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## DEPRESSION, ANXIETY AND STRESS AMONG TYPE II DIABETIC PATIENTS IN AL-MADINAH, SAUDI ARABIA

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#### ABSTRACT

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*Keywords:* Depression, Anxiety, Stress, Diabites

Diabetes mellitus is one of the highest global health emergencies of the 21st century, and the Kingdom of Saudi Arabia (KSA) has one of the highest prevalence rates of type 2 diabetes prevalence all over the world. Diabetes mellitus is a chronic disease that requires long-term medical attention to limit the development of its complications and manage them when they occur. Therefore, patients with diabetes have a greater risk of psychological problems, such as depression, stress, and anxiety, than people without diabetes. The study aims to estimate the prevalence and levels of depression, anxiety, and stress among type 2 diabetic patients and to identify the possible predictors of depression, anxiety, and stress among type 2 diabetic patients in Al-Madinah, Saudi Arabia. A cross-sectional design was conducted at primary healthcare centers affiliated with the Ministry of Health (MOH) in Al-Madinah City. This study observed that 3.3% of diabetes patients have depression from mild to moderate levels (2.5%, and 0.8%, respectively). The 34.4 diabetes patients had anxiety from mild to severe levels (17.6%, 11.6%, and 0.3%, respectively). 29.6% of diabetes patients had mild to extremely severe stress levels (10.6%, 19.8%, 3.8%, and 0.2%, respectively). These findings also suggest that the healthcare system must pay attention to the psychological aspects of diabetes and routinely request the screening and continual monitoring of DASS in diabetic patients.

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#### Introduction

Diabetes mellitus is one of the highest global health emergencies of the 21st century; as stated by the International Diabetes Federation (IDF) [1]. It is estimated that 463 million adults aged 20–79 exist with diabetes worldwide, and this will increase to 700 million in 2045 if no efforts are taken to overcome the situation [2]. The Kingdom of Saudi Arabia (KSA) has one of the highest prevalence rates of type 2 diabetes prevalence all over the world [1]; the prevalence of diabetes mellitus (DM) in adults was estimated as 25% [3]. Diabetes mellitus is a chronic disease that requires long-term medical attention to limit the development of its complications and manage them when they occur [4]. Therefore, patients with diabetes have a greater risk of psychological problems, such as depression, stress, and anxiety, than people without diabetes [5]. This could be attributed to the influence of stress on daily diabetic management, as well as alterations in diet, constant dependence on medication, short and long-term side effects, and the burden of costs [6, 7]. Psychologically disturbed diabetic patients are usually less likely to adapt to the added burden of the disease's self-care demands, less likely to adhere to their dietary regimen, less physically active, and less likely to comply with prescribed medications. And hence more liable to diabetic complications [8]. It has been documented that 10-30% of diabetic patients suffer from a major depressive disorder or sub-threshold depression [9, 10]. Diabetics are at a 24% increased risk of developing depression [11].

Despite numerous investigations, the underlying pathophysiology of the metabolic abnormalities related to the two diseases is poorly understood. A possible explanation could be due to the increased counter-regulatory hormone release involved in

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#### Aljohani et al., 2022

#### Pharmacophore, 13(3) 2022, Pages 106-112

glucose homeostasis, alterations in the glucose transport function, and increased inflammatory activation triggered by depression [12]. The high prevalence of depression among diabetic patients is associated with poorer quality of life, impaired self-care activities, higher healthcare costs, a higher risk for developing diabetes complications, and increased mortality rates [13, 14]. Despite these known adverse effects, the high prevalence of depression in diabetes, and the fact that effective treatments are available, there is a considerable under-detection and subsequent under-treatment of these conditions. Less than half of the depressed patients with diabetes are recognized [15, 16].

Furthermore, studies suggested that diabetic patients are more prone to anxiety than healthy individuals [17, 18]. Stress among diabetics can result in an elevation of the blood glucose level and poor glycemic control due to its interaction with the endocrine system to influence nutritional behaviors, self-care-related activities, and physical activity [19]. The study aims to estimate the prevalence and levels of depression, anxiety, and stress among type 2 diabetic patients and to identify the possible predictors of depression, anxiety, and stress among type 2 diabetic patients.

After reviewing the literature, few locally published studies from Saudi Arabia have been cited. However, none of them was carried out in Al-Madinah Region. In addition, some regional and international studies were found. In Western Region, KSA (2019), Alzahrani *et al.* carried out a cross-sectional study that included 450 adults with T2DM to estimate the prevalence and investigate determinants of depression, anxiety, and stress among patients with T2DM. The prevalence of depression was 33.8%, whereas anxiety and stress were 38.3% and 25.5%, respectively [20].

In Arar, Northern Saudi Arabia (2019), Mukrim *et al.* conducted a cross-sectional study to test the possible association between type II DM among those over 12 years and depression, anxiety, and stress. The prevalence rates of depression, anxiety, and stress were 37.4%, 45.6%, and 18.7%, respectively; female patients were more likely to have depressive symptoms. Depression and anxiety were significantly associated with the patient's age and lower educational level. Single status was significantly associated with depression [21].

In Qatar (2011), Bener *et al.* conducted a matched case-control study to compare depression, anxiety, and stress symptoms in diabetic patients (n=889) with those in a matched group of controls (n=889), Severe depression, anxiety, and stress scores were more reported in diabetic patients compared to healthy controls [22]. In Bahrain, a cross-sectional study was carried out to examine the association of co-morbid depression, anxiety, and stress disorders with type 2 diabetes.

A higher proportion of DM2 patients were found in the mild-moderate, and severe- extremely severe depression, chronic disease, and disease duration were significantly associated with the three disturbances. In contrast, employment status was associated with anxiety and depression [23]. In Iran, Ahangari *et al.* (2016) implemented a cross-sectional study to estimate the prevalence of depression, stress, and anxiety in type 2 diabetic patients and investigate their association with patients` demographic characteristics. The prevalence rate of depression, stress, and anxiety were 83.1%, 78.1%, and 96%, respectively. There was a significant positive correlation between depression, anxiety, stress, and the level of education. There was a significant association between diabetes complications and anxiety [24].

In Malaysia (2015), Tan *et al.* conducted a cross-sectional study. The prevalence of depression, anxiety, and stress were 26.6%, 40%, and 19.4%, respectively. Marital status and family history of depression were significantly associated with depression [25]. In Pakistan (2015), Rehman A and Kazmi SF have conducted a cross-sectional study to assess the prevalence of depression, anxiety, and stress in type II diabetic patients and compare patients with (n=120) those without complications (n=120).

Rates of depression, anxiety, and stress were 47.9%, 69.6%, and 62.9%, respectively, being significantly higher in patients with complications compared to those without complications [26]. In China (2016), Sun *et al.* conducted a cross-sectional community-based study to estimate the prevalence and define the determinants of depression and anxiety and assess their effect on glycemic control in 893 types 2 diabetic patients, the prevalence of depression was 56.1%, whereas that of anxiety was 43.6% [27]. In Greece (2009), Roupa *et al.* surveyed the existence of anxiety and depression symptoms in 310 type 2 diabetics with regard to sex and body mass index; women had a double risk of depression than men (41.4% versus 17.8 % [28].

#### **Materials and Methods**

A cross-sectional design was conducted at primary healthcare centers affiliated with the Ministry of Health (MOH) in Al-Madinah City of Saudi Arabia (KSA) (n=40). All type 2 diabetic patients attending the primary healthcare centers, MOH, in Al-Madinah city throughout data collection conduction (November- December 2020) are eligible to participate in the study. A stratified random sampling technique with equal allocation will be applied to select type 2 diabetic patients from 53 primary healthcare centers in this study. Data were collected by distributing a self-administered questionnaire composed of two parts; the first section addressed the sociodemographic data of each patient. The second part screened for depression, anxiety, and stress using the previously validated Arabic version of the Depression, Anxiety, and Stress Scale (DASS-21) questionnaire [29]. It consists of 21 items distributed on three scales for depression, anxiety, and stress, i.e., seven items each. Subjects are asked if they experienced a set of symptoms for each scale during the last week.

#### Statistical Analysis

All questionnaires were checked and entered Statistical Package for the Social Science (SPSS) version 20 software; it was used for descriptive and inferential analysis. The Scores for each scale of the DASS-21 are calculated by summing the scores

#### Aljohani et al., 2022

#### Pharmacophore, 13(3) 2022, Pages 106-112

of the items, and the Mean of DASS is calculated. Individual scores were categorized into five groups and then transformed into a binominal variable. Univariate statistics such as frequencies and proportion percentages were derived for categorical variables, and Bivariate analyses (Pearson chi-square test) were used to measure the strength of association between the variables in the study. All tests were two-tailed, with significance defined as p < 0.05.

#### **Results and Discussion**

A total of 602 diabetic patients who visited primary healthcare centers completed the questionnaire, female patients represent 65.1% of participants, 38.0% of participants are between 45-54 years old, almost 37.5% of the participants had secondary education and 60.5% were unemployed (**Table 1**). The result showed that 82.9% of participants have co-morbidities of diabetes, while only 66.3% have regular follow-ups in primary healthcare centers. Most patients received only oral hypoglycemic (65.8%), whereas 22.3%% received both oral and insulin (**Table 2**).

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Social status       married       435(72.3%)         Divorced       33(5.5%)         Widow/er       97(16.1%)         employed       133(22.1%)         job       unemployed       364(60.5%)         retired       105(17.4%)         Table 2. Clinical characteristics of participants         Variable       Categories       N(%)         Diabetes complication       yes       499(82.9%)         Diabetes complication       yes       499(82.9%)         Smoking History       No       103(17.1%)         Smoker       70(11.6%)       103(17.1%)         Lifestyle and Diet       57(9.5%)       114(18.9%)         Lifestyle and Diet       57(9.5%)       00ral hypoglycemic         Oral hypoglycemic       396(65.8%)       134(22.3%)         Insulin only       15(2.5%)       15(2.5%)         Family History of psychological illness       Yes       96(15.9%)         No       506(84.1%)       100         DM duration       Less than 4 years       78(13%)		single	37(6.1%)			
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Widow/er       97(16.1%)         job       employed       133(22.1%)         unemployed       364(60.5%)         retired       105(17.4%)         Table 2. Clinical characteristics of participants         Variable       Categories       N(%)         Diabetes complication       yes       499(82.9%)         Diabetes complication       No       103(17.1%)         Smoking History       Non-smoker       418(69.4%)         x-smoker       114(18.9%)       114(18.9%)         Lifestyle and Diet       57(9.5%)       0ral hypoglycemic       396(65.8%)         Oral hypoglycemic       396(65.8%)       114(22.3%)       113(22.1%)         Family History of psychological illness       Yes       96(15.9%)       506(84.1%)         DM duration       Less than 4 years       78(13%)       506(84.1%)	Social status –	Divorced	33(5.5%)			
$\begin{tabular}{ c c c c c } \hline & employed & 133(22.1\%) \\ \hline & unemployed & 364(60.5\%) \\ \hline & retired & 105(17.4\%) \\ \hline \hline \end{tabular} tab$	-	Widow/er	97(16.1%)			
job unemployed 364(60.5%) retired 105(17.4%) Table 2. Clinical characteristics of participants Variable Categories N(%) Diabetes complication yes 499(82.9%) Diabetes complication No 103(17.1%) Smoking History Non-smoker 70(11.6%) Smoker 70(11.6%) X-smoker 114(18.9%) Lifestyle and Diet 57(9.5%) Oral hypoglycemic 396(65.8%) Oral hypoglycemic 396(65.8%) Oral+insluin 134(22.3%) Insulin only 15(2.5%) Family History of psychological illness Yes 96(15.9%) no 506(84.1%) DM duration Less than 4 years 78(13%)		employed	133(22.1%)			
retired       105(17.4%)         Table 2. Clinical characteristics of participants         Variable       Categories       N(%)         Diabetes complication       yes       499(82.9%)         Diabetes complication       No       103(17.1%)         Smoking History       Smoker       70(11.6%)         Smoking History       Non-smoker       418(69.4%)         X-smoker       114(18.9%)         Lifestyle and Diet       57(9.5%)         Oral +yoglycemic       396(65.8%)         Oral +insluin       134(22.3%)         Insulin only       15(2.5%)         Family History of psychological illness       Yes       96(15.9%)         No       500(84.1%)       No         DM duration       Less than 4 years       78(13%)	job	unemployed	364(60.5%)			
Table 2. Clinical characteristics of participantsVariableCategoriesN(%)Diabetes complicationyes499(82.9%)No103(17.1%)Smoking HistorySmoker70(11.6%)Smoking HistoryNon-smoker418(69.4%)x-smoker114(18.9%)Lifestyle and Diet57(9.5%)Oral hypoglycemic396(65.8%)Oral hypoglycemic396(65.8%)Oral+insluin134(22.3%)Insulin only15(2.5%)Yes96(15.9%)Family History of psychological illnessYesPM durationLess than 4 years78(13%)		retired	105(17.4%)			
VariableCategoriesN(%)Diabetes complicationyes499(82.9%)No103(17.1%)Smoking Historysmoker70(11.6%)Smoking HistoryNon-smoker418(69.4%)x-smoker114(18.9%)Lifestyle and Diet57(9.5%)Oral hypoglycemic396(65.8%)Oral+insluin134(22.3%)Insulin only15(2.5%)Family History of psychological illnessYes96(15.9%)DM durationLess than 4 years78(13%)	Т	able 2. Clinical characteristics of participants				
Diabetes complication       yes       499(82.9%)         No       103(17.1%)         smoker       70(11.6%)         Smoking History       Non-smoker         X-smoker       418(69.4%)         x-smoker       114(18.9%)         Lifestyle and Diet       57(9.5%)         Oral hypoglycemic       396(65.8%)         Oral+insluin       134(22.3%)         Insulin only       15(2.5%)         Yes       96(15.9%)         no       506(84.1%)         DM duration       Less than 4 years       78(13%)	Variable	Categories	N(%)			
$\begin{tabular}{ c c c c c } \hline Diabetes complication & & & & & & & & & & & & & & & & & & &$		yes	499(82.9%)			
Smoking History       smoker       70(11.6%)         Non-smoker       418(69.4%)         x-smoker       114(18.9%)         Lifestyle and Diet       57(9.5%)         Oral hypoglycemic       396(65.8%)         Oral+insluin       134(22.3%)         Insulin only       15(2.5%)         Yes       96(15.9%)         no       506(84.1%)         DM duration       Less than 4 years       78(13%)	Diabetes complication	No	103(17.1%)			
Smoking History       Non-smoker       418(69.4%)         x-smoker       114(18.9%)         Lifestyle and Diet       57(9.5%)         Oral hypoglycemic       396(65.8%)         Oral+insluin       134(22.3%)         Insulin only       15(2.5%)         Family History of psychological illness       Yes         Yes       96(15.9%)         no       506(84.1%)         DM duration       Less than 4 years		smoker	70(11.6%)			
x-smoker       114(18.9%)         Lifestyle and Diet       57(9.5%)         Oral hypoglycemic       396(65.8%)         Oral+insluin       134(22.3%)         Insulin only       15(2.5%)         Family History of psychological illness       Yes         Yes       96(15.9%)         no       506(84.1%)         DM duration       Less than 4 years       78(13%)	Smoking History	Non-smoker	418(69.4%)			
Lifestyle and Diet       57(9.5%)         Oral hypoglycemic       396(65.8%)         Oral+insluin       134(22.3%)         Insulin only       15(2.5%)         Family History of psychological illness       Yes       96(15.9%)         no       506(84.1%)         DM duration       Less than 4 years       78(13%)	-	x-smoker	114(18.9%)			
Type of treatment       Oral hypoglycemic       396(65.8%)         Oral+insluin       134(22.3%)         Insulin only       15(2.5%)         Family History of psychological illness       Yes       96(15.9%)         no       506(84.1%)         DM duration       Less than 4 years       78(13%)		Lifestyle and Diet	57(9.5%)			
Type of treatment       Oral+insluin       134(22.3%)         Insulin only       15(2.5%)         Family History of psychological illness       Yes       96(15.9%)         no       506(84.1%)         DM duration       Less than 4 years       78(13%)	-	Oral hypoglycemic	396(65.8%)			
Insulin only       15(2.5%)         Family History of psychological illness       Yes       96(15.9%)         no       506(84.1%)         DM duration       Less than 4 years       78(13%)	Type of treatment	Oral+insluin	134(22.3%)			
Yes       96(15.9%)         no       506(84.1%)         DM duration       Less than 4 years       78(13%)	-	Insulin only	15(2.5%)			
Family History of psychological illness       no       506(84.1%)         DM duration       Less than 4 years       78(13%)		Yes	96(15.9%)			
DM duration Less than 4 years 78(13%)	Family History of psychological illness	no	506(84.1%)			
•	DM duration	Less than 4 years	78(13%)			

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	5-10years	316(52.5%)
	11-15years	149(24.8%)
	16-19years	45(7.5%)
	20 years and more	14(2.3%)
	Yes	399(66.3%)
Follow-up in chilic —	no	203(33.7%)

The prevalence of stress, anxiety, and depression was 30.2%, 35%, and 4%, respectively, as shown in **Table 3**. 70.4% of diabetes patients have no stress, 17.6% have mild stress, 11.6% have moderate stress, and 0.3% have severe stress. 65.6% of diabetes patients have no anxiety, 10.6% have mild anxiety, 19.8% have moderate anxiety, and 3.8% have severe anxiety. 96.7% of diabetes patients having no depression, 2.5% have mild depression, and 0.8% have severe depression.

Table 3. Stress, anxiety, and depression prevalence by categorical				
	Stress	Anxiety	Depression	
Normal	424(70.4%)	395(65.6%)	582(96.7%)	
Mild	106(17.6%)	64(10.6%)	15(2.5%)	
Moderate	70(11.6%)	119(19.8%)	5(0.8%)	
Severe	2(0.3%)	23(3.8%)	0	
Extremely severe	0	1(0.2%)	0	

**Table 4** shows the difference between the DASS status and clinical or sociodemographic variable. There was no significant difference between gender and between job status and depression, while there was a significant difference between stress, anxiety, and job status; it demonstrated that (57.5%) of anxiety patients are unemployed and (28.1%) of stress patients are retired. Results showed that the education level is significantly different, (30.3%) of stress patients and (26.6%) of anxiety patients are primary school level, while (25.0%) of depression patients are at the elementary school level.

Predicting variables	Stress symptoms		Anxiety symptoms		Depression symptoms		
	yes	no	yes	no	yes	no	
Gender							
Male	71(39.9%)	139(32.8%)	73(35.3%)	137(34.7%)	6(30.0%)	204(35.1%)	
Female	107(60.1%)	285(67.2%)	134(64.7%)	258(65.3%)	14(70.0%)	378(64.9%)	
	Chi-square	Chi-square test, P=0.11		Chi-square test, P=0.92		Chi-square test, P=0.81	
Age							
Less than 44	1(3.0%)	32(97.0%)	3(9.1%)	30(90.9%)	0	33(100%)	
45-54	48(21.0%)	181(79.0%)	56(24.5%)	173(75.5%)	11(4.8%)	218(95.2%)	
55-64	48(26.4%)	134(73.6%)	51(28.0%)	131(72.0%)	6(3.3%)	176(96.7%)	
65-74	27(35.1%)	50(64.9%)	38(49.4%)	39(50.6%)	2(2.6%)	75(97.4%)	
75-84	38(65.5%)	20(34.5%)	37(63.8%)	21(36.2%)	0	58(100%)	
>85	16(69.6%)	7(30.4%)	22(95.7%)	1(4.3%)	1(4.3%)	22(95.7%)	
	Fisher test, P=0.00		Fisher test, P=0.00		Fisher test, P=0.42		
Job							
Employee	30(16.9%)	103(24.3%)	36(17.4%)	97(24.6%)	5(25.0%)	128(22.0%)	
No job	98(55.1%)	266(62.7%)	119(57.5%)	245(62.0%)	12(60.0%)	352(60.5%)	
Retired	50(28.1%)	55(13.0%)	52(25.1%)	53(13.4%)	3(15.0%)	102(17.5%)	
	Chi-square	test, P=0.00	Chi-square test, P=0.001		<b>-0.001</b> Chi-square test, P=0.		
Education level							
No formal education	22(12.4%)	18(4.2%)	21(10.1%)	19(4.8%)	5(25.0%)	35(6.0%)	
primary school	54(30.3%)	39(9.2%)	55(26.6%)	38(9.6%)	3(15.0%)	90(15.5%)	
Elementary school	38(21.3%)	43(10.1%)	53(25.6%)	28(7.1%)	5(25.0%)	76(13.1%)	

	A	johani <i>et al</i> ., 202	2			
	Pharmacophe	ore, 13(3) 2022, P	ages 106-112			
33(18.5%)	193(45.5%)	46(22.2%)	180(45.6%)	3(15.0%)	223(38.3%)	
31(17.4%)	131(30.9%)	32(15.5%)	130(32.9%)	4(20.0%)	158(27.1%)	
Chi-square	test, P=0.00	Chi-square	test, P=0.00	Fisher to	est.P=0.006	
83(46.6%)	316(74.5%)	109(52.7%)	290(73.4%)	14(70.0%)	385(66.2%)	
95(53.4%)	108(25.5%)	98(47.3%)	105(26.6%)	6(30.0%)	197(33.8%)	
Chi-square	test, P=0.00	Chi-square	test, P=0.00	Chi-square test, P=0.72		
107(60.1%)	287(67.7%)	129(62.3%)	265(67.1%)	13(65.0%)	381(65.5%)	
71(39.9%)	137(32.3%)	78(37.7%)	130(32.9%)	7(35.0%)	201(34.5%)	
Chi-square test, P=0.074		Chi-square test, P=0.24		Chi-square test, P=0.96		
41(23.0%)	55(13.0%)	41(19.8%)	55(13.9%)	14(70.0%)	82(14.1%)	
137(77.0%)	369(87.0%)	166(8.2%)	340(86.1%)	6(30.0%)	500(85.9%)	
Chi-square test, P=0.002		Chi-square test, P=0.61		0Fisher test.P=0.00		
163(91.6%)	336(79.2%)	193(93.2%)	306(77.5%)	19(95.0%)	480(82.5%)	
15(8.4%)	88(20.8%)	14(6.8%)	89(22.5%)	1(5.0%)	102(17.5%)	
Chi-square test, P=0.00		Chi-square test, P=0.00		Fisher test.P=0.22		
2(13.3%)	13(86.7%)	2(13.3%)	13(86.7%)	0	15(100%)	
78(19.7%)	318(80.3%)	87(22.0%)	309(78.0%)	9(2.3%)	387(97.7%)	
82(61.2%)	52(38.8%)	86(64.2%)	48(35.8%)	10(7.5%)	124(92.5%)	
16(28.1%)	41(71.9%)	32(56.1%)	25(43.9%)	1(1.8%)	56(98.2%)	
Fisher te	st, P=0.00	Fisher te	st, P=0.00	Fisher to	est, P=0.11	
	33(18.5%) 31(17.4%) Chi-square 83(46.6%) 95(53.4%) Chi-square 107(60.1%) 71(39.9%) Chi-square 41(23.0%) 137(77.0%) Chi-square 163(91.6%) 15(8.4%) Chi-square 2(13.3%) 78(19.7%) 82(61.2%) 16(28.1%) Fisher te	Al       Pharmacophe       33(18.5%)     193(45.5%)       31(17.4%)     131(30.9%)       Chi-square test, P=0.00       83(46.6%)     316(74.5%)       95(53.4%)     108(25.5%)       95(53.4%)     108(25.5%)       Chi-square test, P=0.00       107(60.1%)     287(67.7%)       71(39.9%)     137(32.3%)       Chi-square test, P=0.074       41(23.0%)     55(13.0%)       137(77.0%)     369(87.0%)       Chi-square test, P=0.002       41(63(91.6%)     336(79.2%)       15(8.4%)     88(20.8%)       Chi-square test, P=0.00       2(13.3%)     13(86.7%)       78(19.7%)     318(80.3%)       82(61.2%)     52(38.8%)       16(28.1%)     41(71.9%)	Aljohani et al., 202       Pharmacophore, 13(3) 2022, Pa       33(18.5%)     193(45.5%)     46(22.2%)       31(17.4%)     131(30.9%)     32(15.5%)       Chi-square test, P=0.00     Chi-square       83(46.6%)     316(74.5%)     109(52.7%)       95(53.4%)     108(25.5%)     98(47.3%)       Chi-square test, P=0.00       Chi-square test, P=0.00       Chi-square test, P=0.00       Chi-square test, P=0.074       Chi-square test, P=0.074       Chi-square test, P=0.074       Chi-square test, P=0.074       Chi-square       41(23.0%)     55(13.0%)     41(19.8%)       137(77.0%)     369(87.0%)     166(8.2%)       Chi-square test, P=0.002     Chi-square       Chi-square test, P=0.00       Chi-square test, P=0.00       Chi-square       2(13.3%)     13(86.7%)     2(13.3%)       78(19.7%)     318(80.3%)     87(22.0%)       82(61.2%)     52(38.8%)     86(64.2%)       16(28.1%)     41(71.9%)     32(56.1%)  <	Aljohani et al., 2022       Pharmacophore, 13(3) 2022, Pages 106-112       33(18.5%)     193(45.5%)     46(22.2%)     180(45.6%)       31(17.4%)     131(30.9%)     32(15.5%)     130(32.9%)       Chi-square test, P=0.00       Chi-square test, P=0.00       Signation of the square test, P=0.00       Signation of the square test, P=0.00       Chi-square test, P=0.0174       Chi-square test, P=0.24       41(23.0%)     55(13.0%)     166(8.2%)     340(86.1%)       Chi-square test, P=0.02     Chi-square test, P=0.61       Chi-square test, P=0.00     Chi-square test, P=0.61       Chi-square test, P=0.00     Chi-square test, P=0.00       Chi-square test, P=0.00     Chi-square test, P=0.00       Chi-square test	Aljohani <i>et al.</i> , 2022         Pharmacophore, 13(3) 2022, Pages 106-112 $33(18.5\%)$ 193(45.5\%)       46(22.2\%)       180(45.6\%)       3(15.0%) $31(17.4\%)$ 131(30.9\%)       32(15.5%)       130(32.9%)       4(20.0%)         Chi-square test, P=0.00       Fisher test, P=0.00       Fisher test, P=0.00         Signature test, P=0.00       Chi-square test, P=0.02       Chi-square test, P=0.02       Chi-square test, P=0.01       OFisher test, P=0.02         Chi-square test, P=0.00       Chi-square test, P=0.00       Chi-square test, P=0.01       OFisher test, P=0.00         Chi-square test, P=0.00       Chi-square test, P=0.00       Chi-square test, P=0.00         Chi-square test, P=0.00 <td co<="" td=""></td>	

The first objective of this study was to assess the prevalence of stress, anxiety, and depression in patients with type 2 diabetes mellitus. This study observed that 3.3% of diabetes patients have depression from mild to moderate levels (2.5%, and 0.8%, respectively). The 34.4 diabetes patients had anxiety from mild to severe levels (17.6%, 11.6%, and 0.3%, respectively). 29.6% of diabetes patients had mild to extremely severe stress levels (10.6%, 19.8%, 3.8%, and 0.2%, respectively).

In the western Region of Saudi Arabia, the prevalence of depression was 33.8%, whereas those of anxiety and stress were 38.3%, and 25.5%, respectively [1]. In the North region of Saudi Arabia, 22.4% of diabetic patients experienced significant depressive symptoms, and 28.5% experienced significant anxiety symptoms [30]. In Taif, the prevalence of anxiety among people with diabetes was 45.45% [31]. Many studies showed the prevalence of depression among diabetic patients to be within the range of 8.5% - 27.3%. Our study showed that depression was 3.3% which is not consistent with other studies. The cause may be related to different data collection tools or cultural factors.

Similar to two studies of diabetic patients in Saudi Arabia [31, 32] that examined anxiety compared to other mental health problems, anxiety was the most common form of psychological distress. The other objective is to study the predicting factor of DASS among diabetic patients. The result showed that stress, anxiety, and depression are more prevalent in females (60.1%. 64.7%, and 70.0%, respectively), but it is not significantly associated with other studies [24, 25] find that a female diabetic is a predicting factor for psychological symptom. Additionally, anxiety and stress are more prevalent in unemployed diabetic patients (55.1% and 57.5%, respectively), which is consistent with the study done in Bahrain [23] that concludes employment status is strongly associated with psychological symptoms.

Similar to other studies [14, 21, 24], the result of proving that age and educational level were significantly related to the DASS status of diabetics patients. We found that the family history of psychological disease had a statistically significant relationship with stress and anxiety. However, there was no relationship with depression, while another study [25] found a significant association between anxiety, stress, and depression.

Studies done in Pakistan [26] have shown a positive association between diabetes complications and DASS; our study only proves it for stress and anxiety. Meanwhile, the result approves that if patients not regularly visiting primary healthcare centers will express stress and Anxiety symptoms, it showed that 53.4 % of stress-symptomatic patients were not regularly visiting primary healthcare centers.

We found that type of diabetes treatment can affect the patient's psychological status; anxiety and stress are presented in 61.2% and 64.2% of patients using oral hypoglycemia and insulin; the cause may relate to newly introduced insulin as treatment. Another study done in Saudi Arabia [30] found an association between insulin use and depression. Other studies [25, 33] did

#### Aljohani et al., 2022

#### Pharmacophore, 13(3) 2022, Pages 106-112

not find any association between various social and clinical factors, such as marital status, smoking status, and duration of DM, which were predicted to be associated with DASS status. However, our study failed to prove such an association.

#### Conclusion

The present study showed that the prevalence reached approximately 35% for anxiety, 30.2% for stress, and 4% for depression among diabetic patients. Diabetic patients are often constantly challenged to control their blood glucose and prevent co-morbidities. These findings also suggest that the healthcare system must pay attention to the psychological aspects of diabetes and routinely request the screening and continual monitoring of DASS in diabetic patients. Especially for the vulnerable group, i.e., females, family history of psychological disease, newly introduced insulin, and presence of complications.

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Conflict of interest: None

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Ethics statement: Informed written consent was obtained from all participants

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Pharmacophore, 13(3) 2022, Pages 106-112

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