Type 2 diabetes and influence of diabetes-specific distress on depression

Mukut Roy [a,b,*], Nilanjan Sengupta [b], Pranab Kumar Sahana [b], Chanchal Das [c,b], Payel Talukdar [d], Arjun Baidya [b], Soumik Goswami [b]

[a] Department of Medicine, Tripura Medical College & D.R.B.R.A.M Teaching Hospital, Agartala, Tripura, India
[b] Department of Endocrinology, Nilratan Sircar Medical College, Kolkata, West Bengal, India
[c] West Bengal Health Services
[d] Department of Psychiatry, Nilratan Sircar Medical College, Kolkata, West Bengal, India

ARTICLE INFO

ABSTRACT

AIMS: Common psycho-social emotional reactions of patients with diabetes may be termed as diabetes-specific distress which is conceptually distinctive from depression. In patients with type 2 diabetes, different screening methods for depression may get influenced by simultaneous presence of diabetes distress. This study was planned to assess magnitude and relationship of depression and diabetes specific distress in patients with type 2 diabetes.

Methods: Two hundred and fifty (250) adult patients with type 2 diabetes (T2DM) were assessed for depression based on Beck Depression Inventory (BDI) and Diagnostic and Statistical Manual, Fourth edition (DSM IV) criteria. Diabetes specific distress was assessed as per Diabetes Distress Scale (DDS) score.

Results: Among study population of 250 adult T2DM patients, based on BDI score, 97 (38.8%) patients were found to suffer from depression and based on DSM IV criteria, prevalence of depression was 29.2%. A total of 62 (24.8%) patients were found to suffer from diabetes specific distress based on DDS score. Patients with severe diabetes specific distress had associated matching of symptoms with mild depression based on BDI score which was also statistically significant ($p < 0.0001$). However, these same individuals were non-depressed as per DSM-IV criteria.

Conclusion: Recognizing depression with self-administered questionnaires may be influenced by concomitant presence of symptoms due to diabetes specific distress. Therefore, proper diagnosis of depression may be established by structured clinical interview and psycho-social management of type 2 diabetes should possibly include both assessment of depression and diabetes specific distress.

© 2018 Elsevier B.V. All rights reserved.

1. Introduction

The relationship between diabetes and depression is well-known and likely to be bidirectional in nature [1]. It has been proposed that depression may be the result of the daily burden of living with diabetes and its long-term complications [2]. Results of a meta-analysis found that patients with diabetes have a variety of emotional reactions including shame,

fear, shock and guilt which might more precisely be termed diabetes-specific distress rather than depression [3,4]. But diabetes distress is virtually distinct from major depressive disorder (MDD) and is seen as a collective psychosocial symptom of diabetes, predicated on a variety of medical, contextual and individual factors and not due to a psychiatric condition [4].

A number of cross-sectional studies in India used only self-reported questionnaires to assess depression in type 2 diabetes mellitus (T2DM) patients [5–7]. In the background of diabetes mellitus, self-reported questionnaires might also measure diabetes related problems along with true depression. Again, diabetes distress content may fall into areas related to negative emotional reactions due to diabetes. Thus, the diverse tools for the measurement of depression, may be vulnerable to influence by concomitant presence of diabetes distress [8,9].

Most studies concerning psychological health of patients with diabetes are based on the literature on depression, suggesting a need to consider different interventions for diabetic patients who are distressed but not clinically depressed and also for those who are both distressed and clinically depressed [9,10]. With this background, this study was taken up to assess the magnitude of epidemiological evidence and the association of depression and diabetes specific distress in type 2 diabetes patients in a clinical referral hospital in Eastern India.

2. Subjects

Inclusion criteria: Adult (18–64 years) patients with type 2 diabetes were selected as per the American Diabetes Association (ADA) guidelines [11].

Exclusion criteria: Patients with type 1 diabetes were excluded. Patients with type 2 diabetes patients with other predisposing factors for depression such as family history of depression and seriously ill patients, other chronic diseases, other major psychiatric illness, those with recent stressful and psychological causes of depression and patients with gross cognitive deficit and pregnant patients were excluded from the study.

3. Materials and methods

This single point cross-sectional study was conducted at Department of Endocrinology, in collaboration with Department of Psychiatry, Nilratan Sircar Medical College and Hospital, Kolkata. Screening, severity and diagnosis of depression were done using the Beck Depression Inventory (BDI) score [12–14] and the Diagnostic and Statistical Manual, Fourth edition (DSM-IV) criteria [15,16]. To assess depression, as a variety of self-reported questionnaires, BDI score was used. A BDI score of 11–16 was taken as mild; 17–30 as moderate and more than 30 as severe depression.

For the standard diagnosis of depression as per structured clinical interview, DSM-IV criteria was used as DSM-V criteria came at the later phase of the current study. However, neither the core criterion symptoms applied to the diagnosis of major depressive episode nor the requisite duration of at least 2 weeks has changed from DSM-IV to DSM-V.

To assess diabetes specific distress, the Diabetes Distress Scale (DDS) score was used [4]. DDS is a 17-item instrument representing the distress experienced over the previous month using a scale, with each item scored from 1 (no distress) to 6 (serious distress) and comprising four subscales, i.e. emotional burden (five items), physician-related distress (four items), regimen-related distress (five items) and interpersonal diabetes-related distress (three items). Total DDS score is calculated as sum of 17 item scores divided by 17. A mean item score ≤ 2 indicates no distress, 2–2.9 indicates moderate distress and ≥ 3 indicates severe distress.

Estimation of sample size for the study was planned with the assumption that data is normally distributed and population (N) was very large. Sample size (n) was calculated by using the following formulae, $n = Z_{1-\acute{\alpha}}^2 (p (1 - p)/D^2)$. Hence, for this cross-sectional study to calculate the prevalence, the researcher had to take at least 247 subjects after considering the prevalence of depression in diabetes may be taken as near minimum average from previously published studies [5–7,17–18].

Sample size of 250 was therefore considered after keeping the power of the study at 95% confidence interval (CI) with an allowable type 1 error at 5%. A total of 369 patients were approached and among them, finally 250 patients agreed to participate in the study. With the guidance of the psychiatrist, the corresponding author himself had conducted all the assessment of depression including the structured interview and also the assessment of diabetes specific distress. Among the study group, 65 patients did not able to communicate in English and required assistance in Bengali for understanding. Those having difficulty in understanding the English language was given assistance in the form of translation in the local language (Bengali) without modifying the basic tool. The study was approved by the institutional ethics committee and all patients were consented before participating in the study.

Descriptive statistical analysis was carried out in the present study. Results on continuous measurements were presented on Mean ± SD (Min-Max) and results on categorical measurements were presented in number (n) and percentage (%). Significance was assessed at 5% level. Chi-square/Fisher Exact test had been used to find the significance of study parameters on categorical scale between two or more groups. Logistic regression was used to find out the odd's ratio.

4. Results

Study population of 250 patients with T2DM had mean age of 47.80 ± 8.34 years (25–65 years) and among them, 138 (55.2%) patients were male and 112 (44.8%) were female.

Based on BDI score, a total of 97 (38.8%) patients were found to suffer from depression, of which 44 (45.36%) patients had moderate, 29 (29.9%) had severe and rest (24.74%) had mild levels of depression. Based on DSM IV criteria, 73 patients of study population had depression and the prevalence of depression was 29.2%. A total of 62 (24.8%) patients were found to suffer from diabetes specific distress based

on DDS score. Patients on insulin therapy were more depressed than the patients on oral anti-diabetic drugs (p < 0.05). Also, patients on insulin therapy had high DDS score than patients on oral anti-diabetic drugs (OADS) (p = 0.011).

Only one (1) patient with moderate DDS score had depression based on DSM-IV criteria and no overlapping of symptoms could be established. Twenty four (24) patients who were not depressed based on DSM-IV criteria but had the positive screening status of mild depression based on BDI score had also shown associated evidence of diabetes distress as severe (N = 21) or moderate (N = 3) DDS score (Table 1). Patients with severe diabetes specific distress also had significant association of evidence with mild depression (p < 0.05) based on BDI score.

Among the total study population, 177 T2DM patients were diagnosed as non-depressed as per DSV-IV criteria.

Further analysis of these 177 subjects (based on DDS and BDI score), reveal that presence of diabetes specific distress leads to favorable BDI score even in these DSM IV negative cohort of non-depressed subjects (40.98%) and was also statistically significant (p < 0.001). To add, odds ratio was too 1.69 times higher (95% CI: 1.37–2.08) (Table 2) (Fig. 1).

The area under the ROC (Receiver operating characteristic) curve (Fig. 2) for predicting mild depression based on BDI score with relation to diabetes specific distress based on DDS score as per logistic regression model is 0.899 with 95% confidence interval (0.809, 0.990). Thus severity of diabetes distress may be considered as good predictor of self-reported questionnaires tools of depression at least up to mild depression based on BDI score. Also, the area under the curve is significantly different since p-value is <0.001 meaning that the logistic regression model for predicting mild BDI score by DDS severity classifies the group significantly better than by chance. From model validation, we found that the overall correctly specified group (mild depression based on BDI score) percentage is 90.9% based on diabetes distress severity.

5. Discussion

Depression and diabetes distress both are used generally as indicators of psychological state in patients with type 2 diabetes. Only selected studies have demonstrated the influence of diabetes distress on diabetes. Our study is possibly the first comparative study of the prevalence of diabetes distress and depression in type 2 diabetes patients in India. Prevalence of depression among patients with T2 DM from this study was within the range of estimates from similar studies from India [5–7,17]. On the contrary, in India, there is scarcity of data regarding the prevalence and magnitude of diabetes specific distress. A total of 24.8% patients with T2 DM were found to suffer from diabetes specific distress based on DDS score in our study. In a recent study from China, the prevalence of diabetes distress was almost 64% and the disease management and self-care were emotionally burdensome for the majority of diabetes patients [19].

The most widely used method of depression assessment is self-administered questionnaires, e.g., Beck Depression Inventory (BDI), the Center for Epidemiological Studies Depression (CES-D) scale and the Patient Health Questionnaire-9 (PHQ-9). There is also substantial overlap in different studies in the different measures of depression and diabetes specific distress [9,10]. Again, in our study, twenty four (24) patients who were not depressed based on DSM-IV score but with mild depression as per BDI score had shown high (N = 21) or moderate distress (N = 3). Up to the moderate category of distressed patients with T2 DM (based on DDS score), there was no significant overlapping of symptoms with BDI scoring. Patients with severe diabetes specific distress had significant association with mild depression (p < 0.05) based on BDI score. So, we may conclude that diabetes specific distress, when it becomes severe, may overlap with the mild depression symptoms based on BDI score. This was also supported by ROC curve analysis. However, in contrast, only one (1) patient with moderate DDS score had depression based on DSM-IV criteria. Therefore no overlapping of symptoms could be established between diabetes distress and depression based on DSM IV criteria. Roy et al. pointed out that self-reported tools (e.g. BDI score) should be used only as a first step to screen for symptoms that could then lead to a clinical interview [20]. And, in the same time, misidentifying distressed patients with diabetes as having depression could lead to unnecessary prescription of antidepressants [21]. Other studies also relied on questionnaire methods alone when linking depression to poor diabetes

Table 1 – Depression in distressed adult patients with type 2 diabetes.

Diabetes distress based on DDS score	Depression based on BDI score			
	No	Mild	Moderate	Severe
Moderate DDS Score	34	3	0	0
Severe DDS Score	3	21	1	0

Table 2 – Relationship of Diabetes Distress (based on DDS score) and depression (based on BDI score) in Non-Depressed subjects (N=177) (based on DSM IV criteria).

Diabetes distress	Depression as per BDI score		Total	p value	Odd's Ratio
	Absent	Present			
Absent	116 (n) 100%	0 (n) 0%	116 (n)	<0.001	1.69 (95% CI - 1.37–2.08)
Present	36 (n) 59.02%	25 (n) 40.98%	61 (n)		
Total	152 (n)	25 (n)	177 (n)		
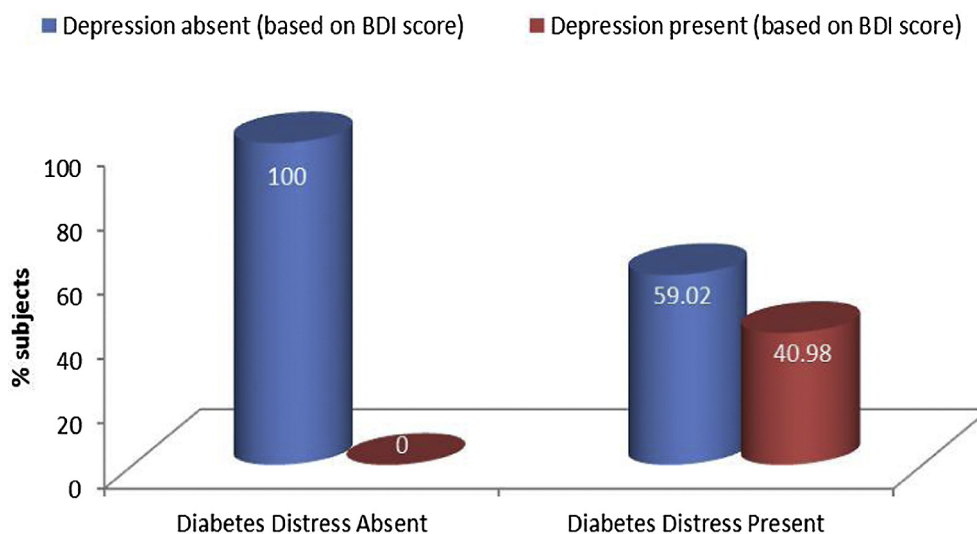
Fig. 1 – Relationship of diabetes distress and depression as based on BDI score.
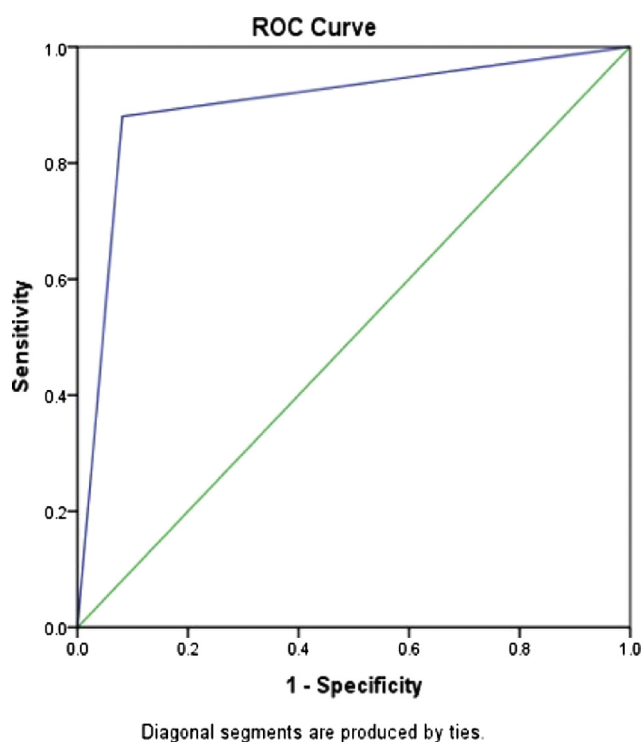

Diagonal segments are produced by ties.

Fig. 2 – ROC Curve showing relationship of mild category of depression (based on BDI score) with diabetes specific distress.

outcomes [22,23]. For example, in a recent meta-analysis, 11.4% of patients reached criteria for a depressive disorder using interview methods, whereas 31.0% had significantly elevated depressive symptoms using questionnaire methods [18].

The results of the Chinese study confirmed the hypothesis that even low levels of depression could have a significant negative impact on treatment adherence and suggested that diabetes distress was an effective indicator of minor depression which could impair treatment adherence and self-management. Therefore, they suggested that some specialized psychological intervention e.g., both using a diabetes distress scale and depression, would be an effective tool to prevent psychological problems and promote patient adherence with treatment in patients with type 2 DM [19].

But the use of a screening methodology that results in a high rate of false-positives for depression among patients with diabetes presents challenges to treatment planning and intervention. Therefore, in this study of patients with T2 DM, we used both self-administered questionnaires (BDI score) and standardized, structured clinical interview (DSM IV) for the screening and diagnosis of depression and also found probable overlapping of symptoms of diabetes specific distress (based on DDS score) with BDI score. So, for the avoidance of misidentifying distressed patients with diabetes as having depression, simple screening for diabetes specific distress and subsequently, proper counseling may avoid the use of antidepressants.

6.   Limitation

It may be observed that the author conducted all the assessment of depression (both DSM IV and BDI) and also the assessment of diabetes specific distress. It was possible that the findings from one might have biased the results of the other. However, to minimize the bias, the assessment and summation of the total scores were done on separate days.

7.   Conclusion

This present study may hypothesize that, in patients with type 2 diabetes, screening for depression with self-administered questionnaires (e.g. BDI score) may be appropriate but in presence of diabetes specific distress, the symptoms may overlap. So, the diagnosis of depression should be confirmed by a structured clinical interview (e.g. DSM IV criteria). Screening for the diabetes-specific distress also may allow a quick snapshot of patient's adjustment to the burden of diabetes and may be excluded before the screening for

depression. Therefore, a comprehensive approach to type 2 diabetes may include both the assessment of depression and diabetes specific distress with appropriate screening and diagnostic methods.

Any grants or fellowships supporting the writing of the paper

None.

Disclosure summary

The authors have nothing to disclose.

Conflicts of interest

Nil.

REFERENCES

[1] Mezuk B, Eaton WW, Albrecht S, Golden SH. Depression and type 2 diabetes over the lifespan: A meta-analysis. Diabetes Care 2008;31(12):2383–90.

[2] Talbot F, Nouwen A. A review of the relationship between depression and diabetes in adults: is there a link? Diabetes Care 2000;23:1556–62.

[3] Gask L, Macdonald W, Bower P. What is the relationship between diabetes and depression? A qualitative meta-synthesis of patient experience of co-morbidity. Chron Illn 2011;7:239–52.

[4] Polonsky WH, Fisher L, Earles J, et al. Assessing psychosocial stress in diabetes: development of the diabetes distress scale. Diabetes Care 2005;28:626–31.

[5] Joseph N, Unnikrishnan B, Raghavendra Babu YP, Kotian MS, Nelliyanil M. Proportion of depression and its determinants among type 2 diabetes mellitus patients in various tertiary care hospitals in Mangalore city of South India. Indian J Endocr Metab 2013;17:681–8.

[6] Mathew CS, Dominic M, Isaac R, Jacob JJ. Prevalence of depression in consecutive patients with type 2 diabetes mellitus of 5-year duration and its impact on glycemic control. Indian J Endocr Metab 2012;16:764–8.

[7] 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 2010;132:195–200.

[8] Gonzalez J, Delahanty L, Safren S, Meigs J, Grant R. Differentiating symptoms of depression from diabetes-specific distress: relationships with self-care in type 2 diabetes. Diabetologia 2008;51:1822–5.

[9] Fisher L, Skaff MM, Mullan J, et al. Clinical depression versus distress among patients with type 2 diabetes: not just a question of semantics. Diabetes Care 2007;30:542–8.

[10] Fisher L, Glasgow R, Strycker L. The relationship between diabetes distress and clinical depression with glycemic control among patients with type 2 diabetes. Diabetes Care 2010;33:1034–6.

[11] American Diabetes Association. Diagnosis and classification of diabetes mellitus. Diabetes Care 2012;35(Suppl 1):S64–71.

[12] Beck AT, Ward CH, Mendelson M, Mock J, Erbaugh J. An inventory for measuring depression. Arch Gen Psychiatry 1961;4:561–71.

[13] Beck AT, Steer RA, Ball R, Ranieri W. Comparison of Beck Depression Inventories - IA and - II in psychiatric outpatients. J Pers Assess 1996;67:588–97.

[14] Lustman PJ, Clouse RE, Griffith LS, Carney RM, Freedland KE. Screening for depression in diabetes using the Beck Depression Inventory. Psychosom Med 1997;59(1):24–31.

[15] First MB, Spitzer RL, Gibbon M, Williams JB. The structured clinical interview for DSM-III-R personality disorders (SCIDII). Part I. Description. J Person Dis 1995;9:2–12.

[16] Diagnostic and Statistical Manual of Mental Disorders: DSM-IV. 4th ed. American Psychiatric Association. Washington, DC: American Psychiatric Assoc; 1994.

[17] Bajaj S, Agarwal SK, Varma A, Singh VK. Association of depression and its relation with complications in newly diagnosed type 2 diabetes. Indian J Endocr Metab 2012;16:759–63.

[18] Anderson RJ, Freedland KE, Clouse RE, Lustman PJ. The prevalence of comorbid depression in adults with diabetes: a meta-analysis. Diabetes Care 2001;24:1069–78.

[19] Zhang Jie, Cui-ping Xu, Hong-xia Wu, et al. Comparative study of the influence of diabetes distress and depression on treatment adherence in Chinese patients with type 2 diabetes: a cross-sectional survey in the People's Republic of China. Neuropsychiatr Dis Treat 2013;9:1289–94.

[20] Roy T, Lloyd CE, Pouwer F, Holt RIG, Sartorius N. Screening tools used for measuring depression among people with type 1 and type 2 diabetes: a systematic review. Diabet Med 2012;29(2):164–75.

[21] Fournier JC, De Rubeis RJ, Hollon SD, et al. Antidepressant drug effects and depression severity: a patient-level meta-analysis. JAMA 2010;303:47–53.

[22] Fisher L, Chesla CA, Mullan JT, Skaff MM, Kanter RA. Contributors to depression in Latino and European - American people with type 2 diabetes. Diabetes Care 2001;24:1751–7.

[23] Lustman PJ, Anderson RJ, Freedland KE, de Groot M, Carney RM, Clouse RE. Depression and poor glycemic control. Diabetes Care 2000;23:934–42.