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Research Article

Association of major depression with blood pressure and vascular complications of type 2 diabetes mellitus

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ABSTRACT

Background: The WHO estimates the diabetic population to increase to 366 million by 2030 worldwide, with maximum 79.4 million Indians. Depression is an undiagnosed co-morbidity leading to significant disability, non-compliance and postulated to cause poorer glycemic control leading to early disease complications. We aimed to detect depression and study its correlation with vascular complications among type 2 diabetes mellitus (T2DM) patients.
Methods: In an observational study, 312 randomly selected T2DM patients were evaluated at tertiary care center in Northern India. Socio-demographic, clinical and laboratory data was collected. Montgomery Asberg depression rating scale (MADRS) was used to detect depression. Groups with and without major depression were compared for various diabetes variables. Statistical analysis was carried out using the SPSS version 14.0.
Results: One third T2DM patients (32.05%) suffered from major depression. Depression was significantly associated with diabetic patients having cardiac (p 0.01), ophthalmic (p 0.04), nephropathy (p 0.01), cerebrovascular (p 0.001) complications and diabetic foot (p 0.04). However, depression showed no significant association with systolic blood pressure, neuropathic and infectious complications.
Conclusions: Identification of depression and its appropriate management may go a long way in delaying diabetic vascular complications by improving treatment adherence and subsequently glycemic control.

Keywords: Depression, Diabetes, Complications, Blood pressure

INTRODUCTION

Diabetes mellitus is a growing epidemic in the last 30 years. The WHO has estimated a rise in the prevalence of diabetes by 2030 from 2.8% to 4.4% in all age group world-wide. WHO estimates the diabetic population to increase from 171 million in 2000 to 366 million in 2030 worldwide.[1] The international diabetic federation (IDF) estimated a global mortality of 6.8% in 2010 as a result of complications associated with diabetes.[2] Depression by 2020 is estimated to be 5.7% of total global burden of disease, and would be second leading cause of disability-adjusted life years (DALY). Studies have reported,

considerably higher prevalence of depression in diabetes than in normal population, ranging between 12-28%.[3] Depression leads to significant dysfunction, disability, poor control of life in suffers and poses a significant burden on caregivers. Meta-analyses have shown a pooled relative risk between 1.6 and 1.8 for Chronic heart disease in depressed subjects.[4,5] Depression has also been associated with poor compliance to treatment, which can be disastrous in chronic ailment like Type 2 diabetes (T2DM).[6,7]

India being the projected diabetic capital by 2030 and depression being poorly identified in this population, there is a need for research on the impact of depression complications of this chronic disease.

METHODS

Patient selection

The study sample consisted of 312 Type 2 DM patients, presenting at OPD or IPD from April 2013 to September, 2014 at department of medicine, Mahatma Gandhi medical college and hospital (MGMCH), Jaipur, Rajasthan, India.

General protocol

In an cross-sectional observational study, an informed consent was taken from 312 randomly selected type 2 diabetes mellitus patients, after excluding those who had received any form of psychiatric treatment (pharmacological or non-pharmacological), or those with significant unstable physical illness (e.g. acute myocardial infarction, diabetes ketoacidosis, hyperglycemic hyperosmolar state, or stroke).

Clinical protocol

After collection of socio-demographic data, clinical and laboratory profiling was done. Diabetic complications at time of interview were categorized as a) neuropathy, b) nephropathy c) retinopathy, d) cardiovascular, e) diabetic foot and f) infections.

Diagnoses of peripheral neuropathy was based on history of paraesthesia, absent ankle jerk or impaired sensations such as pain, temperature, touch or vibration sense. Direct/Indirect fundoscopy was used for making diagnosis of diabetic retinopathy after full dilatation of pupil. All doubtful cases were referred to department of ophthalmology for a second opinion. Blood pressure was recorded twice, 10 minutes apart- both arms, standing and lying down. Nephropathy was diagnosed based on 24 hour urine proteinuria (mg/24 h). A value >300 mg/dl was taken as confirmed nephropathy. Twenty four hour collection was done taking care of factors interfering with proteinuria (like uncontrolled hypertension, urinary infection etc.). Coronary artery disease was diagnosed from history and electrocardiograph (and/or 2 D echocardiography). Diet and exercise habits were assessed through a diabetes questionnaire, where subject‘s adherence to their health provider‘s treatment, in addition to diet and exercise habits was noted.

Assessment of major depression

Montgomery Asberg depression rating scale (MADRS) was developed from Asberg‘s comprehensive psychopathological rating scale, was used to assess the severity of depression. The 10 ratings use 0-6 severity scales, with higher scores reflecting more severe symptoms.

Laboratory data

Among the various laboratory parameters evaluated were complete blood count, glucose, total cholesterol, triglycerides, and creatinine etc., in all subjects, glycosylated hemoglobin (HbA1c) in all T2DM subjects.

Statistical analysis

Statistical analysis was carried out using the SPSS version 14.0.

RESULTS

The duration of T2DM ranged between 1-24 years. The mean duration of diabetes in studied subjects was 7.8±2.42 years. 50% (156) study subjects were in range of 5-9 years duration. 46 subjects had T2DM for ≥10 years; of which 8 subjects had T2DM for ≥20 years. Age of diabetic subjects, was not found to be significantly associated with depression (p 0.591).

The mean systolic and diastolic blood pressure was higher in males as compared to female (systolic 139.6±25.4 versus 126.2±26.2 and diastolic 85.6±13.8 versus 83.8±13.4). With an overall mean systolic BP of 134.8±25.6 mmHg and mean diastolic BP of 84.8±13.2 mmHg. 84 (26.92%) subjects had hypertension. 41 (48.8%) of these had a history of hypertension between 5 to 9 years; whereas 28 (33.33%) subjects had a history of <5 years duration and 15 (17.85%) subjects had a history of more than or equal to 10 years.

One Third (32.05%), of the T2DM subjects had major depressive disorder (MDD); score of MADRS ≥7. Of which 56% were females and 44% males, suggesting that females with T2DM were more prone for depression (p 0.032). The unadjusted mean systolic blood pressure (SBP) in depressed and non-depressed groups were comparable, i.e. 132.2 and 136.8 respectively. No significant correlation was found between unadjusted systolic blood pressure (SBP) and depression (p 0.68). Table 2 shows results of linear regressions, testing the adjusted associations of depression with SBP. The regression coefficients show the amount of change in each outcome per single unit change in each independent

variable. For categorical independent variables, the coefficients indicate the value of the difference in the means of each outcome between the categories specified in the row of above table and their reference category.

Depression did not show significant association with blood pressure. Our results suggested that blood pressure is more strongly associated with age than with any other independent variable as most age categories above 40 years differed significantly from reference category.

Prevalence of depression was significantly higher in all diabetes complication categories. Depression was significantly correlated with diabetic patients having cardiac complications (p=0.01; including CAD, CHF, MI, cardiomyopathy and arrhythmias). Ophthalmic (p=0.04; including retinopathy, macular edema, cataract). Nephropathy (p=0.01), diabetic foot (p=0.047) and cerebrovascular complications (p=0.001). Depression was not significantly associated with complications like neuropathy (p=0.08), and infections (p=0.09).

Table 1: Distribution of diabetic complications in depressed subjects.

Distribution of diabetic complications	Depression (%)	No depression (%)	p value
Cardiac	28	16.5	0.01*
Ophthalmic	26	16.98	0.04*
Nephropathy	27	14.15	0.01*
Cerebrovascular	16	5.19	0.001**
Neuropathy	31	21.23	0.08
Diabetic foot	14	7.08	0.04*
Infection	44	31.13	0.09

*p <0.05; **p<0.01.

Table 2: Linear regression estimates of the association of hypertension with depression.

Variable	Systolic blood pressure (mmHg)	
	Coefficient estimate	p value
Depressed*	-0.32	0.72
Female	1.57	0.06
Duration of diabetes	0.05	0.17
Insulin treatment	-0.12	0.94
Married	-0.23	0.84
Age (Years)		
30-39	3.51	0.21
40-49	8.17	<0.01
50-59	11.38	<0.01
60-69	11.79	<0.01
70-79	13.03	<0.01
≥80	10.55	0.04

DISCUSSION

The mean duration of diabetes were 7.8±2.42 years, with majority 50% (156) ranging suffering from 5-9 years of illness. Most studies from tertiary care centers reported similar results; Raval et al reported 8 years (4-13), Balhara et al 10.26±9.75 years and Agarwal et al 8.3±4.7 years, as the mean duration of DM in their study sample.[3,8,9]

Age of diabetic subjects, showed no correlation with depression (p 0.591). Several other studies have reported no association between age and prevalence of depression among T2DM patients, whereas there are very few studies that have reported a significant association between age and depression in diabetic subjects.[11-14]

Depression was significantly (p 0.032) higher among female patients (33.94% versus 29.93% males), which has also been reported by various other studies which can be attributed to various socio-cultural factors.[11,12,13,15] A meta-analysis, found that diabetes doubles the risk of depression and is significantly more among females 28.2% compared to 18% among males.[13] Whereas, few studies have not supported this correlation, 26.92% hypertensive subjects among studied T2DM patients; were comparable to results by Sosale et al and UKPDS study group.[8,10,14,16,17]

In our study, the unadjusted mean systolic BP (mmHg) was only slightly higher and was not significantly associated with depression (p 0.68), (132.2 depressed versus 136.8 non-depressed). On linear regression (Table 2) depression did not show significant association with systolic blood pressure (p 0.72). Several studies, support our results.[8,18] Few studies show contrary results mainly owing to smaller sample size.[15,19]

Presence of depression was higher in all diabetes complication categories studied (Table 1). Depression was significantly associated with diabetic patients having cardiac complications (p 0.01), ophthalmic (p 0.04), nephropathy (p 0.01), and cerebrovascular (p 0.001) and diabetic foot (p 0.04). Presence of complications among the study participants was found to be significantly associated with depression in the present study, which is similar to the observations made by Rahman et al.[11] Nasser et al in a Bahrain-based study found presence of nephropathy (p 0.011) and ischemic heart disease (p 0.046) to be significantly associated with depression and neuropathy was not (p 0.157) like in our study.[12] In similar Indian study, Guruprasad et al, found 25.9% of the depressive diabetic patients to have ischemic heart disease (IHD) as a significantly associated co-morbid medical illness (p 0.008) similar to our results.[10] Raval et al, observed that presence of neuropathy, nephropathy and diabetic foot disease was significantly associated with depression among diabetic patients.[8] The present study also found the presence of coronary artery disease to be associated with depression which was also reported

by Téllez-Zenteno et al.[20] Few other studies observed nephropathy, neuropathy and macro-vascular complications to be significantly associated with depression.[21-23] Depression is postulated to share a causal correlation with diabetes and its vascular complications. Neuro-endocrinal and biochemical changes (e.g. proinflammatory cytokines, hypercortisolemia, altered glucose transportation and leptin activation in limbic system) associated with diabetes or its treatment, have been implicated in this causal association.[24] These internal physiologic changes are thought to cause insulin resistance and beta islet cell dysfunction, ultimately leading to T2DM and its complications. In future longitudinal, population based, studies should be directed at impact of depression on severity of diabetic complications; morbidity and mortality benefit of treating depression.

CONCLUSION

Major depression is a very common, still undiagnosed co-morbidity in T2DM patients. Female diabetics are more prone for depression. Diabetic vascular complications (cardiac, ophthalmic, renal, cerebrovascular and diabetic foot) show close association with depression; in contrast to hypertension.

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REFERENCES

1. Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. Diabetes care. 2004;27(5):1047-53.
2. Egede LE, Ellis C. Diabetes and depression: global perspectives. Diabetes research and clinical practice. 2010;87(3):302-12.
3. Balhara YP, Sagar R. Correlates of anxiety and depression among patients with type 2 diabetes mellitus. Indian journal of endocrinology and metabolism. 2011;15(Suppl 1):S50-4.
4. Wulsin LR, Singal BM. Do depressive symptoms increase the risk for the onset of coronary disease? A systematic quantitative review. Psychosom Med. 2003;65:201-10.
5. Nicholson A, Kuper H, Hemingway H. Depression as an aetiologic and prognostic factor in coronary heart disease: A meta-analysis of 6362 events among 146 538 participants in 54 observational studies. Eur Heart J. 2006;27:2763-74.
6. DiMatteo MR, Lepper HS, Croghan TW. Depression is a risk factor for noncompliance with medical treatment: meta-analysis of the effects of anxiety and depression on patient adherence. Arch Intern Med. 2000;160:2101-7.
7. Lin EH, Katon W, Von Korff M, Rutter C, Simon GE, Oliver M, et al. Relationship of depression and diabetes self-care, medication adherence, and preventive care. Diabetes Care. 2004;27:2154-60.
8. Raval A, Dhanaraj E, Bhansali A, Grover S, Tiwari P. Prevalence and determinants of depression in type 2 diabetes patients in a tertiary care centre. The Indian journal of medical research. 2010;132:195-200.
9. Agarwal RP, Ranka M, Beniwal R, Sharma S, Purohit VP, Kochar DK, et al. Prevalence of Micro and Macro vascular complications in Type 2 Diabetes and their risk factors. International Journal of Diabetes Developing Countries. 2004;24:11-6.
10. Guruprasad, Niranjan MR, Ashwin S. A study of association of depressive symptoms among the type 2 diabetic outpatients presenting to a tertiary care hospital. Indian Journal of Psychological Medicine. 2012;34(1):30-3.
11. Rahman M, Rahman MA, Flora MS, Rakibuz-Zaman M. Depression and associated factors in diabetic patients attending an urban hospital of Bangladesh. Int J Collabor at Res Intern Med Public Health. 2011;3:65-76.
12. Nasser J, Habib F, Hasan M, Khalil N. Prevalence of depression among people with diabetes attending diabetes clinics at primary health settings. Bahrain Med Bull. 2009;31:1-7.
13. Anderson RJ, Freedland KE, ClouseRE, Lustman PJ. The prevalence of comorbid depression in adults with diabetes: a meta-analysis. Diabetes care. 2001;24(6):1069-78.
14. Poongothai S, Pradeepa R, Ganesan A, Mohan V. Prevalence of depression in a large urban South Indian population - The Chennai urban rural epidemiology study (CURES-70). PloS One. 2009;4:E7185.
15. Kiran N, Kohrt BA, Flora MS, Thapa N, Mumu SJ, Pathak R, et al. Prevalence of depression and associated risk factors among persons with type-2 diabetes mellitus without a prior psychiatric history: across sectional study in clinical settings in urban Nepal. BMC Psychiatry. 2013;13:309.
16. Aravind S, Prasanna Kumar KM, Sadikot SM, Nigam A, Bajaj S, Zargar AH, et al. Chronic complications in newly diagnosed patients with type 2 diabetes mellitus in India. Indian J Endocrinol Metab. 2014;18(3):355-60.
17. UKPDS study group, UK Prospective Diabetes study XII: Differences between Asian, Afro Caribbean and white Caucasian type 2 diabetic patients at diagnosis of diabetes, UK Prospective Diabetes Study Group. Diabet Med. 1994;11:670.
18. Stankoviü Z, Jašoviü-Gašiü M, Leþiü-Toševski D. Psychological problems in patients with type 2 diabetes: Clinical considerations. Vojnosanit Pregl. 2013;70(12):1138-44.
19. Nitin J, 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 Journal of Endocrinology and Metabolism. 2013;17(4):681-8.
20. Téllez-Zenteno JF, Cardiel MH. Risk factors associated with depression in patients with type 2 diabetes mellitus. Arch Med Res. 2002;33:53-60.
21. Lloyd CE, Dyer PH, Barnett AH. Prevalence of symptoms of depression and anxiety in a diabetic clinic population. Diabet Med. 2000;17:198-202.
22. de Groot M, Jacobson AM, Samson JA, Welch G. Glycemic control and major depression in patients with type 1 and type 2 diabetes mellitus. J Psychosom Res.1999;46:425-35.
23. Miyaoka Y, Miyaoka H, Motomiya T, Kitamura S, Asai M. Impact of sociodemographic and diabetes related characteristics on depressive state among non-insulin-dependent diabetic patients. Psychiatry Clin Neurosci. 1997;51:203-6
24. Talbot F, Nouwen A. A review of the relationship between depression and diabetes in adults: is there a link? Diabetes care. 2000;23(10):1556-62.

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