International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

Screening for Depression and Well-Being among Patients with Diabetes in an Outpatient Diabetic Clinic at a Tertiary Care Hospital in Saudi Arabia: A Cross-Sectional Study

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Running Title: Depression and well-being

Abstract: ***Background and Aim: Depression is a common and severe medical condition with a lifetime occurrence in economically low-income countries around 11% to 15% in high-income countries. In this study, we aimed to screen depression and well-being among patients with diabetes in Saudi Arabia. Methods: This cross-sectional study was conducted among 185 (age range 18-75yrs) patients with diabetes at the Diabetes Treatment Center, Prince Sultan Military Medical City (PSMMC), Riyadh, Saudi Arabia. The depression level was measured using a psychological screening scale, the 9-item Patient Health Questionnaire (PHQ-9) and the World Health Organization Well-being Index (WHO-5)used to assess psychological well-being. In addition to screening the depression, demographic variables, diabetes-related complications, glycated hemoglobin (HbA1c), and type of medications used for treatment were also collected. Results: According to PHQ-9, a higher percentage of the study population possess mild (29.7%) depression, 21.6% moderate, 12.4% moderate to severe, and 7.6% have severe depression. Further, significantly higher mean scores of depression were observed among insulin pump users (p = 0.044), patients with macrovascular complications (p = 0.049) and patients with long duration of diabetes (p = 0.041). According to the WHO-5 screening scale, significantly lower mean scores of mental well-beingwere observed among insulin pump users (p = 0.008), patients with macrovascular complications (p = 0.032) and patients with long duration of diabetes (p = 0.044). A positive correlation was observed between WHO-5 and PHQ-9 (R^2 =0.52). Conclusions: A higher number of patients with diabetes have mild to severe depression and a lower level of mental well-being. These findings could be of immense assistance to the government, healthcare systems, educational institutions, and researchers to develop evidence-based programs, policies, and guidelines for increasing the knowledge and awareness about depression among diabetes, so that primary detection and management can be ensured to control the escalating burden of depression among diabetes in Saudi Arabia.***

Keywords: Depression, well-being, diabetes, Saudi Arabia

1. Introduction

The Kingdom of Saudi Arabia is one of the 19 countries and territories of the International Diabetes Federation (IDF), the Middle East and North Africa (MENA) region [1]. From a recent World Health Organization (WHO) report, irrespective of the income group, over the past three decades, a dramatic increase has been observed in the incidence of diabetes in all countries worldwide [2]. The IDF, Diabetes Atlas 10th edition 2021 statistics stated that on a global level, 537 million adults in the 20 to 79 year age range live with diabetes; or express it more concisely, 1 in every ten persons is a diabetic [3]. However, this number is estimated to rise to 643 million by 2030 and touch an alarming 784 million by 2045 [3].

Over the past few years, Saudi Arabia has experienced an extensive increase in diabetes mellitus (DM) and its alarming growth rate. Indeed, in the past thirty years, a ten-fold rise in the prevalence of DM seen in Saudi Arabia [4-6]. Importantly, the most recent statistics by Worldometer, out of a population of about 34.8 million in Saudi Arabia, 4.274.1 million people have diabetes. Further, 1.863.5 million people have diabetes; however, they have not yet been identified. Besides, the IDF also projected that the DM prevalence will double in Saudi Arabia by 2045 [7].

Recent reports stated that depression is a common and significant medical disease with a lifetime prevalence ranging from 11% in low-income countries to 15% in high-income countries [3]. There is evidence that compared to normal glucose metabolism individuals, the prevalence of depression is moderately increased in patients with prediabetes and undiagnosed diabetes, and markedly increased in patients with diabetes previously diagnosed [8]. Further, worldwide, compared with the general population, the prevalence of depression could be up to two times higher in people with type 2 diabetes (T2D) and three times higher in people with type 1 diabetes (T1D) [9]. Also, similar to depression, anxiety appears 40% of patients with type 1 and 2 diabetes [10]. Diabetic patients with depression and anxiety worsens the prognosis of diabetes, upsurges the non-compliance he

medical treatment, decline quality of life and upsurges the mortality rate [11-13]. Recently, it has been demonstrated that screening depressive symptoms regularlyis essential for people with diabetes. However, compared to the developing countries, limited researches are currently available about the depression and well-being among patients with diabetes. Hence, in this present study, we aimed to find the level of depression and well-being among patients with diabetes in Saudi Arabia.

2. Methods

This is a non-interventional, descriptive cross-sectional study conducted from May 2021 to September 2021, using 185 patients diabetes at the Diabetes Treatment Center, Prince Sultan Military Medical City (PSMMC), Riyadh, Saudi Arabia. The research was conducted following the declaration of Helsinki and approved by the Research and Ethics Committee of PSMMC, Riyadh, Saudi Arabia.

Inclusion and exclusion criteria

Patients with T1D or T2D, aged 18-75 yrs. were included in this study. Exclusion criteria were patients with pregnancy, breast feeding, non-ambulatory status, illiteracy, severe mental illnesses or malignant disease, and other issues resulting in an obstacle to completing a written questionnaire. The participants were instructed about their roles in this study, and signed informed consent was received before enrolling.

Data collection

Demographic information such as age, gender, marital status, body mass index (BMI), smoking status, and education level were collected during patient assessment through an interview by the investigators. The glycated hemoglobin (HbA1c), diabetes-related complications, and type of medications for diabetes treatment were also collected.

WHO-5 Well-Being Index (WHO-5)

The WHO-5 is a short, self-administered measure of well-being over the last two weeks (15, 16). It contains five positively worded items rated on a 6-point Likert scale, ranging from 0 (at no the time) to 5 (all of the time). The raw scores are converted from 0 to 100, with lower scores representing worse well-being. A score of ≤50 specifies poor well-being and recommends further examination into possible symptoms of depression. A score of 28 or below is indicative of depression [14]. Although the WHO-5 was initially developed as a measure of subjective well-being, numerous studies suggest that it also has satisfactory psychometric properties for assessing depressive symptoms [15, 16].

Patient Health Questionnaire-9 (PHQ-9)

The PHQ-9 is a 9-item self-report instrument aimed to measure the depression severity. The items duplicate the 9 diagnostic criteria for major depressive disorder covered in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV). The PHQ-9 examines, in the past two weeks how frequently participants have been disturbed by problems. Each item scored on a 4-point Likert scale, from 0 (not at all) to 3 (nearly every day). The PHQ-9 total score range from 0-27. Total scores of 5-9, 10-14, 15-19, and 20-27 represent cut points for mild, moderate, moderately severe and severe depression, respectively. 0-4 are considered as none or minimal [17].

Statistical analysis

Data were recorded using Microsoft Excel 2019 (Microsoft Corporation, Seattle, WA, USA) and analysed using Statistical Package for Social Sciences version 22 (SPSS Inc., Chicago, IL, USA). In addition to, the descriptive analysis and "t" test was done to identify the variables associated with screening for depression and well-being among patients with diabetes. A p-value of < 0.05 was considered to be statistically significant.

3. Results

Table 1 lists the demographic variables collected in this study. The number of patients enrolled was 185 (mean age 56.1 ± 11.2 years). A higher number of the population (55.7%) in the study included individuals ≥40 years of age, male gender (53 %), married (77.8 %), non-smokers (73%), BMI ≥25, T2D (56.2%) and have had diabetes for a duration of diabetes ≥10 years (60.5 %).

Table 2 reveals the responses that the participants gave concerning PHQ-9. Significantly lower mean scores of depression were observed among insulin pump users ($p = 0.044$), patients with macrovascular complications ($p = 0.049$) and patients with long duration of diabetes ($p = 0.041$).

Table 3 reveals the responses that participants gave concerning WHO well-being Index-5. Significantly lower mean well-being scores were observed among insulin pump users ($p = 0.008$), patients with macrovascular complications ($p = 0.032$) and patients with long duration of diabetes ($p = 0.044$).

Table 4 shows the results of regression analyses with β-coefficient and 95% confidence interval for depression adjusted for significant confounders. No significant changes were observed among the insulin pump users, patients with macrovascular complications and duration of diabetes.

Figure 1 displays the depression level of the study population. According to PHQ-9, a higher percentage of the study population possess mild (29.7%) depression, 21.6% moderate, 12.4% moderate to severe and 7.6% have severe depression. Figure 2 shows the correlation between PHQ-9 and WHO-5. A positive correlation was observed between WHO-5 and PHQ-9 ($R^2 = 0.52$).

4. Discussion

In recent years, research reports stated that positive psychological features might be a protective factor for depression, distinct from the absence of negative characteristics [18]. Well-being is a characteristic of positive psychological functioning that captures a person's level of positive affect, a sense of purpose in life and life satisfaction [13]. Several, cross-sectional studies stated that well-being has constantly been associated with depression and other mental disorders. However, worldwide particularly in Saudi Arabia, studies on depression among diabetes are lacking [19, 20]. Hence, in this present study, we aimed to screen the depression and well-being among patients with diabetes in Saudi Arabia.

It is well demonstrated that depression is related to poor compliance with diabetes self-care, including the dietary regimen, blood glucose monitoring and medication adherence resulting in worse real clinical outcomes [21]. A systematic review shows that patients with T2D are more likely to be depressed, and there is a higher prevalence of depression among people with diabetes than those without diabetes [22]. In Saudi Arabia, a recent study in Arar city reported that depression among patients with diabetes was 37.4% [23]. Another survey from Eastern Province stated that the prevalence of depression among patients with T2D was 49.6% [24]. In Qassim, a study reported that 34.8% of diabetes experienced depression [25]. In the present study, a higher percentage of the population possess mild (29.7%) depression, followed by 21.6% moderate, 12.4% moderate to severe, and 7.6% have severe depression. Further, significantly lower mean scores were observed among insulin pump users, patients with macrovascular complications and patients with a short duration of diabetes.

A study stated that psychological well-being is considerably poorer among patients with prediabetes or diabetes than persons without diabetes. This study further stated that individuals without diabetes reported that they could focus on whatever they were doing and were found to be reasonably happy compared to the patients with prediabetes or diabetes [26]. In the present study, significantly lower mean well-being scores were observed among insulin pump users, patients with macrovascular complications and patients with short duration of diabetes according to the WHO-5 well-being score. Further, in this study, we also found that the WHO-5 scores were significantly correlated with PHQ-9. This finding is compatible with previous results that the WHO-5 score is correlated with measures of depression, anxiety, stress, well-being, mental health and self-esteem, and quality of life [27].

This present study has some limitations, a small number of participants, a limited number of risk factors evaluated, limited social and demographic characteristicsexamined, and its single-centre design. However, these limitations can be circumvented on a larger scale by doing similar studies. However, in the face of these limitations, the present study provides valuable data on the depression and well-being of diabetes in Saudi Arabia.

In conclusion, a higher number of patients with diabetes have mild to severe depression and a lower level of mental well-being. These findings could be of immense assistance to the government, healthcare systems, educational institutions, and researchers to develop evidence-based programs, policies, and guidelines for increasing the knowledge and awareness about depression among diabetes, so that early finding and management can be ensured to control the escalating burden of depression among diabetes in Saudi Arabia.

Table 1: Demographic characteristics of the study population

Variables	Frequency	Percentage
Gender		
Female	87	47
Male	98	53
Age		
<40 yrs.	82	44.3
≥40 yrs.	103	55.7
Marital status		
Single	41	22.2
Married	144	77.8
Smokers		
Yes	50	27
No	135	73
BMI		
<25	51	27.6
≥25	134	72.4
Insulin Pump		
Yes	7	3.8
No	178	96.2
Medication		
Yes	157	84.9
No	28	15.1
Microvascular		
Yes	62	33.5
No	123	66.5
Macrovascular		
Yes	46	24.9
No	139	75.1
Diabetes Type		
Type 1	81	43.8
Type 2	104	56.2
Duration		
<10 yrs.	73	39.5
≥10 yrs.	112	60.5
HbA1c		
<7	23	12.4
≥7	162	87.6

Table 2: Influence of demographic and clinical variable on PHQ-9

	PHQ-9	**P value**
Gender		
Female	12.06 ± 11.9	0.210
Male	8.01 ± 7.79	
Age		
<40 yrs.	11.5 ± 10.8	0.381
≥40 yrs.	8.62 ± 9.41	
Marital status		
Single	10.10 ± 9.64	0.641
Married	9.86 ± 0.3	
Smokers		
Yes	9.02 ± 5.6	0.123
No	10.2 ± 11.5	

BMI		
<25	11.8 ± 10.9	0.221
≥25	9.17 ± 9.77	
Insulin Pump		
Yes	10.11 ± 10.2	0.044
No	5.2 ± 3.72	
Medication		
Yes	10.4 ± 10.6	0.618
No	7.04 ± 6.19	
Microvascular		
Yes	10.6 ± 11.6	0.141
No	8.40 ± 6.0	
Macrovascular		
Yes	10.5 ± 11.6	0.049
No	8.40 ± 6.0	
Diabetes Type		
Type 1	8.88 ± 9.5	0.533
Type 2	11.2 ± 10.8	
Duration		
<10 yrs.	9.02 ± 7.46	0.041
≥10 yrs.	11.2 ± 13.2	
HbA1c		
<7	9.82 ± 8.8	0.942
≥7	10.57 ± 16.2	
≥40 yrs.	60.1 ± 22.1	
Marital status		
Single	59.1 ± 20.2	0.162
Married	64.2 ± 23.7	
Smokers		
Yes	62.9 ± 22.2	0.903
No	63.9 ± 23.5	
BMI		
<25	56.5 ± 23.5	0.903
≥25	65.5 ± 22.4	
Insulin Pump		
Yes	62.7 ± 23.3	0.008
No	71.4± 8.1	
Medication		
Yes	61.8 ± 23.1	0.368
No	69.7 ± 21.7	
Microvascular		
Yes	57.1 ± 23.5	0.680
No	63.1 ± 22.8	
Macrovascular		
Yes	57.2 ± 23.1	0.032
No	67.8 ± 23.1	
Diabetes Type		
Type 1	59.9 ± 21.7	0.361
Type 2	65.5 ± 23.7	
Duration		
<10 yrs.	65.9 ± 23.5	0.044
≥10 yrs.	56.6 ± 22.2	
HbA1c		
<7	67.9 ± 22.6	0.368
≥7	62.3 ± 23.1	

Groups compared by t-test

Table 3: Influence of demographic and clinical variable on WHO-5

	WHO-5	P value
Gender		
Female	56.3 ± 20.9	0.664
Male	68.6 ± 23.5	
Age		
<40 yrs.	65.4 ± 23.6	0.557

Groups compared by t-test.

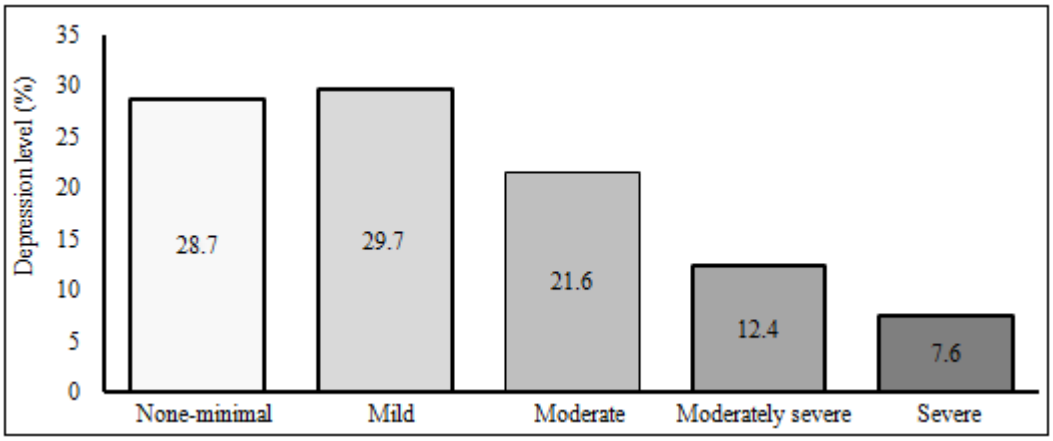

Figure 1: The depression level of the study population.

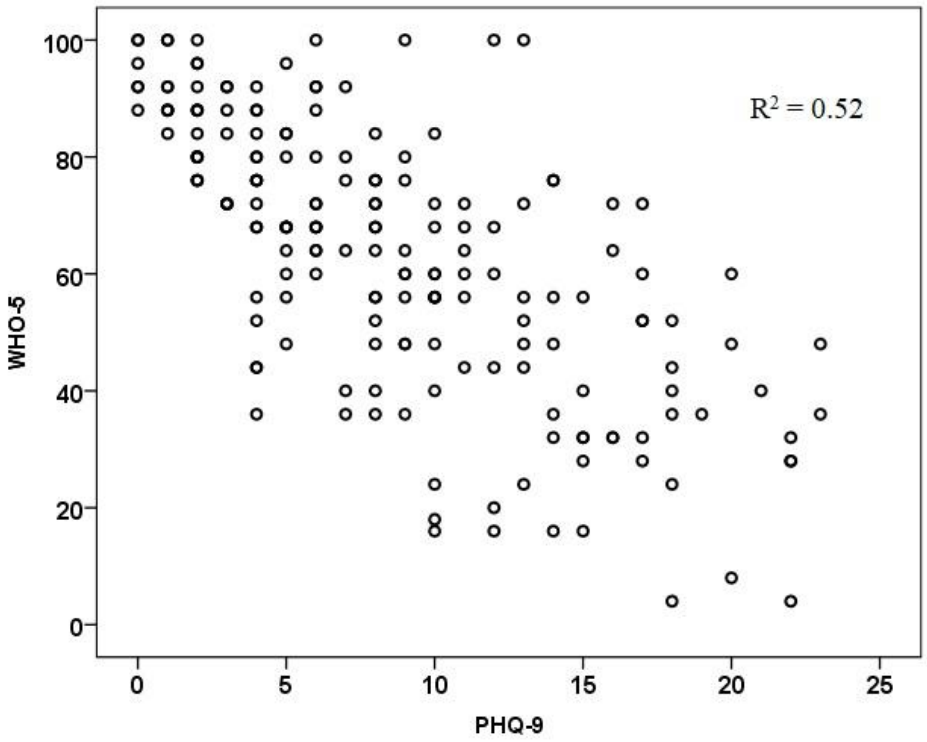

Figure 2: Correlation between PHQ-9 and WHO-5 scores

Table 4: Results of regression analyses with β-coefficient and 95% confidence interval for depression and well-being adjusted for significant confounders

Variables (PHQ-9)	Beta	95 CI		Sig.
		Lower Bound	Upper Bound	
Insulin pump user	4.941	-2.77	12.6	0.208
Macrovascular complications	1.459	-1.96	4.88	0.402
Duration of diabetes	-.076	-.248	.096	0.386
Variables (WHO-5)	Beta	95 CI		Sig.
		Lower Bound	Upper Bound	
Insulin pump user	4. 760	-3.36	8.842	0.327
Macrovascular complications	3.179	-4.63	10.99	0.423
Duration of diabetes	.029	-.365	.422	0.886

Conflict of interest

Authors have no conflict of interests, and the work was not supported or funded by any drug company.

Data Sharing Statement

No data sharing as this manuscript and the data were not published elsewhere.

Ethical Approval

The study protocol was approved by the Research and Ethics committee of Prince Sultan Military Medical City, Riyadh, Saudi Arabia (Approval #: 1455)

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