*Original Research Article*

# Depression among People Living with Type II Diabetes in Kathmandu Valley of Nepal: A Cross-Sectional Study

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## ABSTRACT

**Objectives:** Depression among people living with type II diabetes is a complicated issue in low resource setting like Nepal. The objective of this study is to assess the prevalence and factors associated with depression among patients with type II diabetes.

**Methods:** A cross sectional study based on clinical setting was conducted among 309 type II diabetic patients visiting a diabetic center located in Lalitpur metropolitan city, Nepal. Pre-tested semi-structured questionnaire was used to assess the socio-demographic characteristics and depression was measured by using validated Nepali version of Beck Depression Inventory (BDI). Collected data was entered in Micro-soft Excel 2010 and analysis was done by using SPSS IBM v. 16.

**Results:** Prevalence of undiagnosed depression among patients with type II diabetes was 35.6%, in which 4.5% had severe depression according to BDI. Age (p< 0.001), marital status (p= 0.004), educational status (p< 0.001), presence of co-morbidity (p= 0.007) and types of physical activity (p= 0.003) were associated with depressive condition among people living with type II diabetes. Hypertension was mostly reported co-morbidity.

**Conclusion:** More than a quarter of people with type II diabetes are suffering from depression. Biological, behavioural and social factors are the contributing factors for developing depression among people with type II diabetes. Hence, these factors need to be focused for addressing depression and better health outcome among people living with type II diabetes.

*Key words:* Depression, Type II diabetes, Beck Depression Inventory, Nepal

## INTRODUCTION

Diabetes mellitus, a chronic metabolic disease characterized by elevated levels of blood glucose (or blood sugar), is a public health problem worldwide. Type II diabetes which is the most common metabolic disorder is increasing steadily among adults in the last decades. [1] In 2017, there were 451 million people living with diabetes [2] and it is projected that this number will rise to 592 million by 2035. [1] Most people with type II diabetes live in low- and middle-income countries, and it is estimated that, these countries will have the greatest increase over the next 19 years. [3]

Type II diabetes is emerging as a major health care problem in Nepal with rising prevalence and its complications especially in urban populations. [4] The estimated national prevalence of type II diabetes is 8.6% in Nepal whereas overall prevalence of diabetes in Kathmandu valley is 25.9%. [5-7] This increasing burden of type II diabetes is attributed to increased obesity; change in dietary pattern, increased physical inactivity, and to some extent, lack of awareness and diagnosis also played a crucial role. [8]

Type II diabetes is not only a problem as a disease itself but worrying is

always accompanied by co-morbidity with people living with type II diabetes. [9-11] Although depression and type II diabetes frequently co-occur, depression is difficult to recognize and treat approximately in two thirds of patients with both conditions and the course of depression in patients with type II diabetes is chronic and severe. [12] Some studies have reported that individuals with depression are two times more likely to develop type II diabetes mellitus than those who are non-depressed. [13] A recent study in 2018 showed that 34% of prevalence of depression among type II diabetic patients residing in Kathmandu valley. [14] Depression in our society is highly stigmatized. [15] It has multiple effects on the life of an individual. Type II diabetes is accompanied by a marked reduction in patient's quality of life and leads to higher disability-adjusted life years than most diseases. [16] Depression further deteriorates quality of life and is associated with poor treatment outcomes and lowered glycemic control in type II diabetes. [17]

The study on depression among people with type II diabetes is limited especially in context of Nepal. This study helps to assess the current status of depression among people with type II diabetes and factors associated with it. Thus, it can be useful for designing various intervention programs for people living with type II diabetes and provides baseline information for policy makers, researchers and government officials. The objective of this study was to assess the prevalence and its factors associated with depression among people living with type II diabetes visiting a central diabetic clinic of Lalitpur metropolitan city.

## MATERIALS AND METHODS

We conducted an institution based cross sectional study in Lalitpur district of Nepal. Face to face interview was done among the type II diabetic patients attending the diabetic clinic. Data were collected between April and May 2019. A total of 309 type II diabetic patients, who gave consent and meet the inclusion criteria were included in this study. Patient of type II diabetes diagnosed at least six months earlier during the time of data collection and were above 20 years of age were included as participants whereas patients with inability to complete the survey tools because of communication or cognitive difficulties were excluded from the study. Inclusion criteria were confirmed through their Out Patient Department (OPD) cards where the type of diabetes, current medication and duration of diagnosis was clearly written. Pre-tested semi-structured questionnaire was used to assess the socio-demographic characteristics and depression was measured by using validated Nepali version of Beck Depression Inventory (BDI). [18] Content and face validity was maintained through extensive literature review and consultation with experts. Nepali version of the questionnaire was pretested among 50 type II diabetic patient of another diabetic clinic of Kathmandu. Some of the words were changed, which was easier to understand. Then the Nepali version was back translated to English to ensure the linguistic validity. During pretesting the Cronbach alpha of Beck Depression Inventory was found to be 0.75, which shows a good internal consistency of the tool.

Ethical approval was obtained from institutional review committee of Manmohan Memorial Institute of Health Sciences, Kathmandu Nepal. Informed written consent was taken from each and every participant after explaining the objective of the study.

Anthropometric measurement was done to calculate Body Mass Index. Height was measured by using stadiometer to its nearest centimeters and weight was measured by using bathroom scale calibrated initially at zero. Average of two measurements (for both height and weight) were calculated and considered as final. Socio-economic status was categorized as 'below poverty line' and 'above poverty line'. The poverty line was set according to World Bank criteria of 1.25 US dollar per

day per person. This information was assessed by asking both formal and informal income of the participants.

## Statistical analysis

We entered the collected data in Micro-soft Excel 2010 and analysis was done in Statistical Package for Social Science (SPSS IBM v. 16). Data was presented in the form of frequency and percentage. Chi-square test (at 5% level of significance and 95% CI) was done to see the association between dependent and independent variables.

## RESULTS

**Table 1: Demographic characteristics of the respondents (n=309)**

| Variables | Frequency | Percentage |
|---|---|---|
| Age (in years) | | |
| Mean ± SD | 57.41 ± 12.7 | |
| 21-40 | 40 | 12.9 |
| 41-60 | 127 | 41.1 |
| 61-80 | 134 | 43.4 |
| Above 80 | 8 | 2.6 |
| Sex | | |
| Male | 178 | 57.6 |
| Female | 131 | 42.4 |
| Ethnicity | | |
| Brahmin | 93 | 30.1 |
| Chhetri | 74 | 23.9 |
| Janajati | 105 | 34.0 |
| Dalit | 8 | 2.6 |
| Madhesi | 23 | 7.4 |
| Others | 6 | 1.9 |
| Marital Status | | |
| Unmarried | 12 | 3.9 |
| Married | 265 | 85.8 |
| Divorced/Separated | 2 | .6 |
| Widowed | 30 | 9.7 |
| Residence | | |
| Rural | 29 | 9.4 |
| Urban | 280 | 90.6 |
| Family Type | | |
| Nuclear | 113 | 36.6 |
| Joint | 182 | 58.9 |
| Extended | 14 | 4.5 |
| Educational level | | |
| Illiterate | 33 | 10.7 |
| Literate | 64 | 20.7 |
| Primary | 42 | 13.6 |
| Secondary | 94 | 30.4 |
| Higher education | 76 | 24.6 |
| Employment status | | |
| Unemployed | 17 | 5.5 |
| Business | 81 | 26.2 |
| Service | 23 | 7.4 |
| House makers | 89 | 28.8 |
| Retired | 62 | 20.1 |
| Others | 37 | 12.0 |
| Socio-economic status | | |
| Below poverty line | 2 | .6 |
| Above poverty line | 307 | 99.4 |

Table 1 represents the demographic characteristics of the respondents. The mean age of the participants was 57.41 ± 12.7 years with majority (57.6%) of male. Most (85.5%) of them were married and were from urban area.

Biological and behavioural characteristics of the participants are shown in table 2. Most (33.3%) of the respondents were suffering from diabetes less than five years, where 60% of respondents had some co-morbidities. More than half (60.2%) of the respondent had family history of diabetes. Hypertension was mostly reported co-morbidity.

**Table 2: Biological and behavioural characteristics of the respondents.**

| Variables | Frequency | Percentage |
|---|---|---|
| Duration of disease | | |
| < 1 year | 54 | 17.5 |
| 1-5 years | 103 | 33.3 |
| 5-10 years | 72 | 23.3 |
| > 10 years | 80 | 25.9 |
| Reported co-morbidity | | |
| Absent | 121 | 39.2 |
| Present | 188 | 60.8 |
| Types of co-morbidity* | | |
| Hypertension | 153 | 54.8 |
| Eye problem | 15 | 5.4 |
| Cancer | 3 | 1.1 |
| Thyroid | 61 | 21.9 |
| Prostate | 8 | 2.9 |
| Heart problems | 6 | 2.2 |
| High blood cholesterol | 21 | 7.5 |
| Others | 12 | 4.3 |
| BMI | | |
| Underweight | 7 | 2.3 |
| Normal | 146 | 47.2 |
| Overweight | 111 | 35.9 |
| Obese | 45 | 14.6 |
| Family history | | |
| Absent | 123 | 39.8 |
| Present | 186 | 60.2 |
| Physical activity | | |
| Regular vigorous exercise | 7 | 2.3 |
| Regular moderate exercise | 80 | 25.9 |
| Regular mild exercise | 161 | 52.1 |
| No exercise and/or sedentary activities | 61 | 19.7 |
| Consumption of tobacco | | |
| Never | 263 | 85.1 |
| Occasionally | 13 | 4.2 |
| Regularly | 33 | 10.7 |
| Alcohol consumption | | |
| Never | 225 | 72.8 |
| Occasionally | 77 | 24.9 |
| Regularly | 7 | 2.3 |
| Stressful life events | | |
| No | 255 | 82.5 |
| Yes | 54 | 17.5 |

*=multiple responses recorded

Table 3 shows the distribution of depression status among the respondents. About 35.6% of the respondent had some form of depression, in which 21.7% of the type 2 diabetic patients had mild depression.

Association between demographic variables and depression is shown in table 4. Age (p< 0.001), marital status (p= 0.004), educational level (p< 0.001), reported co-morbidity (p= 0.007) were found to be associated with depression.

Table 5 represents the association between behavioural factors and depression among the type II diabetic patients visiting the central diabetic center. Among the behavioural factor, Physical activity (p= 0.003) was found to be associated with depression.

**Table 3: Depression among the respondents (n=309)**

| Depression among diabetic patients | Frequency | Percentage |
|---|---|---|
| Prevalence of depression | | |
| No depression | 119 | 64.4 |
| Depression | 110 | 35.6 |
| Level of depression | | |
| No depression (0-13) | 119 | 64.4 |
| Mild depression (14-19) | 67 | 21.7 |
| Moderate depression (20-28) | 29 | 9.4 |
| Severe depression (29-63) | 14 | 4.5 |

**Table 4: Association of demographic variables with depression (n=309)**

| Variables | No Depression (%) | Depression (%) | P value |
|---|---|---|---|
| Age (in years) | | | |
| 21-40 | 32 (16.1) | 8 (7.3) | |
| 41-60 | 92 (46.2) | 35 (31.8) | |
| 61-80 | 73 (36.7) | 61 (55.5) | <0.001 |
| Above 80 | 2 (1.0) | 6 (5.5) | |
| Sex | | | |
| Male | 116 (58.3) | 62 (56.4) | 0.743 |
| Female | 83 (41.7) | 48 (43.6) | |
| Ethnicity | | | |
| Brahmin | 58 (29.1) | 35 (31.8) | |
| Chhetri | 53 (26.6) | 21 (19.1) | |
| Janajati | 69 (34.7) | 36 (32.7) | 0.366 |
| Dalit | 4 (2) | 4 (3.6) | |
| Madhesi | 11 (5.5) | 12 (10.9) | |
| Others | 4 (2) | 2 (1.8) | |
| Marital status | | | |
| Unmarried | 10 (5.0) | 2 (1.8) | |
| Married | 176 (88.6) | 89 80.9) | |
| Divorced/Separated | 2 (1) | 0 (0) | 0.004 |
| Widowed | 11 (5.5) | 19 (17.3) | |
| Residence | | | |
| Rural | 18 (9.0) | 11 (10.0) | 0.783 |
| Urban | 181 (91.0) | 99 (90.0) | |
| Educational level | | | |
| Illiterate | 15 (7.5) | 18 (16.4) | |
| Literate | 30 (15.1) | 34 (30.9) | |
| Primary | 28 (14.1) | 14 (12.7) | <0.001 |
| Secondary | 61 (30.7) | 33 (30.0) | |
| Higher education | 65 (32.7) | 11 (10.0) | |
| Employment status | | | |
| Unemployed | 11 (5.5) | 6 (5.5) | |
| Business | 53 (26.6) | 28 (25.5) | |
| Service | 16 (8.0) | 7 (6.4) | |
| Housemakers | 54 (27.1) | 35 (31.8) | 0.095 |
| Retired | 34 (17.1) | 28 (25.5) | |
| Others | 31 (15.6) | 6 (5.5) | |
| Socio-economic status | | | |
| Below Poverty line | 2 (1) | 0 (0) | 0.291 |
| Above Poverty Line | 197 (99.0) | 110 (100) | |
| Duration of disease | | | |
| < 1 year | 42 (21.1) | 12 (10.9) | |
| 1-5 Years | 67 (33.7) | 36 (32.7) | |
| 5-10 Years | 46 (23.1) | 26 (23.6) | 0.062 |
| > 10 Years | 44 (22.1) | 36 (32.7) | |
| Reported co-morbidity | | | |
| Present | 89 (44.7) | 32 (29.1) | 0.007 |
| Absent | 110 (55.3) | 78 (70.9) | |
| Family history | | | |
| Positive | 121 (60.8) | 65 (59.1) | 0.768 |
| Negative | 78 (39.2) | 45 (40.9) | |

**Table 5: Association of behavioral characteristics of the respondents with depression**

| Variables | No Depression (%) | Depression (%) | P value |
|---|---|---|---|
| Physical activity | | | |
| Regular vigorous exercise | 4 (1.3) | 3 (1) | |
| Regular moderate exercise | 61 (19.7) | 19 (6.1) | |
| Regular mild exercise | 106 (34.3) | 55 (17.8) | 0.003 |
| No exercise and/or sedentary activities | 28 (9.1) | 33 (10.7) | |
| Consumption of tobacco | | | |
| No | 169 (84.9) | 94 (85.5) | 0.595 |
| Occasionally | 7 (3.5) | 6 (5.5) | |
| Regularly | 23 (11.6) | 10 (9.1) | |
| Alcohol consumption | | | |
| No | 141 (70.9) | 84 (76.4) | 0.384 |
| Occasionally | 56 (28.1) | 21 (19.1) | |
| Regularly | 2 (1.0) | 5 (4.5) | |
| Stressful life events | | | |
| Present | 30 (15.1) | 24 (21.8) | 0.135 |
| Absent | 169 (84.9) | 86 (78.2) | |

## DISCUSSION

This study found 35.6% prevalence of depression among people living with type II diabetes, in which 21.7% had mild depression, 9.4% had moderate depression and 4.5% had severe depression. A recent study conducted in Nepal also found 34% prevalence of depression among type II diabetic patient. [14] Similar result was demonstrated in the study conducted in China (35.1%) and South India (37.5%). [11,19] Contradicting to this result other study conducted in Nepal showed slightly higher prevalence of depression, Niraula et al. (40.3%), Joshi et al. (44.1%) and Mishra et al. (54.1%). [17,20,21] Whereas a community based study conducted in Bangladesh reported 27.9% prevalence of depression. [22]

This study found age and educational status as strong predictor of depression among people with type II diabetes. Study conducted in North India also found age as strong determinant of depression. [23] Along with this finding, relation between depression, anxiety and age of patient was well established among general people. [24,25] This may be because as duration of disease increases with increasing age, anxiety and depression level are also increased. But contradicting to these findings other studies did not find any association between age and depression. [20,26] Although in this study statistical association between duration of diabetes and depression was not observed. Study

from India showed similar findings. [10] Increasing educational status was positively associated with depression, [14] which indicates that with increasing knowledge among diabetic patients, it is more likely to become aware about complications due to diabetes leading to anxiety and depression. Association between sex and depression was not found in this study, this result was supported by study done by Niraula et al. And Pahari et al. in Nepal, [14,20] Our findings on association between marital status and depression was contradicted with findings of study from Nepal [14] and Pakistan [27] but supported by the study from Saudi Arabia. [28] Change in marital status brings change in roles and responsibilities which might have affected the status of depression among people with type II diabetes. Although in this study association between ethnicity and depression was not found, relation between lower cast and depression was well established by different studies. [25,29,30] Along with as being diabetic, the disparity among different cast exist within Nepalese society might have also affected the depressive status among people with type II diabetes.

The study showed no association between socio-economic status and depression. Aminu et al. supported our findings. [11] But fluctuation of depression with different socio-economic status was well demonstrated by studies conducted by Mendenhall et al., [31] Kalsekar et al. [32] Socio-economic status determines the

accessibility and affordability of health care services. It is more likely to afford the health care services by higher economic status people, which decreases anxiety and depression as being diabetic.

Result did not reveal the relationship between behavioural factors like, consumption of tobacco in any form and consumption of alcohol with depression. This finding is similar among diabetic patient of Nepal. [20] But Goldney et al. had shown association between these behavioural factor and depression. [26] Strong association between physical activities and depression was demonstrated by this study. As physical activity increases, it helps in maintaining blood sugar level, which might have reduced stress level among type II diabetic patients. Contradicting to our result, an earlier study had not shown relation between depression and physical activity. [14] Presence of co-morbidity further affected the depression status. Along with our result, study conducted by Egede et al., [33] Unützer et al. [34] and Das et al. [10] have also demonstrated association between depression and co-morbidity. Type II diabetes as being chronic disease affects lifelong. The presence of co-morbidity like hypertension, thyroid further affects health status affecting their mental health.

Although this study is limited to a single diabetes center of Lalitpur district, the result produced may helps program planner and caregiver for addressing depression among diabetic patients.

## CONCLUSION

The present study revealed 35.6% prevalence of depression among people with type II diabetes attending diabetic center of Lalitpur district. Among them 21.7% had mild, 9.5% had moderate and 4.5% had severe form of depression. We found age, marital status, educational status, presence of co-morbidity and types of physical activity are the contributing factors for developing depressive condition. Screening of depression among people with type II

diabetes can be done on regular basis (both in clinical and community setting) and is recommended to incorporate the screening process as a compulsory procedure (in clinical settings). Family support seems to be immense necessity as the depression level was affected by the individual factors. Thus, there is a need of awareness program at community level. Similarly, these factors need to be focused by the program planner and policy maker for addressing depression and better health outcome among people living with type II diabetes.

## REFERENCES
1. 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, 103(2):137-149.
2. Cho N, Shaw J, Karuranga S, Huang Y, da Rocha Fernandes J, Ohlrogge A, Malanda B: IDF Diabetes Atlas: Global estimates of diabetes prevalence for 2017 and projections for 2045. Diabetes Res Clin Pract 2018, 138:271-281.
3. Whiting DR, Guariguata L, Weil C, Shaw J: IDF diabetes atlas: global estimates of the prevalence of diabetes for 2011 and 2030. Diabetes Res Clin Pract, 94(3):311-321.
4. Gyawali B, Ferrario A, Van Teijlingen E, Kallestrup P: Challenges in diabetes mellitus type 2 management in Nepal: a literature review. Global health action, 9(1):31704.
5. Thapa S, Jha N, Baral DD, Pyakurel P: Health Care Seeking Behaviour among People Living With Type-2 Diabetes in Rural Area of Eastern, Nepal. Int J Pub Health Safe 2018, 3:166.
6. Gyawali B, Sharma R, Neupane D, Mishra SR, van Teijlingen E, Kallestrup P: Prevalence of type 2 diabetes in Nepal: a systematic review and meta-analysis from

2000 to 2014. Global health action 2015, 8:29088-29088.

7. Chhetri MR, Chapman RS: Prevalence and determinants of diabetes among the elderly population in the Kathmandu Valley of Nepal. Nepal Med Coll J 2009, 11(1):34-38.

8. Thapa S, Pyakurel P, Baral DD, Jha N: Health-related quality of life among people living with type 2 diabetes: a community based cross-sectional study in rural Nepal. BMC Public Health 2019, 19(1):1171.

9. Thour A, Das S, Sehrawat T, Gupta Y: Depression among patients with diabetes mellitus in North India evaluated using patient health questionnaire-9. Indian J Endocrinol Metab, 19(2):252.

10. Das R, Singh O, Thakurta RG, Khandakar MR, Ali SN, Mallick AK, Roy P, Bhattacharrya AK: Prevalence of depression in patients with type II diabetes mellitus and its impact on quality of life. Indian J Psychol Med, 35(3):284.

11. Aminu AS, Chandrasekaran V, Nair S: Depression among patients with diabetes: A community-based study in South India. Journal of Medical Sciences, 37(6):237.

12. Lin EHB, Rutter CM, Katon W, Heckbert SR, Ciechanowski P, Oliver MM, Ludman EJ, Young BA, Williams LH, McCulloch DK: Depression and advanced complications of diabetes: a prospective cohort study. Diabetes Care, 33(2):264-269.

13. Eaton WW, Armenian H, Gallo J, Pratt L, Ford DE: Depression and risk for onset of type II diabetes: a prospective population-based study. Diabetes Care 1996, 19(10):1097-1102.

14. Pahari DP, Upadhyay R, Sharma CK: Depression among diabetic patients visiting a diabetes center in Nepal. Health Prospect, 17(1):21-25.

15. Yokoya S, Maeno T, Sakamoto N, Goto R, Maeno T: A brief survey of public knowledge and stigma towards depression. J Clin Med Res, 10(3):202.

16. Goldney RD, Phillips PJ, Fisher LJ, Wilson DH: Diabetes, depression, and quality of life: a population study. Diabetes Care 2004, 27(5):1066-1070.

17. Mishra SR, Sharma A, Bhandari PM, Bhochhibhoya S, Thapa K: Depression and Health-Related Quality of Life among Patients with Type 2 Diabetes Mellitus: A Cross-Sectional Study in Nepal. PLoS One 2015, 10(11):e0141385-e0141385.

18. Kohrt BA, Kunz RD, Koirala NR: Validation of the Nepali version of beck anxiety inventory. Journal of Institute of Medicine 2007, 26(3).

19. Wang L, Song R, Chen Z, Wang J, Ling F: Prevalence of depressive symptoms and factors associated with it in type 2 diabetic patients: a cross-sectional study in China. BMC Public Health 2015, 15(1):188-188.

20. Niraula K, Kohrt BA, Flora MS, Thapa N, Mumu SJ, Pathak R, Stray-Pedersen B, Ghimire P, Regmi B, Macfarlane EK et al: Prevalence of depression and associated risk factors among persons with type-2 diabetes mellitus without a prior psychiatric history: a cross-sectional study in clinical settings in urban Nepal. BMC Psychiatry 2013, 13:309-309.

21. Joshi S, Dhungana RR, Subba UK: Illness Perception and Depressive Symptoms among Persons with Type 2 Diabetes Mellitus: An Analytical Cross-Sectional Study in Clinical Settings in Nepal. Journal of diabetes research 2015, 2015:908374-908374.

22. Asghar S, Hussain A, Ali SMK, Khan AKA, Magnusson A: Prevalence of depression and diabetes: A population based study from rural Bangladesh. Diabet Med 2007, 24(8):872-877.

23. Raval A, Dhanaraj E, Bhansali A, Grover S, Tiwari P: Prevalence & determinants of depression in type 2 diabetes patients in a tertiary care centre. Indian J Med Res, 132(2):195.

24. Kohrt BA, Hruschka DJ, Worthman CM, Kunz RD, Baldwin JL, Upadhaya N, Acharya NR, Koirala S, Thapa SB, Tol WA: Political violence and mental health in Nepal: prospective study. The British Journal of Psychiatry, 201(4):268-275.

25. Kohrt BA, Speckman RA, Kunz RD, Baldwin JL, Upadhaya N, Acharya NR, Sharma VD, Nepal MK, Worthman CM: Culture in psychiatric epidemiology: using ethnography and multiple mediator models to assess the relationship of caste with depression and anxiety in Nepal. Ann Hum Biol 2009, 36(3):261-280.

26. Goldney RD, Phillips PJ, Fisher LJ, Wilson DH: Diabetes, depression, and quality of life: a population study. Diabetes Care 2004, 27(5):1066-1070.

27. Perveen S, Otho MS, Siddiqi MN, Hatcher J, Rafique G: Association of depression

with newly diagnosed type 2 diabetes among adults aged between 25 to 60 years in Karachi, Pakistan. Diabetol Metab Syndr, 2(1):17.

28. El Mahalli AA: Prevalence and Predictors of Depression among Type 2 Diabetes Mellitus Outpatients in Eastern Province, Saudi Arabia. Int J Health Sci (Qassim) 2015, 9(2):119-126.

29. Lin EHB, Katon W, Von Korff M, Rutter C, Simon GE, Oliver M, Ciechanowski P, Ludman EJ, Bush T, Young B: Relationship of depression and diabetes self-care, medication adherence, and preventive care. Diabetes Care 2004, 27(9):2154-2160.

30. Everson SA, Maty SC, Lynch JW, Kaplan GA: Epidemiologic evidence for the relation between socioeconomic status and depression, obesity, and diabetes. J Psychosom Res 2002, 53(4):891-895.

31. Mendenhall E, Shivashankar R, Tandon N, Ali MK, Narayan KMV, Prabhakaran D: Stress and diabetes in socioeconomic context: A qualitative study of urban Indians. Soc Sci Med, 75(12):2522-2529.

32. Kalsekar ID, Madhavan SS, Amonkar MM, Makela EH, Scott VG, Douglas SM, Elswick BLM: Depression in patients with type 2 diabetes: impact on adherence to oral hypoglycemic agents. Ann Pharmacother 2006, 40(4):605-611.

33. Egede LE, Zheng D, Simpson K: Comorbid depression is associated with increased health care use and expenditures in individuals with diabetes. Diabetes Care 2002, 25(3):464-470.

34. UnÃ¼tzer Jr, Patrick DL, Diehr P, Simon G, Grembowski D, Katon W: Quality adjusted life years in older adults with depressive symptoms and chronic medical disorders. Int Psychogeriatr 2000, 12(1):15-33.

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