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Original Research Article

Depressive symptoms in type II diabetics of a tertiary care hospital in southern India

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ABSTRACT

Background: International diabetes federation has highlighted that "the diabetic epidemic is here and threatens to overwhelm health systems if unchecked''. The global prevalence of diabetes among adults has risen from 4.7% in 1980 to 8.5% in 2014. India unfortunately tops the list of countries with the largest number of people living with diabetes. Diabetes and depression are independent risk factors for one another and both are associated with increased risk of cognitive decline. Prevalence of depression is doubled in Diabetes mellitus, and also appears to vary by type of Diabetes mellitus, race/ethnicity, and duration of diabetes and associated debilitating complications and co-morbidities. Various studies using different methodology have revealed varying prevalence of depression. Data on this association of Diabetes and depression is limited in Indian context.
Methods: This is a cross sectional study conducted on type 2 Diabetics attending outpatient department of Victoria and Bowring and Lady Curzon Hospital. Data regarding duration and treatment of diabetes, HbA1c levels and associated comorbidities were collected along with basic particulars of the patient. Becks depression questionnaire were used for analyzing the depressive symptoms.
Results: A total of 302 diabetic patients were included in the study, out of which Males were 156 and Females were 146. Severe depressive symptoms were found in 18.21% of diabetics, and moderate depressive symptoms were found in 39.74% of study population. It is also found that the significant predictors of these depressive symptoms are increasing age, longer duration of diabetes, treatment intensity.
Conclusions: In conclusion depressive symptoms are more common in diabetic subjects compared to non-diabetic population. Especially this increases with duration of diabetes and uncontrolled sugars. Hence there is a need to screen all diabetes subjects for depression.

Keywords: Beck's score, Diabetes mellitus, Depression, HbA1C, Southern India

INTRODUCTION

Diabetes mellitus (DM) refers to a group of common metabolic disorders that share the phenotype of hyperglycemia.[1] According to the World Health Organization, it is estimated that 422 million people had diabetes in 2014, representing 8.5% of adults worldwide. The prevalence of diabetes has been increasing consistently for three decades, and is projected to continue rising.[2] It is projected that 366 million people will be diabetic in 2030, 290millions of whom will be living in developing countries.[3] Diabetes is a highly prevalent chronic and debilitating disorder that is associated with significant morbidity, mortality, both in

developed and developing countries like India with increased health care costs.

The metabolic dysregulation associated with DM causes secondary pathophysiologic changes in multiple organ systems that impose a tremendous burden on the individual with diabetes and on the health care system.

Diabetes is associated with several complications including loss of vision, kidney failure, cardiovascular disease, and lower limb amputation, and recent evidence indicates that it may lead to increased cognitive decline.[2] Depression is the most common psychiatric disorder seen in diabetic community.[4]

Depression is a common mental illness, with an estimated 350 million people affected around the world, that is similarly associated with cognitive decline as measured by neuropsychological assessments and rates of dementia.[5] It was estimated that depressive disorders were the fourth leading cause of disease burden in women and seventh leading cause in men.[6,7]

In addition to being risk factors for cognitive decline, studies show that diabetes and depression are independent risk factors for each other.[8] The presence of depression in people with diabetes is associated with problems in diabetes management and several health outcomes.

Recent evidence indicates that it may lead to increased cognitive decline.[3] Relationship between DM and depression has been investigated by many researchers. Prevalence of depression among individuals with DM appears to vary by type of DM, race/ethnicity, and among developed and developing nations.[9,10]

Evidence shows comorbid depression in diabetes is associated with lower adherence to self-care behaviors such as diet, physical activity, use of medication, and glucose monitoring, as well as poor glycemic control, and microvascular and macrovascular complications.[11-16] Comorbid depression in diabetes also represents greater financial burden, as it is associated with higher healthcare costs relative to diabetes only.[17]

Given this tendency toward poorer outcomes, it is likely that the simultaneous presence of both depression and diabetes similarly be associated with worse cognitive functioning than is seen in people with diabetes alone.[9]

Major depression was found to be the second leading cause of disability-adjusted life years (DALYs) lost in women and the tenth leading cause of DALYs in men.[18] Depression is a leading cause of disability, work place absenteeism, lost productivity, and increased use of health care resources. Data on this association of Diabetes and depression is limited in Indian context. Therefore, screening for depression among diabetic patients is important.

METHODS

This is a cross sectional study done on type 2 diabetic patients attending to outpatient department during 1 year period from December 2015 to November 2016 of Victoria hospital and Bowring and Lady Curzon Hospital of Bangalore medical college and research institute, Bangalore.

All type 2 diabetic patients, both newly detected and those who are previously diagnosed with type 2 diabetes who comes to OPD for follow up irrespective of their glycemic status, type of antidiabetic medication used and complications of diabetes were included in study after taking written informed consent from the patient. And those diabetic patients with associated comorbid conditions like hypertension, Ischemic heart disease, and known psychiatric illness were excluded from the study.

All diabetic patients who were included in the study were given a proforma which includes patients details like age, sex, duration of diabetes, type of antidiabetic medication, HbA1C level and comorbid illness with multiple choice questionnaire, which includes 21 questions. The highest possible score for the whole test is 63, the lowest possible score is zero. Interpretation of the score is done using Becks depression scoring system. It includes,

Table 1: Interpretation of the score.

Depression
0-13= Minimal depression
14-19= Mild depression
20-28= Moderate depression
29-63= Severe depression

Using Becks score, patients were categorized into minimal, mild, moderate and severe depression. Severity of the depression is correlated with parameters like age, sex, duration of diabetes, type of antidiabetic medication, and HbA1C level.

Statistical analysis was done using: Spearman correlation, Pearson Chi-Square, Canonical correlation, Simple linear regression.

RESULTS

A total of 302 Patients were interviewed for the study. Among these, males were 156 (51.6%) and females were 146(48.3%).

Most of the patients (120 patients) in our study had moderate depression (39.7%). Severe depression was present in 55 patients (18.2%). In our study it was found that there was no gender difference in depression levels. The gender wise distribution and severity of the enrolled patients are listed in Table 2.

Table 2: Gender wise prevalence of depression.

Beck's Score and depression level	Male		Female		Total	
	No	%	No	%	No	%
(0-13) Minimal Depression	36	11.9	20	6.6	56	18.5
(14-19) Mild Depression	33	10.9	38	12.5	71	23.5
(20-28) Moderate Depression	60	19.8	60	19.8	120	39.7
(29-63) Severe Depression	27	8.9	28	9.2	55	18.2
Total	156	51.6	146	48.3	302	100

In our study we also found that there are various other factors like age, duration of diabetes and HbA1C levels also related to the severity of the depression. Majority of the diabetics in our study were elderly patients (216 patients) with the mean age of 63.12 years followed by middle aged patients (70 patients) with the mean age of 46.61 years. Out of total patients, 17 were young with the mean age of 37.29 years, and we found that, depression increases by 0.1533 with each additional increase in year. Age wise distribution of the patients and its correlation with Becks score is listed in Table 3 and Figure 1.

Majority of the diabetic patients in our study with the longer duration of diabetes (mean duration11.6 years) had higher mean Becks score of 22.68±10.09, compared with those diabetics with shorter duration (mean duration of 5.35) with the mean Becks score of 20.47±5.63.

Significantly positive correlation was noticed between depression and duration of diabetes (0.192), as duration of diabetes increases beck score also increases in small proportion. Correlation of Becks score with duration of diabetes is described in the Tables 3 and 4.

Table 3: Relation between level of depression in correlation with HBA1C and duration of diabetes.

Age group	No.	Age	Duration	HbA_1C	Becks score
		Mean±SD	Mean±SD	Mean±SD	Mean±SD
Younger aged	17	37.29±3.06 P=0.000*	5.35±1.56 P=0.002*	9.12±3.12 P=0.001*	20.47±5.63 P=0.001*
Middle-aged	70	46.61±2.67 P=0.001*	6.23±2.33 P=0.004*	8.64±1.95 P=0.000*	19.70±9.63 P=0.000*
Elderly aged	216	63.12±8.11 P=0.000*	11.64±6.81 P=0.000*	9.40±2.00 P=0.000*	22.68±10.09 P=0.000*

Table 4: Association of depression with other influencing variables.

Spearman's correlation coefficient	Beck's score	Duration of diabetes	Age	HbA1C
Beck's Score	1.000	0.192**	0.161**	0.207**
Sig. (2-tailed)		0.001	0.005	0.000
Total Number of respondents	303			

Interpretation (Table 4)

Significantly positive correlation was noticed between depression and duration of diabetes, age and HbA1C levels.

Duration of 0.192, hence as the duration of diabetes increases Beck score also increases in small proportion, Age of 0.161 and HbA1C of 0.207, so as age and HbA1C increases Beck score also increases in small proportion, at both 1 % and 5 % level of significance.

In our study we also found that, depression is strongly related with HbA1C levels.

216 elderly aged patients with the poor glycemic control with mean HbA1C of 9.4 is associated with severe depression with mean Becks score of 22.68 which is statistically significant, described in the Tables 3 and 4.

The regression coefficient of 0.7162 suggests that, a depression increases by 0.7162 with each additional increase in HbA1C-as described in the Figure 2.

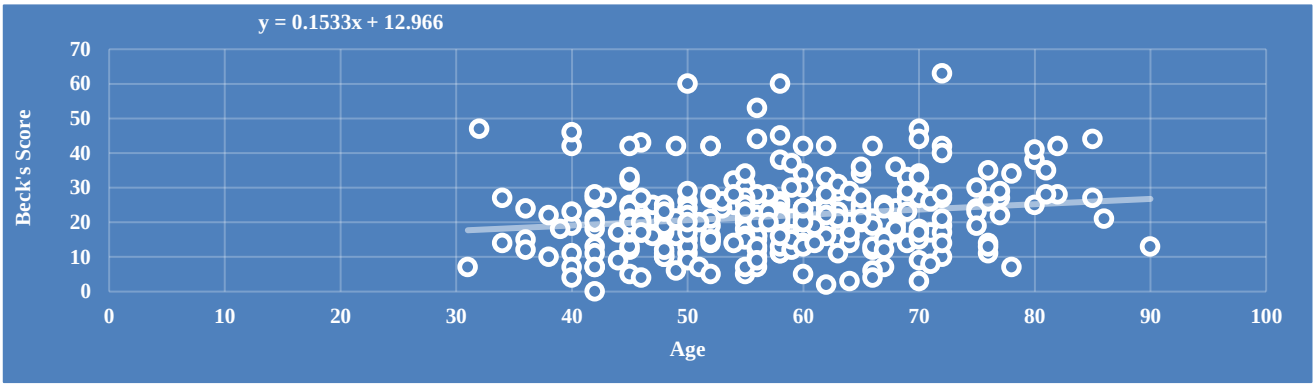

Figure 1: A scatter plot showing a linear relationship between age and beck score along with regression equation.

Figure 1 shows, Uni variable linear regression studies the linear relationship between the dependent variable Y and a single independent variable X.

The linear regression model describes the beck score with a straight line that is defined by the equation Y = 12.966 + 0.1533 × X, where a is the y-intersect of the line, and b is its slope. First, the parameters a and b of the regression line are estimated from the values of the beck score and age with the aid of statistical methods. The regression line enables one to predict the value of the beck score Y from that of the independent variable age.

The regression coefficient of 0.1533 means that, in this model, a depression increases by 0.1533 with each additional increase in year.

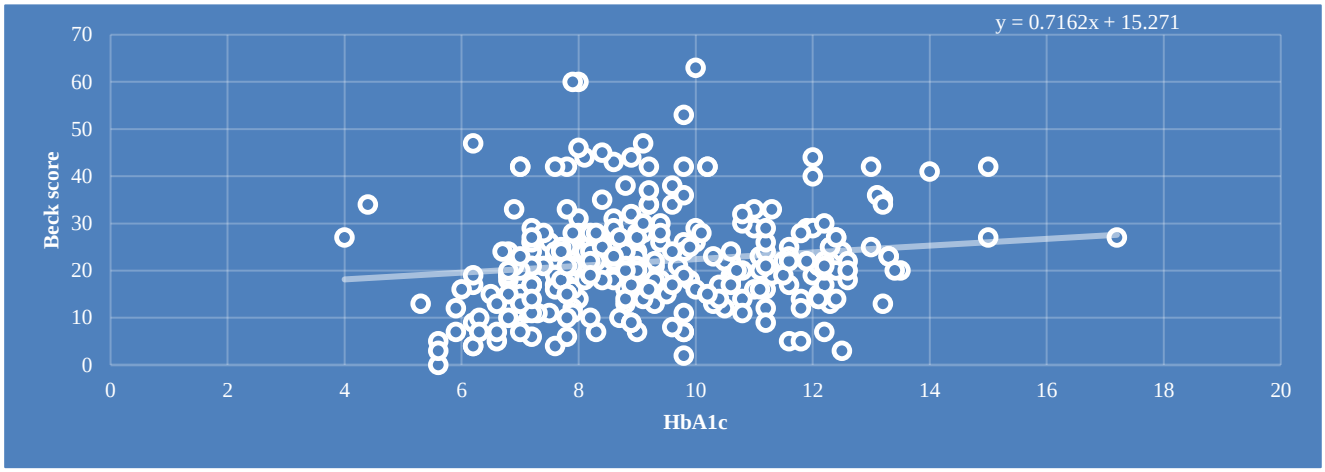

Figure 2: A scatter plot showing a linear relationship between HbA1c and Beck score along with regression equation.

Figure 2 shows, Uni variable linear regression studies the linear relationship between the dependent variable Y and a single independent variable X. The linear regression model describes the beck score with a straight line that is defined by the equation Y = 15.27 + 0.7162 × X, where a is the y-intersect of the line, and b is its slope. First, the parameters a and b of the regression line are estimated from the values of the beck score and age with the aid of statistical methods. The regression line enables one to predict the value of the beck score Y from that of the independent variable age.

The regression coefficient of 0 .7162 means that, in this model, a depression increases by 0.7162 with each additional increase in Hb1A1c.

DISCUSSION

The growing burden of non-communicable diseases (NCDs) constitutes of the major challenges facing our country in the present century. The NCD's include heart diseases, stroke, mental health disorders, diabetes mellitus, and cancers.

The international diabetes federation has highlighted that "the diabetes epidemic is here and threatens to overwhelm health systems if unchecked." The number of people with diabetes has risen from 108 million in 1980 to 422 million in 2014.[2] The global prevalence of diabetes among adults over 18 years of age has risen from 4.7% in 1980 to 8.5% in 2014.[19] Diabetes prevalence has been rising more rapidly in middle- and low-income countries.

WHO projects that diabetes will be the 7th leading cause of death in 2030. India unfortunately tops the list of countries with the largest number of people living with diabetes (50.8 million) in 2010 and will remain so in 2030.[20]

Diabetes is a major cause of blindness, kidney failure, heart attacks, stroke and lower limb amputation.[2]

Depression is another condition with high prevalence worldwide. Approximately 340 million people worldwide suffer from depression at any given time including 18 million in the United States.[6]

According to the World Health Organization (WHO), depression is responsible for the greatest proportion of burden associated with non-fatal health outcomes and account for approximately 12% of total years lived with disability. Recently conducted World mental health survey indicated that major depressive symptoms are experienced by 10-15% of people in their lifetimes. Indian studies indicate prevalence of major depressive symptoms in 15.9% of general population.

Depression has been bi-directionally associated with diabetes mellitus.[21] Subjects who are depressed are more likely to develop type 2 diabetes mellitus either because of the metabolic abnormalities caused by the drugs used to treat depression or because of poor food choices and lack of physical activity that may accompany major depressive episode.[22] But many a times these depressive symptoms in diabetics are neglected by clinicians as nonspecific symptoms or musculoskeletal disorders.

Depression and presence of elevated depressive symptoms are higher among persons with diabetes compared with the general population.[23,24] These associations may be related to increased risk of depressive symptoms in individuals with diabetes, increased risk of type 2 diabetes in individuals with depressive symptoms, or both. Several but not all longitudinal studies have reported that elevated depressive symptoms are associated with incident type 2 diabetes.[25-34]

Several factors associated with depressive symptoms, including obesity-promoting health behaviors (Example: physical inactivity, hyper-caloric diets), and activation of the neuroendocrine and inflammatory responses (resulting in increased cortisol, catecholamines, and cytokines), can induce insulin resistance and the development of type 2 diabetes.[28-32,34-41]

A diagnosis of diabetes or the burden of dealing with its complications might also lead to symptoms of depression.[42]

A large meta-analysis by Andersen et al. in 2001 incorporating data from 42 studies concluded that the presence of diabetes doubles the odds of having co-morbid depression.[43]

A qualitative aggregation of studies conducted by the International diabetes federation published in 2009 in Diabetic atlas concludes that Diabetes and depression are chronic debilitating conditions that are associated with significant morbidity, mortality, and healthcare costs.

Coexisting depression in people with diabetes is associated with decreased adherence to treatment recommendations, poor metabolic control, higher complication rates, and decreased quality of life, increased healthcare use and cost, increased disability and lost productivity, and increased risk of death.[44] This study supports our study, depression is associated with poor metabolic control.

The CURES 102 study titled "Association of depression with complications of type 2 diabetes "conducted by Poongothai S et al in Chennai, concluded that, among Asian Indians, the prevalence of depression is higher in T2DM subjects with retinopathy, neuropathy, nephropathy and PVD compared to those without the respective complications.[45]

A study conducted by Tapash Roy et al. in Bangladesh concluded that the prevalence of depressive symptoms was 34% (PHQ-9 score $\geq$ 5) and 36% (WHO-5 score < 52) with audio questionnaire delivery method. The prevalence rates were similar regardless of the type (PHQ-9 vs. WHO-5) and language of the questionnaires, and methods of delivery (standard assisted vs. audio methods). The significant predictors of depressive symptoms using either the PHQ-9 or WHO-5 questionnaires were; age, income, gender, treatment intensity, and co-morbid cardiovascular disease. Further, depression was strongly associated with poor glycemic control and number of co-morbid conditions.[46]

In our study also we found that, depressive symptoms are related with age, duration, and glycemic control of diabetes.

A study by Cynthia Susan Mathew and others in 2012 in Christian medical college, Ludhiana concluded that of the 80 patients interviewed, 31 (38.8%) had depressive symptoms. Among them 20 (25%) had mild depression, 10 (12.5%) had moderate depression, and 1 (1.3%) had severe depression. Over one third of patients with type 2 diabetes mellitus of over 5-year duration had depressive

symptoms. The presence of depressive symptoms was associated with a significant worsening of glycemic control.[47] This study is comparable with our study, duration of diabetes is related more with depressive symptoms.

A study conducted by Amit Raval and others at PGIMER, Chandigarh showed high prevalence of depression in patients with T2DM. The risk factors for depression were age, central obesity, diabetic complications particularly neuropathy and diabetic foot disease and increased pill burden.[48] In our study also we found that increase in age is a risk factor for development of depressive symptoms.

CONCLUSION

Depressive symptoms are more common in diabetic patients compared to non-diabetic population. There are various factors that affect the development of depressive symptoms in diabetic patients like old age, increased duration of diabetes, poor glycemic control. Hence development of comorbid depression in diabetic patients will lead to poor quality of life due to poor adherence to treatment and so more complications related to diabetes. Hence there is a need to screen all diabetes subjects for depression to improve the outcome.

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