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Self-Management and Mental Health of type 2 Diabetic patients in Jazan: An observational study

Suhaila A. Ali[1], Amani Osman[1] , Sarah Salih[1], Anwar Makeen[1]

[1] Department of family and community medicine, Faculty of medicine, Jazan University, Jazan, Saudi Arabia

Corresponding author: Suhaila Abdalkarim Ali
suali@jazanu.edu.sa

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Abstract:

Background: With the increasing prevalence of type 2 diabetes mellitus, there is continuous surge of self-management to prevent long-term complications. Hence, the aim of this cross-sectional study is to determine the association between mental health, educational levels and their relationship with diabetes self-management among type 2 diabetes patients in Jazan region of Saudi Arabia.

Methods: An observational cross-sectional study design was employed, with data collected through a structured, validated, self-administered questionnaire. The instruments used included the Patient Health Questionnaire (PHQ-4) and the Diabetes Self-Management Questionnaire (DSMQ). The study's sample size was determined to be 445 diabetic patients. Data analysis was conducted using IBM SPSS Statistics software, incorporating both descriptive and inferential statistical methods.

Results: The study included 445 participants, of whom 51.7% were female. Most participants were married (57.9%), fell within the age range of 36-55 years (43.4%), and had attained a university-level education (40.8%). In terms of self-management activities, the study revealed that 52.8% of participants never checked their blood sugar levels, and 34.7% occasionally missed planned physical activities. Additionally, 39.6% frequently missed taking their diabetes medication. The study also assessed psychological disorders among the participants, finding that 37.0% reported a lack of interest and pleasure in activities, and 33.0% struggled to control anxiety and worry. Furthermore, the results indicated a significant correlation between education level, duration of illness, and diabetes self-management.

Conclusions: The study identified a significant association between long-term diabetes, educational status, and self-management. In Jazan, Saudi Arabia, poor self-care behaviors among individuals with T2DM are prevalent due to inadequate dietary habits.

Keywords: Diabetes mellitus, self-management, type 2 diabetes, mental health, educational level, questionnaire.

Introduction

Diabetes mellitus is the most common chronic endocrine disorder, affecting approximately 5-15% of the adult population globally. According to the International Diabetes Federation's 2022 statistics, the number of adults with diabetes increased from 285 million in 2009 to 463 million in 2019 [1]. If not diagnosed and managed properly, diabetes can lead to chronic comorbidities, potentially resulting in permanent organ failure and death. The rise in diabetes prevalence is notable among individuals aged 20-79 years in developing countries like Saudi Arabia. According to the World Health Organization, the Middle East region ranks second in the global prevalence of diabetes [1]. A recent systematic review reported that the current prevalence of type 2 diabetes in Saudi Arabia is around 28% [2].

Patients with type 2 diabetes mellitus (T2DM) are required to adhere to continuous and specific health management guidelines throughout their lives. Effective long-term care for T2DM involves active patient participation in various aspects of daily life, including diet, exercise, and medication management [3]. Globally, self-care management practices have become a crucial component of diabetes care. However, studies in the United States indicate that less than 50% of patients adhere to the recommended diabetes management guidelines [2]. Research in China has shown that patients with low socioeconomic status and lower levels of education tend to have higher glycemic indices and poorer self-management practices [4]. Diabetes self-management is considered a key factor in controlling glucose levels, and studies have reported that patients who engage in self-management can achieve a 37% improvement in diabetes control [4]. Despite the growing evidence supporting the importance of self-management in diabetes control, a limited number of patients adhere to these practices.

Psychosocial factors, such as anxiety, depression, and psychological distress can significantly impact diabetes self-management among patients [5]. Reduced psychological well-being can disempower patients and are linked to adverse outcomes, such as reduced self-care, poor health status, and compromised diabetes self-management [5]. When diabetic patients experience severe psychological stress, their ability to engage in self-care activities may be impaired, increasing the risk of complications such as heart disease, diabetic nephropathy, leg amputation, and even early death [6].

To achieve effective diabetes management, it is crucial for patients to have a clear understanding of the signs and symptoms of the disease and the proper strategies for managing and controlling their condition [7]. Health literacy plays a critical role in influencing key health outcomes, especially in the context of diabetes management. Effective patient health literacy is both important and challenging, as it requires individuals to have the awareness and capability to understand specific health information necessary for managing their diabetes [8].

In the USA, a study involving 402 patients revealed that a significant proportion, nearly 50%, lacked understanding of how lifestyle and dietary factors impact glycemic control due to inadequate health literacy [9]. This lack of knowledge and poor health literacy are significant barriers to effective diabetes self-management [10]. Despite this, findings on the relationship between health literacy and diabetes self-care are inconsistent. For instance, recent research has shown that low health literacy is associated with poorer diabetes self-management, inadequate glycemic control, and a higher prevalence of comorbid conditions [10].

In Saudi Arabia, misinterpretation of medical instructions is common among patients, particularly in hospices, due to the country's health literacy rate, which ranges from 13% to 30%. This issue is likely linked to privatization of education within the Kingdom [11]. Conversely, individuals aged 18 to 40 years in Saudi Arabia exhibit notably better health literacy compared to those aged 41 and older, potentially because the younger group has higher educational attainment [8]. Additionally, another study indicates that over 50% of diabetic patients in Saudi Arabia report insufficient e-health knowledge and difficulties in interpreting health information available online [12].

In a study on health literacy found no association between self-management and glycemic control [13]. This inconsistency could be due to factors like low education levels, depression, anxiety, and other demographic factors. Nevertheless, this association suggests the requirement of educational interventions in management of type 2 diabetes mellitus. The relationship between educational interventions, self-managements and psychological factors for type 2 diabetes is unknown among the population of Saudi Arabia. Only few studies have been conducted in eastern and western region of Saudi Arabia demonstrating a controversial result [12, 14]. Hence, this study aimed to determine the association between mental health, educational levels and their relationship with diabetes self-management among type 2 diabetes patients in Jazan region of Saudi Arabia.

Patients and Methods

Study Design, setting and population

An observational cross-sectional study was conducted to evaluate self-management practices among individuals with type 2 diabetes in Jazan, Saudi Arabia, and to explore the relationship between these practices and their psychological well-being. The study took place between November 2022 and January 2023 at the Diabetes Center in Jazan, a referral facility that manages both controlled and uncontrolled diabetic patients from various regional primary healthcare centers. The center serves a population of over 10,000 diabetic patients. The study included patients who were diagnosed with type 2 diabetes, had an active medical file at the center, were aged 18 years or older, and could communicate independently and provide informed written consent. Patients with type 1 diabetes and other comorbidities like hypertension, cardiac disorder and genetic anomalies were excluded from the study.

Sample size and Sampling technique

The study sample size was determined to be 480 diabetic patients, calculated using the formula: $N = [Z^2 * p * (1 - p)] / d^2$. In this formula, N represents the initial sample size, p is the expected population proportion, Z corresponds to the confidence level (typically 1.96 for a 95% confidence interval), and d represents the required margin of error. The initial sample size was estimated at 400 participants, assuming a 50% expected population proportion, a 95% confidence level, and a 5% margin of error. To account for potential non-responses, the sample size was increased by 20%, resulting in a final sample size of 480 participants.

Methods

The study has employed a structured, self-administered, and validated questionnaire in Arabic, which includes sections on socio-demographic background, diabetes-related information, the Saudi version of the Patient Health Questionnaire (PHQ-4), and the Diabetes Self-Management Questionnaire (DSMQ). The DSMQ is a 16-item validated instrument designed to assess self-care activities that influence glycemic control. It comprises four subscales: 'Glucose Management' (GM), 'Dietary Control' (DC), 'Physical Activity' (PA), and 'Health-Care Use' (HU), along with a 'Sum Scale' (SS) that serves as a global measure of self-care [15]. This tool has been validated and used across various studies in middle east. Each item is scored on a scale from 1 ("none of the time") to 5 ("all of the time"), with the total score ranging from 6 to 30. The PHQ-4, a screening test for psychological distress, has been translated into Arabic and validated in a study by Alhadi et al., with a total score ranging from 0 to 12 [16, 17].

Statistical analysis

Data entry and analysis were performed using IBM SPSS Statistics for Windows, version 24.0 (developed by IBM Corp., Armonk, New York, USA). The analysis utilized both descriptive and inferential statistics. For the descriptive analysis, frequency and percentage distributions were calculated to summarize the sociodemographic variables. To explore the relationships between the study variables and determine their significance, linear regression analysis was applied. This approach was also employed to evaluate the main outcomes of the study. In the regression analysis, R-squared (R^2) was used to indicate the proportion of variance in the dependent variable explained by the independent variable(s) in the model. A p-value of less than 0.05 was required to establish statistical significance. To ensure data quality, a pilot study involving 20 participants, selected based on the inclusion and exclusion criteria, was conducted. This pilot study tested the clarity of the questionnaire and identified potential design issues, though the results were not included in the final data analysis.

Ethical consideration

This research adhered to ethical standards and received approval from the Jazan Ethics Committee (national registration number: NCBE-KACST, KSA: H-10-Z-073) under approval number 2057.

Informed written consent, with assurances of participant anonymity, was obtained from all participants. All collected data was kept confidential and utilized solely for the purposes of this research.

Results

The demographic characteristics of the study participants are presented in Table 1. Among the respondents, 51.7% were female, and 47.4% were male. Married individuals constituted the largest proportion, representing 57.9% of the sample. Most participants, 43.4%, were in the 36-55 age group. The most common level of education among respondents was a graduate degree, accounting for 40.8% of the participants, while 12.5% had no formal education. A significant majority, 91.8%, were Saudi nationals. Regarding monthly income, 48.6% of participants reported earning less than 5000 Riyal. In terms of body mass index (BMI), 32.1% of the participants were classified as overweight, and 32.5% as obese. Additionally, over 33.0% of the participants had been living with diabetes for more than ten years. A large portion of the participants, 44.1%, relied on someone else to manage their medication, and 65.3% had a family member with diabetes.

Table 1 Background characteristics of the study participants

Factor	Frequency	Percent
Gender		
Male	213	47.4%
Female	232	51.7%
Social status		
Single	79	17.6%
Married	260	57.9%
Divorced	52	11.6%
Widow	49	10.9%
Age group		
19-35	140	31.2%
36-55	195	43.4%
more than 55	114	25.4%
Educational level		
Uneducated	56	12.5%
Primary	41	9.1%
Intermediate	57	12.7%
higher secondary	108	24.1%
University	183	40.8%
Nationality		
Saudi	412	91.8%
Non-Saudi	33	7.3%
Employment		
Employed	229	51.0%
Unemployed	210	46.8%
Monthly income		
less than 5000	218	48.6%
5000-10000	34	7.6%
more than 10000	136	30.3%
BMI		
under weight	5	1.1%
healthy weight	145	32.3%
over weight	144	32.1%
Obese	146	32.5%
How long have you been diabetic?		
less than a year	113	25.2%
1-5 years	99	22.0%

6-10 years	86	19.2%
more than 10 years	148	33.0%
Someone taking care of your medication?		
Yes	198	44.1%
No	103	22.9%
Sometimes	142	31.6%
A family member with diabetes		
Yes	293	65.3%
No	67	14.9%
I don't know	89	19.8%

Table 2 presents the self-management practices among individuals with type 2 diabetes, highlighting a range of behaviors related to blood sugar monitoring, dietary habits, medication adherence, and physical activity.

Blood Sugar Monitoring: A significant portion of participants, 52.8%, reported never checking their blood sugar levels, while only 11.8% consistently monitor their levels. Additionally, 67% of participants never record their sugar levels regularly.

Dietary Habits: When it comes to diet, 53.9% of participants sometimes follow a diet that helps maintain good blood sugar levels, but 39% reported frequently consuming sweets and carbohydrates. Only 6.2% of participants always follow the nutritional recommendations given by their doctor.

Medication Adherence: In terms of medication adherence, 37% of participants reported never missing their prescribed doses, while 16.7% always adhere to their medication regimen. However, 40.5% of participants sometimes miss taking their diabetes medication.

Doctor Visits: Regularly attending doctor's appointments is a challenge for many, with only 22.3% always keeping their appointments. In contrast, 44.1% of participants sometimes avoid appointments, and 4.7% always avoid appointments.

Physical Activity: Regarding physical activity, 56.6% of participants sometimes exercise to maintain good blood sugar levels, while 21.8% never engage in exercise. Moreover, 37% of participants often miss planned physical activities, and 60.8% never avoid physical activities.

Overall Self-Care: In terms of overall self-care, 42.5% of participants rated their diabetes self-care as sometimes poor, with 39.2% believing their self-care is maintained.

These findings reveal significant variability in self-management practices among individuals with type 2 diabetes, with notable gaps in critical areas such as blood sugar monitoring, dietary adherence, and physical activity.

Table 2 Self-management practices among type-2 diabetics

Self-management among type-2 diabetics					
Statement		Never	Sometimes	Often	Always

I check my sugar level	Frequency	237	112	41	53
	percentage	52.8%	24.9%	9.1%	11.8%
My food helps maintain a good blood sugar level	Frequency	83	242	82	34
	percentage	18.5%	53.9%	18.3%	7.6%
Keep doctors' appointments for diabetes	Frequency	64	137	139	100
	percentage	14.3%	30.5%	31.0%	22.3%
I take the medicine according to the prescription	Frequency	166	116	86	75
	percentage	37.0%	25.8%	19.2%	16.7%
I eat a lot of sweets and carbohydrates	Frequency	175	130	81	55
	percentage	39.0%	29.0%	18.0%	12.2%
I record my sugar level regularly	Frequency	301	89	33	25
	percentage	67.0%	19.8%	7.3%	5.6%
I avoid doctors' appointments to treat diabetes	Frequency	184	198	44	21
	percentage	41.0%	44.1%	9.8%	4.7%
I exercise to maintain a good blood sugar level	Frequency	98	254	65	29
	percentage	21.8%	56.6%	14.5%	6.5%
Strictly follow the nutritional recommendations given by my doctor	Frequency	83	156	180	28
	percentage	18.5%	34.7%	40.1%	6.2%
I do not check my blood sugar levels regularly	Frequency	177	185	65	19
	percentage	39.4%	41.2%	14.5%	4.2%
I avoid physical activities	Frequency	273	90	62	22
	percentage	60.8%	20.0%	13.8%	4.9%
I often miss taking my diabetes medication	Frequency	178	182	60	28
	percentage	39.6%	40.5%	13.4%	6.2%
Sometimes I get bouts of excessive cravings	Frequency	87	252	72	35
	percentage	19.4%	56.1%	16.0%	7.8%
I have to see a diabetes doctor more often	Frequency	115	227	69	32
	percentage	25.6%	50.6%	15.4%	7.1%
I often miss planned physical activity	Frequency	156	98	166	28
	percentage	34.7%	21.8%	37.0%	6.2%
My self-care for diabetes is bad	Frequency	176	191	48	32
	percentage	39.2%	42.5%	10.7%	7.1%

Figure 1 indicates that 37.0% of participants frequently experienced a lack of interest and pleasure in activities for most of the day. Additionally, a significant portion, 61.5%, reported feeling uncomfortable, depressed, or hopeless on several days throughout the week. Similarly, 59.0% of participants often feel stressed, nervous, and anxious on some days. Furthermore, 33.0% of the participants struggled with an inability to control anxiety and worry for most of the day.

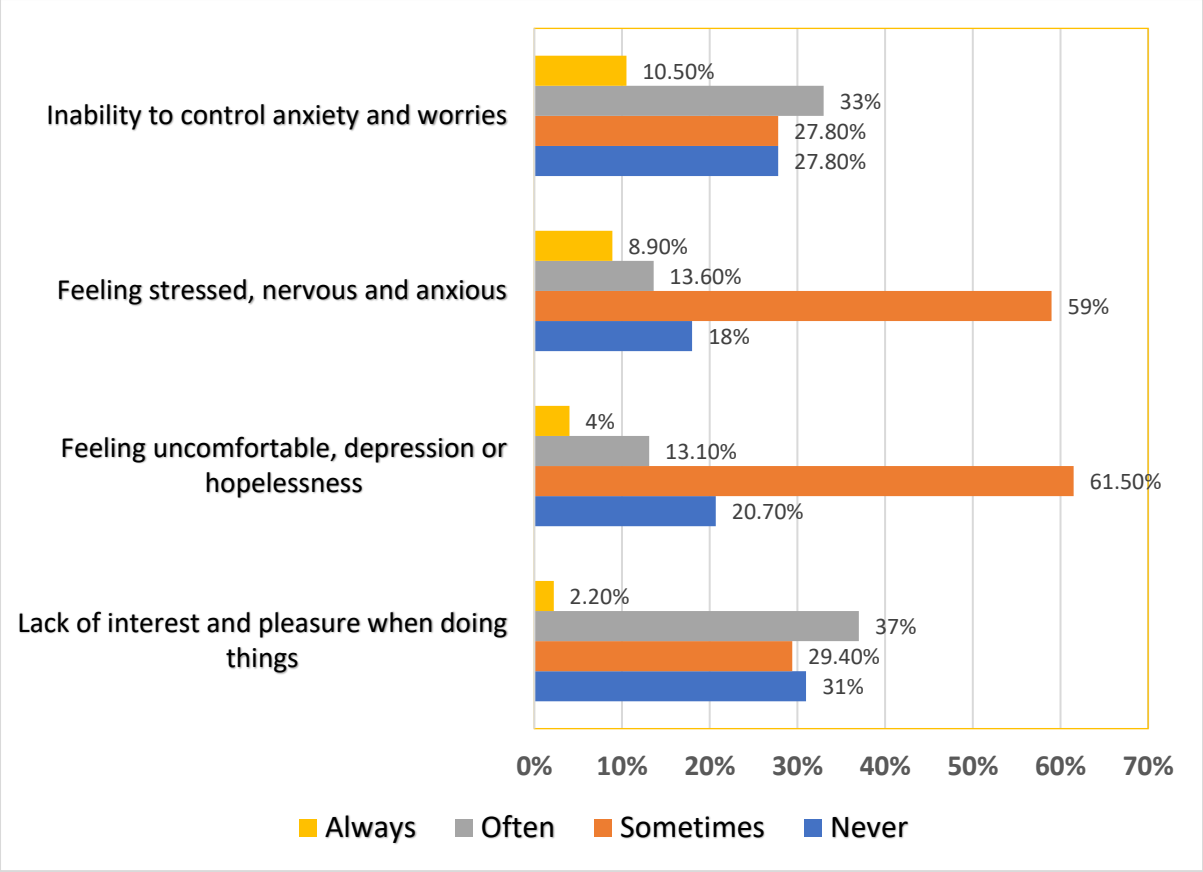

Figure 1: Psychological disorders items among study participants

The linear regression model examined the relationship between various demographic and health-related variables and medication adherence among individuals with type 2 diabetes. The dependent variable in this model is "Adherence to medications," with the model explaining 20.4% of the variance in medication adherence ($R^2 = 0.204$) (Table 3).

Constant: The intercept of the model is 20.625, indicating the expected value of medication adherence when all independent variables are held at zero.

Gender: The coefficient for gender is 1.260 ($p = 0.125$), with a standardized beta of 0.082. This suggests a positive, though not statistically significant, association between gender and medication adherence.

Social Status: The coefficient for social status is -0.710 ($p = 0.171$), with a standardized beta of -0.077. This indicates a negative relationship with medication adherence, but it is not statistically significant.

Age Group: The coefficient for age group is -0.412 ($p = 0.498$), with a standardized beta of -0.040, indicating a non-significant negative relationship between age and medication adherence.

Educational Level: The educational level has a coefficient of 0.649 ($p = 0.112$) and a standardized beta of 0.115, suggesting a positive but not statistically significant association with medication adherence.

Nationality: The coefficient for nationality is -0.597 ($p = 0.732$), with a standardized beta of -0.017. This shows a slight negative relationship, but it is not statistically significant.

Employment Status: Employment status shows a significant positive relationship with medication adherence, with a coefficient of 2.715 (p = 0.010) and a standardized beta of 0.174. This indicates that employed individuals are more likely to adhere to their medication regimen.

Monthly Income: The coefficient for monthly income is 0.218 (p = 0.681), with a standardized beta of 0.026, indicating a non-significant positive relationship with medication adherence.

BMI: The BMI coefficient is -0.396 (p = 0.385), with a standardized beta of -0.045, suggesting a non-significant negative relationship between BMI and medication adherence.

Duration of Diabetes: The variable "How long have you been diabetic?" is significantly associated with medication adherence, with a coefficient of 2.527 (p = 0.000) and a standardized beta of 0.392. This suggests that individuals who have been diabetic for a longer period are more likely to adhere to their medication.

Medication Management by Others: The coefficient for whether someone else takes care of the participant's medication is 0.059 (p = 0.902), with a standardized beta of 0.007, indicating a non-significant relationship with medication adherence.

The regression analysis highlights that employment status, and the duration of diabetes are the only variables significantly associated with medication adherence. Employed individuals and those who have been living with diabetes for a longer period are more likely to adhere to their prescribed medication regimen. Other variables, such as gender, social status, age, education level, nationality, monthly income, BMI, and external medication management, did not show significant associations with medication adherence in this study (Table 3).

Table 3 Linear regression for the relationship of demographic factors and adherence to medications.

Variables	Unstandardized Coefficients		Standardized Coefficients	t	p value .
	B	Std. Error	Beta		
(Constant)	20.625	4.391		4.697	.000
Gender	1.260	.819	.082	1.538	.125
Social status	-.710	.517	-.077	-1.373	.171
Age group	-.412	.607	-.040	-.678	.498
Education. Level	.649	.407	.115	1.594	.112
Nationality	-.597	1.744	-.017	-.342	.732
Employment	2.715	1.047	.174	2.594	.010
Monthly Income	.218	.528	.026	.412	.681
BMI	-.396	.455	-.045	-.870	.385
How long have you been diabetic?	2.527	.379	.392	6.671	.000
Is there someone taking care of your medication?	.059	.475	.007	.124	.902
a. Dependent Variable: Adherence to medications; R^2 = .204					

The linear regression analysis explored factors influencing self-management practices among individuals with type 2 diabetes, with the model accounting for 12.5% of the variance in self-management ($R^2 = 0.125$) (Table 4).

Education Level: Significantly positively associated with self-management (coefficient = 1.029, p = 0.014, β = 0.189), indicating that higher education correlates with better self-management practices.

Duration of Diabetes: Significantly negatively associated with self-management (coefficient = -1.749, p = 0.000, β = -0.279), suggesting that a longer duration of diabetes is linked to poorer self-management.

Other Variables: Gender, social status, age group, nationality, employment, monthly income, BMI, and whether someone else manages the participant's medication did not show statistically significant relationships with self-management (p > 0.05 for all).

In summary, higher education is positively related to better self-management, while a longer duration of diabetes is associated with poor self-management.

Table 4: Demographic factors associated with Self-management among the study participants

Variables	Unstandardized Coefficients		Standardized Coefficients	t	P value
	B	Std. Error	Beta		
(Constant)	11.816	4.548		2.598	.010
Gender	-.891	.842	-.060	-1.058	.291
Social status	-.703	.513	-.079	-1.369	.172
Age group	.833	.613	.083	1.359	.175
Education Level	1.029	.417	.189	2.469	.014
Nationality	2.434	1.785	.071	1.363	.174
Employment	1.512	1.097	.099	1.379	.169
Monthly income	-.476	.548	-.059	-.870	.385
BMI	.575	.466	.066	1.234	.218
How long have you been diabetic?	-1.749	.385	-.279	-4.540	.000
Is there someone taking care of your medication?	-.259	.480	-.031	-.539	.590
a. Dependent Variable: Self-management; R2= .125					

The linear regression analysis examined the factors affecting psychological disorders among individuals with type 2 diabetes, with psychological disorders as the dependent variable. The model explained 9.4% of the variance in psychological disorders ($R^2 = 0.094$)(Table 5).

Constant: The intercept of 7.252 (p = 0.000) represents the baseline level of psychological disorders when all other variables are held constant.

Gender: The coefficient for gender is 0.358 (p = 0.223) with a standardized beta of 0.068, indicating a non-significant positive relationship with psychological disorders.

Social Status: The coefficient for social status is 0.204 (p = 0.258) with a standardized beta of 0.065, suggesting a non-significant positive effect on psychological disorders.

Age Group: The coefficient for age group is 0.471 (p = 0.029) with a standardized beta of 0.132, indicating a statistically significant positive association. Older age groups are associated with higher levels of psychological disorders.

Education Level: The coefficient for education level is -0.025 (p = 0.861) with a standardized beta of -0.013, showing a non-significant negative effect on psychological disorders.

Nationality: The coefficient for nationality is 0.717 (p = 0.263) with a standardized beta of 0.058, suggesting a non-significant positive relationship with psychological disorders.

Employment: The coefficient for employment is -0.662 (p = 0.079) with a standardized beta of -0.123, reflecting a non-significant negative relationship with psychological disorders, approaching significance.

Monthly Income: The coefficient for monthly income is -0.182 (p = 0.336) with a standardized beta of -0.064, indicating a non-significant negative effect on psychological disorders.

BMI: The coefficient for BMI is -0.052 (p = 0.749) with a standardized beta of -0.017, showing a non-significant negative effect on psychological disorders.

Duration of Diabetes: The coefficient for the duration of diabetes is -0.413 (p = 0.002) with a standardized beta of -0.188, indicating a significant negative relationship. Longer duration of diabetes is associated with fewer psychological disorders.

Medication Management: The coefficient for whether someone else manages the participant's medication is 0.279 (p = 0.103) with a standardized beta of 0.093, showing a non-significant positive effect on psychological disorders.

The analysis identifies age group and the duration of diabetes as significant predictors of psychological disorders. Older age is associated with higher psychological distress, while a longer duration of diabetes is associated with fewer psychological disorders. Other factors, including gender, social status, education level, nationality, employment status, monthly income, BMI, and external medication management, did not show significant associations with psychological disorders in this model (Table 5).

Table 5 Linear regression for the relationship of demographic factors and psychological disorders

Variables	Unstandardized Coefficients		Standardized Coefficients	t	p value
	B	Std. Error	Beta		

(Constant)	7.252	1.593		4.552	.000
Gender	.358	.293	.068	1.220	.223
Social status	.204	.180	.065	1.133	.258
Age group	.471	.215	.132	2.195	.029
Education Level	-.025	.146	-.013	-.175	.861
Nationality	.717	.639	.058	1.122	.263
Employment	-.662	.376	-.123	-1.759	.079
Monthly income	-.182	.188	-.064	-.964	.336
BMI	-.052	.163	-.017	-.320	.749
how long have you been diabetic?	-.413	.134	-.188	-3.085	.002
Is there someone taking care of your medication?	.279	.170	.093	1.637	.103
a. Dependent Variable: Psychological disorders ; R2= .094					

Discussion

The result of this study provided a valuable insight into the self-management and mental health of type-2 diabetes mellitus patients in Jazan, Saudi Arabia. The research indicates a significant link between inadequate glycemic control and poor self-management, emphasizing the critical role of effective self-care in managing diabetes. Furthermore, the study reveals a high prevalence of mental health disorders among diabetic patients, with a notable tendency for these individuals to experience anxiety and depression. Similar findings were reported in a study in Jazan province where depression was higher in type 1 and 2 DM patients compared to controls [18]. In a study in Damman region of Saudi Arabia, patient with poor glycemic control had higher chances of depression and stress compared to controls [8].

These findings align with existing research that underscores the influence of diabetes on mental health and the importance of self-management. A systematic review on self-management and psychological health of type 2 DM patients reported that by consistent improvement in self-management (exercise and social support) there are chances for improvement in short-term glycemic control [6]. This review has provided various self-management measures and mode of delivery for those to control type 2 diabetes [6]. In a meta-analysis it was reported that multi-component of self-management of type 2 DM leads to improvement in behavior and reduction in glucose levels [19]. In a study in Mexico, it was found that type-2 diabetes patients with low-socioeconomic status requires more self-management programs to improve the health outcomes and reduce the complications [20].

In the present study a significant association was found between educational levels and self-management. Previous studies found better compliance with dietary instructions, for instance, less educated patients had a lack of knowledge and attitude towards self-management compared to educated

patients. This result could be attributed to the fact that higher education directly impacts on the knowledge and the inspiration to control type 2 DM. Conversely, in another study on type 2 DM patients of Saudi Arabia it was mentioned that there is no association between variables like education levels and type 2 DM [21]. The authors of this study mentioned that the eating culture of Saudi population consist of high amounts on carbohydrates and fats making it impossible to control diet and follow self-management regimes [21].

Regarding physical exercise, males were found more physically active than females and followed exercise regimen regularly. Saudi females were found disproportionately inactive, starting from their school years. This could be attributed to the cultural barriers, lack of social support, and absences of physical activities in female schools. In a study conducted at Riyadh hospital the major barrier mentioned was lack of physical activities especially among the lower socioeconomic and rural areas [12].

The duration of illness was found as a significant factor influencing self-management behaviors, with individuals experiencing longer durations of type 2 DM being less likely to engage in effective self-management practices [12]. This trend may be attributed to factors such as fatigue, burnout, or a growing complacency towards managing the disease over time. Therefore, it is crucial for healthcare providers to acknowledge these barriers and provide continuous support and education to individuals with long-term diabetes mellitus [22]. Furthermore, the analysis revealed that both age and the duration of illness were associated with a higher prevalence of psychological disorders among individuals with type 2 diabetes. Older individuals were more likely to exhibit symptoms such as reduced interest in activities, feelings of discomfort or depression, heightened stress and anxiety, and difficulties in controlling anxious behaviors [23]. These findings align with previous research, which also indicates a higher prevalence of psychological disorders among those with diabetes.

The result of linear regression analysis showed a positive association between type 2 DM and psychological illness. Previously published literature showed that depressive symptoms are associated with long term diabetes mellitus. Biologically, with depression there is alteration in neuroendocrine and glucose metabolism eventually increasing glucose levels in blood [24]. Moreover, studies have reported that negative moods like anger and depression, is commonly associated with the lack of glycemic control [7, 10, 20, 23, 25].

Patients with long term diabetes have a higher prevalence of depression than controlled diabetes. In a comparative study it was found that elderly men with long term diabetes mellitus had more risk of developing depression compared to short term diabetes. In a questionnaire-based study it was found that 55.5% of individuals with type 2 diabetes suffered from depression and anxiety [11]. In this study psychological symptoms were positively correlated with duration of the disease. However, there was no significant association between blood glucose levels and depression and self-management strategy. Similarly, in the current study psychological factors are positively associated with duration of disease.

However, no significant association was found between glycemic levels and depression and self-management.

The result of this study reported the requirement of regular self-management interventions for individuals with type 2 DM. Currently, approximately 50% of individuals diagnosed with diabetes mellitus (DM) do not meet the recommended targets for key clinical indicators: glycated hemoglobin (HbA1c) levels below 7.0%, blood pressure under 130/80 mmHg, and low-density lipoprotein cholesterol levels below 100 mg/dL[26]. In response, the American Diabetes Association (ADA) and the American Association of Clinical Endocrinologists emphasize the importance of diabetes self-management education (DSME) and diabetes self-management support (DSMS) as integral components of diabetes management [26, 27]. DSME involves the facilitation of the knowledge, skills, and abilities necessary for effective diabetes self-care, while DSMS focuses on providing the ongoing support required to implement coping strategies and behaviors essential for successful self-management [27].

A systematic review conducted by Chrvala et al. examined the effects of diabetes self-management education on HbA1c levels in adults with type 2 diabetes mellitus (T2DM), comparing outcomes between those who received education and patients without education [26]. The study found that patients who participated in educational interventions experienced reductions in HbA1c levels ranging from −0.1 to −2.50, compared to those who did not receive such interventions. The authors concluded that diabetes self-management education is significantly associated with improved glycemic control [19]. Additionally, increased self-management knowledge has been shown to positively impact the reduction of HbA1c levels and slow the progression of the disease [10].

The burden of type 2 diabetes is higher in Saudi Arabia and self-management has not been reported that much. In a study by Almigbal et al. it was reported that besides receiving educational interventions around 100 Saudi patients did not show any improvement in their blood glucose levels at 6-months and 12 months of follow-ups [13]. Hence, there is requirement for educational and self-management interventions to reduce the burden of type 2 DM.

Limitations

The author acknowledges various limitations associated with the current study. Firstly, the study was conducted in one province of Saudi Arabia hence, the results cannot be generalized. Secondly, no scale was used to check the level of depression among the patients with type 2 diabetes. As a result, the data may be biased due to under or over-reporting. Additionally, this study does not cater about blood glucose level of the patient, and dietary habits. As a result, the author does not know the current state of diabetes control of the patients. Lastly, the questionnaire-based findings of this study could result in recall and self-administered bias.

Conclusion

Based on the findings of this study, a significant association was found in between long-term diabetes, educational status and self-management. It is recommended that health care professionals in public health centers acquire the media and methods used to deliver health information. Providing opportunities for individuals with diabetes to share their feelings and experiences in managing their condition. Enhancing the delivery of health information is expected to reduce feelings of isolation and improve self-efficacy in blood sugar management. Furthermore, health centers should develop targeted programs and provide resources for families of patients with HbA1c levels greater than 9% to better support self-management efforts.

Patients with type 2 DM should be regularly screened for sign and symptoms of psychological disorder and should be referred to a psychologist if required. Furthermore, poor self-care behavior is common among individuals with type 2 diabetes mellitus (T2DM) in Jazan, Saudi Arabia, due to inadequate dietary habits. Therefore, it is essential to promote effective diabetes self-care behaviors among patients with T2DM. Healthcare providers should make continuous efforts to accurately assess how patients can implement recommended lifestyle changes and enhance self-care education to support these individuals in managing their condition effectively.

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References

1. Zimmet, P.Z., et al., *Diabetes: a 21st century challenge.* Lancet Diabetes Endocrinol, 2014. **2**(1): p. 56-64.
2. Fazeli Farsani, S., et al., *Global trends in the incidence and prevalence of type 2 diabetes in children and adolescents: a systematic review and evaluation of methodological approaches.* Diabetologia, 2013. **56**(7): p. 1471-88.
3. *Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). UK Prospective Diabetes Study (UKPDS) Group.* Lancet, 1998. **352**(9131): p. 837-53.
4. Guo, X.H., et al., *A nationwide survey of diabetes education, self-management and glycemic control in patients with type 2 diabetes in China.* Chin Med J (Engl), 2012. **125**(23): p. 4175-80.
5. Gonzalez-Zacarias, A.A., et al., *Impact of demographic, socioeconomic, and psychological factors on glycemic self-management in adults with type 2 diabetes mellitus.* Frontiers in public health, 2016. **4**: p. 195.
6. Fiest, K.M., et al., *Systematic review and assessment of validated case definitions for depression in administrative data.* BMC Psychiatry, 2014. **14**: p. 289.
7. Yosef, T., D. Nureye, and E. Tekalign, *Poor Glycemic Control and Its Contributing Factors Among Type 2 Diabetes Patients at Adama Hospital Medical College in East Ethiopia.* Diabetes Metab Syndr Obes, 2021. **14**: p. 3273-3280.
8. Alshahri, B.K., et al., *Assessment of Self-Management Care and Glycated Hemoglobin Levels Among Type 2 Diabetes Mellitus Patients: A Cross-Sectional Study From the Kingdom of Saudi Arabia.* Cureus, 2020. **12**(12): p. e11925.
9. Saaddine, J.B., et al., *Improvements in diabetes processes of care and intermediate outcomes: United States, 1988-2002.* Ann Intern Med, 2006. **144**(7): p. 465-74.
10. Tang, T.S., et al., *Peer-led, empowerment-based approach to self-management efforts in diabetes (PLEASED): a randomized controlled trial in an African American community.* The Annals of Family Medicine, 2015. **13**(Suppl 1): p. S27-S35.
11. Saad, A.M.J., et al., *Self-efficacy, self-care and glycemic control in Saudi Arabian patients with type 2 diabetes mellitus: A cross-sectional survey.* Diabetes Res Clin Pract, 2018. **137**: p. 28-36.
12. Alzahrani, A., et al., *Prevalence and predictors of depression, anxiety, and stress symptoms among patients with type II diabetes attending primary healthcare centers in the western region of Saudi Arabia: a cross-sectional study.* Int J Ment Health Syst, 2019. **13**: p. 48.
13. Al Mansour, M.A., *The Prevalence and Risk Factors of Type 2 Diabetes Mellitus (DMT2) in a Semi-Urban Saudi Population.* International Journal of Environmental Research and Public Health, 2020. **17**(1): p. 7.
14. Alshahrani, N.Z., et al., *Compliance of the Gulf Cooperation Council airlines with COVID-19 mitigation measures.* J Travel Med, 2021. **28**(2).
15. Schmitt, A., et al., *The Diabetes Self-Management Questionnaire (DSMQ): development and evaluation of an instrument to assess diabetes self-care activities associated with glycaemic control.* Health Qual Life Outcomes, 2013. **11**: p. 138.

16. Alshahrani, S.M., et al., *Association between diabetes consequences and quality of life among patients with diabetes mellitus in the Aseer Province of Saudi Arabia.* Open Access Macedonian Journal of Medical Sciences, 2020. **8**(E): p. 325-330.
17. Kroenke, K., R.L. Spitzer, and J.B. Williams, *The PHQ-9: validity of a brief depression severity measure.* J Gen Intern Med, 2001. **16**(9): p. 606-13.
18. Alkhormi, A.H., N.Z. Alshahrani, and S.E. Mahmood, *Khat chewing leads to increase in glycaemic parameters in patients with type 2 diabetes mellitus in Jazan region, Saudi Arabia and Yemen.* Diabetes Metab Syndr, 2021. **15**(2): p. 565-568.
19. Rosenbaum, S., et al., *Physical activity interventions for people with mental illness: a systematic review and meta-analysis.* J Clin Psychiatry, 2014. **75**(9): p. 964-74.
20. Shi, C., et al., *Barriers to Self-Management of Type 2 Diabetes During COVID-19 Medical Isolation: A Qualitative Study.* Diabetes Metab Syndr Obes, 2020. **13**: p. 3713-3725.
21. Albasheer, O.B., et al., *Depression and related risk factors among patients with type 2 diabetes mellitus, Jazan area, KSA: A cross-sectional study.* Diabetes & Metabolic Syndrome: Clinical Research & Reviews, 2018. **12**(2): p. 117-121.
22. Dal Canto, E., et al., *Diabetes as a cardiovascular risk factor: An overview of global trends of macro and micro vascular complications.* European Journal of Preventive Cardiology, 2020. **26**(2_suppl): p. 25-32.
23. Hussain, S., et al., *Prevalence of depression among type 2 diabetes mellitus patients in India: A meta-analysis.* Psychiatry Res, 2018. **270**: p. 264-273.
24. Powers, M.A., et al., *Diabetes self-management education and support in type 2 diabetes: a joint position statement of the American Diabetes Association, the American Association of Diabetes Educators, and the Academy of Nutrition and Dietetics.* Diabetes Educ, 2015. **41**(4): p. 417-30.
25. Utli, H. and B. Vural Doğru, *The effect of the COVID-19 pandemic on self-management in patients with type 2 diabetics.* Prim Care Diabetes, 2021. **15**(5): p. 799-805.
26. Chrvala, C.A., D. Sherr, and R.D. Lipman, *Diabetes self-management education for adults with type 2 diabetes mellitus: a systematic review of the effect on glycemic control.* Patient education and counseling, 2016. **99**(6): p. 926-943.
27. Kueh, Y.C., T. Morris, and A.-A.-S. Ismail, *The effect of diabetes knowledge and attitudes on self-management and quality of life among people with type 2 diabetes.* Psychology, health & medicine, 2017. **22**(2): p. 138-144.