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Research Article

ANXIETY AND DEPRESSION AMONG TYPE 2 DIABETICS VISITING PRIMARY HEALTH CARE CENTER AT ARMED FORCES HOSPITAL IN DHAHRAN, SAUDI ARABIA: PREVALENCE AND ASSOCIATED FACTORS

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Abstract:

Objectives: The objectives of the study were to assess the prevalence of anxiety and depression among type 2 diabetes mellitus (T2DM) patients and to identify the associated risk factors of anxiety and depression among T2DM patients.

Method: This cross-sectional study was conducted between September and November 2021 in a primary health care center (PHCC) at armed forces hospital in Dhahran, Eastern region of Saudi Arabia. Calculated sample size was 341 Saudi nationals T2DM patients aging between 18 to 40 years. Hospital anxiety and depression scale (HADS) was used to assess the prevalence of anxiety and depression among study participants.

Results: Prevalence of anxiety was found among 76(22.6%) and depression in 40(11.9%) of the study participants. Significantly high proportion of female patients were suffering from anxiety ($p=0.007$) and depression (0.003). Marital status and presence of comorbidities were also found significant association with prevalence of anxiety and depression. Management of diabetes through diet and exercise or taking oral medicine reduced the chances of anxiety ($p=0.00$ and $p=0.00$) and depression ($p=0.001$ and $p=0.015$).

Conclusion: The study has shown that the prevalence of anxiety among T2DM was found higher than depression. Several factors were found significant cause of developing anxiety and depression namely, gender, marital status, occupation, comorbidities and diabetes management.

Keywords: T2DM, Anxiety, Depression, Primary health care, Prevalence

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INTRODUCTION:

In the non-communicable chronic diseases, diabetic mellitus is among the highly prevalent disease across the globe (1). According to international diabetes foundation, count of number of adults living with diabetes were about 425 million in 2017 which is expected to reach up to 629 million by 2045 (2). Similarly, in Kingdom of Saudi Arabia (KSA) prevalence of diabetes mellitus is high and KSA is among the top 10 countries which have highest projection of this disease (3). In 2011, prevalence of diabetes mellitus among the Saudi population was about 16.2% which was estimated to become around 20.8% by 2030 (4).

Among the types of diabetes, type 2 had highest prevalence and around 90% of diabetic patients diagnosed with type 2 (2). Its victims are not only elderly population but increasing number of patients in children, adolescents and younger population was also observed (2). There are other health complications generated over time among the diabetic patients and psychological disorder is one of them. Many researches have been conducted to study the relation between prevalence of diabetes and psychological disorder and studies reported the most common disorders like clinical depression, anxiety disorder (AD), depression affect and diabetes-specific distress and these can lead to affect the behaviors negatively which includes disease management, health care cost, days of missed work and mortality (5-8).

Studies reported the prevalence of anxiety and depression among the general population of Saudi Arabia which was between 16% and 40% (9,10). Many researchers found that diabetic patients are more prone to develop depression or patients suffering from depression had higher risk of developing T2DM (11,12). Association between anxiety and depression was repeatedly reported and presence of both anxiety and depression among T2DM was not uncommon reported (13). Furthermore, presence of anxiety and depression in the T2DM could lead to worse diabetic outcomes (14).

Literature reported low detection rate of such psychiatric comorbidities which could delay the appropriate management that perhaps resulting in complicating the health profile of the patients (10). In Saudi Arabia, few studies were conducted to study the prevalence and characteristics of anxiety and depression among T2DM patients (15). To the authors best knowledge, limited studies have been conducted

in Eastern region of Saudi Arabia to report the prevalence of anxiety and depression among T2DM patients. Hence, present study was designed with the objectives to assess the prevalence of anxiety and depression among T2DM patients and to identify the associated risk factors of anxiety and depression among T2DM patients.

METHOD:

This cross-sectional study was conducted between September and November 2021 in a primary health care center (PHCC) at armed forces hospital in Dhahran, Eastern region of Saudi Arabia. Ethical approval of the study was granted by the Ministry of Defense, Saudi Arabia (IRB protocol # AFHER-IRB-2021-017). After getting the ethical approval data collection process was started.

This study was conducted on type 2 diabetic mellitus (T2DM) patients and hence only T2DM patients visiting PHCC could be study participants. Therefore, inclusion criteria of the study were 1) age of a patient should be between 18 to 70 years, 2) T2DM patients whom disease was diagnosed at least one year ago, 3) patient must be Saudi National. The exclusion criteria were 1) patients who would not be able to communicate due to any medical reason excluded from the study, 2) patients having any mental or psychiatric illness or taking psychiatric medication except medication for depression or/and anxiety, 3) Untreated hypothyroidism and hyperthyroidism, 4) Gestational diabetic patients.

Total number of T2DM patients visited armed forces PHCC during 2019 was obtained and used as study population. There were 3019 T2DM patients visited PHCC during 2019. Chance to include a patient in the study was 50%, confidence level was set as 95% and alpha 0.05. Hence, simple random sample technique was used for sample calculation. A online sample size calculator "openepi" was used for sample size calculation. After input all the values, the calculated sample size was 341.

For collecting the data, a questionnaire was devised which collected the data into three aspects. Demographics, health care parameters and hospital anxiety and depression scale (HADS). In the demographics, age, gender, marital status, education level, occupation and monthly income were noted. Initially, age was collected as continuous variable however later, for analysis purposes, it was categorized into two groups (1. Up to 50 years old, 2. More than 50 years old). Health care related questions included, duration of disease and

management of disease. In the last section, prevalence of anxiety and depression among T2DM was assessed for this purpose HADS questionnaire was used. This questionnaire was developed by Zigmond and Snaith in 1983 and later it was translated into Arabic by El Rufaie in 1995. The questionnaire had total of 14 questions in which 7 were related to anxiety and 7 for depression. Four-points Likert scale was used for taking responses which varied from 0 (not present to 3 (considerable). Hence, the total score for each anxiety or depression could be varied between 0 to 21, higher the score higher the level of anxiety or depression. Whelan-Goodinson further classified the score into levels of distress, if total score ranged between 0-7 meant normal, mild distress (8-10), moderate distress (11-14) and severe distress (15-21). However, for analysis purposes, researchers used the cut-off value of 8 which meant score less than 8 showed no anxiety/depression and score 8 or higher showed presence of anxiety/depression (16,17).

Statistical package for social sciences (SPSS v.23) was used for data entry and analysis. in descriptive analysis, frequencies, percentages and graphs were

used to present the characteristics of the data. For inferential statistics, chi-square test was used for test of dependency between anxiety/depression and patients' demographics. Furthermore, binary logistic regression was employed to study the odds ratios between anxiety/depression and demographic and health care parameters. P-values less than 0.05 was considered statistically significant.

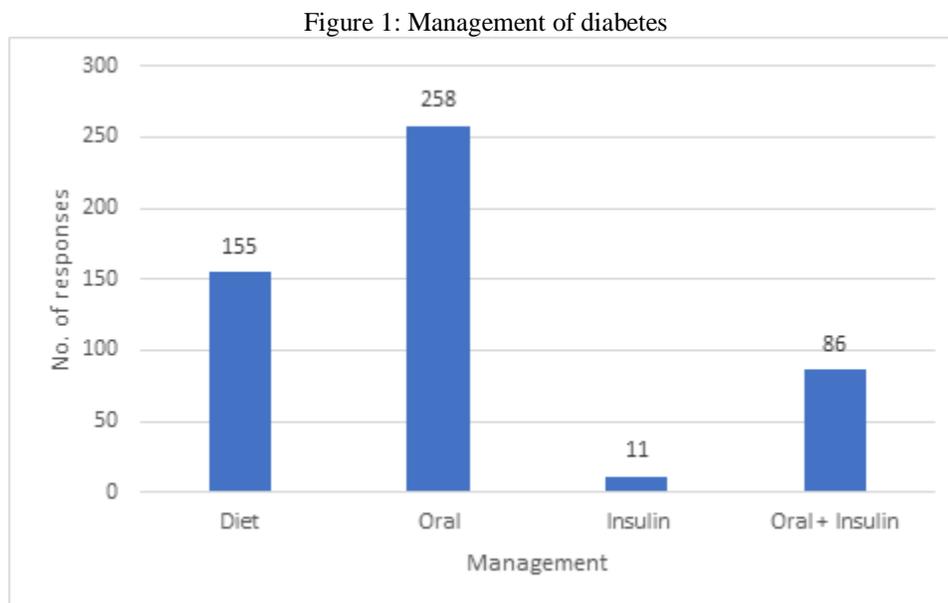
RESULTS:

Total number of diabetic type 2 patients participated and filled the survey were 339. However, after evaluation of responses, 3 forms were rejected because they were not filled completely. Hence, number of responses included after screening were 336. There were 130(38.7%) patients aged up to 50 years and 206(61.3%) were more than 50 years old. Participation rate from male patients was higher compare to females, there were 210(62.5%) males and 126(37.5%) females participated in the study. Most of the study participants were married, had comorbidities, family history of diabetes and onset of disease less than 19 years ago (Table 1).

Table 1: Descriptive characteristics of study participants

Variable	Responses	Percent
Marital Status		
single	11	3.3
married	289	86.0
divorced	11	3.3
widowed	25	7.4
Education Level		
primary	67	19.9
secondary	159	47.3
university	60	17.9
Intermediate school	50	14.9
Occupation		
unemployed	102	30.4
employed	117	34.8
retired	117	34.8
Monthly Income		
less than 5000	104	31.0
5000-10000	113	33.6
10001-15000	89	26.5
more than 15000	30	8.9
Comorbidities		
Yes	234	69.6
No	102	30.4
Family history		
yes	244	72.6
no	92	27.4
Disease Onset		
1-10	212	63.1
11-20	97	28.9
more than 20	25	7.4

Prevalence of anxiety was found among 76(22.6%) patients while 40(11.9%) were suffering from depression. Furthermore, level of anxiety was further assessed and found 52(15.5) had mild, 20(6%) had moderate and 4(1.2%) had severe level of anxiety. Similarly, 26(7.7%) had mild depression, 13(3.9%) had moderate and 1(0.3%) had severe depression. Figure 1 demonstrated the ways of management of diabetes among the participants.



It was found from the analysis that prevalence of anxiety among diabetic type-2 patients was about 22.6% (n=76). Similarly, 11.9%(n=40) patients were suffering from depression. Association between anxiety and depression with sociodemographic variables was tested and tabulated in table 2. Presence of anxiety and depression in females compare to males, widowers, unemployed were significantly high. Furthermore, those who were managing diabetes through diet and exercise or oral medications had significantly low prevalence of anxiety and depression however those who were using both oral and insulin to manage diabetes had significantly high prevalence of anxiety and depression. In addition, those who were diagnosed for diabetes for 11-20 years ago had significantly high prevalence of anxiety and depression. Similarly, suffering from other comorbidities had also significant association with anxiety and depression.

Table 2: Association between patients' demographics and Anxiety and depression

	Anxiety		P-value	Depression		P-value
	No(%)	Yes(%)		No(%)	Yes(%)	
Age (years)						
Up to 50	105(80.8)	25(19.2)	0.284	120(92.3)	10(7.7)	0.083
More than 50	155(75.2)	51(24.8)		176(85.4)	30(14.6)	
Gender						
Male	173(82.4)	37(17.6)	0.007*	194(92.4)	16(7.6)	0.003*
Female	87(69)	39(31)		102(81)	24(19)	
Marital Status						
Single	8(72.7)	3(27.3)	0.000*	9(81.8)	2(18.2)	0.000*
Married	233(80.6)	56(19.4)		265(91.7)	24(8.3)	
Divorced	8(72.7)	3(27.3)		9(81.8)	2(18.2)	
Widowed	11(44)	14(56)		13(52)	12(48)	
Education						
Primary	52(77.6)	15(22.4)	0.428	57(85.1)	10(14.9)	0.147
Secondary	123(77.4)	36(22.6)		144(90.6)	15(9.4)	

University	50(83.3)	10(16.7)		55(91.7)	5(8.3)	
Intermediate school	35(70)	15(30)		40(80)	10(20)	
Occupation						
Unemployed	68(66.7)	34(33.3)	0.008*	81(79.4)	21(20.6)	0.005*
Employed	96(82.1)	21(17.9)		108(92.3)	9(7.7)	
Retired	96(82.1)	21(17.9)		107(91.5)	10(8.5)	
Income						
Less than 5000	74(71.2)	30(28.8)	0.219	85(81.7)	19(18.3)	0.108
5000-10000	88(77.9)	25(22.1)		103(91.2)	10(8.8)	
10001-15000	72(80.9)	17(19.1)		80(89.9)	9(10.1)	
More than 15000	26(86.7)	4(13.3)		28(93.3)	2(6.7)	
Diabetes Management						
Diet and exercise						
Yes	134(86.5)	21(13.5)	0.000*	148(95.5)	7(4.5)	0.000*
No	126(69.6)	55(30.4)		148(81.8)	33(18.2)	
Oral						
Yes	211(81.8)	47(18.2)	0.001*	234(90.7)	24(9.3)	0.015*
No	49(62.8)	29(37.2)		62(79.5)	16(20.5)	
Insulin						
Yes	9(81.8)	2(18.2)	1.00	10(90.9)	1(9.1)	1.00
No	251(77.2)	74(22.8)		286(88)	39(12)	
Oral & Insulin						
Yes	59(68.6)	27(31.4)	0.036*	70(81.4)	16(18.6)	0.033*
No	201(80.4)	49(19.6)		226(90.4)	24(9.6)	
Onset of Disease (yrs)						
1-10	167(78.8)	45(21.2)	0.399	187(88.2)	25(11.8)	0.752
11-20	71(73.2)	26(26.8)		84(86.6)	13(13.4)	
More than 20	21(84)	4(16)		23(92)	2(8)	
Comorbidities						
Yes	174(74.4)	60(25.6)	0.048*	200(85.5)	34(14.5)	0.027*
No	86(84.3)	16(15.7)		96(94.1)	6(5.9)	
Family History						
Yes	189(77.5)	55(22.5)	1.00	216(88.5)	28(11.5)	0.707
No	71(77.2)	21(22.8)		80(87)	12(13)	

*Statistically significant at 0.05 level of significance

Multivariate logistic regression was used to explore the predictors of anxiety among diabetic type-2 patients. Table 3 summarized the simple odds ratio and logistic regression outcome. It was found that those who were divorced had significantly higher odds of suffering from anxiety compared to singles according to HADS anxiety scale. Furthermore, management of diabetes through diet and exercise was also found significant predictor of anxiety. Odds were significantly high 2.23(1.12-4.22) of being suffered from anxiety if patients were not trying to manage diabetes by controlling diet and doing exercise.

Similarly, odds ratio and multiple logistic regression was used for depression as outcome variable and patients' demographics as predictors. Table 4 summarized the findings and those variables which were significant predictors of anxiety were also had significant predictors of depression. Diabetic patients who were divorced had significantly high odds 6.98(2.0-24.1) of having depression compare to singles according to HADS scale for assessing anxiety and depression. Furthermore, those who were not managing diabetes by controlling diet and doing exercise had significantly high odds of having depression 4.8(1.8-12.8).

Table 3: Predictors of anxiety among diabetic type-2 patients

Variables	Anxiety			
	Unadjusted OR	P-value	adjusted OR	P-value
Age (Years)				
Up to 50				
More than 50	1.38(0.81-2.34)	0.239	1.08(0.49-2.35)	0.85
Gender				
Male				
Female	2.09(1.2-3.5)	0.005*	1.47(0.56-3.89)	0.437
Marital Status				
Single				
Married	3.4(0.73-15.89)	0.121	2.56(0.39-16.7)	0.327
Divorced	5.29(2.28-12.28)	0.000*	3.59(1.2-10.4)	0.019*
Widowed	3.39(0.72-15.89)	0.121	4.74(0.7-31.9)	0.109
Education				
Primary				
Secondary	1.49(0.64-3.4)	0.352	1.62(0.57-4.6)	0.365
University	1.46(0.72-2.97)	0.292	0.74(0.29-1.9)	0.518
Intermediate school	2.14(0.86-5.3)	0.10	0.78(0.21-2.9)	0.710
Occupation				
Unemployed				
Employed	0.44(0.23-0.82)	0.01*	0.51(0.14-1.9)	0.315
Retired	1.0(0.51-1.95)	1.0	0.78(0.21-1.9)	0.590
Income				
Less than 5000				
5000-10000	0.38(0.12-0.18)	0.094	0.67(0.13-3.6)	0.643
10001-15000	0.54(0.17-1.7)	0.29	0.49(0.12-1.7)	0.243
More than 15000	0.65(0.20-2.12)	0.476	0.52(0.15-1.9)	0.318
Diabetes Management				
Diet and exercise				
Yes				
No	2.78(1.59-4.86)	0.000*	2.23(1.12-4.22)	0.014*
Oral				
Yes				
No	2.66(1.5-4.6)	0.001*	2.61(0.78.8.7)	0.118
Insulin				
Yes				
No	1.32(0.28-6.3)	0.721	3.28(0.42-25.4)	0.25
Oral & Insulin				
Yes				
No	0.533(0.31-0.92)	0.025*	1.68(0.5-5.67)	0.40
Onset of Disease (yrs)				
1-10				
11-20	0.71(0.23-2.2)	0.543	0.628(0.17-2.3)	0.48
More than 20	0.52(0.16-1.65)	0.269	0.65(0.18-2.4)	0.518
Comorbidities				
Yes				
No	0.54(0.29-0.99)	0.047*	0.584(0.29-1.23)	0.156
Family History				
Yes				
No	1.02(0.57-1.8)	0.956	1.16(0.59-2.24)	0.651

*Statistically significant at 0.05 level of significance

Table 4: Predictors of depression among diabetic type-2 patients

	Depression		Depression	
	Unadjusted OR	P-value	adjusted OR	P-value
Age (Years)				
Up to 50				
More than 50	2.04(0.96-4.3)	0.062	1.52(0.49-4.6)	0.467
Gender				
Male				
Female	2.85(1.45-5.6)	0.002*	2.1(0.569-7.75)	0.27
Marital Status				
Single				
Married	4.1(0.74-23.2)	0.105	2.21(0.23-21.5)	0.494
Divorced	10.2(4.2-24.8)	0.000*	6.98(2.0-24.1)	0.002*
Widowed	4.1(0.74-23.2)	0.105	3.1(0.041-23.2)	0.27
Education				
Primary				
Secondary	1.42(0.54-3.74)	0.472	1.62(0.46-5.8)	0.455
University	2.4(1.0-5.75)	0.049*	1.05(0.31-3.6)	0.937
Intermediate school	2.75(0.87-8.67)	0.084	1.04(0.17-6.3)	0.969
Occupation				
Unemployed				
Employed	0.36(0.16-0.81)	0.013*	0.684(0.12-3.9)	0.67
Retired	1.12(0.44-2.86)	0.811	1.0(0.23-3.6)	1.00
Income				
Less than 5000				
5000-10000	0.32(0.07-1.45)	0.14	1.16(0.11-12.6)	0.903
10001-15000	0.74(0.15-3.55)	0.702	0.73(0.104-5.2)	0.756
More than 15000	0.63(0.12-3.11)	0.58	0.413(0.07-2.6)	0.347
Diabetes Management				
Diet and exercise				
Yes				
No	4.7(2.02-10.99)	0.000*	4.8(1.8-12.8)	0.002*
Oral				
Yes				
No	2.52(1.26-5.02)	0.009*	0.89(0.14-5.7)	0.904
Insulin				
Yes				
No	1.36(0.17-10.94)	0.77	1.4(0.074-27.6)	0.904
Oral & Insulin				
Yes				
No	0.465(0.234-0.92)	0.029*	0.86(0.14-5.23)	0.87
Onset of Disease (yrs)				
1-10				
11-20	0.65(0.14-2.93)	0.57	0.37(0.06-2.28)	0.287
More than 20	0.56(0.12-2.67)	0.468	0.64(0.103-4.0)	0.636
Comorbidities				
Yes				
No	0.368(0.15-0.905)	0.03*	0.415(0.14-1.26)	0.123
Family History				
Yes				
No	1.12(0.56-2.4)	0.692	1.39(0.57-3.36)	0.466

*Statistically significant at 0.05 level of significance

DISCUSSION:

Diabetic type 2 patients visited in primary health care center at armed forces hospital in Dhahran, Saudi Arabia were study participants in which 22.6% were suffering from anxiety and 11.9% were suffering from depression according to hospital anxiety and depression scale (HADS) used in the study. The prevalence was found lower in comparison to the previously published studies. A study conducted in Qassim region of Saudi Arabia which reported 43.6% and 34.8% prevalence of anxiety and depression among the study participants respectively (10). Some other studies published from different cities of Saudi Arabia reported the prevalence of anxiety and depression among T2DM patients. Al-Khathami et al were found 16% of the sampled diabetic patients had depression (18). A study from Eastern region of Saudi Arabia was found high proportion of diabetic patients (49.6%) were depressed (19). Studies from other parts of the world also reported the prevalence of anxiety and depression among diabetic patients, a study from Malaysia reported 31.4% and 40.3% of anxiety and depression respectively (20). In Ireland, 32% and 22%, in China 56.1% and 43.6% of anxiety and depression was found among T2DM patients (21,22).

In general, it is well known that females are more depressed compare to males (23) and this could be due to several reasons. One probable reason would be difference in lifestyle, the gender specific role of women which demand to spend more time at home which decreased physical activity and cause poor eating habits (24). Social role of women demands to be more emotional and extroverted then men (23). Due to these factors, it was prominently witnessed in the present study findings that significantly high proportion of female compare to men were having anxiety and depression. Al-Mohaimed AA from Saudi Arabia reported the same findings where higher proportion of diabetic females were suffering from anxiety and depression (10), Hawamdeh et al conducted a systematic review on the studies published from Arab countries and reported that T2DM Arab women were found more depressed (25).

Other demographic variables like marital and employment status had found significant association with anxiety and depression. Those who were widowed and the unemployment was causing increase in the prevalence of the studied psychological problems. These findings were in line with the previously published articles in which prevalence of anxiety and depression was found higher

among unmarried (divorced or single) individuals (10). Mikaliukštie et al reported that association between marital status and prevalence of anxiety and depression was statistically significant (26).

T2DM with comorbidities had significantly high chances of suffering from anxiety and depression. Hunag et al reported that risk of generalized anxiety disorder (GAD) among T2DM patients was significantly associated with the comorbidities like congestive heart failure and peripheral vascular disease (27). Diabetes combined with comorbidities like hypertension and dyslipidemia causes increase in complications and lead to poor treatment outcome (28).

This study was a single center study with small sample size hence its findings could not provide accurate prevalence of anxiety and depression among T2DM patients living in Eastern region of Saudi Arabia. Temporal relationship between anxiety and depression and other diabetes-related variables could not be assessed because the study was a cross-sectional study.

CONCLUSION:

The study has shown that the prevalence of anxiety among T2DM was found higher than depression. Several factors were found significant cause of developing anxiety and depression namely, gender, marital status, occupation, comorbidities and diabetes management. This study was unicentral study with small sample size and because of this prevalence of anxiety and depression among the study participants was not as high as reported in previous studies. A large sample size study with multiple health care centers included is recommended.

REFERENCES:

1. WHO. Global report on diabetes executive summary [Internet]. Available: http://apps.who.int/iris/bitstream/handle/10665/204871/1/9789241565257_eng.pdf
2. International Diabetes Federation. Diabetes Atlas , 4 [http://www.worlddiabetesfoundation.org/composite-35.htm], Accessed October 20th, 2019
3. Al-Hariri M, Khan S, Albaker W, Al Malik W. Impact of Knowledge and Practice on Fasting Blood Glucose Levels among Diabetics During Ramadan Fasting. Journal of epidemiology and global health. 2019 Dec;9(4):288.
4. Guariguata L, Whiting DR, Hambleton I, Beagley J, Linnenkamp U, Shaw JE. Global estimates of

- diabetes prevalence for 2013 and projections for 2035. *Diabetes Res Clin Pract* 2014;103:137–49.
5. Holt RIG, Mitchell AJ. Diabetes mellitus and severe mental illness: mechanisms and clinical implications. *Nat Publ Gr [Internet]* 2014; 11(2): 79e89. Nature Publishing Group. Available from: <http://dx.doi.org/10.1038/nrendo.2014.203>
 6. Medved V. The comorbidity of diabetes mellitus. *Psychiatria Danubina* 2009; 21(4): 585e588.
 7. Huang CJ, Lin CH, Lee MH, Chang KP, Chiu HC. Prevalence and incidence of diagnosed depression disorders in patients with diabetes: a national population-based cohort study. *Gen Hosp Psychiatry*. 2012;34:242-8.
 8. Huang CJ, Chiu HC, Lee MH, Wang SY. Prevalence and incidence of anxiety disorders in diabetic patients: a national population-based cohort study. *Gen Hosp Psychiatry*. 2011;33:8-15.
 9. Alduraywish A, Fattah DA, Abd-eltawab A, Al-ruwili M, Alhassan A, Alnafe N, et al. Depression and anxiety and their correlates in patients with diabetes mellitus in Al-Jouf Region, Saudi Arabia. *Clin Med Diagn*. 2017;7(2):48–56. 26.
 10. Al-Mohaimed AA. Prevalence and factors associated with anxiety and depression among type 2 diabetes in Qassim: a descriptive cross-sectional study. *J Taibah Univ Med Sci*. 2017;12(5):430–6. <https://doi.org/10.1016/j.jtumed.2017.04.002>.
 11. Hellman R. The Patient Safety Exchange. AACE Patient Safety – Editorials. Depression and Diabetes and Patient Safety. Editorial dated 09-02;2008:16:42:38.
 12. Rubin RR, Ma Y, Marrero DG, Peyrot M, Barrett-Connor EL, Kahn SE, et al. Elevated depression symptoms, antidepressant medicine use, and risk of developing diabetes during the diabetes prevention program. *Diabetes Care* 2008;31:420-6.
 13. Katon W, Lin EH, Kroenke K. The association of depression and anxiety with medical symptom burden in patients with chronic medical illness. *Gen Hosp Psychiatry* 2007;29:147-55
 14. de Groot M, Anderson R, Freedland KE, Clouse RE, Lustman PJ. Association of depression and diabetes complications: A meta-analysis. *Psychosom Med* 2001;63:619-30.
 15. Alzahrani A, Alghamdi A, Alqarni T, Alshareef R, Alzahrani A. 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 Jul 16;13:48. doi: 10.1186/s13033-019-0307-6. PMID: 31341512; PMCID: PMC6631923.
 16. Zigmond AS, Snaith RP. The hospital anxiety and depression scale. *Acta Psychiatr Scand [Internet]* 1983 Jun; 67(6): 361e370 [cited 2017 Jan 19]. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/6880820>.
 17. Bjelland I, Dahl AA, Haug TT, Neckelmann D. The validity of the hospital anxiety and depression scale. *J Psychosom Res [Internet]* 2002; 52: 69e77. Available from: <http://www.sciencedirect.com/science/article/pii/S0022399901002963>.
 18. Al-Khathami AD, Ogbeide DO. Prevalence of mental illness among Saudi adult primary-care patients in Central Saudi Arabia. *Saudi Med J* 2002; 23(6): 721e724.
 19. El Mahalli AA. Prevalence and predictors of depression among type 2 diabetes mellitus outpatients in Eastern Province, Saudi Arabia. *Int J Health Sci (Qassim) [Internet]* 2015; 9(2). Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4538888/>.
 20. Ganasegeran K, Renganathan P, Manaf RA, Al-Dubai SAR. Factors associated with anxiety and depression among type 2 diabetes outpatients in Malaysia: a descriptive cross-sectional single-centre study. *BMJ Open [Internet]* 2014; 4(4): e004794. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid/44010817&tool/4pmcentrez&rendertype/abstract>.
 21. Collins MM, Corcoran P, Perry JJ. Psychology anxiety and depression symptoms in patients with diabetes. *Diabet Med* 2009: 153e161.
 22. Sun N, Lou P, Shang Y, Zhang P, Wang J, Chang G, Shi C. Prevalence and determinants of depressive and anxiety symptoms in adults with type 2 diabetes in China: a cross-sectional study. *BMJ open*. 2016 Aug 1;6(8).
 23. Khuwaja AK, Kadir MM: Gender differences and clustering patterns of behavioral risk factors for chronic non-communicable diseases: community-based study from a developing country. *Chronic Illn* 2010, 6(3):163-170.
 24. Al-Tuwijri A, Al-Dogheter M, Akturk Z, et al. Quality of life of people with diabetes attending primary care health centres in Riyadh: bad control good quality? *Qual Prim Care* 2007;15:307–14.
 25. Hawamdeh S, Dator WLT, Abunab HY. Prevalence of depression among Arab women

- with type 2 diabetes: a systematic review and meta-analysis. *Health* 2016; 650-657.
26. Mikaliū kštienė A, Žagminas K, Juozulynas A, et al. Prevalence and determinants of anxiety and depression symptoms in patients with type 2 diabetes in Lithuania. *Med Sci Monit* 2014;20:182–90.
27. Huang CJ, Hsieh HM, Tu HP, Jiang HJ, Wang PW, Lin CH. Generalized anxiety disorder in type 2 diabetes mellitus: prevalence and clinical characteristics. *Brazilian Journal of Psychiatry*. 2020 Dec;42(6):621-9.
28. Mooradian AD. Dyslipidemia in type 2 diabetes mellitus. *Nat clin Pract Endocrinol Metab*. 2009; 5:150-9.