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High prevalence of depressive symptoms in patients with Diabetes Mellitus in outpatient care

Alta prevalência de sintomas depressivos em pacientes com Diabetes Mellitus em assistência ambulatorial

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ABSTRACT

Introduction: Chronic diseases such as Diabetes Mellitus affects the wellbeing leading to depressive symptoms and even mental trouble like depression. Both conditions represent a high prevalence among the population. Although the investigation of mental illness during medical monitoring of diabetes is still not frequent.**Objective:** To assess the prevalence of depression and depressive symptoms in outpatients with diabetes. **Method:** This is an observational, quantitative, descriptive, prospective and cross-sectional study. **Results:** Out of the total of 120 respondents, 77 participants (64.2%) reported that emotional issues are not addressed during diabetes follow-up appointments. Among all participants, 45 (37.5%) had previously been diagnosed with depression. According to the PHQ-9 questionnaire, 27.5% exhibited mild symptoms, 25% exhibited moderate symptoms, and 10% exhibited severe symptoms. No correlation was observed between the diagnosis of depression and the duration of diabetes or glycemic control. Interestingly, among patients with moderate to severe symptoms, 15 patients (36%) were unaware of their previous depression diagnosis. **Conclusion:** This study concludes that patients with diabetes have a high prevalence of depression, highlighting the importance of conducting thorough investigations during diabetes follow-up appointments. Additionally, it is observed that mental health is insufficiently addressed during medical visits, leading to patients living with depressive symptoms persistently, as well as a failure to diagnose.

Keywords: Diabetes Mellitus; Complications of diabetes; Depression.

INTRODUCTION

Diabetes Mellitus (DM) is a term used to describe heterogeneous metabolic disorders in which the main finding is chronic hyperglycemia caused by a deficiency in insulin secretion, a defect in insulin action, or both[1]. The estimated prevalence of the disease in the world population was 9.3% in 2019[2]. It is noted, in this condition, a significant reduction in the quality of life of patients, with depression being one of the factors responsible for this scenario[3]. Depression is the most common psychiatric illness in the world, affecting about 4.4% of the population according to the World Health Organization (WHO)[4] and affects twice as many DM patients as non-DM patients[3,5]. This pathology is classified by the American Psychiatric Association as a mood disorder that

causes problematic repercussions in the way a person feels, thinks, and behaves[6].

Both conditions can have significant impacts on the lives of affected individuals. Diabetes increases the risk of premature death by 15% and may cause numerous micro[7] and macrovascular complications in the short or long term, such as coronary heart disease, stroke, diabetic retinopathy, chronic kidney disease, and diabetic neuropathy[8], significantly affecting functional capacity, autonomy, and quality of life[9]. Additionally, people living with diabetes often experience specific diabetes distress, which can act as a risk factor for depression[10].

Depressive symptoms include depressed mood, loss of interest in previously pleasurable activities, and decreased energy or increased fatigue[6], with a lifetime risk of developing depression in a healthy individual being 15-18%[11]. According to the study by Dibato J. et al., diabetes increases the risk of depression by about 36-64% based on the odds ratio (OR) association measure from cohort studies with a 95% confidence interval (CI)[12]. The presence of these symptoms in people with diabetes is related to low medication adherence, unhealthy lifestyle and dietary habits, and low levels of physical activity, which increase the possibility of complications and mortality[13]. A study with hospitalized people living with diabetes found the presence of depression in about half of them, with moderate to severe severity[14]. Despite the mechanism being poorly understood, Subba et al. suggest that neuroinflammation caused by sustained levels of hyperglycemia may interfere with the secretion of neurotransmitters related to diabetes such as serotonin, noradrenaline, and dopamine[15].

Depression appears to be poorly recognized and inadequately managed in people with diabetes. Although the recommendations of the American Diabetes Association[16] emphasize the need for routine assessment of mental health problems in patients with the metabolic disease, there are still many barriers. Patients face difficulties as well as the stigma of living with these conditions and not feeling comfortable addressing them, or not recognizing their symptoms as related to depression, highlighting the importance of an effective approach[17]. The prevalence of diabetes and depression are rapidly increasing worldwide, exceeding those of other mental illnesses and non-communicable diseases[10]. According to the International Diabetes Federation (IDF), it is estimated that there are 11.9 million cases of diabetes, which could reach 19.2 million by 2035. Global estimates indicate that 382 million people live with DM (8.3%), and this number could increase to 592 million by 2035[18,19].

In this context, the relevance of studying these conditions and their impacts on the daily life of the patient becomes evident. Nevertheless, many patients remain undiagnosed or untreated because emotional issues are not addressed during the follow-up of diabetes, which focuses more on drug therapy[20]. This study has a goal to evaluate the prevalence of depression and depressive symptoms in patients with Diabetes Mellitus treated at a Secondary Care Outpatient Clinic of the Unified Health System (SUS).

METHODOLOGY

Study Design

This is a cross-sectional, prospective, observational study that aimed to evaluate the presence of depressive symptoms in patients with diabetes attending the Medical Sciences Outpatient Clinic.

Sample

The research sample consisted of patients with Diabetes Mellitus who were treated at the Medical Sciences Outpatient Clinic, more specifically in the Endocrinology specialty. The sample collection period was 6 months, from April to June and from August to October 2022. Convenience sampling was used,

in which data were collected from all patients who fit the inclusion criteria during the collection period. The sampling technique was chosen because it relied on the flow of the Outpatient Service for data collection, which posed challenges in accessing the sample. Participants were recruited through verbal invitations at the outpatient clinic immediately after their scheduled medical consultations, and the forms were completed in person right after the consultations. To reduce possible communication errors in the questionnaires, the interviewer asked the questions and the participant simply responded. The research participants received an Informed Consent Form (TCLE) in which all study procedures were duly explained. Patients had the chance to clarify any doubts, signed the form of their own free will, and each received a copy of the ICF to take with them.

Female and male patients with diabetes, aged over 18 years, who were undergoing health monitoring at the outpatient clinic were included. Patients who had any cognitive deficit that compromised the understanding of the questionnaire questions were excluded.

The study was approved by the Research Ethics Committee, under number CAAE 55374521.0.0000.5134.

Instruments

The research was performed during the SARS-CoV pandemic period, so the questionnaire was applied following the health guidelines, social distancing, hygiene measures and isolation recommended by the clinic and the municipality.

The first questionnaire included questions about the individual and their health. Patients were asked about the presence of clinical comorbidities and the duration of their diabetes diagnosis, categorized as less than 5 years, 5-10 years, 10-15 years, 15-20 years, and more than 20 years: associated diseases (open field); presence of complications related to Diabetes Mellitus, such as, for example, Retinopathy, Neuropathy, Nephropathy, Cardiovascular Disease, Cerebrovascular Disease and Peripheral Vascular Disease; most recent test results (HbA1c and fasting glucose); previous hospitalizations (yes or no) and use of medication for diabetes at the time the questionnaire was administered. Regarding the patient's mental health, they were asked the following questions during diabetes monitoring consultations:

- Were emotional issues addressed? (Options: No, they were never addressed; Yes, but infrequently; Yes, they were addressed)
- Have you been hospitalized or used medication for depression? (Options: Yes or No)
- Have you ever seen a psychiatrist? (Options: Yes, before the diagnosis of diabetes; Yes, after being diagnosed with diabetes; No, I have never seen a psychiatrist)

In the second questionnaire, the Patient Health Questionnaire-9 (PHQ-9) was used to search for depressive symptoms. The PHQ-9 was validated for use in Brazil and makes diagnoses based on criteria for depression disorders, being a reliable measure that evaluates the criteria for psychological disorders. The questionnaire consists of 9 questions, which refer to 9 diagnostic criteria for depression. Scores for each item range from 0-3. At the end, the sum is performed, and the score of 0-4 indicates absence of depressive symptoms, 5-9 represents mild depressive symptoms, 10-14 indicates moderate depressive symptoms, 15-19 indicates moderately severe depressive symptoms and 20-27 indicates severe depressive symptoms[19].

Statistical Analysis

Categorical variables were presented as absolute and relative frequencies and numerical variables as mean ± standard deviation. The numerical variables were subjected to the Anderson-Darling Normality test and, for possible comparisons of means/medians, the t-test

or the Mann-Whitney test was used. To evaluate possible associations, the results consider the following statistics: frequency (n) and percentage value (%), in addition to p-values for the tests (Fisher's exact test) and (Pearson's Chi-squared test). A significance level of 5% was used. To determine the sample size, with patients meeting the inclusion criteria, it was estimated how many data collections could be carried out per week and this was multiplied by the time allocated to this stage of the project.

RESULTS

Sample characterization

A total of 120 people completed the questionnaire, in person, and the value of a recent glycated hemoglobin (HbA1c) result was requested from all of them, however, only one patient did not have a value available.

In table 1, we can observe the demographic characterization of the sample of patients evaluated as well as data on diabetes, its control and presence of comorbidities. Of the sample, 91 (75.8%) were female. The average age was 59.78 years (SD = ±14.72), with 65.8% of people aged between 46-73 years. Regarding education: 44 (36.7%) had incomplete primary education, 26 (21.7%) had completed primary education and 29 (24.2%) had completed secondary education (Table 1).

Regarding the type of diabetes, 11 (9.2%) had type 1 diabetes mellitus and 109 (90.8%) had type 2 diabetes mellitus. The time since diabetes diagnosis was less than 5 years in 36 (30%) patients and 32 (26.7%) had been diagnosed for more than 20 years. When asked about other diseases, the prevalence was 90 (37.2%) for systemic arterial hypertension (SAH); 58 (24%) for dyslipidemia; 30 (12.4%) for obesity; 18 (7.4%) for hypothyroidism and 33 (13.6%) for other diseases (asthma, hepatic steatosis, breast cancer, gastroesophageal reflux disease, rheumatoid arthritis, AIDS, osteoarthritis, goiter, COPD, thyroid cancer, gout, osteoporosis, psoriasis, Chagas disease, fibromyalgia, labyrinthitis, leiomyosarcoma and pancreatitis) (Table 1).

To analyze the participants' glycemic control, a recent HbA1c test was used, in which 27 (22.5%) had a result <7.0% indicating good diabetes control, 55 (45.8%) out of 7, 0-9.0% representing poorly controlled diabetes and 37 (30.8%) had a result >9.0% representing very poorly controlled diabetes. Regarding hospitalization caused by diabetes complications, 88 (73.3%) of patients had never been hospitalized for this cause. Out of the participants, 64.2% used insulin, either alone or in combination with oral medication, while only 35.8% used oral medication alone. It is important to note that this research was conducted in secondary care, which accounts for the higher proportion of patients who require insulin.(Table 1).

Complications related to DM

Table 2 presents complications of diabetes in the patients evaluated. Among them, 33 (27.5%) people had no complications, 60 (50%) had 1-2 complications and 27 (22.5%) had 3 or more. Regarding the specific complication, 53 (24.8%) reported retinopathy; 24 (11.2%) reported nephropathy; 56 (26.2%) reported neuropathy; 19 (8.9%) reported peripheral vascular disease; 26 (12.1%) reported cardiovascular disease and 3 (1.4%) reported cerebrovascular disease.

Table 1. Descriptive analysis of the participants' profile

Variables	AF	RF (%)
Sex		
Male	29	24,2
Female	91	75,8
Age (average±SD)	59,78 ±	
< 46 years	14,72	16,7
46-73 years	20	65,8
> 73 years	79	17,5
	21	
Scholarity		
Incomplete Elementary Education	44	36,7
Complete Elementary Education	26	21,7
Incomplete High School	3	2,5
Complete High School	29	24,2
Incomplete Higher Education	5	4,2
Complete Higher Education	13	10,8
Type of diabetes		
Type 1	11	9,2
Type 2	109	90,8
Time since diagnosis		
< 5 years	36	30,0
5-10 years	20	16,7
10-15 years	20	16,7
15-20 years	12	10,0
> 20 years	32	26,7
Comorbidities		
SAH	90	37,2
Dyslipidemia	58	24,0
Obesity	30	12,4
Hypothyroidism	18	7,4
Others	33	13,6
Have no Other illness	13	10,8
Glicemic control (HbA1c)		
< 7%	27	22,5
7-9%	55	45,8
> 9%	37	30,8
Hospitalization for diabetes		
Yes	32	36,7
No	88	73,3
Diabetes medication		
Uses insulin	77	64,2
Uses oral medication only	43	35,8

AF: Absolute frequency
RF: Relative frequency
SD: Standard deviation

Table 2. Presence of complications related to diabetes

Variables	AF	RF(%)
Number of complications		
None	33	27,5
1-2	60	50,0
3 or more	27	22,5
Presence of complications		
Retinopathy	53	24,8
Nephropathy	24	11,2
Neuropathy	56	26,2
Peripheral Vascular Disease	19	8,9
Cardiovascular Disease	26	12,1
Cerebrovascular Disease	3	1,4

AF: Absolute frequency
RF: Relative frequency

Assessment of depressive symptoms and depression

Table 3 shows data related to emotional issues, diagnosis of depression and assessment of depressive symptoms using the PHQ-9 questionnaire. Participants were asked whether emotional aspects are addressed during diabetes follow-up consultations and 77 (64.2%) of them reported that this subject is not addressed; about having already seen a psychiatrist, 74 (61.7%) had never seen one. Of the 120 people who participated, 45 (37.5%) of them said they had already been diagnosed with depression by a doctor, but only 2 (1.7%) people had already been hospitalized because of depression. Of all of them, with and without diagnosed depression, 47 (39.2%) currently use antidepressant medication. Regarding the results of the application of the PHQ-9 questionnaire, 45 (37.5%) showed no depressive symptoms, 33 (27.5%) showed the presence of mild depressive symptoms, 30 (25%) showed the presence of moderate depressive symptoms and 12 (10%) showed the presence of severe depressive symptoms (Table 3).

Table 3. Characterization of the sample in relation to emotional issues and depression

Variables	AF	RF(%)
"Are emotional issues addressed during your diabetes follow-up appointments?"		
Yes	27	22,5
Yes, infrequently	16	13,3
No	77	64,2
Appointment with a psychiatrist		
Yes	46	38,3
Never	74	61,7
Depression diagnosis		
Have already received the diagnosis	45	37,5
Have never received the diagnosis	75	62,5
Use of antidepressant medication		
Yes	47	39,2
No	57	47,4
No, but have already used in the past	16	13,3
Hospitalization for depression		
Yes	2	1,7
No	118	98,3
Depressive symptoms according to the PHQ-9		
Absence of depressive symptoms	45	37,5
Presence of mild depressive symptoms	33	27,5
Presence of moderate depressive symptoms	30	25,0
Presence of severe depressive symptoms	12	10,0

AF: Absolute frequency
RF: Relative frequency

The relationship between the diagnosis of depression and the time since diagnosis of diabetes, glycemic control, hospitalization for diabetes and the presence of depressive symptoms using the PHQ-9 questionnaire is shown in table 4. No relationships were seen between the diagnosis of depression and the duration of diabetes, glycemic control, or previous hospitalization for diabetes. Regarding the diagnosis of depression, the only variable that showed statistical significance was the presence of depressive symptoms in the questionnaire.

Table 5 presents the relationship between the presence of depressive symptoms in the PHQ-9 questionnaire with glycemic control, hospitalization for diabetes and diagnosis of depression. It was found that the presence of moderate to severe symptoms of depression in the PHQ-9 questionnaire did not correlate with metabolic control in the evaluated sample but was positively related to the previous diagnosis of depression. It was also observed that 15 patients (36% of the sample) with moderate or severe symptoms did not have a previous diagnosis of depression, that is, a high probability of being underdiagnosed.

Table 4. Relationship between the diagnosis of depression and time since diagnosis, glycemic control, hospitalization for diabetes and depressive symptoms in the PHQ-9.

Variables	Sample	Without depression N=75	With depression N=45	P-value[1]
Time since diagnosis				0.6
< 5 years	36	23 (31%)	13 (29%)	
5-10 years	20	14 (19%)	6 (13%)	
10-15 years	20	13 (17%)	7 (16%)	
15-20 years	12	5 (6.7%)	7 (16%)	
> 20 years	32	20 (27%)	12 (27%)	
Glicemic control (Hba1c)				0.3
< 7%	27	15 (20%)	12 (27%)	
7-9%	55	33 (44%)	22 (50%)	
> 9%	37	27 (36%)	10 (23%)	
Hospitalization for diabetes				0.4
Yes	32	18 (24%)	14 (31%)	
No	88	57 (76%)	31 (69%)	
Depressive symptoms according to the PHQ-9				< 0.001
Absence of depressive symptoms	45	38 (51%)	7 (16%)	
Presence of mild depressive symptoms	33	22 (29%)	11 (24%)	
Presence of moderate depressive symptoms	30	11 (15%)	19 (42%)	
Presence of severe depressive symptoms	12	4 (5.3%)	8 (18%)	

Source: elaborated by the authors

[1]Fisher's exact teste; Pearson's Chi-squared test

Table 5. Relationship between the presence of depressive symptoms in the PHQ-9 questionnaire and glycemic control and previous diagnosis of depression.

Variables	Sample	Absent/mild symptoms N= 78	Moderate/ severe symptoms N=42	P-value[1]
Glicemic control (Hba1c)				0.7
< 7%	27	16 (21%)	11 (27%)	
7-9%	55	37 (47%)	18 (44%)	
> 9%	37	25 (32%)	12 (29%)	
Depression diagnosis				< 0.001
Yes	45	18 (23%)	27 (64%)	
No	75	60 (77%)	15 (36%)	

[1]Chi-square test of association

DISCUSSION

This study found a slightly higher prevalence of depression than what is found in the literature. Mohammad Khaled's meta-analysis published in 2019 analyzed 248 studies and identified a global depression prevalence of 28%. Although, the prevalence of depression in women with diabetes was 38% in that same study, which is compatible with the sample of this study, since most of the sample is made up of women[21]. This data is like the percentage of patients who reported using some antidepressant medication in the present study. No studies were found on the prevalence of depression in diabetic patients in the state and country for a comparison with the current study to be made.

The PHQ-9 is currently the most used tool for screening depression in primary care. The studies by Levis et. Al (2019) and Negeri et. al (2021) demonstrated that the diagnostic accuracy using this questionnaire compared to semi-structured interviews is greater than when compared to diagnoses carried out by other reference standards[22,23]. A PHQ-9 cutoff score of 10 or higher is acceptable for detecting major depressive disorder 88% of the time[22,23]. The present study found an association between the diagnosis of depression and depressive symptoms, with people with a previous diagnosis of depression presenting more severe symptoms in the questionnaire, which corroborates the use of this tool as a screening method.

Furthermore, the study found that a significant proportion of patients (36%) without a previous diagnosis of depression presented moderate or severe symptoms on the PHQ-9 questionnaire. One behavior that contributes to this is the lack of approach to emotional issues in diabetes monitoring consultations, as illustrated in the present study, in which many people reported that this subject is not something covered in diabetes control consultations. It is essential that this is an active stance on the part of the healthcare professional, as many patients do not raise these complaints spontaneously.

No association was found between glycemic control and the presence of moderate and severe symptoms in the evaluated patients. It is important to note that the results of this study may have been influenced by the limited sample size. However, it is important to note that while the participant's most recent HbA1c value was taken into consideration, we did not have access to the precise value at the time they completed the questionnaire. Therefore, there is a possibility that the null hypothesis could not be accepted, potentially indicating a Type II error. The literature indicates that the presence of depression and depressive symptoms has been associated with poor eating habits[13,24], poor adherence to physical exercise[25] and the use of medication[26]. It is also important to highlight that some antidepressants have an impact on blood glucose and require special attention when administered to patients with diabetes. Tricyclic and tetracyclic antidepressants, especially those with predominantly no-

radrenergic action, such as Imipramine, Nortriptyline and Maprotiline, can inhibit the release of insulin from the pancreas, resulting in an increase in blood glucose. Furthermore, tricyclics have anticholinergic and antihistamine properties and can trigger postural hypotension and cardiovascular symptoms, which can worsen the symptoms of diabetes[24].

When analyzing the characterization of the sample, it was possible to notice that a large portion of it was made up of female people (75.8%). There was no selectivity on the part of the researchers to recruit participants, however there was a considerable difference in the number of men and women with diabetes who sought outpatient care in Endocrinology and General Practice. This disparity can be explained by a study by Rossanei et. al (2016) who demonstrated that men with diabetes and other chronic diseases seek health services less, citing lack of time due to work, schedule incompatibility or absence of serious symptoms[27]. According to the literature, the prevalence of type 2 diabetes in Brazil is 8.1% in males and 10.2% in females[26], therefore, the sample analyzed did not represent the general population, which may limit the generalization of results. Added to this, a specific analysis of the prevalence of depression between genders was not carried out.

Regarding the duration since diagnosis, the sample was concentrated at the extremes, with most participants having been diagnosed with diabetes either less than 5 years ago or more than 20 years ago. This hypothesis suggests that there may be a discontinuation of medical monitoring for the disease after a few years of diagnosis, with individuals only seeking medical attention when complications arise. In this study, a small proportion of patients had good glycemic control, that is, glycated hemoglobin < 7%. Brazilian data from the DISCOVER study, by Khunti et. al (2020), show that around 85% of 404 Brazilian patients have unsatisfactory glycemic control. In the total global sample (n=11891), only 20% had HbA1c < 7%, considered good glycemic control, and approximately 50% of patients had HbA1c > 8%, with low education, low income in the country being the biggest time since diabetes diagnosis, the main factors associated with poor glycemic control[28].

In terms of complications related to diabetes, only a small percentage of patients had no complications at the time of evaluation.The most prevalent complications were retinopathy and neuropathy. The meta-analysis by Fasalis et. al (2020) points to a worldwide prevalence of 25.16% of retinopathy in people with DM2, which is lower than that found in the sample of this research. Meanwhile, the same meta-analysis supports the findings of this study, indicating a 50% prevalence of neuropathy in patients with type 2 diabetes. Microvascular complications tend to manifest early, with an estimated 25% of individuals recently diagnosed with diabetes already experiencing one or more complications. These findings underscore the significance of early suspicion and investigation[29]. Screening for kidney disease and retinopathy should be started immediately after the diagnosis of DM2 due to the frequent delay in diagnosis among the population[21]. As this study was conducted in a secondary care center, patients were possibly referred due to the presence of more severe diabetes, with complications already present.

Limitations of the study

It is crucial to consider the limitations of this study to contextualize the obtained results. Firstly, the diagnosis of depression relied on self-reporting by the participants, which may not always align completely with the actual diagnosis, as many patients may be unaware of their exact diagnosis. Nevertheless, the significant use of antidepressants among a substantial

portion of patients may suggest the accuracy of the reported diagnosis.

Secondly, the limited sample size imposes a potential limitation on the generalization of the findings. The chosen sample group may not sufficiently represent the variability present in the target population, thereby reducing the applicability of the results in a broader context.

It is also important to highlight that this study was performedduring the COVID-19 pandemic, in which there was a 27.6% increase in the prevalence of major depression according to a review published by The Lancet magazine in 2021[30]. Hence, it is possible that the symptoms reported by the study participants are influenced by the current circumstances they are experiencing.

Furthermore, the lack of detailed information about the sociodemographic and clinical aspects of the participants is also a gap. The lack of medical history and other pertinent factors hinders a more comprehensive analysis of the sample's regional representativeness. These limitations underscore the necessity for future research that includes larger and more robust samples, along with detailed sociodemographic information. Such efforts will aid in better understanding the scope and generalizability of the results obtained in this study.

CONCLUSION

Through this study, it was possible to conclude that patients with diabetes treated at the Outpatient Clinic have a considerable prevalence of depression, with a prevalence of 37.5% in the analyzed sample. However, mental health is only addressed in a minority of consultations, resulting in many patients experiencing moderate to severe depressive symptoms and a failure to diagnose individuals with depression.

Finally, it is crucial to emphasize the significance of screening patients with diabetes who exhibit symptoms of depression, as it is essential to assess the need for referral to specialists. The implementation of a simple and efficient questionnaire in diabetic medical consultations would facilitate the identification of patients requiring specialized evaluation and appropriate treatment.

REFERENCES

1. Petersmann A, Muller-Wieland D, Muller UA, Landgraf R, Nauck M, Freckmann G. Definition, Classification and Diagnosis of Diabetes Mellitus. Experimental and Clinical Endocrinology & Diabetes 2019;127:S1-S7.
2. Saeedi P, Petersohn I, Salpea P, Malanda B, Karuranga S, Unwin N, et al. Global and Regional Diabetes Prevalence Estimates for 2019 and Projections for 2030 and 2045: Results from the International Diabetes Federation Diabetes Atlas, 9th Edition. Diabetes Research and Clinical Practice 2019; 157(157):107-843.
3. Bădescu SV, Tătaru C, Kobylinska L, Georgescu EL, Zahiu DM, Zăgrean AM, et al. The association between Diabetes mellitus and Depression. Journal of Medicine and Life 2016;9(2):120–5.
4. Zhu GL, Xu C, Yang K, Tang SQ, Tang LL, Chen L, et al. Causal relationship between genetically predicted depression and cancer risk: a two-sample bi-directional mendelian randomization. BMC Cancer 2022;22(1).
5. Gomes TF, Santos EM de F, Korthals AM, Gomes JAM, Costa LM, Souza MGGR de, et al. Diabetes Mellitus E Depressão: Há Uma Relação? Uma Revisão Integrativa. Revista Atenas Higeia 2020;2(4):42–9.
6. Sabella D. Antidepressant Medications. AJN, American Journal of Nursing 2018 Sep;118(9):52–9.
7. Khan RMM, Chua ZJY, Tan JC, Yang Y, Liao Z, Zhao Y. From Pre-Diabetes to Diabetes: Diagnosis, Treatments and Translational Research. Medicina 2019;55(9):546.
8. Dal Canto E, Ceriello A, Rydén L, Ferrini M, Hansen TB, Schnell O, et al. Diabetes as a

cardiovascular risk factor: An overview of global trends of macro and micro vascular complications. European Journal of Preventive Cardiology 2019;26(2):25–32.
9. Costa AF, Flor LS, Campos MR, Oliveira AF de, Costa M de F dos S, Silva RS da, et al. Carga do diabetes mellitus tipo 2 no Brasil. Cadernos de Saúde Pública 2017;33(2).
10. Sartorius N. Depression and diabetes. Body-mind interaction in psychiatry 2018; 20(1):47–52.
11. Malhi GS, Mann JJ. Depression. Lancet 2018;392:2299-2312.
12. Dibato J, Montvida O, Ling J, Koye D, Polonsky WH, Paul SK. Temporal trends in the prevalence and incidence of depression and the interplay of comorbidities in patients with young- and usual-onset type 2 diabetes from the USA and the UK. Diabetologia 2022;65(12):2066-2077.
13. Escobar F de A. Relação entre Obesidade e Diabete Mellitus Tipo II em Adultos. Cadernos UniFOA 2009;4(11):69–72.
14. Zhang Y, Chen Y, Ma L. Depression and cardiovascular disease in elderly: Current understanding. Journal of Clinical Neuroscience 2018;47:1–5.
15. Subba R, Sandhir R, Singh SP, Mallick BN, Mondal AC. Pathophysiology linking depression and type 2 diabetes: Psychotherapy, physical exercise, and fecal microbiome transplantation as damage control. Eur J Neuroscience 2021; 53(8):2870-2900.
16. ElSayed NA, et al, American Diabetes Association. Facilitating Positive Health Behaviors and Well-being to Improve Health Outcomes: Standards of Care in Diabetes. Diabetes Care 2023;46:S68-S96.
17. Mukherjee N, Chaturvedi SK. Depressive symptoms and disorders in type 2 diabetes mellitus. Current Opinion in Psychiatry 2019; 32(5):416–21.
18. Iser BPM, Stopa SR, Chueiri PS, Szwarcwald CL, Malta DC, Monteiro HO da C, et al. Prevalência de diabetes autorreferido no Brasil: resultados da Pesquisa Nacional de Saúde 2013. Epidemiologia e Serviços de Saúde 2015 Jun;24(2):305–14.
19. Flor LS, Campos MR. Prevalência de diabetes mellitus e fatores associados na população adulta brasileira: evidências de um inquérito de base populacional. Revista Brasileira de Epidemiologia 2017;20(1):16–29.
20. Kroenke K, Spitzer RL, Williams JBW. The PHQ-9: Validity of a brief depression severity measure. Journal of General Internal Medicine 2001;16(9):606–13.
21. Khaled M, Haghighatdoost F, Feizi A, Aminorroaya A. The prevalence of comorbid depression in patients with type 2 diabetes: an updated systematic review and meta-analysis on huge number of observational studies. Acta Diabetologica 2019;56(6):631–50.
22. Levis B, Benedetti A, Thombs BD. Accuracy of Patient Health Questionnaire-9 (PHQ-9) for screening to detect major depression: individual participant data meta-analysis. BMJ [Internet] 2019;365(1476).
23. Negeri ZF, Levis B, Sun Y, He C, Krishnan A, Wu Y, et al. Accuracy of the Patient Health Questionnaire-9 for screening to detect major depression: updated systematic review and individual participant data meta-analysis. BMJ 2019; 365.
24. Fráguas R, Soares SM de SR, Bronstein MD. Depressão e diabetes mellitus. Archives of Clinical Psychiatry 2009;36:93–9
25. de Oliveira SG, dos Santos LL, da Silva DN, da Silva SL. “Exercícios físicos e diabetes mellitus: Revisão. *Brazilian Journal of Development* 2021;7:8837-8847**.**
26. Muzy J, Campos MR, Emmerick I, Silva RS da, Schramm JM de A. Prevalência de diabetes mellitus e suas complicações e caracterização das lacunas na atenção à saúde a partir da triangulação de pesquisas. Cadernos de Saúde Pública 2021;37.
27. Rossaneis MA, Haddad M do CFL, Mathias TA de F, Marcon SS. Differences in foot self-care and lifestyle between men and women with diabetes mellitus. Revista Latino-Americana de Enfermagem 2016;24.
28. Khunti K, Chen H, Cid-Ruzafa J, Fenici P, Gomes MB, Hammar N, et al. Glycaemic control in patients with type 2 diabetes initiating second-line therapy: Results from the global DISCOVER study programme. Diabetes, Obesity and Metabolism. 2019;22(1):66–78.
29. Faselis C, Katsimardou A, Imprialos K, Deligkaris P, Kallistratos M, Dimitriadis K. Microvascular

Complications of Type 2 Diabetes Mellitus. Current Vascular Pharmacology 2020;18(2):117–24.

30. Santomauro DF, Herrera AMM, Shadid J, Zheng P, Ashbaugh C, Pigott DM, et al. Global prevalence and burden of depressive and anxiety disorders in 204 countries and territories in 2020 due to the COVID-19 pandemic. *The Lancet* 2021;398: 1700-1712.

THE AUTHORS DECLARE THAT THERE IS NO CONFLICT OF INTERESTS IN RELATION TO THIS ARTICLE.