Research Article

# Depression and Associated Factors among Type Two Diabetes Mellitus Patients in Palestine: a Cross-Sectional Study, 2013

Zaher Nazzal[1*], Assef Hamdan[1], Zaid Thaher[1], Issa Alawneh[1], Iyad Abu Baker[2], Amira Hindi[3]

[1]An-Najah National University, Faculty of Medicine and Health Sciences ,Palestine

[2]General Psychiatry, Palestinian MoH

[3]Palestinian MoH

*Corresponding author: Dr. Zaher Nazzal, Assistant Professor in Community Medicine. An-Najah National University/ Faculty of Medicine and Health Sciences, Nablus, Palestine, Tel: +(972) (599) 545421; Email: znazzal@najah.edu; nazzalzaher@yahoo.com;

Copyright:  © 2015 Zaher

## Abstract

### Background

Diabetes Mellitus and depression are two common public health problems affecting people all over the world. As being diagnosed with Diabetes Mellitus is a major life stress per se, the prevalence of depression among diabetics is high. Depression is believed to influence the treatment outcomes and prognosis of Diabetes Mellitus as well as the quality of life among diabetics. The aim of our study is to determine the prevalence of depression and to assess the factors associated with it among patients with Type Two Diabetes Mellitus.

### Methods

This is a cross-sectional study involving a total of 400 respondents from Nablus governorate's Primary health care centers. Subjects were evaluated for depression using the Arabic version of the Beck Depression Inventory questionnaire as a data collecting tool. Patients were interviewed to gather data on socio-demographics & medical factors as well as chronic illnesses or complications of Diabetes Mellitus.

### Results

A total of 400 respondents were interviewed. The mean age of the patients was 58.5 year and the majority (61.5%) was females. The prevalence of depression among diabetic patients, regardless of the severity, was found to be as high as 28.3% (113 out of 400 patients). The prevalence of severe depression was found to be 4% of the whole sample. Both the Diabetes control status and residency were significantly associated with depression (p values= 0.023, OR=2.182) & (p value= 0.013, OR= 1.959), respectively.

### Conclusion

The prevalence of depression among diabetic patients is as relatively high. This does deserve to be taken into consideration while following diabetic patients up. Controlled diabetes appeared to be a protective factor against depression.

**Keywords:** Diabetes Mellitus; Depression; Primary Health Care; Palestine

# Background

Many chronic medical diseases are complicated by emotional and psychological disorders. These emotional aspects of such chronic medical conditions are often taken into consideration during medical care [1]. Diabetes Mellitus (DM) and depression are two of the commonest public health problems affecting people around the world [2]. The World Health Organization (WHO) predicts that more than 360 million people worldwide will have diabetes by 2030 [3].

Depression is also highly prevalent. According to the WHO, approximately 5.8% of men and 9.5% of women will experience a depressive episode in a year. This varies according to populations and could be high in some populations [4]. The prevalence of depression is elevated in those with chronic illnesses such as DM [5]. The risk of depression in patients with Type 2 DM (T2DM) is near twice greater than for non-diabetic subjects [6].

Being diagnosed with DM is a major life stress per se. It needs a large number of physical and mental accommodations. Many newly diagnosed diabetics patients go through the typical stages of depression which include denial, anger before acceptance [7]. Depression is not only highly co-morbid with DM but also affects treatment goals. It has a serious negative effect on the quality of life of diabetes patients [8] and also associated with poorer glycemic control [9]. In addition, depression significantly decreases adherence to medication and dietary regimens prescribed for glycemic control and may contribute to poor diabetes-related outcomes [10-12]. Gonzalez and colleagues concluded that depressive symptoms are good predictors of poor adherence to self-care particularly in adherence to medications and diet and exercise regimens [13].

Despite that, depression is a modifiable risk factor whose treatment could improve glycemic control and health outcomes in patients with DM [14]. The available data on the prevalence of depression among T2DM in Palestine is limited. Therefore, the aim of this study is to determine the prevalence of depression in T2DM patients and to assess the factors associated with it among them.

# Methodology

### Study Design and Population
A cross-sectional study was conducted in the period from the 1st of September 2013 till the 31st of December 2013 at the out-patient follow-up DM clinics. These clinics belong to both the Ministry of Health (MoH) and United Nations Relief and Works Agency (UNRWA) primary health care centers (PHCs) in Nablus district.

The study populations consisted of all T2DM patients who already had been diagnosed at PHCs as having DM for more than 3 months, and usually have their follow-up in MOH & UNRWA centers in Nablus district. Exclusion criteria included; patients who refused to undergo our interview or didn't complete the study, patients with type 1 diabetes mellitus or who were treated and followed up outside the MoH and UNRWA clinics and those who had recent (last 2-3 weeks) significant physical or psychic disability.

Sample size calculations were made based on expected proportion of 40%, a 95% confidence interval (CI) and a 5% absolute precision on either side of the proportion, and indicated that the minimum required sample size was 400 DM patients. Systematic random sampling technique was used to select the calculated sample, taking every second patient upon registration in the follow up clinic.

### Data Collection
Data was collected using a self-administered questionnaire and through reviewing patients files. The questionnaire contained a brief introduction about the study and its objectives, and was divided into two sections. *Section I* was about demographics of the participants, like age, gender, place of residence, marital status, duration of diabetes, Employment status, and treatment regimen. Section II was a bout screening for depression using the Arabic version of the Beck Depression Inventory (BDI) scale. It consists of 21 questions; each of them consists of four choices (from 0-3). The total score is calculated by summation of all the patient's responses. A BDI score of ≥16 is mostly recommended to identify a potential case of depression and those with a score ≥30 were classified as having severe depression [15].

This scale has been chosen because it is one of the most widely used screening tool for depression in people with diabetes and easy to administer. The BDI was found to be reliable (internal consistency is 0.92 in English version) and valid [16, 17]. In this particular sample; Cronbach's alpha for Arabic version BDI was 0.84 which is considered good. Patients' files were reviewed for glycemic control, where HbA1c <7 indicated controlled T2DM

### Statistical Analysis
Statistical Package for Social Sciences (SPSS) version 17 was used for data entry and statistical analysis. Descriptive statistics were computed to assess the personal characteristics of the participants. Univariate analysis was conducted using a Chi-square test to assess for depression risk factors. Moreover, multivariable logistic regression was carried out to assess for predictors of depressive symptoms among T2DM for cofounders, where all variables with p value p value < 0.10 in the univariate analysis were included in the model. A *P*-value

of <0.05 was considered to indicate statistical significance.

The study protocol was approved by the Institutional Review Board (IRB) at An-Najah National University. A consent form was obtained from patients prior to participation. Participants' privacy was assured and all collected data were treated confidentially. Patients screened positive for Depression were advised to arrange an appointment with their Primary Health Care physician for further management.

## Results

A total of 400 respondents were interviewed at PHCs where they usually have their medical follow up; 38.3% of them had being followed at UNRWA clinics and the remaining at MoH PHCs. They were chosen on the basis of meeting the inclusion criteria set for the study.

The mean age of the patients was 58.5 year. It ranges from 28 to 85 years. The majority of the participants (61.5%) were female patients and almost all of them were married (80.2%). More than half of the patients had a secondary-and-higher level of education (53.5%). Most of the patients interviewed reside in villages (48.2%), those who live in Nablus city constituted 32.8% of the sample and 67.2% live in Camps or villages. Unemployment is as obvious as 69.5% of the patients don't have a job (Table 1).

For the clinical characteristics of the participants, the majority of them had controlled status of DM (64.5%), and around three quarters were compliant to having their medications (75.8%). The mean duration of DM was 9 years; however, 34.8% of them had the disease for more than 10 years. The vast majority of the patients weren't smokers (78.5%). Around two thirds reported having at least one chronic disease or complication of DM (67.5%) (Table 1).

**Table1.** Socio-demographic and medical Characteristics of the participants (n = 400).

| Variable | Frequency | Percent % |
|---|---|---|
| **Age** | | |
| Less than 60 | 205 | 51.2 |
| 60 and more | 195 | 48.8 |
| **Gender** | | |
| Male | 154 | 38.5 |
| Female | 246 | 61.5 |
| **Education** | | |
| Primary School and less | 186 | 46.5 |
| Secondary School and College | 214 | 53.5 |

| | | |
|---|---|---|
| **Marital Status** | | |
| Married | 321 | 80.2 |
| Non- Married | 79 | 19.8 |
| **Residency** | | |
| City | 131 | 32.8 |
| Camp or Village | 269 | 67.2 |
| **Job** | | |
| Employed | 122 | 30.5 |
| Unemployed | 278 | 69.5 |
| **Place of Follow Up** | | |
| MOH | 247 | 61.8 |
| UN | 153 | 38.3 |
| **Diabetes** | | |
| Controlled | 258 | 64.5 |
| Uncontrolled | 142 | 35.5 |
| **Duration of DM** | | |
| 10 years and less | 261 | 65.2 |
| More than 10 years | 139 | 34.8 |
| **Patient Compliance** | | |
| Compliant | 303 | 75.8 |
| Non-Compliant | 97 | 24.2 |
| **Smoking** | | |
| Smoker | 86 | 21.5 |
| Non- Smoker | 314 | 78.5 |
| **Other Chronic Diseases** | | |
| None | 130 | 32.5 |
| One or More | 270 | 67.5 |

The prevalence of depression among diabetic patients, regardless of the severity, was found to be as high as 28.3% (113 out of 400 patients). The prevalence of severe depression was found to be 4% of the whole sample (16 out of 400 patients) (Figure 1).
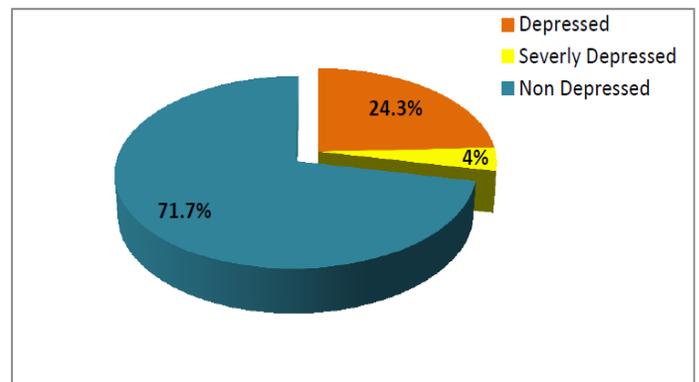


**Figure 1.** Prevalence of depression among diabetic patients

**Table 2.** Distribution of socio-demographic characteristics in relation to depression status.

| Variable | Depression | | P-Value* |
|---|---|---|---|
| | Non-Depressed | Depressed | |
| **Age** | | | |
| < 60 years | 153 (74.6%) | 52 (25.4%) | 0.189 |
| ≥60 years | 134 (68.7%) | 61 (31.3%) | |
| **Gender** | | | |
| Male | 117 (76%) | 37 (24%) | 0.138 |
| Female | 170 (69.1%) | 76 (30.9%) | |
| **Education** | | | |
| Primary and less | 125 (67.2%) | 61 (32.8%) | 0.060 |
| Secondary and college | 43 (53.1%) | 38 (46.9%) | |
| **Marital Status** | | | |
| Married | 50 (63.3%) | 29 (36.7%) | 0.062 |
| Non Married# | 237 (73.8%) | 84 (26.2%) | |
| **Residency** | | | |
| City | 104 (79.4%) | 27 (21.6%) | 0.026 |
| Village or Camp | 170 (62.1%) | 104 (37.9%) | |
| **Job** | | | |
| Employed | 98 (80.3%) | 24 (19.7%) | 0.012 |
| Unemployed | 19 (68%) | 89 (32%) | |
| **Place of Follow Up** | | | |
| MOH | 174 (70.4%) | 73 (29.6%) | 0.461 |
| UN | 113 (73.9%) | 40 (26.1%) | |

*Chi-squared test, #Divorced, widowed or single

The status of depression was studied in relation to patient's demographic and clinical chara cteristics using the Chi-square test. T2 DM patients living in the city showed depressive symptoms than patients living in village or camps (p=0.026). Additionally, un employed T2DM patients showed higher frequency of depressive symptoms than the employed patients (p=0.012). Other variables; age, gender, education and marital status, weren't found to be statistically significant in relation of depression status (Table 2).

For the clinical characteristics of the participants, patients with controlled T2DM and those compliant to treatment were less likely to show depressive symptoms compared to the patients with uncontrolled T2DM (p = <0.001) and the non-compliant patients (p = <0.001). On the other hand, duration of the disease, smoking and presence of other chronic diseases had no significant association with depression (p values > 0.05) (Table 3).

**Table 3.** Distribution of clinical characteristics in relation to depression status.

| Variable | Depression | | P-Value* |
|---|---|---|---|
| | Non-Depressed | Depressed | |
| **Diabetes** | | | |
| Controlled | 204 (79.1%) | 54 (20.9%) | <0.001 |
| Uncontrolled | 83 (58.5%) | 59 (41.5%) | |
| **Duration of DM** | | | |
| ≤10 years | 193 (73.9%) | 68 (26.1%) | 0.181 |
| > 10 years | 94 (67.6%) | 45 (33.4%) | |
| **Compliance** | | | |
| Compliant | 232 (76.6%) | 71 (23.4%) | <0.001 |
| Non-Compliant | 55 (56.7%) | 42 (43.3%) | |
| **Smoking** | | | |
| Smoker | 65 (75.6%) | 21 (24.4%) | 0.373 |
| Non-Smoker | 222 (70.7%) | 92 (29.3%) | |
| **Chronic Diseases** | | | |
| None | 101 (77.7%) | 29 (23.3%) | 0.067 |
| One or More | 186 (68.9%) | 84 (31.1%) | |

*Chi-squared test

Table 4 summarizes the results of the multiple logistic regression analyses. Among all variables included in the model, patients with uncontrolled T2DM are at a nearly doubled risk of having depression (OR = 2.2), compared to those with a controlled DM status (p value= 0.023). Likewise, patients who live in the camp or village appeared to have two-times more risk of being depressed compared to those who reside in the city (OR=2.0, CI= 1.2 – 3.3). All the other variables included in the model were not found to be statistically significant.

**Table 4.** Multivariable analysis showing risk factors associated with Depression.

| Variable | Odds Ratio | CI# | P-Value |
|---|---|---|---|
| **Diabetes Status** Controlled* Uncontrolled | 2.1 | 1.2 - 4.3 | 0.023 |
| **Compliance** Compliant* Non-Compliant | 1.3 | 0.6 - 2.6 | 0.560 |
| **Marital Status** Married* Unmarried | 0.8 | 0.4-1.3 | 0.321 |
| **Job** Employed* Unemployed | 1.5 | 0.9 – 2.6 | 0.164 |
| **Residency** City* Camp or Village | 2.0 | 1.2 – 3.3 | 0.013 |
| **Education** Primary and less* Secondary and college | 0.9 | 0.5 – 1.4 | 0.560 |
| **Other chronic** None* One or More | 1.6 | 0.9 – 2.7 | 0.76 |

* Reference group

#Confidence interval

## Discussion

Depression is well recognized to be associated with chronic diseases and non psychiatric medical illnesses [18-20]. Due to the increasing rates of depression in patients with DM, it is important to understand the disease and plan mental services to improve their quality of life. Early detection and treatment of depression will lead to improve in glycemic control [21].

In our cross-sectional study, prevalence of depression was found to be 28.3% (113 out of 400 patients). Among whom, 13% had a severe status of depression (16 out of 113), i.e. 4% of the whole sample (16 out of 400). Other studies in the Middle East region resulted in a wide range of prevalence of depression; 12.5% in UAE [22], 33.3% in Bahrain [20], and 45.5% in Saudi Arabia [23]. Global percentages of such prevalence in USA and Europe were 16.2% and 14%, respectively [24, 25]. The fact that the act of living in the West is largely different from living in Palestine could explain the difference in such findings. In Europe and USA, the quality of life, resources of entertainment, the governmental support and individual's income, all play a role in minimizing such prevalence, compared to the case in Palestine.

Our study revealed that depression is mainly affected by the DM control status **(**OR= 2.1, CI=1.2 - 4.3). This was consistent with what was found by Lustman et al., who completed a meta-analysis of 24 studies finding that depression was significantly associated with poor glycemic control in individuals with T2DM [26]. This could be reasonably attributed to the further worsening of quality of life and frequent hospitalizations. Moreover, uncontrolled status exposes the diabetic patient to the complications of DM which per se cause an additional burden affecting the psychological state directly.

In addition to the status of DM, other medical factors were investigated including the presence of superimposed chronic illnesses or complications, duration of the DM, smoking and compliance. None of these variables was shown to have a significant association with depression. However, Compliance to anti-DM medications appeared to be significant by univariate regression. This was partly in the line of a study conducted in Massachusetts General Hospital and Harvard Medical School in Boston [10] that showed a significant association between adherence to the recommended regimen and depression. These relatively surprising results (no association with such medical factors) were found in other studies like a Malaysian study [27].

Residency appeared to be significantly associated with depression among diabetics in our study (OR=2.0, CI= 1.2 – 3.3). The increased prevalence of depression among those who live outside the city could be attributed to the more-difficult psycho-social situation. That's to say, rural residents generally have lower socio-economic statuses, lower incomes and problems of poorer access to public services. However, such a variable hadn't been investigated in other equivalent studies, according to our knowledge. This could be attributed to the minimal differences between urban and non-urban areas regarding what may affect the psychological status, compared to the case in Nablus district in Palestine; particularly because of the presence of overcrowded camps and far-from-city villages. Another possible explanation could be attributed to the scarcity of pleasure resources in villages and camps like public parks, social centers, clubs…etc.

Various social factors might be associated with depression among T2DM including age, sex, marital status, level of education and occupation were the factors most frequently cited with its occurrence. Our study was unable to show a significant association between these factors with depression. We found that the age wasn't a significant factor ( $x^2$=1.726, p value= 0.189) [9, 10, 27-30]. This is consistent with what was found by many other researches in different regions. Concerning gender differences, although a non-significant variable, it was found that there's an increased prevalence among females. The prevalence in our study was 24% among

males and 30.9% among females. This is in the line of the result of a meta-analysis of 42 studies which resulted in a prevalence of depression of 28% in women and 18% in men [31]. Likewise, in an Iranian study, the prevalence among female diabetics was 29% and among male ones was 21% [9].

However, although the effect of having a job appeared to be significant by the univariate regression, it lost its significant relationship once re-examined by the multivariable logistic regression. A similar result was obtained from the above-mentioned Malaysian study that showed those with social factors don't have a significant impaction on the development of depression [27].

On comparing the still-married patients with those of other marital statuses, we found that such a difference isn't a significant factor affecting the prevalence of depression among diabetics. The opposite result was obtained from studies conducted at countries of other ethnicities like in Nigeria where they realized that the family plays a role in gaining the psychological support [32]. However, we quietly believe that being non-married in the Palestinian society don't necessarily mean that they are living alone or lacking the social and psychological support.

Our study had two main aspects of strength. The first is that it was directed toward a critical public health issue among patients who have a life-long disease, diabetes. Therefore, we believe that taking care of a non-organic complaint, the psychological status, in these patients adds a lot of strength, in terms of the importance of the outcomes of the scientific research. The second the high response rate, the reasonable sample size and its representativeness of the three different demographic regions of Nablus District that was taken into consideration.

Some limitations should be considered when interpreting the results of this study. Firstly, the cross-sectional nature of this study limits making interpretation or confirmation regarding causal relationships between depression and any of the studied factors could be made. The study also did not include a control group thus limiting its overall power. Finally, the study was held in one governorate only, so it might not represent the whole Palestinian society. It could have been stronger if conducted among patients of multiple governorates.

## Conclusions

The obtained results showed that there's a relatively high prevalence of depression among diabetic patients. This does deserve to be taken into consideration when following diabetic patients up. The control of DM is as important as it seemed to be associated with the patients from having depressive episodes. In other words, the most significant association with

depression is having an uncontrolled elevated level of blood sugar, as resulted in our research and supported by many other ones.

Based on the study findings we recommend that Specific care or attention to the psychological status of patients should be taken into consideration by PHC doctors while following diabetic patients up the significant risk factors should be modified as much as possible. It is worthwhile to take policies to educate and counsel diabetic patients about importance of control of blood sugar through multidisciplinary approach involving nutritionist, social workers and physician. Moreover, HbA1C should be done regularly to achieve this point. Regarding the residency, we recommend view in depth about why non urban are much more at risk of depression. However, establishing multisectoral extension of their conditions to improve their quality of life could help to minimize this risk factor.

## Acknowledgements

## References

1. Turner J, Kelly B. Emotional dimensions of chronic disease. The Western journal of medicine. 2000, 172(2): 124-128.

2. World Health Organization (WHO): The global burden of disease: 2004 update. Geneva2008.

3. World Health Organization. Diabetes Action Now. Diabetes Voice. 2004, 49(2): 27-31

4. .World Health Organization: The World Health Report - Mental Health: New Understing. Geneva2001.

5. Palinkas LA, Wingard DL, Barrett-Connor E. Chronic illness and depressive symptoms in the elderly: a population-based study. Journal of clinical epidemiology. 1990, 43(11): 1131-1141.

6. Knol MJ, Twisk JW, Beekman AT, Heine RJ, Snoek FJ et al. Depression as a risk factor for the onset of type 2 diabetes mellitus. A meta-analysis. Diabetologia. 2006, 49(5): 837-845.

7. Sridhar GR, Madhu K. Psychosocial and cultural issues in diabetes mellitus. Current Science. 2002, 83(12): 1556-1564.

8. Schram MT, Baan CA, Pouwer F. Depression and quality of

life in patients with diabetes: a systematic review from the European depression in diabetes (EDID) research consortium. Current diabetes reviews. 2009, 5(2): 112-119.

9.   Shamsaei F, Cheraghi F, Allahverdipour H. Depression in Diabetic Patients. Journal of Research in Health Sciences. 2006, 6(1): 39-43.

10.   Gonzalez JS, Safren SA, Cagliero E, Wexler DJ, Delahanty L et al. Depression, Self-Care, and Medication Adherence in Type 2 Diabetes. Diabetes care. 2007, 30(9): 2222–2227.

11.   Lin EH, Katon W, Von Korff M, Rutter C, Simon GE et al. Relationship of depression and diabetes self-care, medication adherence, and preventive care. Diabetes Care. 2004, 27(9): 2154-2160.

12.  Black SA, Markides KS, Ray LA. Depression predicts increased incidence of adverse health outcomes in older mexican americans with type 2 diabetes. Diabetes Care 2003, 26(10): 2822-2828.

13.  Gonzalez S., Safren SA, Delahanty LM, Cagliero E, Wexler DJ et al. Symptoms of depression prospectively predict poorer self-care in patients with Type 2 diabetes. Diabet Med. 2008, 25(9): 1102-1107.

14.  Gendelman N, Snell-Bergeon JK, McFann K, Kinney G, Paul Wadwa R et al. Prevalence and correlates of depression in individuals with and without type 1 diabetes. Diabetes care. 2009, 32(4): 575-579.

15.   Lustman PJ, Clouse RE, Griffith LS, Carney RM, Freedland KE. Screening for depression in diabetes using the Beck Depression Inventory. Psychosomatic medicine. 1997, 59(1): 24-31.

16.  Wang YP, Gorenstein C. Assessment of depression in medical patients: a systematic review of the utility of the Beck Depression Inventory-II. Clinics. 2013, 68(9): 1274-1287.

17.   Brown M, Kaplan C, Jason L. Factor analysis of the Beck Depression Inventory-II with patients with chronic fatigue syndrome. Journal of health psychology. 2012, 17(6): 799-808.

18.   Gary TL, Crum RM, Cooper-Patrick L, Ford D, Brancati FL. Depressive symptoms and metabolic control in African-Americans with type 2 diabetes. Diabetes care. 2000, 23(1): 23-29.

19.  Coker AO, Ohaeri JU, Lawal RA, Orija OB. Specific psychiatric morbidity among diabetics at a Nigerian General Hospital. East African medical journal. 2000, 77(1): 42-45.

20.   Nasser J, Habib F, Hasan M, Khalil N. Prevalence of Depression among People with Diabetes Attending Diabetes Clinics at Primary Health Settings. Bahrain Medical Bulletin. 2009,31(3).

21.   Bagher L, Maryam K, Shahi B, Mahboubeh KG, Fatemeh B et al. Association Between Depression and Diabetes. German J Psychiatry. 2004, 7(62-65).

22.   Sulaiman N, Hamdan A, Tamim H, Mahmood D Young D. The prevalence and correlates of depression and anxiety in a sample of diabetic patients in Sharjah, United Arab Emirates. BMC Family Practice. 2010, 11: 80.

23.   AL-Baik M, Moharram M, Elsaid T, Al-Baik S, Al-Dahan S et.al. Screening for Depression in Diabetic Patients. International Journal of Medical Science and Public Health. 2014, 3(2): 156-160.

24.  Kessler RC, Berglund P, Demler O, Jin R, Koretz D, Merikangas KR et al. The epidemiology of major depressive disorder: results from the National Comorbidity Survey Replication (NCS-R). JAMA. 2003, 289(23): 3095-3105

25.   Alonso J, Angermeyer MC, Bernert S, Bruffaerts R, Brugha TS et al. Prevalence of mental disorders in Europe: results from the European Study of the Epidemiology of Mental Disorders (ESEMeD) project. Acta psychiatrica Scandinavica Supplementum. 2004, (420): 21-27.

26.   Anderson RJ, Freedland KE, Clouse RE, Lustman PJ. The prevalence of comorbid depression in adults with diabetes: a meta-analysis. Diabetes care. 2001, 24(6): 1069-1078.

27.   Mohamed R, Kadir R, Yaacob LH. A study on Depression among patient with type 2 Diabetes Mellitus in North East-coast Malaysia. International Journal of Collaborative Research on Internal Medicine and Public Health. 2012, 4(8): 1590 -1600.

28.   Katon W, von Korff M, Ciechanowski P, Russo J, Lin E et al. Behavioral and clinical factors associated with depression among individuals with diabetes. Diabetes care. 2004, 27(4): 914-920.

29.   Engum A, Mykletun A, Midthjell K, Holen A, Dahl AA. Depression and diabetes: a large population-based study of sociodemographic, lifestyle, and clinical factors associated with depression in type 1 and type 2 diabetes. Diabetes care. 2005, 28(8): 1904- 1909.

30.  Ciechanowski PS, Katon WJ, Russo JE. Depression and diabetes: impact of depressive symptoms on adherence, function, and costs. Archives of internal medicine. 2000, 160(21): 3278-3285.

31.   Sadock BJ, Sadock VA. Kaplan and Sadock's Synopsis of Psychiatry: Behavioral Sciences/Clinical Psychiatry. 9 ed.

Philadelphia: Lippincott Williams and Wilkins. 2003.

32.  Igwe MN, Uwakwe R, Ahanotu CA, Onyeama GM, Bakare MO et al. Factors associated with depression and suicide among patients with diabetes mellitus and essential hypertension in a Nigerian teaching hospital. African health sciences. 2013, 13(1): 68-77.