



Systemic Regulatory Abnormalities in Glycemic Control and its Relation with Depression - A Cross-Sectional Study



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Article History:

Received: 02nd Mar., 2024

Accepted: 19th June, 2024

Published: 30th June, 2024

Keywords:

Depression, Glycemic index, Depression severity, Type 2 Diabetes Mellitus

How to cite this Article:

Aravindh. M, Shabeeba Z Kailash, Kailash Sureshkumar (2024). Systemic regulatory abnormalities in glycemic control and its relation with depression - A cross-sectional study. *International Journal of Experimental Research and Review*, 40(spl.), 164-175.

DOI:

<https://doi.org/10.52756/ijerr.2024.v40spl.013>

Abstract: Globally, depression is the 3rd leading cause of disability-adjusted life years. The presence of depression and its symptoms has been associated with improper control of glucose and poor glycemic index and a bidirectional relationship was seen between depressive disorders and diabetes mellitus. Depression, even at subclinical levels, has the tendency to increase the risk of incident type 2 diabetes by 25–60%. This study aims to find the prevalence of Type 2 diabetes mellitus (T2DM) in depression patients and to find the relationship between the severity of depression and the severity of T2DM in a Cross-sectional study. A total of 178 patients who attended psychiatry OPD of a tertiary healthcare hospital for a study period of 6 months were recruited into the study after considering inclusion and exclusion criteria evaluated by an experienced psychiatrist. Details like sociodemographic profiles and clinical data related to Major depression and T2DM were collected through self-structured proforma. To assess the severity of depression, HAM-D scale was used and the glycemic severity measure was used to assess the severity of T2DM by a well-trained psychiatrist. Statistical analysis was done and results were framed. The prevalence of Type 2 Diabetes mellitus in depressive disorder patients was found to be 25.2%. A significant association was seen between the severity of T2DM and the severity of depression, with a p-value of 0.013 and a chi-square value of 12.699. Significance with certain clinical factors like insulin usage ($F=5.635$; $p = 0.019$) and drug compliance ($F=16.841$; $p < 0.001$) was seen in T2DM patients with depression. Nearly $\frac{1}{4}$ th of the patients with depression had T2DM and the severity of hyperglycaemia was also found to be high as those patients were on insulin administration, other medical comorbidity disorders were present and drug compliance was found to be poor. Triglyceride glucose index was also found to be high in patients with severe depression, which contributes to improper blood glucose balance. Treating and reducing both the severity of T2DM and depression simultaneously is needed to improve the functioning of the patients and improve the retention in treatment and drug compliance, thereby preventing morbidity and mortality.

Introduction

Distinct studies have shown there was a hyperlink between non-communicable diseases and depressive disorder, in addition to other types of mental illnesses with excessive health-related complications. There is a bidirectional link between depression and diabetes, which increases the risk's between each other (Li et al., 2024).

In a Mendelian Randomization study, it has shown a significant causal relationship of depression on Type 2 Diabetes mellites. Depression, even at subclinical levels, has the tendency to increase the risk of incident type 2 diabetes by 25–60% (Rotella and Mannucci, 2013; Sur et al., 2023; Maina et al., 2023; Sarkar et al., 2023; Biswas et al., 2023). In concordance with 'The American Heart



Association study,' depressive disorders are the most common mental health illness that is associated with nearly 27% of patients with diabetes, 23% of patients with cerebrovascular disorders and 40% of patients suffering from cancer. Nearly 2-4 fold rise in depression cases was seen in patients having chronic non-communicable disorders like cancer, cardiovascular disorders, cerebrovascular disorders or diabetes mellitus (Mukeshimana and Chironda, 2019; Roy et al., 2023; Acharya et al., 2023). Hence, the World Mental Health Organisation(WHO) insisted on screening regularly for depressive disorders in patients who were diagnosed with one or more NCD [Non-Communicable Disorders] (Anwar et al., 2017).

Stress is one of the major concern for many chronic diseases ranging from psychiatric like depression to endocrine disorders like diabetes (Bhattacharjee and Manna, 2016). Risk factors that are possibly responsible for an individual getting diabetes include genetic predispositions, poor lifestyle, physical activities, smoking and other forms of tobacco usage along with consumption of alcohol and stressful lifestyle (Ilamathi et al., 2023). The presence of depression and its symptoms has been associated with improper glycemic index due to poor self-care and poor lifestyle that showed an interplay was present between depressive disorders and Diabetes mellitus in certain studies done across the globe (Crispín et al., 2015). Type 2 Diabetes mellitus patients can have a risk of a 2.5-fold increase in getting stroke and nearly 1.5 folds increase in getting dementia in future (Van sloten et al., 2020; Sarwar et al., 2010; Cheng et al., 2012).

Non-treated depressive disorders can end up increasing the incidence of diabetes mellitus and will be more commonly seen in the old age population. Uncontrolled T2DM can worsen the condition and develop problems such as heart disease, kidney disease, nerve damage, foot pain, vision and mental health problems (Chellaiyan et al., 2022). Depression treated with antidepressants has shown a reduced association with the risk of diabetes mellitus (Campayo et al., 2010). Abnormal functioning of the stress related reaction, neurotransmission, synaptic plasticity, inflammatory processes and neurogenesis were known to be the risk factors for pathophysiology of depression. The oxidative stress in depression is being important for both its onset and its progression. Indeed, increased generation of reactive oxygen species and lack of efficient antioxidant response could trigger processes like acute & chronic inflammation, neuron degeneration, and death, leading to disturbances in serotonergic pathways by affecting neurogenesis and synaptic plasticity (Correia et al., 2023). This could cause

autoimmune disorders and that can trigger glucose dysregulation.

Compared to the general population, people with diabetes are two-folds as likely to have mental health problems. T2DM is a metabolic disease that can affect the Psychological state of mind (Praveen et al., 2020). Etiopathogenesis of diabetes-related stroke and depression is multifactorial, complex and incompletely understood phenomenon. As in elderly people, type 2 diabetes mellitus is a commonly identified medical illness that has increased relationship with brain stroke and depression where the mechanism of action should be assessed as soon as possible to prevent complications. Cognitive dysfunction and depression frequently co-occur with diabetes (Sullivan et al., 2013; Cummings et al., 2016). Depression is one of the common causes of pregnant women getting diabetes (OuYang et al., 2021).

The medical comorbidities are linked with some serious physical and mental health complications like high morbidity and mortality, low quality of life, debility, increased health-related costs and hospitalization. Prevalence of T2DM in major depression was 21.2% in a study. Some studies hypothesise depression increases the release of hyperglycemic hormones as a response to stress. Some other studies show insulin resistance during testing tolerance to insulin and testing tolerance to glucose in those patients with depression (Kulkarni et al., 2014; Engidaw et al., 2020).

Some studies have shown high HBAIC levels and high BMI were associated in patients with depression. A Meta-analysis study reported that depressed adults have a 37% increased risk of developing type 2 diabetes mellitus. In a large U.S. adult cross-sectional study suggested that a higher triglyceride glucose index had a significant correlation with elevated depressive symptoms. Various studies are proving that there is a greater prevalence of depressive patients having T2DM, and the risk factors, severity, and complications of T2DM were increasingly seen in depressive patients due to various factors that affect glycemic control. In the current study, we have found the prevalence of Type 2 diabetes mellitus in depression patients and found the association between the severity of depression and with severity of T2DM. In addition, we have also explored the relationship between Triglycerides, Body Mass Index (BMI) and Triglyceride glucose index (TyGI) in patients with Depression.

Methodology

The study was conducted among the 178 depressed patients satisfying diagnostic and statistical manual of mental disorders V TR - Major Depressive disorder criteria as evaluated by experienced psychiatrists

attending psychiatry OPD at tertiary healthcare hospital for a period of six months were taken and it was a cross-sectional study. The sample size was calculated with a 95% confidence interval and the precision per cent of 6%. The inclusion criteria were those patients of age group more than 30 years of all genders and should be diagnosed with depression satisfying DSM V TR - Major Depression criteria. The exclusion criteria were those patients with diabetes other than type 2 diabetes (such as gestational diabetes, iatrogenic diabetes, type 1 diabetes, latent autoimmune diabetes, maturity-onset diabetes of the young and secondary), patients who were not willing to participate in this study, patients with other psychiatric illnesses and severe systemic disorders. Materials used in the study were self-structured proforma for collecting sociodemographic details and clinical data relevant to depression and T2DM status of patients. Socio-economic status was assessed with B.G Prasad's classification for the year 2021 (Majhi and Bhatnagar., 2021). To assess depression severity, Hamilton Depression Rating Scale (HAM-D) was used to classify the symptoms which would be difficult to obtain and can be scored as 0 - absent; 1 - mild; 2 - moderate; 3 - severe; 4 - incapacitating. In general, the higher the total score the more severe the depression. HAM-D score level of depression is 10 - 13 for mild; 14-17 for mild to moderate; >17 for moderate to severe (Hamilton M., 1967). T2DM is diagnosed with "American Diabetes Association Criteria for Diabetes Mellitus", hence biochemical glycemetic details of patients were collected through the blood sample and assessed for FBS, PPBS, HBA1c in order to diagnose and classify the severity of T2DM based on glycemetic severity measure by HBA1c level with <7% as Good, 7% - < 8% as intermediate and $8\% \leq$ as poor control and secondly by, treating Hypoglycemic drugs whether monotherapy or combination therapy [with insulin] (Mori et al., 2021). Triglyceride glucose index is calculated by formula = $\ln[\text{triglyceride (mg/dL)} \times \text{fasting blood glucose (mg/dL)} / 2]$ (Salazar et al., 2017). During data collection, ethical considerations were respected by respecting the confidentiality and anonymity of participants; all participants were protected against any harm; the team of health care professionals composed of a registered nurse, a mental health nurse and medical doctor was in place to assist any person in need. Proper ethical committee approval got before starting the study from Institutional Human Ethics Committee for Faculty Research (CARE IHEC -II) under reference number - IHEC-II/0294/23. Throughout the study, complete evaluation and assessments were carried out by an experienced

psychiatrist and statistical analysis was done, following which results were framed.

Statistical analysis

The statistical analysis was done using SPSS (Statistical Package for the Social Sciences) Statistics (Version 27). After confirming the normality check using the Kolmogorov-Smirnov test, the categorical variables were described in numbers and percentages. Continuous variables were described with mean, Standard deviation or median. The chi-square test was done to find the relationship between categorical variables and for continuous variables, independent sample t-test and one-way ANOVA were used. The significant value is considered as <0.05 at a 95% level of confidence interval. The depression prevalence was described as frequency and percentages.

Results

According to our study, the prevalence of T2DM in depressive disorders patients was 25.2% (45 patients) out of which nearly 11.2% (20 patients) depressive patients had severe type 2 diabetes mellitus, 6.7% (12 patients) depressive patients had mild severity of T2DM and 7.3% (13 patients) depressive patients had moderate severity of T2DM. In a study sample of 178 depressive patients, as per table 1 & figure 2 findings, that compared the detailed sociodemographic analysis of individuals with depression of various severity and was found to be that the marital status of an individual shows a significant p-value of 0.011* which displays unmarried and widow population sample found to have increased chances of getting depression when compared with married population sample. Unlike other studies, except marital status all other sociodemographic factors like age, sex, location, education, occupation and socioeconomic status of an individual doesn't contribute as a risk factor for depression in our study sample.

As per table 2 & figure 3 comparison of our study, using the Chi-square test, found that there was a significant association between the severity of T2DM and the severity of depression with a p-value of 0.013*. The table shows an increased number of severely depressed patients (42 patients) experiencing the severe type of T2DM (8 patients) and the affecting frequency was high when compared to other severity types of T2DM and the complications due to T2DM (15.7%) was also found to be increased, that shows the severity of depression plays a role in diabetes severity and its complications (28 patients suffers from diabetes-related complications in depressive patients).

Table 1. Comparison table between socio-demographic profile with severity of depression.

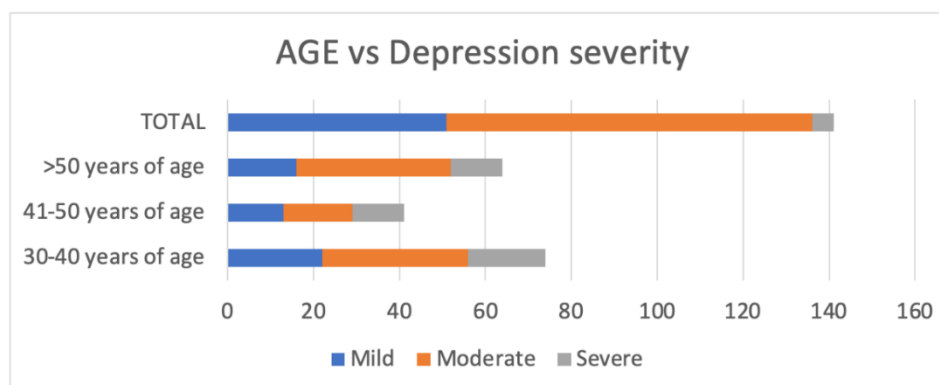
Variables	Depression severity			Total	Chi-square value; P value	
	Mild	Moderate	Severe			
Age (in years)	30-40	22	34	18	74	$\chi^2=4.919$; P=0.296
	41-50	13	15	12	40	
	>50	16	36	12	64	
	Total	51	85	42	178	
Gender	Male	22	30	14	66	$\chi^2=1.434$; P=0.488
	Female	29	55	28	112	
	Total	51	85	42	178	
Marital Status	Married	45	57	30	132	$\chi^2=13.064$; P=0.011*
	Married(Widow)	0	8	7	15	
	Unmarried	6	20	5	31	
	Total	51	85	42	178	
Location	Urban	33	50	28	111	$\chi^2=1.200$; P=0.549
	Rural	18	35	14	67	
	Total	51	85	42	178	
Education	Illiterate	0	2	4	6	$\chi^2=7.237$; P=0.124
	Schooling	31	45	22	98	
	Graduates	20	38	16	74	
	Total	51	85	42	178	
Occupation	Employed	34	63	28	125	$\chi^2=1.010$; P=0.604
	Unemployed	17	22	14	53	
	Total	51	85	42	178	
SES	Lower	17	22	14	53	$\chi^2=3.663$; P=0.454
	Middle	14	17	12	43	
	Upper	20	46	16	82	
	Total	51	85	42	178	

**P value is calculated using chi-square test with $p < 0.05$ as statistically significant, *SES- Socio-economic Status

In table 3, TygI (Triglyceride glucose Index) was calculated with the formula of “ $\ln[\text{triglyceride (mg/dL)} \times \text{fasting blood glucose (mg/dL)/2}]$ ”, and with the cut-off value of 4.49 according to the study by Salazar et al. for insulin resistance and this study’s sensitivity was 82.6% and specificity of 82.1%. When this index was plotted against depression severity using an independent t-test and it was found to have a positive correlation with a p-

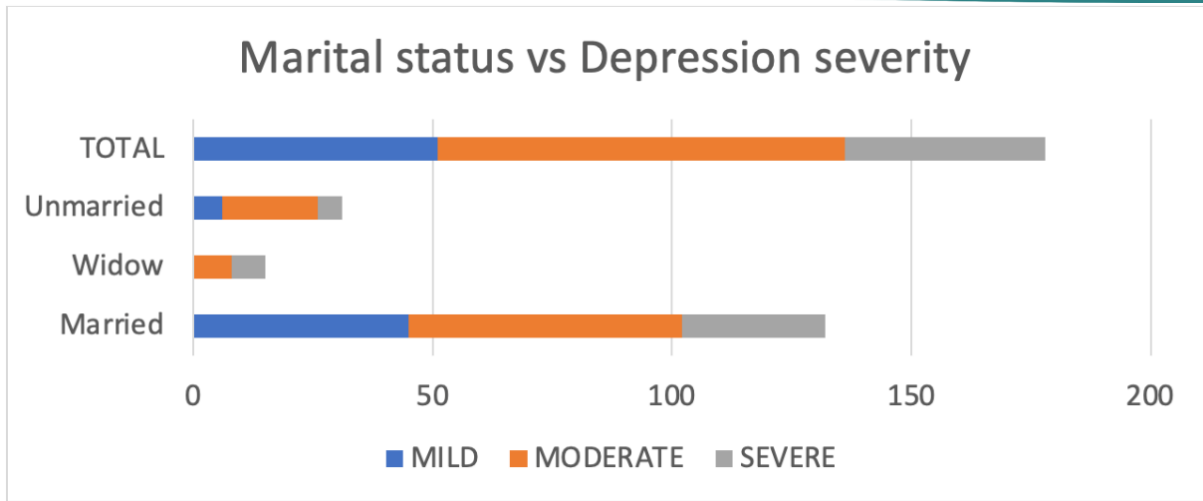
value of 0.002* and a frequency value was 6.378. The total mean value was 4.6896 with a standard deviation value of 0.30453.

Clinical variable factors were compared with the severity of depression in table 4 using an independent t-test and showed significance with certain factors like insulin usage ($F=5.635$; $p = 0.019^*$) and drug compliance ($F=16.841$; $p < 0.001^{**}$). Age, gender, family history of



Total number of depressed patients

Figure 1. Relationship between age and depression severity.



Total number of depressed patients

Figure 2. Relationship between marital status and depression severity.

Table 2. Comparison table between severity of depression and Type 2 Diabetes mellitus.

Depression severity	Diabetes Severity			Total
	No	Mild-Moderate	Severe	
Mild	46	5	0	51
Moderate	61	12	12	85
Severe	26	8	8	42
Total	133	25	20	178
Chi-square=12.699; p = 0.013*				
**P value is calculated using chi-square test with p<0.05 as statistically significant.				

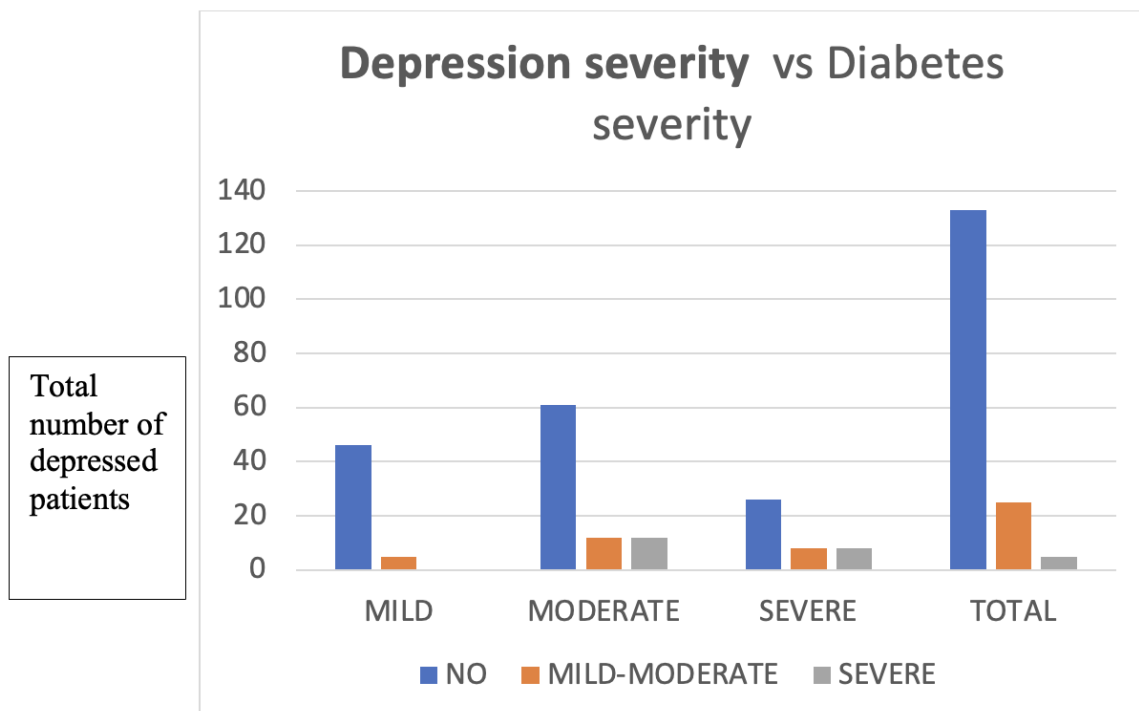


Figure 3. Relationship between Depression severity and Type 2 Diabetes severity.

Table 3. Comparison table between triglycerides glucose index value (Mean) and depression severity.

Depression severity	N	Mean	SD
Mild	51	4.5837	.19629
Moderate	85	4.6971	.30571
Severe	42	4.8029	.36701
Total	178	4.6896	.30453
F=6.378; p = 0.002*			
**P value is calculated using independent t-test with p<0.05 as statistically significant.			

Table 4. Comparison table between clinical factors of Type 2 Diabetes mellitus with HAM-D Score (Mean).

	Variables	N	Mean	SD	p Value
Family history of T2DM	Yes	75	15.5867	4.17552	F=1.183;P=0.278
	No	103	16.2913	4.33325	
	Total	178	15.9944	4.26985	
Insulin	Yes	15	18.4667	4.34029	F=5.635;p = 0.019*
	No	163	15.7669	4.20401	
	Total	178	15.9944	4.26985	
Drug compliance	Poor	31	18.3548	3.64736	F=16.841;p <0.001**
	Fair	45	17.6889	5.40127	
	Good	102	14.5294	3.18320	
	Total	178	15.9944	4.26985	
BMI	Normal	83	15.7831	4.27143	F=972;P=0.380
	Overweight	58	15.7414	4.36718	
	Obese	37	16.8649	4.11071	
	Total	178	15.9944	4.26985	
**Actual P values are given by using one way ANOVA with P < 0.05 as statistically significant, *SD- Standard Deviation, *T2DM- Type 2 Diabetes Mellitus, *BMI- Body Mass Index					

Table 5. Comparison table between depression severity with suicide attempt/ideas.

Depression severity	Suicide attempt/ideas		Total
	Yes	No	
Mild	0	51	51
Moderate	25	60	85
Severe	28	14	42
Total	53	125	178
Chi-square=48.967; p < 0.001**			
**P value is calculated using chi-square test with p<0.05 as statistically significant.			

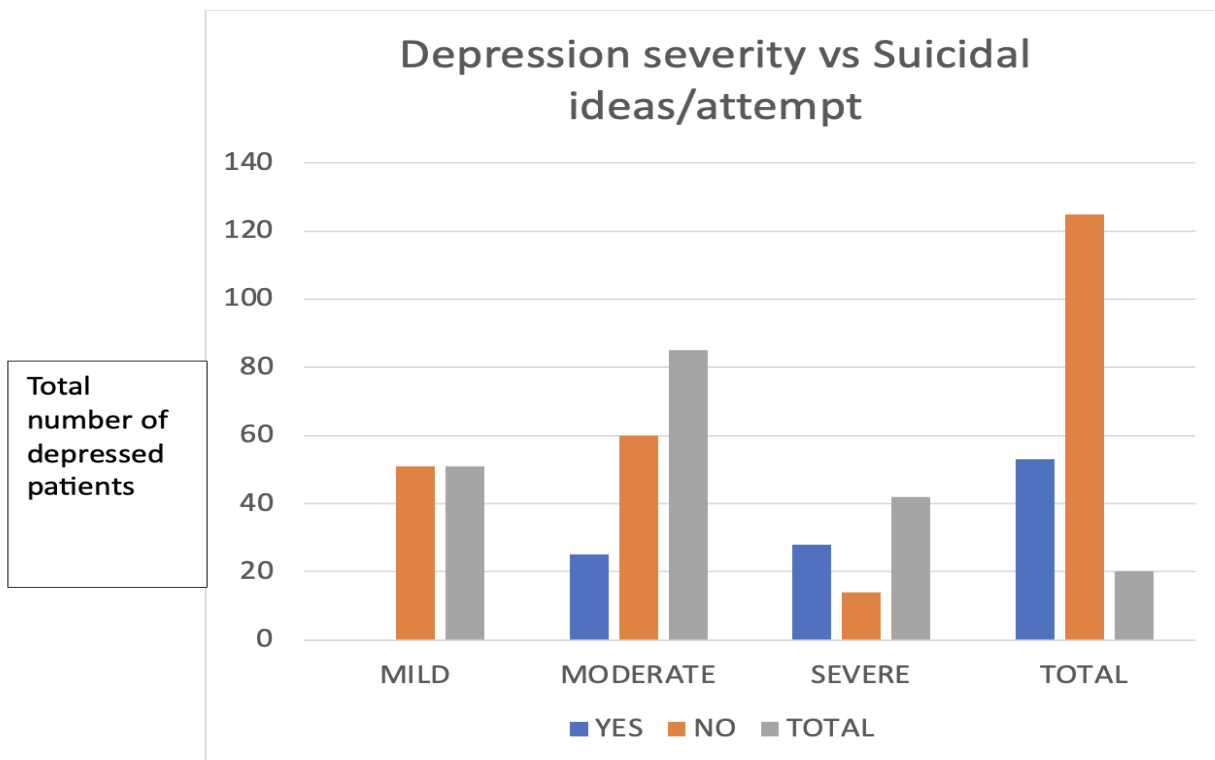


Figure 4. Relationship between depression severity and suicidal attempt/ideas.

Table 6. Comparison table between comorbid factors with HAM-D Score (Mean).

Variables		N	Mean	SD	P value
Type 2 Diabetes Mellitus	Present	45	17.76	4.406	t=2.999; p<0.001**
	Absent	135	15.55	4.232	
Systemic Hypertension	Present	44	16.91	4.419	t=1.414; p=0.158
	Absent	136	15.84	4.338	
Other Comorbidity	Present	28	18.36	3.724	t=3.042; p=0.003*
	Absent	152	15.68	4.363	
**P value is calculated using independent sample t test with p<0.05 as statistically significant, *SD-Standard Deviation					

T2DM and BMI (Body Mass Index) factors showed insignificant relationships with the severity of depression.

Table 5 & figure 4 compares the severity of depression with suicide attempts/ ideas and this comparison was done using a chi-square test and showed a significant relationship with a p-value of <0.001** and a Chi-square value was 48.967. In this table, we can make out without any doubt that the suicidal ideas and previous attempts of suicide were high among the patients with severe depression (28 patients) and found to be low in moderate depression patients and it was nil among the patients with mild depression.

Table 6 findings imply there was a significant relationship between depression severity scores with T2DM and other comorbid physical illnesses (like CAD,

BA, OA, and neuropathies) with significant p-values of 0.00** and 0.003* except systemic hypertension.

Discussion

The prevalence of T2DM was found to be 25.2% in a sample population of 178 depressed individuals in the current study, where 45 patients had T2DM out of 178 depressed patients, which is really high in number. Many studies have proven that single or divorced individuals have higher chances of getting depression (Shek., 1995), as the current study also proves the literature once again as the unmarried and widow population sample suffers from depression significantly more than married individuals. Age, sex, location, education, occupation and socioeconomic status of an individual doesn't contribute as a risk factor for depression in our study sample, contrary to the literature, as in the Ghana population there was a significant relationship with the above

sociodemographic status (Bonful and Anum., 2019). In a study, with a total of 3021 (8.85%) people from 34128 individuals were reported to have depression which was found to be a greater number affected by depression and depression was nearly two-fold high among people with lower socioeconomic status (Li et al., 2021).

Studies have described that an increase in the risk of developing T2DM was seen in those with depression because of clinical symptoms, lifestyle disturbance and sociodemographic background (Demakakos et al., 2010). Insulin resistance, which is more commonly seen in diabetes mellitus, has increased the risk of depression in humans (Li et al., 2024). Depression can increase type 2 diabetes risk by 60% (Mezuk et al., 2008) and increase mortality (Egede et al., 2005). In a recent study with the variables like body mass index classification, daily duration of work, general health conditions, pre-existing health conditions and psychological issues like depression can also contribute to somatic pain symptoms (Madhavudu et al., 2023). In our study, the prevalence of T2DM was found to be high (25.2%) in depressive patients, but there were no significant relationships established about age, sex and socioeconomic background. However, it was found to be highly significant, with a p-value of 0.013* between the severity of T2DM and the severity of depression that implies severity of depression plays a vital role in developing severe forms of T2DM and increases the possibility of diabetes-related complications and that in turn leads to disability and increases the morbidity, mortality through suicides by aggravating the stressful situations even more stressor. Hence, in our study, there was significance between depression severity and suicidal ideas and attempts in their lifetime with the p-value of <0.001*.

In a study after careful investigation found that the prevalence of suicide attempts and suicidal ideas were seen in 91 diabetic patients. This study also found that the lifetime prevalence of suicidal ideas was 26.4% in diabetic individuals, which is really high when compared to the suicide rates observed in the general public population (Goldston et al., 1994). In our sample population of 178 patients, nearly 53 depressive patients attempted or had ideas of suicide at least once in their lifetime out of which more than half the patients were diagnosed to have severe depression (28 patients) and the rest all were of moderate severity of depression (25 patients).

Chronic stress weakens the immune system and increases cytokine production by Hypothalamo-Pituitary adrenal axis (HPA axis) or Sympathetic nervous system. Many inflammatory cytokines induce insulin resistance

by interfering with the function of pancreatic beta cells and increasing the chance of forming T2DM (Wang et al., 2013). There are many studies relating the possibility of total cholesterol, high-density cholesterol, triglycerides, low-density cholesterol and very low-density cholesterol playing a major role in insulin resistance and developing non-alcoholic fatty liver disease and thereby increasing the serum glucose level ultimately leading to the incidence of T2DM, poor control of T2DM and increasing its complications risk. There were no suicidal attempts/ideas seen in patients with mild-severity of depression. In the current study, we have used the formula “ $(\ln[\text{triglyceride (mg/dL)} \times \text{fasting blood glucose (mg/dL)/2}])$ ” (Salazar et al., 2017) to calculate the values and prove that this triglyceride glucose index of depressive patients has its effects to deal with depression severity and it was found to be positive and has significance with the p-value of 0.002*. As per our study results, it again proves that the severity of depression leads to poor drug compliance ($p < 0.001^*$) and that indeed leads to an increase in the severity of T2DM even more further which may end in disability and mortality in the worst-case scenario. Depression severity also increases the chances of T2DM patients becoming more dependent on external insulin due to insulin resistance and systemic dysregulation of glucose control, as in current study shows the insulin dependency in depressed patients by having significant relationship of usage of external insulin is more in severely depressed patients when compared to mild severity of depression. High TyG index has been associated with increased depression.

Multivariate adjusted HR was higher in patients in the 4th quartile of the TyG index than in patients in the 1st quartile of the TyG index which implies the direct proportionality of depression with type 2 diabetes mellitus (Shi et al., 2021).

Recent research, after proper evaluation has unveiled influential mutual inter-relationship between diabetes and depression (Basiri et al., 2023). Depression is more common in diabetes.

This can cause people with diabetes to get worse and make patients less compliant with the treatment for T2DM (Gonzalez et al., 2008). In our study, the p-value was 0.019*, which shows the positive significance between the severity of depression and insulin usage and its dependence. There was no relative significance between the severity of depression and other parameters like age, sex, family history of T2DM and BMI.

In a recent study, comorbid chronic medical illnesses are seen as part of depression nowadays, as the most common physical illnesses like T2DM, systemic hypertension, osteoarthritis, bronchial asthma, cancer, etc., have higher chances of getting depression due to their chronic nature, course of illnesses and complications faced by the patients (Frank et al., 2023). There was a significant relationship seen in our study with T2DM and other comorbid physical illnesses (like CAD, BA, OA, and Neuropathies) with significant p-values of 0.00** and 0.003*, unlike systemic hypertension.

There are certain limitations in this study, we have not compared the case group with the control group population. Unlike other studies, we have not included other psychiatric illnesses except depression, have not seen other lifestyle factors that could have contributed as risk factors to disorders and have not collected data regarding the medications used and their duration. The study population is more than 30 years old in order to exclude Type 1 diabetes mellitus and other types of Diabetes that will not include the population below 30 years where mood disorders are common. The study also possesses certain strengths, like the complete evaluation of patients throughout the study was done by an experienced psychiatrist. We need to extend this study further in future by collecting those biomarkers of inflammation, oxidative stress and other neuroendocrine markers that are contributing to depression and diabetes. Hence, in future, all medical practitioners should know to apply the depression screening scale in all chronic medical comorbidity patients to rule out depression so that we can prevent the worsening of the condition and mortality rate. Various other chronic non-communicable medical and surgical illnesses could bedridden the patient, like cancer, limb deformity, blindness, etc., where the chances of them getting mental health disturbances like depression, anxiety disorders, substance abuse, etc., are more common than the general population. The future direction of the study to find the prevalence and relationship of above-mentioned disorders and to develop a strategy of treatment through consultation liaison psychiatry, thereby providing holistic care to the patients, can be done.

Conclusion

Depression is the major health concern in the population with non-communicable diseases like T2DM. As the study concludes that, patients with depression has increased chances of getting type 2 diabetes mellitus and at the same time the severity of the diseases also marches

up and, complicating the conditions even further. In the current study, nearly ¼ th of the patients with depression had T2DM, and the severity of hyperglycaemia was also found to be high as those patients were on insulin administration. Other medical comorbidity disorders were present, and most importantly, drug compliance was found to be poor.

Triglyceride glucose index was also found to be high in patients with severe depression which contributes to improper blood glucose balance. Insulin resistance increases in the body, which affects blood glucose regulation, eventually leading to consistent hyperglycaemia and related symptoms that can end up in diabetes-related complications like coronary artery disease, stroke and peripheral neuropathy. Triglycerides, total cholesterol and other lipid values have its own effect on glucose regulation and diabetes-related complications. In patients with severe depression, suicidal ideas/attempts were on increasing trend.

Suicide rates are increased because of the complications of the present medical condition and negative attitudes and thoughts towards medical conditions due to depression. Diabetes mellitus and depression represent a prevalent and impactful comorbidity that affects patient and family quality of life, medical costs, long-term diabetes complications, usage of medical services, glycemic self-management and early mortality (Mary de Groot., 2023).

Regular and proper self-management of their illnesses is required in patients with Type 2 diabetes mellitus, which becomes a problem because of depression that impacts their life's social and occupational functioning. Depression mainly disturbs emotion, behavior and cognition, thereby impacting their daily life. The possible pathogenesis of Depression in NCD is stress and inflammation as per numerous studies. Treating and reducing the severity of T2DM and depression simultaneously is needed to improve the quality of life and functioning of the patient and improve the retention in treatment and drug compliance. Depression is the most commonly diagnosed mental illness that has both disability and mortality risks. Hence, it should be diagnosed as early as possible and treated. Periodical health checkups and physician's consultations should be done to control the glucose and to improve the mental status of the mind. Medical practitioners should do screening of depression in patients with chronic medical comorbidities and immediate referral to a mental health professional is required to prevent the other risks related to the condition.

Acknowledgement

The authors thank the Chettinad Hospital and Research Institute (CHRI) and Chettinad Academy of Research and Education (CARE) for providing permissions and supporting the study throughout its duration with all necessary equipment.

Conflict of Interest

The authors declare no conflict of interest.

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How to cite this Article:

Aravindh. M, Shabeeba Z Kailash, Kailash Sureshkumar (2024). Systemic regulatory abnormalities in glycemic control and its relation with depression - A cross-sectional study. *International Journal of Experimental Research and Review*, 40(spl.), 164-175.

DOI: <https://doi.org/10.52756/ijerr.2024.v40spl.013>



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