

Determinants of Depression among Patients of Type 2 Diabetes Mellitus in a Tertiary Care Hospital of Haryana

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Abstract: Introduction: Diabetes is one of the most common chronic diseases and affects virtually every organ of the human system. Depression and anxiety is common among patients with diabetes and associated with worse diabetes outcomes. Methodology: A total of 320 patients having T2DM attending the endocrine out-patient department of Pgims Rohtak from March 2023 to February 2024. Socio-demographic and relevant clinical variables were collected. They were evaluated for depression and anxiety using DASS-21 Scale. Results: It was found that a significantly larger proportion of diabetic patients had depression (29.7%, $P = 0.001$), anxiety (27.6% $P = 0.001$) and stress (23.4% $P = 0.001$). The major predictors for a severe form of depression and anxiety among T2DM according to DASS 21 cases were age, female sex, insulin therapy, retinopathy, nephropathy, and ischemic heart disease. Conclusion: The risk factors for depression and anxiety were age, female sex, insulin therapy, and diabetic complications.

Keywords: T2DM, Anxiety, depression, diabetes mellitus, predictors

1. Introduction

Depression occurrence is two to three times higher in people with diabetes mellitus, the majority of the cases remaining under-diagnosed¹. Only 25% to 50% of people with diabetes who have depression get diagnosed and treated. But treatment therapy, medicine, or both is usually very effective². And without treatment, depression often gets worse, not better. Trying to determine whether anxiety is psychological or due to blood sugar fluctuations can be tough because both hypoglycemia and hyperglycemia symptoms mimic symptoms of anxiety³.

Type 2 Diabetes Mellitus (T2DM) is a chronic metabolic disorder characterized by insulin resistance and hyperglycemia. In India, the prevalence of T2DM has risen dramatically, with an estimated 77 million individuals affected in 2019, projected to increase to 134 million by 2045^{4,5}. This escalating burden not only imposes significant economic costs but also contributes to substantial morbidity and mortality due to associated complications⁶.

Depression is a common comorbidity in individuals with T2DM, adversely affecting disease management and outcomes^{7,8}. A meta-analysis encompassing 43 studies with 10,270 patients in India reported a pooled depression prevalence of 38% among T2DM patients⁹. Another study from Northern India found an even higher prevalence of 49.2%^{10,11}, with significant associations between depression and factors such as longer diabetes duration (≥ 5 years), poor glycemic control ($HbA1c > 7\%$), and insulin use^{12,15}.

Several determinants contribute to the high prevalence of depression among T2DM patients:

- Duration of Diabetes:** Longer disease duration has been linked to increased depression risk, possibly due to the cumulative burden of chronic disease management and the emergence of complications^{13,14}.
- Glycemic Control:** Poor glycemic control ($HbA1c > 7\%$) is significantly associated with depression¹⁶, suggesting a bidirectional relationship where depression may lead to

poor self-care and, consequently, suboptimal glycemic levels¹⁷.

- Diabetes-Related Complications:** The presence of microvascular complications, such as retinopathy, and macrovascular complications, including cardiovascular diseases, has been correlated with higher depression rates^{18,19}.
- Socio-Demographic Factors:** Female gender, old age, higher Body Mass Index (BMI), and rural locality have been identified as independent predictors of depression among T2DM patients^{20,21,25}.

The co-occurrence of depression in T2DM patients leads to poor adherence to treatment regimens, inadequate glycemic control, and diminished quality of life^{23,24,26}. A study from Northern India reported that T2DM patients with depression had significantly poorer quality of life across multiple domains compared to those without depression^{27,28}.

2. Materials and Methods

The cross-sectional study was carried out from March 2023 to February 2024 in Endocrine Department of Pt. B.D. Sharma PGIMS, Rohtak, Haryana, India a tertiary care hospital. The study protocol was approved by the Ethics Committee of the Institute. After taking informed and written consent, a total of 320 participants were included in the study. Three hundred twenty patients were having T2DM and taking medication for depression.

Inclusion criteria

- Patients above 18 years of age
- Patients of either sex
- Patients having T2DM irrespective of their duration of illness or diabetic treatment.

Exclusion criteria

- Patients with chronic medical or surgical illness other than DM
- Patients on long-term treatment for other medical illness
- Patients who were terminally ill

- Patients having renal, neurological, or cardiovascular dysfunction who require immediate hospitalization for serious illness and
- Patients who were on corticosteroids or any psychotropic drug.

Measures

A semi-structured proforma was used to obtain socio-demographic variables of patients and relevant past medical and psychiatric history and duration of illness, treatment taken for diabetes. Anthropometric measurements including weight, waist circumference, body mass index (BMI), were recorded. Fasting and postprandial plasma glucose level glycosylated hemoglobin (HbA1c) levels were done.

Sample size was calculated from a previous study taking prevalence of depression among patients of type 2 diabetes mellitus as 26.3%. Absolute error 5% at level of significance of 95%, using the formula $(N=4 p q / E^2)$ for sample size (N), the sample size would be calculated: Using this formula, the sample size is calculated as 311. So, the total sample of 320 patients will be included in the study.

Sampling Techniques: Patients were selected consecutively endocrinology OPD after taking informed written consent from patients. Then from the selected patient interview was conducted on a pre-designed pre-tested semi-structured interview schedule by the investigator himself.

Data compilation and analysis: The data was entered in the MS EXCEL spread sheet, and then the data will be subjected to appropriate statistical tests wherever applicable using SPSS 26 (Statistical Package for Social Sciences) software latest version as per study objectives.

Ethical Consideration

Ethical clearance will be obtained from the Institutional

Ethics Committee

Results and Discussion: The present study descriptive cross-sectional study was conducted among patients of type 2 diabetes in tertiary care hospital of Haryana of the department of endocrinology and medicine, Pandit BD Sharma PGIMS, Rohtak among Type 2 Diabetics Mellitus patients attending PGIMS OPD in the study. A total of 320 study subjects were interviewed to determine prevalence and correlates the depression for diabetic population. Table 1 gives the socio-demographic and clinical profile of 320 subjects as the majority of (33.75%) study subjects belonged to (56-65 yrs) age group followed by (24.68%) of 66-75 years, (24.06%) of 46-55 years, (15.93%) of subjects were in 36-45 years age and least in (1.56%) belonged to 25-35 years of age group. (Fig.5.1). The mean age of study subjects was 57.29 ± 10.59 years.

Table 1: Sociodemographic and clinical profile of the participants

Variable		n=320	Frequency (%)
Age group(years)	25-35	5	1.56
	36-45	51	15.93
	46-55	77	24.06
	56-65	108	33.75
	66-75	79	24.68
Gender	Male	118	36.8

	Female	202	63.12
Marital status	Married	272	85.0
	Unmarried	44	13.8
	Divorced	2	0.6
	Widowed	2	0.6
Residence (Urban/Rural)	Rural	154	48.1
	Urban	166	51.9
Education	Illiterate	85	26.6
	Primary	40	12.5
	Middle	59	18.4
	Secondary	48	15.0
	Senior secondary	18	5.6
	Graduate	56	17.5
	PG & above	14	4.4
Family type	Nuclear	131	40.9
	Joint	88	27.5
	Third- Generation	101	31.6
Occupation	Private	181	56.6
	Government	38	11.9
	Unemployed	81	25.3
	Retired	20	6.3
Complication	Present	192	60
	Absent	128	40
Type of treatment	Oral	199	62.18
	Injectable	37	11.56
	Both	84	26.25
Antidepressants	taking antidepressant	92	28.75
	not taking antidepressant	228	71.25
Comorbidity	Present	99	30.93
	Absent	221	69.06
Physical activity	< 30 min./day	124	38.8
	>30 min./day	73	22.8
	None	123	38.4

Majority of the subjects were females (63.4%) and remaining were males (36.6%). Most of the study subjects were married (85%), followed by unmarried (13.8%), divorced (0.6%) and widowed (0.6%). In our population urban diabetic subjects was 51.9% higher than the Rural 48.1%. Majority 26.6% of the study subjects were illiterate, 18.4% were Middle class, secondary were 15%, 5.6% were Senior secondary, graduates were 17.5%, 4.4% were having additional higher qualification after post-graduate or equivalent only.

Table 2 gives the DASS-21 interpretation for the Depression, Anxiety and stress in 320 subjects as per no. of subjects and their percentages in various categories, distribution of anxiety, depression, and stress levels among participants based on DASS-21 scores. The majority of individuals fall within the normal range, but a significant percentage experience mild to severe levels of distress. The association of anxiety and stress with gender of the study participants. Anxiety was more prevalent among females' group i.e.50.0%, followed by males (44.9%).

Table 2 Study subjects having the categories as per DASS-21

DASS-21	Depression	Anxiety	Stress
Normal	225 (70.3%)	181(56.6%)	245(76.6%)
Mild	48(15%)	60(18.8%)	50(15.6%)
Moderate	34(10.6%)	48(15%)	22(6.9%)
Severe	10(3.1%)	20(6.3%)	2(0.6%)
Very Severe	3(0.9%)	11(3.4%)	1(0.3%)

This table presents the association between various demographic and clinical factors with depression, anxiety,

and stress among individuals, along with the P-value indicating statistical significance.

Table 3: Relationship between Demographic and Clinical Parameters with Depression, Anxiety, and Stress (DASS-21)

Parameter		Depression	Anxiety	Stress	P-value (Depression)
Age		95	80	75	0.112
Gender	Male	32	53	81	0.442
	Female	63	101	125	
Marital status		93	154	73	0.010*
Residence (Urban/Rural)	Rural	48	70	36	0.576
	Urban	47	51	68	
Education		95	154	114	0.681
Family type	Nuclear	39	54	51	0.036*
	Joint	18	38	44	
	Third- Generation	38	62	71	
Occupation	Private	60	85	43	0.002*
	Government	6	10	28	
	Unemployed	55	34	20	
Complication		63	89	37	0.134
Type of treatment	Oral	45	27	33	0.002*
	Injectable	15	5	20	
	Both	34	33		
Antidepressants	Taking Antidepressant	11	21	12	0.829
	Not Taking Antidepressant	84	74	102	
Comorbidity		99	52	39	0.026*
Physical activity		95	155	120	0.035*

Marital status, family type, occupation, type of treatment, comorbidity, and physical activity show significant associations with mental health ($P < 0.05$). Age, gender, residence, education, complications, and antidepressant use do not show a significant impact ($P > 0.05$). Occupation and type of treatment have the strongest impact ($P = 0.002$), suggesting employment status and diabetes management influence mental health. Physical activity is protective against depression, anxiety, and stress ($P = 0.035$). Comorbid conditions increase the risk of depression and anxiety ($P = 0.026$).

3. Conclusion and Recommendations

The major facts concluded under this shows that Mental health in diabetes is influenced by social, economic, and medical factors rather than just demographics like age and gender.

Improving physical activity and managing co-morbidities could reduce distress levels.

Addressing work stress and family support systems is important for mental well-being.

The study calls for future studies focusing on risk factors of depression, anxiety, stress and other mental disorders among the patients of diabetes mellitus as it is vital for study subjects to have a sound mental health as well as controlled vitals for diabetes mellitus. Therefore, the present study recommended and stressed that: Future studies are necessary on a much larger scale to sight-see the source of those troubles. Authorities need to create awareness, concern and care regarding mental health among chronic diabetics patients. Stress management including spiritual coping strategy could be incorporated into their lifestyle, physical

activities and exercises etc. for maintaining healthy life in diabetes mellitus subjects.

Conflict of Interest

The author(s) declared no conflicts of Interests with respect to the research, authorship and/or publication of this article.

References

- [1] Bromet E, Andrade LH, Hwang I, Sampson NA, Alonso J, de GG, et.al. Cross-national epidemiology of DSM-IV major depressive episode. BMC Med. 2011; 9:90.
- [2] Tol A, Baghbanian A, Mohebbi B, Shojaeizadeh D, Azam K, Shahmirzadi SE, et al. Empowerment assessment and influential factors among patients with type 2 diabetes. J Diabetes Metab Disord 2013; 12: 6.
- [3] OECD. Making Mental Health Count: The Social and Economic Costs of Neglecting Mental Health Care. OECD Health Policy Studies. Paris: OECD Publishing; 2014. doi: <http://dx.doi.org/10.1787/9789264208445-en>. [Google Scholar]
- [4] Bădescu SV, Tătaru C, Kobylinska L, Georgescu EL, Zahiu DM, Zăgrean AM et al. The association between Diabetes mellitus and Depression. J Med Life. 2016 Apr-Jun; 9(2):120-5. PMID: 27453739; PMCID: PMC4863499. "<http://vizhub.healthdata.org/gbd-compare/> [Google Scholar].
- [5] American Psychiatric Association, Task F. Diagnostic and statistical manual of mental disorders DSM-5. Fifth edition 2013.
- [6] Chen S, Zhang Q, Dai G, Hu J, Zhu C, Su L, Wu X. Association of depression with pre- diabetes, undiagnosed diabetes, and previously diagnosed diabetes: a meta-analysis Endocrine. 2016 Jul; 53(1):35-46.

- [7] Roy T, Lloyd CE. Epidemiology of depression and diabetes: a systematic review. *J. Affect Disord.* 2012;142(Suppl):8–21.
- [8] Egede LE, Nietert PJ, Zheng D. Depression and all-cause and coronary heart disease mortality among adults with and without diabetes. *Diabetes Care.* 2005;28: 1339–45.
- [9] Folb N, Lund C, Fairall LR, Timmerman V, Levitt NS, Steyn K, et. al. Socioeconomic predictors and consequences of depression among primary care attenders with non-communicable diseases in the Western Cape, South Africa: cohort study within a randomised trial. *BMC Public Health.* 2015; 15:1194.
- [10] Kyrou I, Tsigos C. Stress hormones: physiological stress and regulation of metabolism. *Curr Opin Pharmacol.* 2009;9: 787–93.
- [11] Chrousos GP. Stress and disorders of the stress system. *Nat Rev Endocrinol.* 2009;5: 374–81.
- [12] Kikuchi Y, Iwase M, Fujii H, Ohkuma T, Kaizu S, Ide H, et. al Association of severe hypoglycemia with depressive symptoms in patients with type 2 diabetes: the Fukuoka Diabetes Registry. *BMJ Open Diabetes Res Care.* 2015;3.
- [13] Sarris J, O'Neil A, Coulson CE, Schweitzer I, Berk M. Lifestyle medicine for depression. *BMC Psychiatry.* 2014; 14: 107.
- [14] A. B. M. Kamrul-Hasan, Mohammad Abdul Hannan, Md Asaduzzaman, Mohammad Motiur Rahman et al. Prevalence and predictors of diabetes distress among adults with type 2 diabetes mellitus: a facility-based cross-sectional study of Bangladesh, *BMC Endocr. Disord.* 2022; 22:28.
- [15] Egede, Leonard & Dismuke, Clara. (2012). Serious Psychological Distress and Diabetes: A Review of the Literature. *Current psychiatry reports.* 14. 15-22. 10.1007/s11920-011-0240-0.
- [16] Liqun Wang, Jiangping Li, Yuqi Dang, Haiyu Ma, Yang Niu. Relationship Between Social Capital and Depressive Symptoms Among Type 2 Diabetes Mellitus Patients in Northwest China: A Mediating Role of Sleep Quality, *Front. Psychiatry.* 2021.
- [17] Brenna N. Renn, Leilani Feliciano, Daniel L. Segal, The bidirectional relationship of depression and diabetes: A systematic review, *Health & Place* Volume 23, September 2013, Pages 63-69.
- [18] MD Richard V. Milani, MD Carl J. Lavie, Behavioral differences and effects of cardiac rehabilitation in diabetic patients following cardiac events, *21Clinical Psychology Review*
- [19] Volume 31, Issue 8, December 2011, Pages 1239-1246.
- [20] Lovibond PF, Lovibond SH. The structure of negative emotional states: comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behav Res Ther.* 1995 Mar;33(3):335-43.
- [21] Peian Lou, Association of sleep quality and quality of life in type 2 diabetes mellitus: A cross-sectional study in China, *Health & Place*, Volume 23, September 2013, Pages 63-69.
- [22] 21.Briana Mezuk ^{a b}, Åsa Chaikiat ^c, Xinjun Li ^c, Jan Sundquist ^c, Kenneth S. Kendler ^b, Kristina Sundquist ^cDepression, neighborhood deprivation and risk of type 2 diabetes, *The American Journal of Medicine*, Volume 100, Issue 5, May 1996, Pages 517-523.
- [23] Ghodke M. Updated BG Prasad's Socioeconomic Status Classification for the Year 2023. *Indian J Community Med.* 2023 Nov-Dec;48(6):934-936. doi: 10.4103/ijcm.ijcm_401_23. Epub 2023 Dec 1. PMID: 38249702; PMCID: PMC10795881.
- [24] Karpka K, Biswas J, Nath S, Dhali A, Sarkhel S, Dhali GK. Factors affecting depression and anxiety in diabetic patients: A cross- sectional study from a tertiary care hospital in Eastern India. *Ann Med Surg (Lond).* 2022 Nov 18; 84: 104945. doi: 10.1016/j.amsu.2022.104945. PMID: 36536746; PMCID: PMC9758324.
- [25] Stevanovic, Dejan & Habtewold, Tesfa & Niksić, Ana & Avicena, Mohamad & Mehta, Gaurav & Popović, Ljiljana & Erić, Anamarija & Ristic, Sinisa & Ćurković, Katarina & Bježančević, Marina & Stanković, Miodrag & Pavlović, Tijana & Knez, Rajna. Anxiety and Depressive Disorders in Diabetes. (2019).
- [26] Williams JS, Egede LE. The Association Between Multimorbidity and Quality of Life, Health Status and Functional Disability. *Am J Med Sci.* 2016 Jul;352(1):45-52. doi: 10.1016/j.amjms.2016.03.004. Epub 2016 Mar 18. PMID: 27432034.
- [27] Kaur G, Tee GH, Ariaratnam S, Krishnapillai AS, China K. Depression, anxiety and stress symptoms among diabetics in Malaysia: a cross sectional study in an urban primary care setting. *BMC Fam Pract.* 2013 May 27; 14:69. doi: 10.1186/1471-2296-14-69. PMID: 23710584; PMCID: PMC3669622.
- [28] Tan KC, Chan GC, Eric H, Maria AI, Norliza MJ, Oun BH, Sheerine MT, Wong SJ, Liew SM. Depression, anxiety and stress among patients with diabetes in primary care: A cross-sectional study. *Malays Fam Physician.* 2015 Aug 31;10(2):9-21. PMID: 27099657; PMCID: PMC4826577.
- [29] 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 Nov 23;10(11):e0141385. doi: 10.1371/journal.pone.0141385. PMID: 26599008; PMCID: PMC4658137.