Original Article

A Study of Depression and Metabolic Syndrome (Mets) In Patients of Type 2 Diabetes Mellitus (T2DM) At Rural Tertiary Care Hospital

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Abstract:

Background: Co-morbid depression may occur among diabetic patients, and may be associated with poor outcomes. However, despite large diabetic population, literature of depression in T2DM from India is scare.
Objective: Our aim was to measure the proportion of depression and metabolic syndrome (Mets) in T2DM in rural population and to determine the association of depression with different demographic and clinical parameters.
Methods: This cross- sectional study was done at the out-patient clinic of rural tertiary care hospital in central India. Cases were eligible patients with T2DM. Depression and Mets were assessed with patient health questionairre- 9 (PHQ- 9) and IDF criteria respectively and their relationship with sociodemographic and clinical profile including complications were analyzed.
Results: Total 300 patients (58.67% females) were evaluated. The proportion of depression and Mets were 25.3%&45.3% respectively. Severe depression (PHQ score ≥15) was present in 13 (17.11%), moderate depression (PHQ score 10-14) in 28 (36.84%), and mild depression(PHQ score 5-9) in 35 (46.05%) of subjects. Depression and Mets were significantly more prevalent in females (33% vs 14.5%) and (53.4% vs. 33.9%) respectively. Patients having comorbid depression and Mets had significantly higher fasting plasma glucose, hypertension, TG, BMI, longer duration of diabetes and lower HDL-C while those with depresion also had significantly higher proportion of pill burden and various complication of T2DM ($p<0.05$).
Conclusions: Our study demonstrates comparatively lower proportion of depression in T2DM patients from rural population. Variety of demographic and clinical parameters are associated with depression in T2DM and those patients should be routinely evaluated for depression.
Key-words: Depression, Metabolic Syndrome, PHQ- 9, Type 2 Diabetes Mellitus.
Key Messages: In this study, we found a comparatively lower prevalence of depression among patients with T2DM from rural population. Patients having co morbid depression and Mets in T2DM had significantly higher age, female sex, higher fasting plasma glucose, hypertension, higher TG, higher BMI, longer duration of diabetes and lower HDL-C while those with depression also had significantly higher proportion of pill burden and various complication of T2DM. The T2DM and depression are causally related and needs attention from physicians to ensure better treatment outcomes. Patients of T2DM should be universally screened for depression, while special attention should be given to those who have metabolic syndrome and complications of T2DM. More large scale studies are required to determine the mechanisms of different associated factors and to test interventions to decrease the risk of co-morbid depression and their adverse outcomes.

Introduction:

Type 2 Diabetes Mellitus (T2DM) is one of the leading non-communicable diseases across the world. WHO estimated increase in the prevalence of T2DM to 4.4% in 2030, with 366 million diabetics worldwide and India is expected to be the leading country for diabetic population with estimated 79.4 million patients by 2030.[1] Depression is associated with significant disability, poor control of life in sufferers and leads to significant burden on caregivers and WHO has proposed the theme for world health day for 2017 as "Depression: let's talk". Depression is estimated to be 5.7% of total global disease burden by 2020, and would be the second leading cause of disability-adjusted life years.[2] Depression can be viewed as a modifiable independent risk factor for T2DM and for complications from either type 1 or T2DM.[3] Meta-analyses showed pooled relative risk between 1.6 and 1.8 for incident CVD in depression.[4, 5] The definitions of metabolic syndrome (Mets) specify following criteria: increased waist circumference, hypertension, dyslipidemia and fasting hyperglycemias. The combination of these components is a strong predictor of cardiovascular disease and T2DM.[6,7] There is an increasing interest in the association between Mets and depression in T2DM and whether causal relationships are involved.[8] Bjorntorp hypothesized that psychological problems are associated with metabolic disorders via visceral fat accumulation.[9] The role

of hypothalamic- pituitary-adrenal (HPA) axis in pathogenesis of central adiposity and Mets suggests Mets as a neuroendocrine disorder.[10] Several studies have been conducted to link T2DM with depression, with results generally supporting association of T2DM with depression. Much of the research around depression among diabetics has been conducted but most of them from high income countries.[11] However, there are limited studies from India investigating depression in diabetes and rural populations which have different social and demographic characteristic as compared to urban population. This study adds to the limited literature of depression in T2DM from India where depression among type 2 diabetics is scarcely researched topic despite large diabetic population.[12] Our study was aimed to study relation of Mets and depression in T2DM patients attending rural tertiary care hospital in central India.

Material and Methods:

Study design: Cross sectional observational study

Aims and objectives:

1. To study frequency of depression in T2DM.
2. To study frequency of metabolic syndrome in T2DM.
3. To study the socio-demographic profile of patients of T2DM with depression.
4. To study association of metabolic syndrome and depression in T2DM.
5. To study correlation of depression with diabetes related complications.

Inclusion criteria:

i. Diagnosed T2DM patients
ii. Age >18 years.

Exclusion criteria:

i. Prior psychiatric illness or treatment.
ii. Current diagnosis on Axis 1 of DSM IV-TR other than depression.
iii. Patients with T1DM.
iv. Pregnancy.
v. Recent death in family or patients who lost their job in last six weeks.
vi. Alcohol and smoking addiction.

Study population: Consecutive patients of diagnosed T2DM attending the outpatient department of tertiary care hospital serving patients from rural areas.

Sample size: 300

Duration of study: 1 year

Data collection: Eligible patients were selected and enrolled in the study after written and informed consent. A pre-tested structured questionnaire was used to collect information on socio-demographic and clinical characteristics from clinical records and history from patients. Patients were examined for anthropometric parameters including waist circumference and blood pressure. Waist circumference was measured using a non-stretchable measuring tape. Patients were asked to stand erect with both feet together. Waist circumference was measured at the midpoint between iliac crest and lower margin of ribs to the nearest centimeter. Blood pressure was recorded in the sitting position in the right arm using the mercury sphygmomanometer (Diamond Deluxe BP apparatus, Pune, India). BP readings were recorded to the nearest 2mm Hg from the top of the mercury meniscus. Systolic pressure was recorded at the first appearance of sound and diastolic pressure at the disappearance of the sound (Korotkoff phase V). A mean of two readings taken 5 minutes apart was recorded. Hypertension was diagnosed in subjects who were on antihypertensive medication or had a systolic BP ≥130 mmHg or diastolic BP ≥85 mmHg. Blood samples (3 ml) were drawn after 8-12 h overnight fasting for the measurement of lipid profile [high density lipoprotein (HDL) cholesterol, and triglycerides (TG)] and fasting plasma glucose (FPG) levels and other relevant biochemical analysis as per patient profile. Plasma glucose was measured using the glucose oxidase method, triglycerides by standard enzymatic procedures and HDL cholesterol by direct assay method. Patients were assessed for Mets as per international diabetes federation (IDF) definition. Neuropathy will be evaluated by history and clinical examination using monofilament, vibration sense by biothesiometer and ankle reflex. Incipient nephropathy was diagnosed by Micral test and it was presumed to be present if two readings out of three of urinary albumin to creatinine ratio were ranging from 30 to 300 µg/mg. Clinical nephropathy was evaluated by the estimation of 24 h urine protein and was diagnosed if urine proteins were more than 500 mg/total volume of urine. Retinopathy was diagnosed by detailed fundoscopy and was classified according to Diabetic Retinopathy Study (DRS) and Early Treatment Diabetic Retinopathy Study (ETDRS). CAD was diagnosed based on positive medical history (documented myocardial infarction (MI), angina pectoris and coronary artery bypass graft) and/or ischemic changes on a conventional 12-lead ECG which included ST-segment depression (Minnesota codes 1-1-1 to 1-1-7) or Q-wave changes (Minnesota codes 4-1 to 4-2). Peripheral vascular disease (PVD) was diagnosed by definitive history of intermittent claudication or if two or more peripheral pulses were absent in both feet. The Depression was assessed by administering the two items PHQ-2 and nine item PHQ 9, a self report version of Primary Care Evaluation of Mental Disorders that assesses the presence of major depressive disorder using modified Diagnostic and Statistical Manual, Fourth edition criteria. In this study Hindi and Marathi version of PHQ 2 and PHQ-9 were used. A score of 3 or more on PHQ2 indicated positive screen and patients were assessed for severity using the PHQ-9. It has been validated in Indian population and is considered to be reliable tool for diagnosis of depression[13].

Definitions:

Metabolic syndrome (Mets): According to the IDF definition[7] for a person to be defined as Mets, must have:

- Central obesity (waist circumference 90 cm for men and 80 cm for women,

Plus any two of the following four factors

- TG level: >150 mg/dl, or specific treatment.
- HDL cholesterol: < 40 mg/dl in males and < 50 mg/dl in females, or specific treatment.
- BP: >Systolic 130 or Diastolic 85 mm Hg, or antihypertensive treatment

- Fasting plasma glucose (FPG) >100 mg/dl or treatment of T2DM.

Depression[15]:

- Depression was assessed by administering the nine item PHQ- 9. Severity classified as Mild: 5- 9; moderate: 10-14 and severe: >15.

Type 2 diabetes mellitus:

- Patients already diagnosed and taking treatment with either insulin or oral hypoglycemic drugs
- Those newly diagnosed as per American Diabetes Association (ADA 1997) criteria.[14]

Ethics: Informed consent was obtained from all the study patients. Identity and confidentiality of patients was protected and they were labeled with numerical for consideration in study for analysis and they had to bear no cost for study purpose.

Quality control measures: Data collection was monitored by senior faculty of department from time to time.

Statistics Statistical analysis was performed using SPSS version 13.0 software. Categorical variables were expressed as mean ± standard deviation and percentages. Comparisons between quantitative data were conducted using independent-sample t tests and categorical variables were analyzed using chi-square tests. Data was presented as odds ratios (OR) with 95% confidence intervals (CI). A binary logistic regression analysis was used to determine association of depression with various complications of diabetes and other parameters. For all statistical tests, p value <0.05 was considered statistically significance

Results:

During the study period, total 300 patients of type 2 diabetes mellitus (T2DM) who fulfilled the inclusion and exclusion criteria were enrolled in study. Patients enrolled for the study were in age group of 29-87 years. The largest numbers of patients; 102 (34%) and 90 (30%) were in the age group of 51-60 years and 41-50 years while lowest 26 (8.67%) and 28 (9.33%) were from age >71 yrs and <40 years respectively (*Table* 1). Out of these, 176 were females (58.67%) and 124 (41.33%) were males (*Table* 1). The distribution of variables like age, fasting blood sugar, duration of diabetes, BMI and BP in study population was similar in both males and females and the differences observed were not statistically significant (p>0.05). However, males had higher values of TG while HDL-C were higher in females and this difference was statistically significant (p<0.05) (*Table* 2). Mets was diagnosed in 136 patients (45.3%) with the proportion of Mets in females (53.4%) being more than males (33.9%) with statistically significant difference. (p<0.05) (*Table* 3) The depression was found in 76 patients (25.3%) with the proportion of depression in females (33%) being more than males (14.5%) with statistically significant difference (p<0.05) (*Table* 4). Out of the 300 patients, 64 (21.3%) had depression with Mets and among these subjects, 48 were females and 16 were males. The proportion among female of depression and Mets together was more (27.3 %) than males (12.9 %) with statistically significant difference (p<0.05) (*Table* 5). Out of 144 patients having high triglycerides; 70 (48.61%) also had depression while only 6 (3.85%) of total 156 patients having normal levels of triglyceride had depression and this difference was statistically significant (p<0.05) (*Table* 6). Out of 160 patients having hypertension; 58 (36.25%) also had depression while only 18 (12.88%) of total 140 patients not having hypertension also had depression with statistically significant difference (p< 0.05) (*Table* 7). Out of 70 patients having low HDL cholesterol; 52 (74.29%) also had depression while only 24 (10.43%) of total 230 patients having normal levels of HDL cholesterol had depression with statistically significant difference (p<0.05) (*Table* 8). Patients with depression were compared to those without depression, had higher mean age (63.42 vs. 54.47), mean FBS (136.5 vs. 117), mean duration of diabetes (11.55 vs.5.63), mean BMI (27.97 vs.24.64), mean systolic BP (128.58 vs.121.75), mean diastolic BP (80.16 vs.74.09), mean TG (174 vs.140.6) and lower HDL (40.47 vs.52.4) with statistically significant differences for all variables (p<0.05) (*Table* 9). T2DM patients having both depression and Mets compared to those without depression and Mets had higher mean age (63.16 vs. 55), mean FBS (139.31 vs. 117.23), mean duration of diabetes (12.66 vs.5.64), mean BMI (28.71 vs.24.61), systolic BP (128.50 vs.122.12), diastolic BP (80.63 vs.74.27), TG (176.28 vs.141.69) and lower HDL (39.63 vs.52.03) with statistically significant differences for all variables (p<0.05) (*Table* 10). This study revealed that the proportion of depression (PHQ score>5) among T2DM was 25.3% (76 of 300) using the PHQ 9 scale. Out of these 76 depression patients, 35 (46.05%) patients had PHQ score of 5-9 and were classified as mild depression, while 28 (36.84%) and 13 (17.11%) had PHQ scales of moderate (10-14) and severe depression (>15) respectively (*Table11*).

A variety of macro and micro vascular complications were noted during the study *(Table 12*). Out of these complications, macro and micro vascular complications in general were seen more commonly in females than males (49.43% vs. 28.22% and 85.22% vs. 69.35% respectively with p<0.05). Complications like Neuropathy (76.13% vs. 54.03%), Nephropathy (38.06% vs. 33.87%), Proliferative retinopathy (32.95% vs. 12.90%), CAD (26.14% vs. 16.13%), PVD (13.66% vs. 5.64%) and Stroke (5.68% vs. 3.22%) were seen more commonly in females than in males (p<0.05). Complications like Diabetic foot (12.90% vs. 3.98%), Amputation (4.84% vs. 1.13%) and Non-Proliferative retinopathy (20.16% vs. 0.80%) were seen more commonly in males as compared to females. (p<0.05)

A binary logistic regression analysis was carried on variety of factors associated with depression in T2DM patients (Table13). It showed significant association between number of prescribed medicine (≤5 vs.>5) (OR=1.27, 95% CI=1.01-1.44), Neuropathy (OR=1.94, 95% CI=1.03-3.66), Nephropathy (OR=1.81, 95% CI=1.02-3.21), CAD (OR=1.56, 95% CI=1.02-1.67), PVD (OR=1.86, 95% CI=1.05-3.46), Stroke (OR=1.34, 95% CI=1.04-1.64) and Diabetic foot (OR=2.32, 95% CI=1.06-5.86) while factors like Insulin use (OR=1.27, 95% CI=1.01-1.44), Retinopathy (OR=1.27, 95% CI=1.01-1.44) had no significant association.(p>0.05)

Discussion:

The present study was conducted on type 2 diabetes mellitus (T2DM) patients to know the proportion of depression and Mets in T2DM and to know various variables associated with them. In this study; Mets was defined using the new International Diabetes Federation (IDF) definition with specific cut-off for waist circumference for Indian population[7] and depression was diagnosed using PHQ 9 scale with score >5 and severity was classified as mild, moderate and severe with scores 5-9, 10-14 and >15 respectively.[14]

In the present study, proportion of Mets in T2DM was 43.5% using the new IDF definition. The present prevalence is higher than study conducted by Ramachandra et al, who reported it as 41% in non-diabetics,[15] Misra et al noted 29.9%,[16] similar to Mundhe et al (43%).[17] The higher rate of prevalence in the present study may be due to the study comprising of diabetics only. Eliaesson et al noted higher prevalence of 77% in T2DM.[18] Our study showed higher proportion of Mets in females as compared to males (53.40% vs. 33.9%) supported by Marques et al (23 Vs. 12% respective study).[19] Similarly, the higher proportion in present study may be due to the study comprising of only T2DM.

The association of depression in T2DM patients is a poorly researched topic in India.[12] Urban clinic based studies from India have reported that between ¼ to ⅓ of T2DM were depressed and these studies demonstrated great variability in proportion of depression in T2DM (highest 84%, and lowest 16.9%).[11] Ali et al reported 27.05% prevalence of co-morbid depression in T2DM patients using BDI and MINI scale while it was 11.11 % among the non- diabetic healthy relatives.[20] In addition, few more clinic based studies from India by Joseph et al,[21] Raval et al,[22] Madhu et al,[23] Siddiqui et al[24] and Thour et al[25] used PHQ- 9 questionnaire for the assessment of depression among diabetics. A study from Mangalore (Karnataka state, southern India) by Joseph et al found a prevalence of 45.2% among T2DM, 30.9% among them had moderate depression while 14.3% had severe depression. Out of these 45.2% people with co morbid depression, majority (75%) were unaware of depression while only 11.5% of those aware had consulted a physician for treatment.[21] Raval et al from Chandigarh (from Northern India) reported a 41% prevalence of depression among T2DM patients in a tertiary care centre.[22] Another tertiary hospital based study from southern India by Madhu et al reported a prevalence of depression as 49% among the T2DM patients.[23] The prevalence of depression in individuals with T2DM was almost twice (35.38%) that in controls (20%) in a study by Siddiqui et al while Thour et al reported this as 41%.[24,25] All these studies were carried out in urban or mix of population from rural and urban setting. Thour et al, [25] had reported higher proportion of depression in rural population as compared to urban population, Raval et al, [22] noted no difference among urban and rural population while Niraula et al[26] reported higher proportion in urban population. This observed difference might be due to the different socioeconomic and cultural factors in different parts of India which has great diversity in its population. In our study on rural population from central India, depression was diagnosed using PHQ 9 scale in 25.3% of T2DM with majority of patients (82.89%) having mild to moderate depression while 17.11% had severe depression. Different studies in past have demonstrated variable proportions of depression among male and females. Our study had higher proportion of depression in females as compared to males. Ali et al, [20] Madhu et al, [23] and Poongothai et al[27] had similar finding of higher proportion of depression in female while no sex predilection for depression was observed by Raval et al[22] and Thour et al.[25] The higher proportion of depression in females might be influenced by secondary socio-cultural roles, different psychological attributes, hormonal effects and poor social support.

We found statistically significant association between depression and increasing age, fasting sugar levels, duration of diabetes, BMI, hypertension, high triglyceride levels and low HDL-C levels. In study by Cardenas et al, [28] depressions were significantly associated with high triglyceride and low HDL-C while BMI and hypertension were not associated significantly. In another study, Raval et al[22] reported significant association of depression with increasing age and BMI while hypertension, duration of diabetes and hyperglycemias were not significantly associated with depression. Many researchers including Katon et al, [29] Gudelj-Radić et al[30] and Sacco et al[31] have reported strong association between obesity and depression. Altered body image with other associated co-morbidities in obesity further perpetuates the depression. The association between glycemic control and depression have conflicting results.[32, 33] Poor glycemic controls might result in depression and *vice versa* depression may result in poor glycemic control. However, in our study we could not measure HbA_{1c} levels due to financial reasons. As one might expect, the number of pill patient has to take daily has bearing on patients' behaviour and in our study, significant association was found between depression and >5 pills daily, was seen similar to literature.[22, 34] Both micro and macro vascular complications of T2DM including neuropathy, nephropathy, diabetic foot, stroke, PVD and CAD were associated with higher proportion of depression. This finding is similar to other researchers who noted increased proportion of depression with various complications of T2DM.[22, 35-36.] However, some researchers have reported no significant association of depression with duration of diabetes, glycemic control and micro vascular complications.[24] Our study demonstrated no significant association with retinopathy and insulin use with depression, similar findings were also reported by Raval et al and Nailboff. [22, 37]

LIMITATIONS OF STUDY

This study being a cross-sectional one, causal relation between depression and diabetes cannot be made. The study was carried on hospital based sample population so selection bias cannot be excluded, as more depressed persons or those with diabetes related complications might be seeking specialized diabetes care. Also, we could not measure the glycemic control using HbA1c levels.

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Table 1: Age distribution of patients studied

Age group (years)	Female	Male	Total (%)
< 40	14	14	28 (9.33)
41-50	48	42	90 (30)
51-60	68	34	102 (340
61-70	32	22	54 (18)
> 71	14	12	26 (8.67)
Total	176 (58.67%)	124 (41.33%)	300 (100)

Table 2: Sex wise distribution of different variables among the study population

Variables	Male				Female				Unpaired t test	
	Mean	SD	Median	IQR	Mean	SD	Median	IQR	T value	P value
Age (years)	56.29	9.35	56.08	15.50	57.06	9.27	57.00	15.50	-0.546	0.585
FBS (mg%)	120.6	27.05	116.0	32.25	122.8	26.71	119.0	31.75	-0.796	0.426
Duration of DM (years)	6.29	5.31	4.00	8.00	7.73	5.15	8.00	8.00	-1.897	0.058
BMI (kg/m^2)	25.00	2.01	24.87	2.77	25.83	2.73	25.33	4.93	-1.632	0.103
Systolic BP	122.4	11.37	120.00	10.00	124.2	14.32	120.00	20.00	-0.632	0.539
Diastolic BP	74.77	6.96	70.00	10.00	76.23	8.23	80.00	10.00	-1.217	0.224
HDL (mg %)	54.31	5.61	54.50	5.00	45.91	9.18	45.00	15.00	-5.747	< 0.0001
TG (mg %)	139.8	23.10	135.00	32.50	155.5	27.84	164.50	50.75	-3.306	0.00095

Table 3: Sex distribution of metabolic syndrome

Metabolic syndrome	Male		Female		Total	
	Number	Percentage	Number	Percentage	Number	Percentage
Yes	42	33.9	94	53.4	136	45.3
No	82	66.1	82	46.6	164	54.7
Total	124	100	176	100	300	100

Pearson Chi-Square = 5.603, df = 1, p = 0.018 (Significant)
OR for metabolic syndrome (yes/no) = 0.447 (95% CI = 0.228-0.875)
For cohort sex = male = 0.618 (95% CI = 0.407-0.937)
For cohort sex = female = 1.382 (95% CI = 1.057-1.808)

Table 4: Sex distribution of depression

Depression	Male		Female		Total	
	Number	Percentage	Number	Percentage	Number	Percentage
Yes	18	14.5	58	33	76	25.3
No	106	85.5	118	67	224	74.7
Total	124	100	176	100	300	100

Pearson Chi-Square = 6.537, df = 1, p = 0.011 (Significant)
OR for depression (yes/no) = 0.345 (95% CI = 0.15-0.796)
For cohort sex = male = 0.5 (95% CI = 0.274-0.915)
For cohort sex = female = 1.449 (95% CI = 1.129-1.859)

Table 5: Sex distribution of depression with metabolic syndrome

Depression	Male		Female		Total	
	Number	Percentage	Number	Percentage	Number	Percentage
Yes	16	12.9	48	27.3	64	21.3
No	108	87.1	124	72.7	236	78.7
Total	124	100	176	100	300	100

Pearson Chi-Square = 4.475, df = 1, p = 0.034 (Significant)
OR for depression with metabolic syndrome (yes/no) = 0.3951 (95% CI = 0.1641-0.9508)
For cohort sex = male = 0.5463 (95% CI = 0.2361-1.2642)
For cohort sex = female = 1.328 (95% CI = 0.751-2.5462)

Table 6: Relation between depression and triglycerides

Depression	TG High		TG Normal		Total	
	Number	Percentage	Number	Percentage	Number	Percentage
Yes	70	48.61	6	3.85	76	25.33
No	74	51.39	150	96.15	224	74.67
Total	144	100	156	100	300	100

Pearson Chi-Square = 39.664, df = 1, p < 0.0001 (Significant)
OR for depression (yes/no) = 23.649 (95% CI = 6.822-81.974)
For cohort TG = high = 2.788 (95% CI = 2.108-3.688)
For cohort TG = normal = 0.118 (95% CI = 0.039-0.3522)

Table 7: Relation between depression and hypertension

Depression	Hypertension yes		Hypertension no		Total	
	Number	Percentage	Number	Percentage	Number	Percentage
Yes	58	36.25	18	12.88	76	25.33
No	102	63.75	122	87.12	224	74.67
Total	160	100	140	100	300	100

Pearson Chi-Square = 10.801, df = 1, p = 0.001 (Significant)
OR for depression (yes/no) = 3.854 (95% CI = 1.627-8.885)
For cohort Hypertension = yes = 1.676 (95% CI = 1.281-2.193)
For cohort Hypertension = no = 0.435 (95% CI = 0.24-0.789)

Table 8: Relation between depression and HDL-C

Depression	Low HDL-C		Normal HDL-C		Total	
	Number	Percentage	Number	Percentage	Number	Percentage
Yes	52	74.29	24	10.43	76	25.33
No	18	25.71	206	89.75	224	74.67
Total	70	100	230	100	300	100

Pearson Chi-Square = 57.835, df = 1, p < 0.001 (Significant)
OR for depression (yes/no) = 24.796 (95% CI = 9.443-65.111)
For cohort HDL-C = low = 8.515 (95% CI = 4.389-16.519)
For cohort HDL-C = normal = 0.343 (95% CI = 0.214-0.55)

Table 9: Comparison of various variables between cases with and without depression

Variables	Male				Female				Unpaired t test	
	Mean	SD	Median	IQR	Mean	SD	Median	IQR	T value	P value
Age (years)	63.42	8.26	64.50	11.25	54.47	8.50	53.00	11.75	-5.17	< 0.001
FBS (mg %)	136.50	29.89	128.00	53.00	117.00	23.82	110.50	30.75	-3.57	0.0004
Duration of DM (years)	11.55	5.38	12.00	7.00	5.63	4.29	4.00	6.00	-5.57	< 0.001
BMI (kg/m^2)	27.97	2.52	28.70	4.08	24.64	1.83	24.60	2.80	-6.44	< 0.001
Systolic BP	128.58	15.31	130.00	21.00	121.75	11.96	120.00	17.50	-2.41	0.0157
Diastolic BP	80.16	8.62	80.00	20.00	74.09	6.80	70.00	10.00	-8.76	0.0002
HDL (mg %)	40.47	8.03	39.00	13.25	52.40	6.97	54.00	9.00	-8.76	< 0.001
TG (mg %)	174.00	18.63	178.00	21.00	140.62	24.12	133.50	37.75	-6.49	< 0.001

Table 10: Comparison of various variables between cases with & without metabolic syndrome and depression

Variables	Male				Female				Unpaired t test	
	Mean	SD	Median	IQR	Mean	SD	Median	IQR	T value	P value
Age (years)	63.16	7.01	62.50	9.75	55.00	9.07	53.00	12.25	-4.708	< 0.001
FBS (mg %)	139.31	30.39	134.50	52.50	117.23	23.74	111.00	30.25	-3.828	0.00013
Duration of DM (years)	12.66	4.54	12.50	6.50	5.64	4.36	4.00	6.25	-6.379	< 0.001
BMI (kg/m^2)	28.71	1.94	28.90	3.43	24.61	1.80	24.60	2.73	-7.545	< 0.001
Systolic BP	128.50	14.85	130.00	23.00	122.12	12.40	120.00	12.50	-2.135	0.03276
Diastolic BP	80.63	8.78	80.00	20.00	74.27	6.87	70.00	10.00	-3.792	0.00015
HDL (mg %)	39.63	7.55	38.50	11.75	52.03	7.27	54.00	9.00	-6.444	< 0.001
TG (mg %)	176.28	17.47	178.50	20.75	141.69	24.37	135.50	41.00	-6.388	< 0.001

Table 11: Severity of depression seen among study population

Level of depression	Number	Percentage
Mild	35	46.05
Moderate	28	36.84
Severe	13	17.11
Total	76	100

Table 12: Complications seen among study population

Complications	Overall		Male		Female	
	Number	Percentage	Number	Percentage	Number	Percentage
Any micro vascular	236	78.67	86	69.35	150	85.22*
Neuropathy	201	67	67	54.03	134	76.13*
Nephropathy	109	36.33	42	33.87	67	38.06*
Retinopathy	118	39.33	41	33.06	77	43.75*
Non proliferative	44	14.67	25	20.16	19	10.80*
Proliferative	74	24.67	16	12.90	58	32.95*
Any macro-vascular compilations	122	40.67	35	28.22	87	49.43*
CAD	66	22	20	16.13	46	26.14
PVD	31	10.33	7	5.64	24	13.66
Stroke	14	4.67	4	3.22	10	5.68
Diabetic foot	23	7.67	16	12.90	7	3.98
Amputation	8	2.67	6	4.84	2	1.13

Table 13: Binary logistic regression analyses showing risk factors associated with depression in T2DM patients

Risk factors	**Odds ratio (95% CI)**	**P value**	**Significance**
Number of prescribed medicine (≤5 *vs.*>5)	1.27 (1.01-1.44)	0.035	Significant
Insulin use	1.08 (0.60-1.95)	0.796	Not significant
Any micro vascular complication	2.39 (1.14-5.04)	0.022	Significant
Neuropathy	1.94 (1.03-3.66)	0.002	Significant
Nephropathy	1.81 (1.02-3.21)	0.041	Significant
Retinopathy	1.18 (0.78-1.79)	0.43	Not significant
Any macro vascular complications	2.27 (1.20-4.30)	0.012	Significant
CAD	1.56 (1.02-1.67)	0.035	Significant
PVD	1.86 (1.05-3.46)	0.017	Significant
Stroke	1.34 (1.04-1.64)	0.001	Significant
Diabetic foot	2.32 (1.06-5.86)	0.016	Significant

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