Correlation of Perceived Stress with Glycemic Control in Type 2 Diabetes Patients with Depressive Symptoms

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Abstract:

Aim: Depression and stress were common disorders in type 2 diabetes. Worldwide diabetes has increased, and it is necessary to reduce the prevalence of factors associated with depression and stress in diabetic individual. Current study assessed the prevalence of stress and depression and identifies their associated factors in type 2 diabetes mellitus patients.

Patients and Methods: This cross-sectional study conducted in 100 patients with type 2 diabetes. The depression & stress prevalence was estimated using the Beck Depression Inventory and the PSS scales.

Results: The rates of depression and stress were 67% and 83%. High prevalence of depression and stress was observed in the 51-60 years age group. Most of the patients were married (79%) and mainly employed (62%). 7% of illiterates showed the association of low education and depression. 75% of diabetic patients have been taking the treatment since 5-10 years, who were observed potential cases of depression. 70% patients undergoing injectable treatment were observed to be potential cases of depression.

Conclusion: Important factors associated with high/very high stress were lack of physical activity, and professional work was still significant associated with high/very high stress. Study confirmed the association of diabetes with both depression and stress. This indicates the need for counseling and psychological care at diabetes centers and people with diabetes in general.

Keywords: perceived stress, glycemic control, type 2 diabetes mellitus, depressive Symptoms.

Introduction

According to the International Diabetes Federation (IDF), "diabetes is one of the largest global health emergencies of the 21st century. [1] In 2015, the prevalence of diabetes worldwide was one in 11 adults, and the estimated prevalence of the impaired glucose toleration was one in15 adults. This prevalence expected to further increase, especially in the urban population, leading to more medical and economic challenges, added on top of the 12% of global health expenditure currently spent on diabetes.

The worldwide prevalence of diabetes mellitus among adults was estimated at 366 million in 2011, and by 2030 this is estimated to increase upto 552 million. [2,3] As a lifestyle and genetic factors, such as high carbohydrate diet, and lack of exercise, appear to account for the increased prevalence of type 2 diabetes, [4] psychological factors such as stress, anxiety, and depression have also been associated with type 2 diabetes mellitus as well as the metabolic syndrome. [5] Various treatment

modalities for diabetes have been developed over the past years, many of them successfully keeping the disease at bay. This is mostly true in the case of DMT2, a psychosomatic illness wherein managing only the somatic and symptomatic aspects of the disease will not help to treat the patient. The focus should also be given to the psychiatric aspect of the disease, especially stress. Thus, all-inclusive treatment constitutes treatment of stress as well as DMT2, since without treating stress, not only are we giving away for recurrences to occur, but also for less than perfect adherence to prevailing, which hinders the proper and effective treatment of the condition.

'Diabetes distress' is the emotional burden specifically related to living with Type 2 diabetes, which includes guilt, anxiety, and feeling overwhelmed or unsupported in relation to diabetes. [6] In the general population, approximately one in three individuals, are suffering from Type 2 diabetes report a high diabetes distress level, which is associated

with higher HbA1c, poor self-care behaviors, and lower self- efficacy to treatment. These higher levels are found in people having complications and who are on insulin. [7]

Depression in people with diabetes is twice as common as people without Type 2 diabetes and is associated with poor diabetes outcomes. The prevalence of the major depressive disorder is found to be 10% among general populations with Type 2 diabetes. Elevated depressive symptoms were reported in 17% of people with Type 2 diabetes. Perceived stress reflects the emotional burden that occurs when an individual's external demands exceed perceived resources for coping with the demands. [8] Perceived stress was found to be significantly associated with depressive symptoms; there was a nearly significant association with fasting blood sugar and BMI and no correlation with HbA1c. Stress may contribute to poor health outcomes through behavioral and physiological pathways in Type 2 diabetes.

Depression is the most common and serious medical disease, with a lifetime prevalence ranging from approximately 11% in low-income countries to 15% in high- income countries. The risk of having a mental health problem in life is about 50%, leading to drop-in employment, wages, and productivity. [8] In developed countries, depression and anxiety are the 4th leading cause, while diabetes is the 8th cause of disability-adjusted life years (DALYs).

As explained by the American Psychiatric Association (APA) Diagnostic and Statistical Manual of Mental Disorders (DSM-5), diabetes is a mood disorder that reunites several symptoms that alter an individual's functionality. Depression disturbs emotions, cognition, and behaviors. [9] According to DSM–5, the diagnostic criteria for a major depressive disorder consist of a core symptom — either a diminished/ irritable mood or decreased interest/ pleasure (anhedonia) — or both, and at least four of the following symptoms: worthlessness or feelings of guilt, fatigue or loss of energy, suicidal thoughts or thoughts about death, concentration problems, weight loss or weight gain (5% change in weight), psychomotor retardation or activation (change inactivity), hypersomnia or insomnia (change in sleep) lasting for at least 2 weeks. Depression can be described as a first episode, a recurrent or chronic episode; it could be mild or moderate or severe, with or without psychotic features. [9-11]

The prevalence rate of depression could be > 3 times higher in patients with diabetes mellitus type 1 and twice as high in people with diabetes mellitus type 2 compared with the general population worldwide. Anxiety appears in 40% of the patients with type 1 or 2 diabetes. In the general popula-

tion for psychiatry measurements, the most common questionnaire used for screening depression is the Beck Depression Inventory (BDI). Currently The BDI-II is used and the reliability and validity were explained. It has 21 items, and each question has 4 options for answering which indicate the severity of symptoms of depression and a total score ranging between 0 and 63. 0–13 points indicate minimal or none, 14–19 points as mild, 20–28 points as moderate, and 29– 63 points as severe depressive symptoms.

Currently we aimed to analyze the prevalence of depression and perceived stress by the BDI scale and PSS-10 scale and to examine their associations with socio-demographic and clinical characteristics.

Materials and methods

Data has been collected study sample 100 participants with diabetes mellitus who came to the general medicine department for general checkup. Patients aged 30-65 years, duration of type 2 diabetes – 1 to 10 years were selected.

Exclusion Criteria: include patients with Organic disorders, Seizure disorder, mental retardation, Persistent neurological deficits, Chronic debilitating medical illnesses include chronic obstructive pulmonary disease, thyroid disease, heart disease, hypertension, dyslipidemia, chronic kidney disease, and any other psychiatric comorbidity or psychoactive substance use.

Data Collection: Beck Depression Inventory score questionnaire and Beck Depression Inventory-Second Edition (BDI-II) are used for the presence of depression.

Perceived stress scale (PSS) used for stress measurement. Total scores will range from 0 to 40, with higher scores indicating greater overall distress. Perceived stress scores are categorized based on the scores: Very low=0-7; low=8-11; average=12-15; high=16-20; very high=21-40. PSS: Perceived Stress Scale

All data collected through interview, lab analysis of biochemical parameters, and measurements taken were registered in a computer database. All the data was analyzed using SPSS software (IBM SPSS Statistics for Mac, Version 24). Continuous data was presented as mean with 95% confidence interval (CI) for descriptive purposes, and categorical data was presented as percentages with 95% CI. Statistical significance is considered when p-value <0.05.

Results

Pearson's correlation analysis between depression and demographic parameters shows that only age and marital status are found to be significantly associated with high BDI-II scores. On univariate

analysis, the factors significantly associated with high/very high stress were age 30–40 yr, lack of physical activity, and having professional work. After multivariate regression, age 30–40 yr, working in a professional job, and lack of physical activity were still found to be significantly associated with high/very high stress.

The mean HbA1c was 7.7 ± 1.5 (range 7.1–8.5), mean LDL-C was 125.4 ± 36.5, mean TG was 1.6 ± 1.4 (mmol/L), and mean HDL-C was 1.6 ± 0.5 (mmol/L).

Table 1: Basic clinical, biochemical and personnel characteristics of diabetic patients

		Frequency %
Marital status	Married	79%
	Unmarried	3%
	Divorced	5%
	Widow	13%
FBS	≤110	12
	110-125	18
	>125	70
HbA1c (%)	<7	38%
	≥7	62%
Duration of DM(Yrs)	>5	38
	5-10	52
	>10	10
Medication	Oral	60
	Injection	28
	Oral + Injection	12
Employment	Employed	248
	Unemployed	152

Table 2: Distribution of cases according to Disease-related variables in type 2 diabetes mellitus

Characteristics		Frequency %	P value
Cigarette Smoking(Dependency)	Yes	36	<0.001
	No	64	
Alcohol Abuse/Dependency	Yes	26	<0.001
	No	74	
Insulin Use	Yes	28	<0.001
	No	72	
High FBS Level (mg/dl)	Yes	70	<0.001
	No	30	
High LDL-C (mmol/L)	Yes	20	<0.001
	No	80	
Low HDL-C (mmol/L)	Yes	13	<0.001
	No	87	
High triglyceride (TG) (mmol/L)	Yes	79	<0.001
	No	21	
HbA1c	≥7	62	<0.001
	<7	38	
Hypertension	Yes	39	<0.001
	No	61	
Depression	With depression	67	0.04
	Without depression	33	
Complications	Yes	4	<0.001
	No	96	
Physical Activity	Yes	43	0.158
	No	57	

Table 3: Distribution of cases according to Beck's Depression Inventory and PSS

	Score	Percentage
Beck's depression inventory		
Minimal	1-10	23
Mild	11-16	10
Borderline	17-20	23
Moderate	21-30	36
Severe	≥31	8
PSS- category		
Very low	0 to 7	1
Low	8 to 11	16
Average	12 to 15	48
High	16 to 20	32
Very high	21- 40	3

Table 4: Association between sociodemographic variables and depression

Variables		Number of patients (%)					p- value
		Minimal Depression (n=23)	Mild Depression(n=10)	Borderline Depression(n=23)	Moderate Depression(n=36)	Severe Depression(n=8)	
Age (years)	%						
≥30	5	1	0	1	2	0	<0.001
31-40	10	3	1	1	3	1	<0.001
41-50	27	7	2	5	8	1	<0.001
51-60	41	8	3	12	20	4	<0.001
>60	17	4	4	4	3	4	<0.001
Sex							
Male	62	16	8	15	30	6	0.6
Female	38	7	2	8	6	2	
Marital status							
Married	79	18	7	20	20	5	<0.001
Unmarried	3	1	0	0	1	0	<0.001
Divorced	5	1	2	0	2	0	<0.001
Widow	13	3	1	3	13	3	<0.001

Table 5: Association between diseases related variables and Depression

Variables		Number of patients (%)					p-value
		Minimal Depression (n=23)	Mild Depression(n=10)	Borderline Depression(n=23)	Moderate Depression(n=36)	Severe Depression(n=8)	
Family history	%						
Yes	80	19	6	19	29	7	<0.001
No	20	4	4	4	7	1	<0.001
FBS (mg/dl)							
≤110	12	3	0	0	8	1	<0.001
110-125	18	5	1	3	7	2	<0.001
>125	70	15	9	20	21	5	<0.001
HbA1c (%)							
<7	38	4	2	2	6	2	0.012
≥7	62	19	8	21	30	6	0.03
Duration of Diabetes mellitus (years)							
>5	38	9	3	3	4	2	<0.001
5-10	52	12	7	18	27	4	<0.001
>10	10	2	0	2	5	2	<0.001
Medication							
Oral	60	8	6	10	28	1	<0.001
Injection	28	10	3	11	2	2	<0.001
Oral + Injection	12	5	1	2	6	5	<0.001

Discussion

Some studies have been conducted in India to study the Prevalence of depression among type 2 diabetes in the past.

However, minimal data is available as far as Andhrapradesh, India is concerned, and rarely does such study has been carried out for other regions of the country, thereby preventing such data.

In our study, four hundred DMT2 patients were questioned for the presence ofdepression symptoms using the Beck Depression Inventory (BDI-II) scale and PSS.

The demographic pattern in our study is consistent with the available relevant literature.

Female predominance was observed as 72% in our study. A study by Kodakandla K et al. (2016) demonstrated female predominance as 71.1%. [12]

In our study, the patients were mostly married and mostly employed. Kodakandla K et al. (2016) Study shows 85.2% married. [12]

Our study showed 67% patients had depression. In our study, most potential cases (35%) of depression were in the age group 51-60 years. Study by Kodakandla K et al. showed a majority of the potential cases of depression were in the age group 40-60 years.

In our study, based on the BDI score, most potential cases (33%) of depression were in the age group 51-60 years. Majority of married patients were potential cases of depression.

Our study results correlate with the previous studies of Nanjundappa G et al., Nichols et al.2003, and Goldney RD et al., 2004., showed an increased prevalence of depression among type 2 diabetic women than type 2 diabetic men. [13,14]

Our study observed 66.2% patients having fasting blood sugar (FBS) ≥125 to be potential cases of depression. 90% patients having duration of diabetes more than ten years were observed potential cases of depression.

In our study, 78.6% patients who undergoing injectable treatment were observed to be potential cases of depression.

Pearson's correlation between depression and demographic parameters shows that age and marital status are significantly associated with high BDI-II scores.

Our study showed that males had higher depression scores compared to men. Several previous studies confirmed a similar result, [15] among people with diabetes. A possible explanation is that women experience gender-specific events such as childbirth and menarche cycle, which means they handle several works and emotions at a time. it makes them more emotional and sensitive in comparison to men[16]

Physical activity is considered to be a protective barrier against depression and the development of other psychological illnesses.

Our study showed a positive effect of high TG on anxiety and depression; other study confirmed the impact of higher TG on increasing depression in type 2 diabetes patients. This may be due to depression coexist with anxiety may increase thelipoprotein lipase activity and increase the levels of circulating catecholamines, thus elevating the serum cholesterol and triglyceride concentrations. [17]

Our study confirmed the association of hypertension with both depression and stress. In our study, the clinically defined depression prevalence (BDI ≥ 16) and the BDI-II score was found to be 67%. A similar prevalence of depression in people with type 2 diabetes was detailed in other studies. [18]

In our study, HbA1c, duration of disease, and treatment duration were observed to be significantly associated with high BDI-II scores.

The current study findings show that the PSS-10 is a reliable and valid instrument for assessing perceived stress among diabetic patients.

Overall, stress was observed in 83% among the total population. On univariate analysis, the high/very high stress had a significant association with the age 30–40 years, lack of physical activity, and professional work. After multivariate regression, age 30–40 years, lack of physical activity, and a professional job had a significant association with high/very high stress. The results of multivariate analysis of covariance, after adjusting for sociodemographic variables, indicated that the women scored higher than men in chronic stress and minor daily stressors. Although there was no difference in the number of life events experienced in the previous 2 years, the women rated their life events as more negative and less controllable than the men. The use of PSS-10 with both researchers and counselors working with university students will obtain the data for the future implication and baseline applications. However, this instrument can be used with the general population as mentioned in the original version; hence this study is one of its own kinds with the subjects of pathological disorder (diabetes mellitus) from the general population.

Current study did not observe any positive association between diabetes complications and depression, which is similar to a previous study. But a previous study showed anassociation that neuropathy is a complication of depression and diabetes. [19]

In our study, level of education was another significant factor associated with depression. Status of work was significantly associated with depression and the probability of depression among homemakers was high. This was expected as unemployment itself is a depressing factor and also may be because there is an increased financial burden imposed by the disease. Family size was also a significant predictor of depression. The probability of depression was high among those living in a smaller family size of ≤ 6 members. This could be since larger family size gives a feeling of social and economic support necessary to cope with the healthcare cost of living with diabetes.

Conclusion

Important factors associated with high/very high stress were lack of physical activity, and professional work was still significant associated with high/very high stress. Study confirmed the association of diabetes with both depression and stress. This indicates the need for counseling and psychological care at diabetes centers and people with diabetes in general.

References

1. Zimmet PZ. Diabetes and its drivers: the largest epidemic in human history? Clinical diabetes and endocrinology. 2017 Dec; 3(1):1-8.

2. Aliasgharzadeh A, Dehghan P, Gargari BP, Asghari-Jafarabadi M. Resistant dextrin, as a prebiotic, improves insulin resistance and inflammation in women with type 2 diabetes: a randomised controlled clinical trial. British Journal of Nutrition. 2015 Jan; 113(2):321-30.

3. Shaw JE, Sicree RA, Zimmet PZ. Global estimates of the prevalence of diabetes for 2010 and 2030. Diabetes research and clinical practice. 2010 Jan 1; 87(1):4-14.

4. Ford ES, Giles WH, Mokdad AH. Increasing prevalence of the metabolic syndrome among US adults. Diabetes care. 2004 Oct 1; 27(10):2444-9.

5. Timonen M, Salmenkaita I, Jokelainen J, Laakso M, Härkönen P, et al. Insulin resistance and depressive symptoms in young adult males: findings from Finnish military conscripts. Psychosomatic Medicine. 2007 Oct 1; 69(8):723-8.

6. Kalra S, Jena BN, Yeravdekar R. Emotional and psychological needs of people with diabetes. Indian journal of endocrinology and metabolism. 2018 Sep; 22(5):696.

7. Pandit AU, Bailey SC, Curtis LM, Seligman HK, Davis TC, et al. Disease-related distress, self-care and clinical outcomes among low-income patients with diabetes. J Epidemiol Community Health. 2014 Jun 1; 68(6):557-64.

8. Butler G. Definitions of stress. Occasional paper (Royal College of General Practitioners). 1993 Aug (61):1.

9. Bromet E, Andrade LH, Hwang I, Sampson NA, Alonso J. de GG, de GR, et al. Cross-national epidemiology of DSM-IV major depressive episode. BMC Med. 2011; 9:90.

10. Hewlett E, Moran V. making mental health count: the social and economic costs of neglecting mental health care. OECD; 2014.

11. Ferrari AJ, Charlson FJ, Norman RE, Patten SB, Freedman G, Murray CJ, Vos T, Whiteford HA. Burden of depressive disorders by country, sex, age, and year: findings from the global burden of disease study 2010. PLoS medicine. 2013 Nov 5; 10(11):e1001547.

12. Maharjan R, Takma KC, Shrestha KD. Psychological Status among Patients with Type 2 Diabetes Mellitus Attending in a Tertiary Level Hospital, Kathmandu. International Journal of Health Sciences & Research 2019; Vol.9; Issue: 4.

13. Nichols GA, Brown JB. Unadjusted and adjusted prevalence of diagnosed depression in type 2 diabetes. Diabetes care. 2003 Mar 1; 26(3):744-9.

14. Goldney RD, Phillips PJ, Fisher LJ, Wilson DH. Diabetes, depression, and quality of life: a population study. Diabetes care. 2004 May 1; 27(5):1066-70.

15. Mirza I, Jenkins R. Risk factors, prevalence, and treatment of anxiety and depressive disorders in Pakistan: systematic review. BMJ. 2004; 328(7443):794.

16. Khuwaja AK, Kadir MM. Gender differences and clustering pattern of behavioural risk factors for chronic non-communicable diseases: community-based study from a developing country. Chronic Illn. 2010; 6(3):163–170.

17. Dehesh T, Dehesh P, Shojaei S. Prevalence and associated factors of anxiety and depression among patients with Type 2 diabetes in Kerman, Southern Iran. Diabetes, metabolic syndrome and obesity. 2020 May 5:1509-17.

18. Smarr KL, Keefer AL. Measures of depression and depressive symptoms: Beck depression Inventory-II (BDI-II), center for epidemiologic studies depression scale (CES-D), geriatric depression scale (GDS), hospital anxiety and depression scale (HADS), and patient health Questionnaire-9 (PHQ-9). Arthritis care & research. 2011 Nov; 63(S11):S454-66.

19. Bai JW, Lovblom LE, Cardinez M, Weisman A, Farooqi MA, Halpern EM, Boulet G, Eldelekli D, Lovshin JA, Lytvyn Y, Keenan HA. Neuropathy and presence of emotional distress and depression in longstanding diabetes: results from the Canadian study of longevity in type 1 diabetes. Journal of Diabetes and its Complications. 2017 Aug 1; 31(8):1318-24.