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Assessment of Metabolic Profiles and Sociodemographic Correlations Among Patients with Type 2 Diabetes Mellitus Using Antidepressants: A Cross-Sectional Study in Duhok, Iraq

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Abstract

Background: Type 2 Diabetes Mellitus (T2DM) is linked to insulin secretion failure or resistance, causing high blood sugar. Depression is closely related to T2DM, and they influence each other. Although antidepressants are broadly used, it has not been clear how they influence glycated hemoglobin (HbA1c) levels and lipid profiles.

Objective: The purpose of this study was to look into the relationship between antidepressant medication and metabolic control, specifically lipid and glycemic (HbA1c) profiles, in patients with Type 2 Diabetes Mellitus in Duhok, Iraq. Additionally, the study aimed to ascertain how lifestyle choices, such as smoking and physical activity, and sociodemographic traits, such as gender, education, and employment, affect these metabolic parameters.

Methods: A comparative cross-sectional study was performed on 162 patients with T2DM divided into three groups consisting of non-depressed diabetic patients (n=100), newly diagnosed depressed patients (n=20), and depressed patients on antidepressants (n=42). HbA1c, fasting blood sugar (FBS), Total cholesterol (TC), Triglycerides (TG), high-density lipoprotein (HDL), and other clinical, demographic, and biochemical parameters, Body mass index (BMI) and Low-density lipoprotein (LDL) were measured.

Results: Gender, education, employment, and physical activity all showed statistically significant differences between the groups. Men with depression had higher FBS and HbA1c values than men without depression. Additionally noteworthy were the lipid profiles and BMI values, which showed elevated cholesterol and signs of obesity in the depressed groups. Diabetes complications and metabolic changes were influenced by antidepressants.

Conclusion: In patients with type 2 diabetes, antidepressant therapy is closely linked to modifications in lipid profiles and glycemic control, with metabolic effects being more pronounced in men. These findings emphasize the need for individualized, comprehensive treatment programs that take metabolic and mental health into account.

تقييم المؤشرات الأيضية والارتباطات الاجتماعية والديموغرافية لدى مرضى السكري من النوع الثاني الذين يستخدمون مضادات الاكتئاب: دراسة مستعرضة في دهوك، العراق

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الخلاصة : يرتبط مرض السكري من النوع الثاني بفشل في إفراز الأنسولين أو مقاومته، مما يؤدي إلى ارتفاع نسبة السكر في الدم. ويرتبط الاكتئاب ارتباطاً وثيقاً بمرض السكري، حيث يؤثر كل منهما على الآخر. وعلى الرغم من استخدام مضادات الاكتئاب على نطاق واسع، لم يتضح بعد كيفية تأثيرها على مستويات معدل السكر التراكمي وملف الدهون .الغرض من هذه الدراسة هو استقصاء العلاقة بين أدوية مضادات الاكتئاب والسيطرة الأيضية، وتحديداً مؤشرات الدهون والسيطرة السكرية(HbA1c) ، لدى المرضى المصابين بداء السكري من النوع الثاني في دهوك، العراق. بالإضافة إلى ذلك، هدفت الدراسة إلى تحديد مدى تأثير الخصائص الاجتماعية والديموغرافية، مثل النوع الاجتماعي والتعليم والتوظيف، والأنماط المعيشية، مثل التدخين والنشاط البدني، على هذه المعايير الأيضية .أُجريت دراسة مقطعية مقارنة على ١٦٢ مريضاً مصاباً بالسكري النوع الثاني، تم تقسيمهم إلى ثلاث مجموعات: مرضى السكري غير المصابين بالاكتئاب (١٠٠ مريض)، ومرضى السكري المصابين بالاكتئاب حديثاً (٢٠ مريضاً)، ومرضى السكري المكتئبين الذين يتناولون مضادات الاكتئاب (٤٢ مريضاً). تم قياس معدل السكر التراكمي، وسكر الدم الصائم ، والكوليسترول الكلي ، والدهون الثلاثية ، والبروتينات الدهنية عالية الكثافة، والبروتينات الدهنية منخفضة الكثافة ، بالإضافة الى مؤشر كتلة الجسم والمعايير السريرية والديموغرافية الأخرى. وجدت فروق ذات دلالة إحصائية بين المجموعات من حيث الجنس، والتعليم، والتوظيف، والنشاط البدني. أظهر الرجال المصابون بالاكتئاب قيمًا أعلى لمعدل السكر التراكمي وسكر الدم الصائم مقارنة بالرجال غير المصابين بالاكتئاب. كما كانت نتائج ملف الدهون وقيم مؤشر كتلة الجسم ذات دلالة إحصائية، حيث أظهرت قيم كوليسترول أعلى ومؤشرات على السمنة ضمن المجموعات المصابة بالاكتئاب. كما ساهمت مضادات الاكتئاب في حدوث تغيرات في الاستقلاب ومضاعفات السكري . يرتبط استخدام مضادات الاكتئاب بشكل كبير بالتغيرات في السيطرة على سكر الدم وملفات الدهون بين مرضى السكري النوع الثاني، وتكون هذه التأثيرات الأيضية أكثر وضوحاً لدى المشاركين الذكور. تسلط هذه النتائج الضوء على أهمية اتباع نهج علاجي متكامل وفردي يعالج كلاً من الاستقرار الأيضي والحالة الصحية النفسية.

الكلمات المفتاحية: الاكتئاب، مضادات الاكتئاب، المؤشرات الحيوية الكيميائية، داء السكري من النوع الثاني.

INTRODUCTION

Type 2 Diabetes Mellitus (T2DM) is an ongoing metabolic illness marked by insulin resistance and hyperglycemia, recognized by the World Health Organization (WHO) as one of the leading causes of death globally [1–3]. Beyond the physical complications such as retinopathy, nephropathy, and neuropathy, T2DM and depression have a complicated, reciprocal relationship [4,5]. About 28% of women and 18% of men with diabetes in the US have depressive symptoms; comorbid depression is associated with a 1.5-fold increase in avoidable early mortality [6,7]. Stress and inflammation are believed to linked to this comorbidity [8], which severely hinders self-care, decreases treatment adherence, lowers quality of life, and raises morbidity, mortality, and healthcare costs [9].

A wide array of antidepressant medications is available including Selective Serotonin Reuptake Inhibitors (SSRIs) and Tricyclic Antidepressants (TCAs) [10]. These drugs mainly act by increasing the concentration of major neurotransmitter, namely serotonin, in the synaptic junction [11]. However, their therapeutic actions may take a few weeks to become evident [12]. There is still conflicting research on how they affect glycemic control. For instance, regardless of the length of the illness, Genis-Mendoza et al. [13] found that patients with T2DM and depression had significantly higher HbA1c levels than diabetic patients without depression. On other hand, SSRIs may enhance short-term glycemic control, according to a Cochrane review by Baumeister et al., [14]. This finding is supported by Bayani et al. [6], who reported significant drop in HbA1c and fasting blood glucose following twelve weeks of sertraline or fluoxetine treatment.

Lipid profiles and body mass index (BMI) show variable associations with antidepressant therapy. Eight weeks of fluoxetine treatment raised serum TG, TC, and LDL levels in depressed patients, according to Pan et al. [15]. On the other hand, BMI, weight, and waist circumference frequently increased in depressed patients receiving treatment, according to Eker et al. [16]. On the other hand, after 12 weeks of oral antidepressant treatment, Santi et al. [17], reported that an interim analysis from a randomized study revealed no significant change in metabolic parameters.

Given these inconsistent results, additional study is required to find out how antidepressant therapy influences metabolic parameters in practical clinical situations. The purpose of this study was to look into the

relationship between antidepressant medication and metabolic control, specifically lipid and glycemic (HbA1c) profiles, in patients with Type 2 Diabetes Mellitus in Duhok, Iraq. Additionally, the study aimed to ascertain how lifestyle choices, such as smoking and physical activity, and sociodemographic traits, such as gender, education, and employment, affect these metabolic parameters. By comparing medicated and non-medicated depressed diabetic cohorts, this research provides a comprehensive analysis of the clinical and demographic factors contributing to metabolic dysregulation in this population."

METHOD

Study Design and Participants

A comparative cross-sectional study used that was authorized by the Scientific Committee, College of Pharmacy, University of Duhok, and the Directorate of Health, Duhok Governorate, Iraq, (Ref: 25092024-8-18). The study was conducted in a period of October 2024 to April 2025. Based on a review of related studies in the field [18], a sample size of 162 participants (aged 18–75) was established. The samples selected randomly from three primary sites in Duhok, Iraq, which include the psychiatric unit of Azadi Teaching Hospital, private psychiatric clinics and the Duhok Diabetes Center. A straightforward random allocation technique was used to split the participants into three groups. The number of participants in each group was based on the individuals who visited the aforementioned centers during the six-month period designated for sample collection.

- Group I (n=100): Non-depressed T2DM controls (50 males, 50 females) on stable antidiabetic regimens including Metformin (1000 mg) alone or combined with Sitagliptin (50 mg) or Glimepiride (5 mg).
- Group II (n=42): Patients with T2DM and DSM-5-confirmed depression (4 males, 38 females) receiving the antidiabetics plus antidepressants—primarily Escitalopram (20 mg), Fluoxetine (20–40 mg), Sertraline (50 mg), or SSRIs combined with Amitriptyline (25 mg)—for over one year.
- Group III (n=20): Newly diagnosed depressed T2DM patients (5 males, 15 females) on standard antidiabetic therapy but not yet on antidepressants.

Inclusion Criteria: Participants aged (18–75) with T2DM and adequate cognitive capacity for interviews were included. The study focused on commonly prescribed antidiabetic and antidepressant medications used in clinical endocrinology and psychiatry.

Exclusion Criteria: Patients with Type 1 diabetes or psychiatric disorders other than depression (e.g., schizophrenia, bipolar disorder) were excluded. Those using antidiabetic drugs for non-diabetic conditions or antidepressants prescribed for non-depressive indications were also excluded, as were individuals with less than 12 months of diabetes or depression treatment.

Data Collection: Structured interviews and medical record reviews were used to collect: Sociodemographic data: age, gender, residence, marital status, education, occupation. Lifestyle factors: smoking, physical activity, diet adherence. Medical history: family history of diabetes and depression, duration of diabetes and depression, diabetes complications.

Biological Sample Collection and Analysis

After overnight fasting, 5 mL of blood was drawn from each participant: 2 mL in EDTA tubes for HbA1c measurement and 3 mL in plain tubes for serum separation. Serum was separated by clotting at room temperature followed by centrifugation at 3000 rpm for 15 minutes. Biochemical analyses (FBS and full lipid profile including TC, TG, HDL, LDL) were performed using a Cobas 6000 analyzer (Roche, Switzerland).

Ethical consideration: The study adhered to the Declaration of Helsinki's ethical guidelines. The following guidelines were closely adhered to: All participant data was kept private and anonymous. The information utilized was only for research purposes. Every participant gave their informed consent.

Statistical Analysis

JMP software Version 18.0 (SAS Institute Inc., Cary, NC, USA) was used to analyze the data. A one-way ANOVA or the Chi-squared test. used to assess the differences in metabolic parameters between the groups. The results of this study were considered significant when the p-value was less than 0.05. For pairwise comparisons, Tukey's post-hoc test was applied.

RESULTS

Demographics and clinical characteristics of the participants

According to the analysis of participant characteristics (Table 1) showed that the study groups were well-matched in terms of age, with no significant differences observed between the non-depressed control and the depressed cohorts ($p = 0.3458$). The participants' average age ranged from 54.55 years and 57.83 years . Likewise, there were no statistically significant differences in the duration of diabetes overall, smoking behaviors, dietary adherence, or marital status ($p > 0.05$).

Nonetheless, a number of notable sociodemographic differences surfaced. There was a significant gender-based difference ($p < 0.0001$); the depressed cohort taking antidepressants was primarily female (90.48 %), whereas the non-depressed group had an equal gender distribution. Additionally, in this population, depression was significantly linked to higher unemployment rates ($p < 0.0001$), lower educational attainment ($p = 0.0018$), and rural residency ($p = 0.0459$). When it came to lifestyle factors, the non-depressed participants had significantly higher levels of regular physical activity (38.00 %) than the depressed groups ($p = 0.0048$). Lastly, the depressed cohorts had a significantly higher prevalence of a family history of depression ($p < 0.0001$), with the majority of these patients (35.71%) reporting a duration of 1–3 years.

Table (1): Comparison of General and Medical Characteristics of the Study Groups.

Characteristics		Group no (%)			P value
		Non-depressive T2DM (n=100)	Diabetic newly diagnosed depression (n=20)	Depressive + T2DM (n=42)	
Age (years)	Mean ± (SD) Min-max Std Err Mean	55.81 (9.15) 35-73 0.92	54.55 (9.39) 35-70 2.10	57.83 (9.29 35-72 1.43	0.3458
Residency n (%)	Rural Urban	31 (31.00) 69 (69.00)	9 (45.00) 11 (55.00)	22 (52.38) 20 (47.62)	0.0459 *
marital status n (%)	Single Married	1 (1.00) 99 (99.00)	0 (0.00) 20 (100)	1 (2.38) 41 (97.62)	0.6880
Gender n (%)	Female Male	50 (50.00) 50 (50.00)	15 (75.00) 5 (25.00)	38 (90.48) 4 (9.52)	<0.0001 *
Occupation n (%)	Employed Retired Unemployed	26 (26.00) 16 (16.00) 58 (58.00)	2 (10.00) 0 (0.00) 18 (90.00)	2 (4.76) 0 (0.00) 40 (95.24)	<0.0001 *
Education n (%)	Uneducated preparatory elementary middle school college	52 (52.00) 7 (7.00) 17 (17.00) 16 (16.00) 8 (8.00)	16 (80.00) 0 (0.00) 3 (15.00) 1 (5.00) 0 (0.00)	38 (90.48) 0 (0.00) 3 (7.14) 0 (0.00) 1 (2.38)	0.0018 *
Smoking n (%)	No Yes	85 (85.00) 15 (15.00)	19 (95.00) 1 (5.00)	36 (85.71) 6 (14.29)	0.4857 *
Exercise n (%)	No Yes	62 (62.00) 38 (38.00)	16 (80.00) 4 (20.00)	37 (88.10) 5 (11.90)	0.0048 *
on diet n (%)	No Yes	35 (35.00) 65 (65.00)	10 (50.00) 10 (50.00)	18 (42.86) 24 (57.14)	0.3765
family history of diabetes n (%)	No Yes	36 (36.00) 64 (64.00)	3 (15.00) 17 (85.00)	17 (40.48) 25 (59.52)	0.1272
family history of depression n (%)	No Yes	100 (100) 0 (0.00)	15 (75.00) 5 (25.00)	29 (69.05) 13 (30.95)	<0.0001 *
Diabetes duration Years, n (%)	1-3 years 4-5 years 6-10 years >10 years	31 (31.00) 15 (15.00) 27 (27.00) 27 (27.00)	5 (25.0) 1 (5.0) 7 (35.0) 7 (35.0)	18 (42.86) 3 (7.14) 11 (26.19) 10 (23.81)	0.5155
duration of depression 2 Years, n (%)	1-3 years 4-5 years 6-10 years >10 years	N/A	N/A	15 (35.71) 8 (19.05) 6 (14.29) 13 (30.95)	N/A

[a] ANOVA one-way and [b] Chi-squared test were performed for statistical analyses.

Clinical and Treatment Characteristics

Table 2 showed that , although this difference was not statistically significant (p = 0.1883), clinical complications such as neuropathy and retinopathy were found to be more common in depressed patients. Metformin, either alone or in conjunction with sitagliptin or glimepiride, was the most widely used antidiabetic medication across all groups (p = 0.1814). SSRIs were prescribed to the majority of the 42 patients taking antidepressants: escitalopram (33.33%), fluoxetine (16.67%), and sertraline (11.90%). In 36% of cases, amitriptyline and SSRIs were used in combination therapy, primarily to treat neuropathic pain and mood disorders. Mirtazapine usage was low (2.38%). Statin use for lipid control was similar across groups (p = 0.6523), reflecting consistent cardiovascular risk management irrespective of depression status.

Table (2): Comparisons of treatments for diabetes and depression among the groups under study.

Treatments	Group no (%)			P Value
	Non-depressive T2DM (n=100)	Diabetic, newly diagnosed depression (n=20)	Depressive + T2DM (n=42)	
Diabetic complication n (%) None Neuropathy Retinopathy Retinopathy Neuropathy	86 (86.00) 2 (2.00) 10 (10.00) 2 (2.00)	15 (75.0) 1 (5.0) 3 (15.0) 1 (5.0)	34 (80.95) 3 (7.14) 5 (11.90) 0 (0.00)	0.1883
Antidiabetic drug n (%) Metformin 1000mg+ glimepiride 5mg Metformin1000mg+Sitagliptin50mg Metformin 1000 mg	25 (25.00) 25 (25.00) 50 (50.00)	2(10.00) 8(40.00) 10(50.00)	8 (19.05) 17 (40.48) 17 (40.48)	0.1814
Antidepressants drug n (%) Escitalopram 20mg Fluoxetine 20 Mg Mirtazepine30mg Sertraline 50mg Escitalopram20mg+Amitriptyline25mg Fluxetine40mg+Amitriptyline25mg sertraline50mg+amitriptyline25mg	N/A	N/A	14 (33.33) 7 (16.67) 1 (2.38) 5 (11.90) 6 (14.29) 6 (14.29) 3 (7.14)	N/A
Other Treatments n (%) None Atorvastatin 20 mg Rosuvastatin 10 mg	53 (53.00) 29 (29.00) 18 (18.00)	7 (35.0) 8 (40.0) 5 (25.0)	23 (54.76) 12 (28.57) 7 (16.67)	0.6523

Chi-squared test was performed for statistical analyses.

Biochemical and Anthropometric Comparisons

Table (3) illustrated that no significant differences were found in average HbA1c (p=0.8605) or FBS (p=0.6395) among the three groups. However, TC showed significant variation (p=0.0183); post-hoc analysis revealed that newly diagnosed depressed patients had significantly lower TC levels compared to non-depressed participants (p=0.0132). While HDL (p=0.0687) and LDL (p=0.0649) levels were numerically lowest in the newly diagnosed depressed group, these trends did not reach statistical significance. TG levels were similar across all groups (p=0.9630). BMI was significantly higher in both depressed groups compared to the non-depressed group (p=0.0057), with post-hoc tests confirming higher BMI in the newly diagnosed (p=0.0252) and antidepressant-treated (p=0.0378) groups relative to controls.

Table (3): Comparison of biochemical parameters between groups in general.

	Study groups			P value (pairwise comparisons)
	Non-depressive T2DM (n=100)	Diabetic newly diagnosed depression (n=20)	Depressive + T2DM (n=42)	
HbA1C (%)	7.73 (1.70)	7.94 (1.32)	7.84 (1.84)	0.8605
FBS (mg/dL)	172.42 (63.15)	174.05 (52.50)	184.24 (84.98)	0.6395
Cholesterol (mg/dL)	189.53 (41.05)	161.25 (24.95)	185.76 (44.22)	0.0183* Post-hoc analysis (non-depressive T2DM >Diabetic newly diagnosed depression (p=0.0132)
HDL (mg/dL)	45.31 (10.94)	39.50 (10.29)	45.59 (9.90)	0.0687
LDL (mg/dL)	110.62 (42.16)	87.90 (25.95)	104.78 (38.47)	0.0649
TG (mg/dL)	165.90 (64.16)	162.40 (46.83)	163.43 (72.73)	0.9630
BMI (kg/m²).	29.67 (3.96)	32.78 (5.83)	31.87 (6.04)	0.0057 * Post-hoc analysis (Diabetic newly diagnosed depression >non-depressive T2DM (p=0.0252) Depressive T2DM >non-depressive T2DM (p=0.0378)

*p < 0.05 (ANOVA). Tukey post-hoc analysis showed a significant difference between non-depressive T2DM and Diabetic newly diagnosed groups (p = 0.0132).

Biochemical and Anthropometric Analysis in Females

Table 4 demonstrated that no statistically significant differences were observed in metabolic parameters among the female cohorts. Glycemic control, assessed by HbA1c (p=0.6806) and FBS (p=0.6612), was similar across all groups. Lipid profiles mirrored the overall population trends, with the newly diagnosed depressed group showing the lowest numerical values for TC and LDL; however, these differences, including HDL variations (p=0.0941), were not statistically significant. All female groups had almost the same TG levels (p=0.9790). Both depressed female groups had higher BMI than non-depressed controls, but this difference was not statistically significant (p=0.1978).

Table (4): Comparisons of biochemical measurements among female study groups.

Outcomes	Group mean ± (SD)			P Value
	Non-depressive T2DM (n=50)	Diabetic newly diagnosed depression (n=15)	Depressive + T2DM (n=38)	
HbA1C (%)	8.03 (2.00)	7.78 (1.08)	7.70 (1.77)	0.6806
FBS (mg/dL)	186.90 (80.38)	167.13 (43.72)	178.63 (80.34)	0.6612
Cholesterol (mg/dL)	192.78 (46.84)	163.27 (36.14)	186.39 (49.44)	0.1030
TG (mg/dL)	165.53 (76.00)	158.80 (44.64)	162.53 (71.91)	0.9790
HDL (mg/dL)	48.16 (12.98)	40.67 (10.05)	45.97 (10.15)	0.0941
LDL (mg/dL)	108.06 (35.91)	86.20 (25.07)	103.76 (38.55)	0.1151
BMI kg/m²).	31.04 (4.64)	33.87 (6.32)	32.29 (6.26)	0.1978

ANOVA one-way was performed for statistical analyses.

Biochemical and Anthropometric Analysis in Males

Table 5 confirmed that the male participants displayed statistically significant differences in glycemic control among the research groups, in contrary to the female subgroup. When compared to non-depressed controls, depressed males had significantly higher levels of HbA1c (p = 0.0413) and FBS (p = 0.0457), with those undergoing antidepressant therapy demonstrating the worst glycemic control. TG, LDL, and TC levels did not differ significantly between the groups in terms of lipid parameters. However, HDL levels were significantly reduced in males with newly diagnosed depression, a pattern consistent with that observed in female participants. No significant differences in BMI were identified among male participants (p = 0.7764), suggesting that the observed association between depression and increased BMI in the overall cohort was predominantly driven by female subjects.

Table 5. Differences in biochemical measurements among male patients across study groups.

Outcomes	Group mean ± (SD)			P Value
	Non-depressive T2DM (n=50	Diabetic newly diagnosed depression (n=5)	Depressive + T2DM (n=4)	
HbA1C (%)	7.45 (1.37)	8.42 (1.95)	9.20 (2.13)	0.0413 * Depressive T2DM >non-depressive T2DM (p=0.0256)
FBS (mg/dL)	163.18 (56.04)	194.80 (75.39)	237.50 (122.11)	0.0457 *
Cholesterol (mg/dL)	187.46 (38.31)	166.00 (13.10)	194.75 (36.67)	0.4200
HDL (mg/dL)	43.00 (9.59)	35.98 (11.33)	42.00 (7.12)	0.3040
LDL (mg/dL)	118.60 (59.34)	93.00 (30.90)	114.50 (41.92)	0.6331
TG (mg/dL)	223.08 (151.00)	286.20 (289.32)	172.00 (91.64)	0.5680
BMI kg/m²).	28.45 (3.20)	29.52 (2.04)	29.08 (7.50)	0.7764

* $p < 0.05$ (one-way ANOVA). Post hoc testing demonstrated a significant difference between patients with depressive T2DM and those with non-depressive T2DM ($p = 0.0256$).

DISCUSSION

Type 2 diabetes mellitus (T2DM) and depression have bidirectional relationship in which the psychological burden of T2DM increases the chance of depression and depression enhances the risk of developing T2DM [8,19]. Long-term antidepressant use may unintentionally raise the risk of type 2 diabetes, according to recent research [20]. The present study was designed to investigate the influence of antidepressant use and selected sociodemographic factors on biochemical markers among patients with type 2 diabetes mellitus, stratified by the presence or absence of depression.

In line with Santi et al. [17], who found no metabolic changes following 12 weeks of antidepressant treatment, our results revealed no significant differences in HbA1c or fasting blood sugar (FBS) between groups. On the other hand, patients with both T2DM and depression had higher HbA1c, according to other studies [13, 21, 22]. Antidepressants may enhance glycemic control by reducing depression, according to Rodhe et al. [23]. The dual function of antidepressants in mood and glucose regulation is further supported by a meta-analysis by Srisurapanont et al. [24]. Interestingly, our research revealed a gender-specific pattern: males with depression had considerably higher HbA1c and FBS; females did not exhibit this trend, perhaps as a result of behavioral or hormonal variations.

We found that newly diagnosed depressed patients had significantly lower TC, while long-term antidepressant users had TC levels comparable to non-depressed controls, indicating metabolic stabilization with treatment. This is consistent with Stuchtey et al. [25], who reported lipid normalization during pharmacological treatment, but in contrast to Richards-Belle et al. [26], who associated antidepressants with unfavorable lipid profiles. Treatment duration, medication types, nutrition, and comorbidities can all cause differences between

studies.

Depressed patients had significantly higher BMI than non-depressed T2DM patients. In line with research that links depression and antidepressant use (SSRIs, TCAs) to weight gain [27,28]. The lack of significant BMI differences in males supports by Grundy et al.'s findings [29], that there is a stronger correlation between depression and obesity in women.

Female gender, living in a rural area, unemployment, and having less education were found to be significantly risk factors for depression in people with type 2 diabetes by our sociodemographic analysis. Consistent with the findings of Katon et al. [30], such socioeconomic stressors are associated with suboptimal lifestyle adherence and increased psychological distress. Although lifestyle modification has been shown to be as effective as pharmacological interventions in improving quality of life, physical inactivity may further accelerate the deterioration of both metabolic control and mental well-being [31].

LIMITATIONS

Despite the insights gained, several limitations must be acknowledged. First, the cross-sectional design hinders the association between antidepressant use and metabolic alterations .Second, the statistical power is diminished by small subgroup sizes, particularly the newly diagnosed depressed group (n=20) and depressed male group (n=4). Furthermore, the results could have been impacted by uncontrolled confounders like diet, exercise, and length of antidepressant use. Even with these constraints, this study provides important information regarding gender-specific metabolic vulnerabilities in type 2 diabetes patients. bigger, ongoing, multicenter investigations are required to get more knowledge of the long-term metabolic consequences of specific antidepressant classes.

CONCLUSION

In conclusion, depression in T2DM is correlated to female sex, rural living, and unemployment. In addition , HbA1c or lipid profiles in this population do not significantly alter by antidepressants. Furthermore Gender-specific metabolic differences were evident, with higher body mass index values more frequently observed among depressed female patients. These results highlight the complex interplay between mental health and metabolic status, suggesting that clinical management should integrate both socioeconomic and gender-specific considerations to optimize outcomes for diabetic patients with comorbid depression.

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