.3)	24(12.2)	84(25.5)		

Diabetes is more prevalent in middle-aged and elder-age populations previously reported by many studies [27–29]. Our data also showed a high prevalence of diabetes in the age group 31–60 years and above 60 years, which is 60.8% and 36.6%, respectively. It is found that diabetes is more prevalent in men compared to women for 30–60 years period. The possible reason could be the work stress and financial support to their families, as in developing countries the males are the main contributors to supporting their families.

Previous studies reported a high prevalence of depression in diabetic patients with age over 60 years [29, 30]. In our findings, we observed that moderately severe and severe depression were high among patients above 60 years of age, which was 22.7% and 14.2% respectively. However, less severe or minimal depression was more prevalent in the population below 60 years. Similar results were observed in both genders. This might be due to the progression of depression severity that starts with mild severity at a younger age and becomes severe as age increases.

According to our analysis, based on the PHQ-9 questionnaire, depression severity is related to diabetic duration. We observed that in the patients with a diabetic duration of 4 years most patients were neither minimally depressed followed by mild depression and the least number of patients were severely depressed. However, with the prolongation of diabetic duration, the severity of depression also rises. In 2023, a study by Mansoura Ismail et al., conducted a study and found the relationship of depression with diabetic duration. They divided the diabetic duration into 3 groups < 5 years, 5–10 years and > 10 years. They reported that in the shortest diabetic duration group the maximum number of individuals were not depressed. However, in > 10 years diabetic duration significantly high number of individuals were found suffering from depression [31]. Another study conducted by Pablo Aschner el al. in 2021 also reported a high number of non-depressed and depressed individuals in the shorter and longer diabetic duration respectively [32]. We found that the 5–8 years diabetic duration group had a smaller number of patients who were non-depressed as compared to the 1–4 years group. However, the number was high for mild, moderate, moderate, severe, and severe depression. A maximum number of patients were suffering from mild depression followed by moderate depression. A similar rise was also observed in the diabetic duration groups 9–12 years and 13 or above years as compared to shorter durations of 1–4 years and 5–8 years. In the 9–12 years group, most patients were suffering from moderately severe depression followed by moderate depression. In the 13 or above year's group, maximum patients were severely depressed and moderately severe. The data showed that depression can become more severe among the population living with diabetes for longer duration. Consistent results were previously reported by Zahra D. Khan et al. in 2019, according to their observation more diabetic patients were depressed in the diabetic duration of more than 10 years [33].

Many factors can contribute to the high prevalence of depression among diabetic patients. First, the adverse physiological impact of diabetes on individuals includes abnormal and dysregulated blood glucose levels, which might lead to disturbance in the chemistry of the brain and can initiate depression symptoms [34]. Second, other chronic complications that are related to diabetes like neuropathy, cardiovascular complications, retinopathy, and nephrological and urological disorders can also play a significant role in the development of depression [35]. Third, social and economic stress such as the financial burden of diabetic treatment might also play a role in depression [36].

However, the high depression rate in diabetic patients has significant implications for the healthcare system and policymakers, but the depression prevalence can be reduced through effective treatment and diabetic care practices [37]. Blood glycemic control through proper treatment and guidance is needed to avoid further chronic complications of diabetes. Integrated health models that address both physical and mental health are critical. A periodic and routine check-up of diabetic patients should be carried out. Depression symptoms should be investigated and treated accordingly through medication, counseling, and lifestyle management if there is any [38].

Despite our crucial findings, this study has some limitations that should be addressed. Usually, cross-sectional studies establish a causal relationship between diabetes and depression, as the dependence on oral questionnaires and lack of proper clinical diagnosis can sometimes introduce bias. Therefore, for more accurate validation of this relationship, a longitudinal study with proper clinical testing along with an oral questionnaire might be needed to establish a comprehensive relationship. Moreover, the PHQ-9 questionnaire was used to assess the depression level at a single time point, and we could not follow up with the patients for a longer period. Investigation of depression in diabetic patients for a longer period follow-up might be helpful to develop a clearer relationship between diabetes and depression. Furthermore, a bidirectional association investigation between diabetes and depression was conducted to determine whether improving blood glycemic control can reduce depression severity or not. Additionally, the investigation of other factors, including co-morbid diseases, socioeconomic status, lifestyle, and cultural influences, might be helpful for accurate information about the cause of depression.

Conclusions

The conducted research is impactful due to the limited reported literature on the mental health issues in diabetic patients in Pakistan. The study investigated the prevalence of depression among the diabetic population and determined the relationship between depression severity and diabetic duration. Our findings reveal a high prevalence of depression among diabetic patients. More than half of the total diabetic population of both males and females are suffering from mild to severe depression. The chances of severe depression are high with the prolongation of diabetes and duration in the old age group. The current findings highlight the urgent need for effective healthcare approaches. In this regard, PHQ-9 questionnaires can be a useful tool to evaluate the patient's depression status and well-being. PHQ-9 is an important contribution to the health care system. Depression is often overlooked by physicians while treating diabetes. We recommend that the endocrinologist to include PHQ-9 based questionnaire in their investigation for timely diagnosis of depression. Overall, these findings reveal a significant burden of depression in diabetic patients and highlight the importance of early screening for effective care and treatment to enhance both mental health and diabetes management. Future studies should be carried out to reduce depression severity and prevention across the diabetic population.

Abbreviations

DHQ	District Headquarters Hospital
DM Type II	Diabetes mellitus type 2
IDF	International Diabetes Federation
KPK	Khyber Pakhtunkhwa
NDSP	National Diabetes Survey
PHQ-9	Personal Health Questionnaire-9

Author contributions
MF: Conceptualization, Literature search; Data curation, interpretation of data, writing, review, editing and revision ZW: Data processing and statistical analysisZD: Data collection LJ: Statistical analysis CK: Project guidance; PX: Project administration.

Data availability
The data sets used or analyzed during the current study are available on reasonable request. Email: madiha.fatima123@outlook.com.

Declarations

Ethics approval and consent to participate
The research is approved by department of Concerned of Kohat DHQ Hospital (IRBEC/944-22-01-24). It is in accordance with the Declaration of Helsinki 2011 and the current study obeyed the principle of ethical medical practice. Consent and was obtained from all the participants. From the adolescents aged 15–17 years ascent from along informed consent from parents or guardians was obtained.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Animal subjects
This study did not involve any animal subjects or tissue, as confirmed by all authors.

Other relationships
All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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