

EFFETCS OF ANXIETY AND DEPRESSIVE DISORDERS ON TYPE 2 DIABETES IN MOROCCAN POPULATION FROM THE PROVINCE OF KENITRA

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Abstract

Depression is a disorder caused by a combination of genetic, environmental, biological and psychological factors. Mood disorders, such as major depression, are frequently observed in patients with type 2 diabetes. The main aim of our study is to evaluate the prevalence of psychiatric disorders, in order to facilitate diabetic management. The questionnaire used in this research is the HAD (Hospital Anxiety and Depression scale) at 300 patients. Specific biological parameters of diabetic disease were also determined in order to establish links between these parameters and depression. This finding deserves careful consideration by researchers and physicians. In our study conducted at the Moulay Hassan Hospital in Kenitra (Morocco), 16% of diabetics were found to have depressive symptoms and 37 % with anxiety symptoms. The biological characteristics give the following results: age of diabetics (58,51±13,11 years), BMI (26,44±3,4 Kg /M²), glycemia (1,85±0,64 g/l), HTA (45,7%) , HbA1c (8,09±1,7%) and chronic complications (41, 7%) including retinopathy (16%) , nephropathy (4%) , neuropathy (3.3%) , cardiovascular disease (16.7%) and dyslipidemia (22.6%) Type 2 diabetic patients (PDT2) show signs of anxiety and are often irritated and tense (59%), PDT2 do not really feel cheerful and in a good mood (50%), have a feeling of fear as if something is going to happen to them (20%) and do not know how to laugh and see the funny side of things really, rarely hold themselves in place (57%), quite often show feelings of panic (52%). Depression increases the risk of developing comorbidities such as cardiovascular disorders and alters the quality of life of patients.

Keywords: Anemia, Pregnant Women, Prevalence, Complementary Medicine, Sidi Kacem, Morocco.

1. INTRODUCTION

The management of type 2 diabetes (T2DM) is relatively complex. The administration of OAD (oral antidiabetic drugs) and insulin are sometimes insufficient to deal with type 2 diabetes. Mental illnesses (anxiety, depression) must also be diagnosed. There is a growing body of research evidence that shows a relationship between mental disorders and diabetes [1,2]. People with severe mental illness, particularly those with depressive symptoms or syndromes, and people with diabetes have a reciprocal susceptibility and high rate of conditions involving mental health [1]. The mechanisms underlying these relationships are governed by multiple factors. There is some evidence that treatment of mental disorders may increase the risk of diabetes. Clinically significant depression is present in one of every four people with type 2 diabetes mellitus (T2DM). Depression increases the risk of the development of T2DM and the subsequent risks of hyperglycemia, insulin resistance, and micro- and macrovascular complications. Conversely, a diagnosis of T2DM increases the risk of incident depression and can contribute to a more severe course of depression. This linkage reflects a shared etiology consisting of complex bidirectional interactions among multiple variables, a process that may include autonomic and neurohormonal

dysregulation, weight gain, inflammation, and hippocampal structural alterations. [3-6]. Biochemical changes due to mental illness may also be involved [7,8], as well as lifestyle changes and associated symptoms [9]. The presence of depression in conjunction with diabetes alters clinical outcome; this is likely due to lethargy that decreases motivation for self-care, which in turn leads to deterioration in physical and psychological status, increased use of health care services and deterioration in adherence to therapy [10,11]. Depression also appears to have an adverse effect on cardiovascular mortality [12,13]. Treatment of depressive symptoms results in a more significant improvement in mood than in glycemic control [14,15]. Anxiety frequently occurs in patients with depressive symptoms [16,17]. One study estimated that 14% of people with diabetes have a generalized anxiety disorder; this proportion is twice as high for subclinical anxiety disorders, and three times as high for the presence of anxiety symptoms [18]. It is therefore essential to diagnose possible mental illnesses in parallel with drug and dietary therapy. In addition to the determination of biologic and clinical parameters, the main objective of our study is limited to the prevalence of anxiety and depression in diabetic patients and to maintain an effective management in parallel with the drug management. Diabetes and depression are both chronic debilitating conditions, and their coexistence has been associated with adverse outcomes.

In this study, we investigated the association between glycemic control and depression in type 2 diabetes (PDT2) patients attending a tertiary healthcare facility in Morocco.

2. MATERIALS AND METHODS

2.1 Study design

Our study focuses on the relationship between psychological illnesses such as anxiety and depression and diabetes, which is often overlooked by health specialists. The HAD was developed by Zigmond and Snaith in 1983 to provide clinicians and scientists with a reliable, valid and practical screening tool for identifying the two most common forms of psychological distress in medical patients, anxiety and depression. It includes 14 items rated from 0 to 3.

Seven questions relate to anxiety (total A) and seven others to the depressive dimension (total D), thus making it possible to obtain two scores (maximum score for each score = 21). This questionnaire also allows for the determination of biological and clinical values of diabetic patients. The HAD scale allows for the diagnosis of both anxiety and depression. The study, carried out using a questionnaire designed for diabetics, also covers clinical, anthropometric and biological parameters.

2.2 Participants

Diabetic people with a blood glucose level above 1.26 g/l who come to the hospital to have their blood glucose and HbA1c levels checked in the morning on an empty stomach are immediately taken to the interviews and answer the questionnaires, which are anonymous and comply with ethical standards.

This is a cross-sectional observational study with a descriptive aim carried out over a period of 3 months in a public hospital (Diabetes Service) in Kenitra (Morocco), on an affective of 300 type 2 diabetic patients.

2.3 Data measurement

To assess mental disorders (anxiety and depression), Hospital Anxiety and Depression scale (HAD) was used in this research. Type 2 diabetic patients with a blood glucose level of more than 1,25 g/l are included. The survey is anonymous and respects the ethical standards recommended by the World Health Organization (WHO).

In addition to the HAD scale, which is used to diagnose diabetic patients using characteristic items (appendix 1), the equipment used consists mainly of a blood pressure monitor, a weighing scale, a ruler, blood glucose strips, a haemoglobinometer and a questionnaire designed especially for diabetic people. In addition to the clinical and biological variables (age, gender, BMI, glycemia, HbA1c, HTA).

2.4 statistical analysis

After coding the data, descriptive analyses (qualitative and quantitative variables) were listed to meet the objectives and study diabetes as a function of the different variables. Statistical analysis was carried out using IBM SPSS 20 statistical analysis software. Bivariate analyses were chosen to study the relationships between the different variables. Chi-square tests were performed for quantitative variables, with a significance level of $p < 0.05$.

3. RESULTS

The results of our survey show that 46% of the type 2 diabetics were men and 54% were women, with an average age of 58.51 ± 13.11 years. Our results show that 37% of diabetic patients suffer from anxiety symptoms and 16% from depressive episodes.

The age of the diabetics varied from the youngest (24 years), which represented 0.4%, to the oldest (89 years), which represented 0.8%. The age of 62 years represents the highest percentage of 5.8%, followed by the age of 47 years which is 4.2%. The educational level of type 2 diabetic patients: illiterate (17%), primary: (19%), secondary (26%), High school (28%) and university (10%). The average weight of patients is $(74,64 \pm 9.9)$ kg.

The BMI is $(26,44 \pm 3.4)$ kg/m². The fasting blood glucose level is (1.85 ± 0.64) g/l. 45.7% of T2DM are hypertensive and 24.7% of them have dyslipidemia. It should be noted that during our survey, T2DM were aware of the importance of the biological parameters glycemia and glycated hemoglobin (HbA1c).

The proportion of T2DM with a normal lipid profile (HDL-LDL-Cholesterol-Triglycerides) is 75.3%, while that of T2DM with an abnormal lipid profile is 24.7%. Type 2 T2DM with abnormal renal function tests accounted for 10.6%.

There was also a highly significant statistical difference between hypertension and age ($p=0.001$), and between lipid levels and age ($p=0.006$), while there was no significant relationship between blood glucose levels, age or gender ($p>0.05$). Concerning the use of medication, oral antidiabetics (OADs) represent (67.4%), insulin (29%) and (OADs and Insulin) (3.6%). The mean value of HbA1c (glycated hemoglobin) was (8.09 ± 1.7) %. Concerning the age of diabetes, 48% of diabetics have diabetes for more than 10 years. The results of this survey show that type 2 diabetic patients (PDT2) are often relatively irritated (59%). PDT2 can stay quietly doing nothing and

feel relaxed (42%). PDT2 feel like they are running in slow motion (54%), have a feeling of fear as if something is going to happen to them (48%). The item I laugh easily and see the good side of things: really less than before (41%). I am restless and can't keep still: a little (57%). I can enjoy a good book or a good radio or television program (46%).

I have some feelings of panic: quite often (52%). I feel cheerful and in a good mood: often (50%). I still enjoy doing the things I used to enjoy: only a little (47%). I am not interested in my appearance anymore: I don't pay as much attention to it (52%). I experience feelings of fear and have a knotted stomach: quite often (43%). During our survey, 40.9% of diabetics representing depressive symptoms.

The distribution of biological parameters (blood glucose and HbA1c) of patients according to sex and age does not confirm any significant statistical relationship ($p > 0.05$) (Table 1), while a highly significant relationship between hypertension and age of patients is noted ($p=0.001$).

On the other hand, there was no significant relationship between hypertension and sex ($p > 0.05$). Regarding lipid and renal status, the only statistically significant relationship was observed between lipid status and age ($p=0.006$).

Table 1: Distribution of biological parameters of patients by gender and age

Biological parameters		Gender (%)		Age (%)					P * < 0,05
		M	W	<40	[41-50]	[51-60]	[61-70]	>70	
Gly (g/l)	< 1.26 g /l	6.6	8	1.3	1.3	4.6	4.3	3	<i>P=0.724</i> <i>P=0.410</i>
	[1.26–2]	25.6	27.6	5.3	12.6	15.3	11.3	8.6	
	[2 – 3]	11.3	14	2.3	4.6	6	6.3	6	
	> 3 g /l	2.3	4.3	0.3	0.6	1.6	3	1	
HbA1c (%)	< 6	4	0.3	0.3	1.3	2	0	0	<i>P=0.399</i> <i>P=0.531</i>
	[6 – 7]	10	13.6	3.6	5.3	7.3	5.3	2.3	
	[7 - 8]	13	14.3	1.3	7	1.3	6	8.6	
	[8 – 10]	15.3	15.3	3.3	4.3	7	10	6	
	> 10	3.3	9.6	0.6	1.3	5.3	3	2.6	
HTA (mmHg)	Normal	27.6	26.6	6.6	13.6	15.3	11.6	7	<i>P=0.062</i>
	Abnormal	18.3	27.3	2.6	5.6	12.3	13.3	11.6	<i>P=0.001*</i>
Lipid test	Normal	36.3	38.6	8.6	16	21	18.6	11	<i>P=0.068</i>
	Abnormal	9.3	13.3	0.6	3.3	6.6	6.33	7.6	<i>P=0.006*</i>
Renal assessment	Normal	41.6	47.6	9.3	18.3	24.6	21.3	15.6	<i>P=0.325</i>
	Abnormal	4.3	6.3	0	1	3	3.6	3	<i>P=0.086</i>

Gly: Glycemia / HTA: arterial hypertension / HbA1c: glycemic hemoglobin

The distribution of psychological characteristics of the patients according to sex, glycemia, hypertension, complications and lipid status (Table 2) revealed the existence of a slight significant relationship between anxiety symptoms and chronic complications ($p=0.06$).

While we also note the existence of a significant relationship between depressive symptoms and glycemia ($p=0,05$). We also note that diabetic women are more affected by anxious symptoms (36.3%) than men, and the same is true for depressive symptoms, where diabetic women have 17,3% compared to diabetic men (13%).

Table 2: Distribution of psychological characteristics of patients according to gender, age, glycemia, hypertension, complications and lipid status

Parameters (%)	Age	Gender (M/W)	Gly (g/l)	HTA (mmHg)	Chronic Complications	Lipid test	P * < 0.05
Anxious symptoms	<50 :18 >50 :49.6	M :31.3 W :36.3	< 1.26: 8.6 [1.26-2] :37 >2 : 22	N: 36 AN :31.6	Absence :39 Presence :28.6	N: 52.6 AB : 15	<i>P=0.391</i> <i>P=0.653</i> <i>P=0.678</i> <i>P=0.060*</i> <i>P=0.266</i>
Depressive symptoms	<50 :8 >50 :22.3	M :13 W :17.3	< 1.26: 4.6 [1.262]:14.5 >2 : 11.3	N :17.6 AN :12	Absence :18.6 Presence :11.6	N :22.3 AB :30.3	<i>P=0.105</i> <i>P=0.050*</i> <i>P=0.816</i> <i>P=0.136</i> <i>P=0.142</i>

Gly: Glycemia/ HTA: Arterial hypetension.

Table 3 represents the distribution of psychological symptoms according to the age of diabetes, the duration of diabetes and the regularity of treatment. We do not note a statistically significant relationship between anxious symptoms and the age of diabetes, the duration of diabetes and the regularity of treatment ($p>0.05$).

On the other hand, we note the existence of a significant relationship between depressive symptoms and the regularity of treatment ($p=0,05$) It is also noted that diabetics with a duration of diabetes of more than 10 years have significant psychological symptoms (anxiety: 37%) and (depression: 14.6%).

The age of diabetes [45-50] years represents the largest percentage (anxiety: 27%) and (depression 11%). However, there is no statistically significant relationship between the distribution of psychological parameters of diabetic patients and the professional level, the level of schooling, the practice of sports and the BMI ($p>0.05$) (Table 4). Diabetics with BMI > 25 Kg/M² have the highest psychological percentage (anxiety: 43%) and (depression: 36.3%).

Table 3: Distribution of psychological symptoms according to age of diabetes, age of diabetes and regularity of treatment

Parameters	Age of diabetes (%)	Diabetes duration (%)	Regulation of the treatment (%)	Cardiovascular risk (%)	P * < 0.05
Anxious symptoms	Less than 40: 14.3 [40-45]: 19.6 [45-50]: 27 More than 50 :16.6	Less than 6 months: 5 Less than 5 years:36 More than 10 years:37	Yes: 59 No : 18.6	No risk: 19.6 Smoking: 6.3 Alcoholism: 1 Obesity: 3 Sedentary lifestyle: 1.3	<i>P=0.292</i> <i>P=0.842</i> <i>P=0.624</i> <i>P=0.906</i>
Depressive symptoms	Less than 40: 5.6 [40-45]: 6.3 [45-50]: 11 More than 50 : 7.3	Less than 6 months: 2.3 Less than 5 years: 14 More than 10 years: 14.6	Yes: 20.3 No :10	No risk: 48 Smoking: 14.3 Alcoholism: 1.6 Obesity: 9 Sedentary lifestyle: 4.6	<i>P=0.641</i> <i>P=0.151</i> <i>P=0.05*</i> <i>P=0.732</i>

BMI: Body mass index

Regarding cardiovascular risks, diabetic patients who smoke have a significant percentage of anxiety (6.3%), they have also a percentage of depression more important (14.3%) (Table 4). More than half of the diabetics are married (55%), 14% widower, 14% divorced and 7% single.

Table 4: Distribution of psychological parameters of diabetic patients according to professional level, school level, sport practice and BMI

Parameters	Professional level	School level	Sports practice	BMI (Kg/ m ²)	P
Anxious symptoms	Civil servant :11 Private: 21.3 Unemployed : 20	Illiterate: 13.6 Primary: 14.3 Secondary school:21.3 High school: 18.3 University : 10	Yes: 40.6 No : 37	<25: 34.6 >25 : 43	<i>P=0.990</i> <i>P=0.183</i> <i>P=0.569</i> <i>P=0.601</i>
Depressive symptoms	Civil servant :10.6 Private: 19.6 Unemployed : 15	Illiterate: 15 Primary: 11 Secondary school:18.6 High school: 21 University: 7.3	Yes: 38.3 No :31	<25: 33.3 >25 :36.3	<i>P=0.704</i> <i>P=0.256</i> <i>P=0.101</i> <i>P=0.630</i>

According to figure 1, the distribution of chronic complications revealed 16% retinopathy, 4% nephropathy, 17% cardiovascular diseases and 4 % loss of memory. The mean blood glucose level is 2,24 g/L with a standard deviation of 0.782 while the mean glycated hemoglobin reaches 8,09% with a standard deviation of 1,725 (Figure 2). The average BMI is 26.44 Kg/H² with a standard deviation of 1. 725.

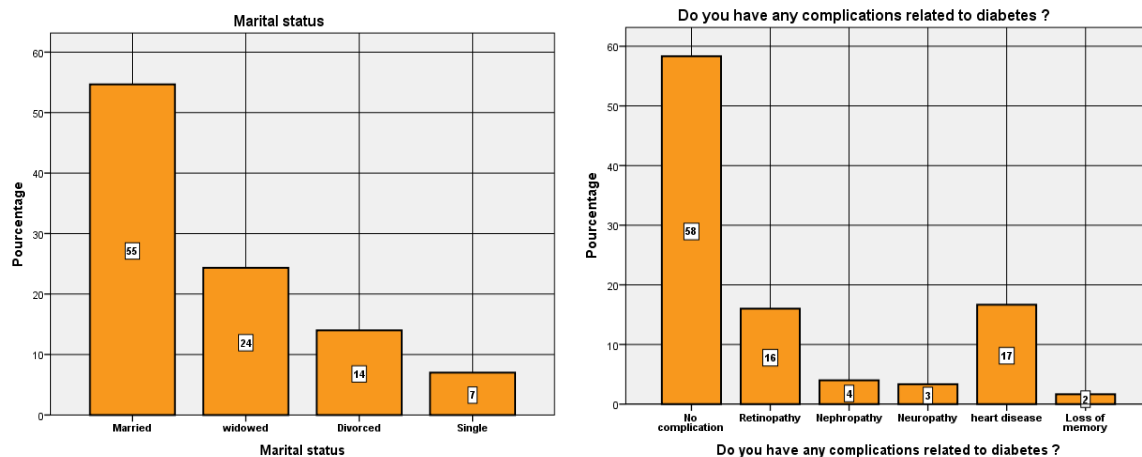


Figure 1: Distribution of diabetics by marital distribution and diabetes-related complications

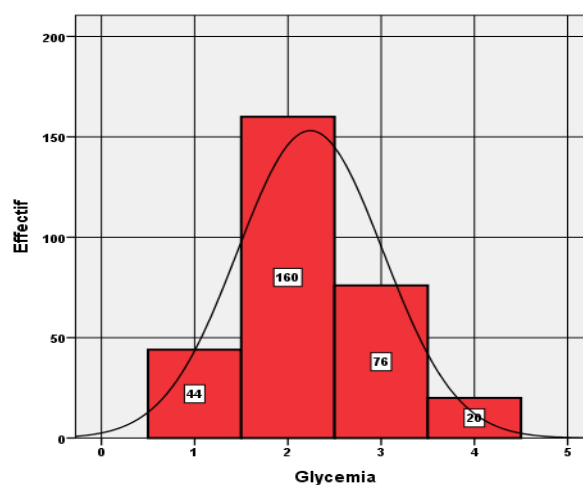


Figure 2: Distribution of patients with diabetes by blood glucose

The prevalence of hypertension in diabetic patients revealed 45.67% of hypertensive patients (Figure3). In particular, the percentage of anxious characteristics was higher in women than in men. There was no statistical relationship between the various anxiety parameters and gender ($p>0.05$). In addition, there was a statistical difference between D1 (I enjoy the same things as before) and D2 (I laugh easily and see the good side of things) and the sex of the patients, with ($p=0.05$) and ($p=0.014$) respectively.

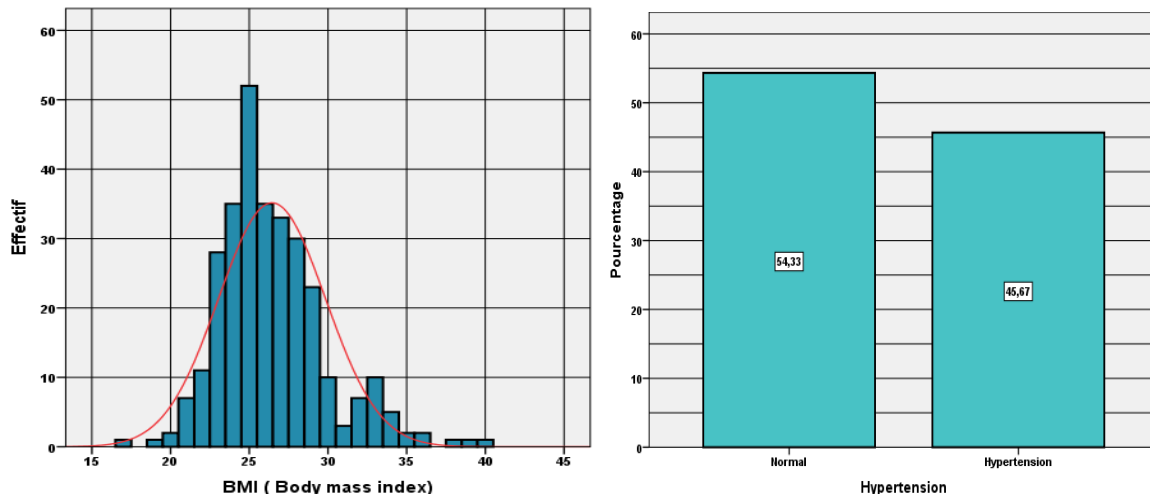


Figure 3: Distribution of patients with diabetes according to BMI and hypertension

4. DISCUSSION

Several studies have shown that the risk of depression is higher among people with diabetes compared to a non-diabetic population. So, this study aims to investigate the association between glycemic control and depression in type 2 diabetes (DT2) patients attending a tertiary healthcare facility in Morocco. According to the results obtained, it is mainly noted that type 2 diabetic patients show considerable anxiety symptoms. Indeed, DT2 are often irritated and tense (59%), worry quite often (49%), PDT2 don't really feel cheerful and in a good mood (50%), have a feeling of fear as if something is going to happen to them (20%), can rarely sit quietly doing nothing (42%) and can't laugh and see the funny side of things really, less than before (41%).

According to our results, type 2 diabetic patients show some depressive symptoms, namely they feel like they are functioning in slow motion (very often: 54%), PDT2 do not pay as much attention to their appearance (52%), rarely stand still (57%). 48% of diabetics look forward to doing certain things less well than before, quite often present feelings of panic (52%) and rarely PDT2 take pleasure in a good book (46%). Statistical significance is mainly noted between depressive symptoms and in particular gender ($p<0.05$) and blood glucose ($p<0.05$) while no statistical association is found with other clinical and bioclinical characteristics.

Diabetes (type 1 or type 2) can cause significant psychological difficulties for the patient and family members [19]. It affects quality of life and is a risk factor for diabetes-related distress and psychiatric disorders. Challenges associated with a diagnosis of diabetes include adjustment to the presence of the disease, adherence to medication and psychological issues. Diabetes is a chronic metabolic disorder that is a public

health problem that can be related to anxiety [20]. The relationship between diabetes and mental health is complex, subtle and two-way. Diabetes can increase mental health problems and vice versa; this can, in turn, worsen control of diabetes, and on occasions both can share the same causal.

The announcement of the diagnosis of diabetes arouses a whole range of emotions in the patient, including fear of the consequences of the disease and the risks associated with it. It is a moment that can be destabilizing and often very distressing for the patient, who needs help to accept and come to terms with his or her illness. Indeed, the diagnosis of diabetes can generate psychological disorders or exacerbate those that already exist, hindering good compliance with treatment. It has been reported that more than 40% of diabetic patients have anxiety disorders. Generalized anxiety disorders are more frequent in diabetics than in the general population, 32% versus 14%. Similarly, depressive symptoms are more common in diabetics. Hence the need for regular screening for depression and anxiety which can interfere with normal functioning in diabetes [21].

In the literature, authors such as Peyrot, Fisher and Blazer have reported that diabetics with a low level of education are the most likely to present with depression [22,23]. Depression is accompanied by important physiological changes that may increase the vulnerability of patients with type 2 diabetes and complications of diabetes mellitus. Depression is accompanied by metabolic changes that translate biologically into increases in the release and activity of hyperglycemic hormones, alterations in glucose transport and activations of inflammatory markers and can leading to other diseases as urolithiasis [24,25]. These abnormalities could promote insulin resistance and/or beta cell dysfunction in the islets of Langerhans [26, 27].

Presented at the European for the Study of Diabetes (EASD 2017), two studies confirm the interest of evaluating the psychological state of diabetic patients to improve management. By proving that the level of anxiety has repercussions on glycemic control, both in type 1 and type 2 diabetes, it is estimated that depression and anxiety disorders are twice as frequent in diabetic patients. The link is bi-directional, with anxiety-depressive disorders favoring diabetes, while diabetes predisposes to the appearance of these disorders [28].

In 2005, Lustman carried out another meta-analysis concerning the links between depression and glycemic control. The results show that diabetic patients suffering from depression had a lower glycemic control as well as a lower compliance with the medication of the diabetes and the hygienic-dietary rules [29]. According to Lustman, depression is commonly associated with hyperglycemic diabetes and has an impact on the disease and its complications. Similarly, poor glycemic control could increase depression and decrease the response to antidepressants [29]. Comorbidity could be considered as an additional burden for diabetic patients. The presence of chronic pathologies associated with diabetes is reported as a risk factor for depression in diabetic subjects by Téllez Zenteno [30]. A more careful study clearly showed the close relationship between insulin therapy and depressive symptoms in Korean diabetic subjects. The authors explained that this association could be due to the drudgery of injections, the increased risk of hypoglycemia, stricter dietary measures and more frequent hospitalizations [31]. Depression is caused by a combination of genetic, environmental, biological and psychological factors, and is known to be more common in people with chronic diseases such as hypertension, heart failure and type 2 diabetes

[32]. In their meta-analysis of more than 21,000 people with type 1 or type 2 diabetes, Anderson et al. observed that the prevalence of depression varied across studies according to gender, age, study population and method of depression assessment, but was higher among patients with diabetes (11.4%) compared to a population without diabetes (5%). In particular, diabetes doubled the risk of depression.

As already mentioned, patients with depression are, on the other hand, at greater risk of having a chronic disease. In particular, depression is an independent risk factor for type 2 diabetes [33]. Recently, Mezuk and colleagues conducted a large meta-analysis to assess the lifetime risk of depression and type 2 diabetes. They found that the risk of developing diabetes was 60% higher in subjects with depression compared to subjects without depression and that the risk of developing depression was 15% higher among diabetic patients compared to non-diabetics [34]. Thus, this is a bidirectional relationship between diabetes and depression. The pathophysiological mechanism linking these two conditions is still unknown, although several theories have been developed by researchers, including the psychological burden of having a chronic disease, biochemical changes specific to diabetes, and the role of inflammation in the pathogenesis and pathophysiology of both disorders [35,36]. The latest guidelines recommend screening for depression in patients with type 2 diabetes. Indeed, there is increasing evidence that depression has a negative impact on the prognosis of diabetes in terms of disease severity, associated complications and mortality. Depression negatively influences the quality of life of diabetic patients and their ability to manage type 2 diabetes with respect to physical activity, diet and medication adherence. In addition, among patients with type 2 diabetes, depression has been associated with poor glycemic control and an increased risk of microvascular and macrovascular complications [37-39].

The impact of obesity in the diabetic population is clinically important because 80% to 90% of subjects with type 2 diabetes are overweight or obese. Weight loss of 5% to 10% has been shown to be beneficial for these individuals [27,40]. The "Look AHEAD (Action for Health in Diabetes)" study of 5,145 people with type 2 diabetes showed that a 5% to 10% reduction in body weight over 1 year was associated with improvements in blood glucose and lipid profiles. Participants who reduced their body weight by 5% to 10% had an increased likelihood of reducing their HbA1c by 0,5% [41-43]. Some studies have looked at the relationship between depression severity (major, minor, and no) with obesity in people with diabetes. The study by Katon and colleagues reported a positive association between depression severity, as assessed by the PHQ-9, and obesity. Analyses of a sample of 4,193 adult diabetic patients from 9 health maintenance organization clinics showed that 67% of those with major depression were obese, compared with 55% with minor depression and 47% without depression [44].

The prevalence of mood disorders, such as major depression, in obese and/or diabetic patients is nearly 30%, which is double that of the general population. This is problematic because depression increases the risk of developing comorbidities such as cardiovascular disorders and alters the quality of life of patients. Thus, understanding the mechanisms involved in the development of depression in obese/diabetic subjects is a major public health issue. Epidemiological, clinical and experimental data have revealed that the action on the brain of the low-grade inflammation that accompanies obesity and diabetes is key in the depressive symptomatology [45]. In comparison with the literature, on a population of 189 diabetic

patients, lists 39% of depressed diabetics [31]. These results are very close to our survey (40.9%). It is likely that there are neurobiological factors that contribute to this co-occurrence. The increased synthesis of pro-inflammatory cytokines (IL1 β , TNF α , IL6) in the central nervous system leads to systemic inflammation due to the passage of these substances through the blood-brain barrier. This leads to insulin resistance and cellular dysfunction and type 2 diabetes. In addition, the hyper-activation of the corticotropic axis in depression leads to a pro-inflammatory state by altering the immune system and insulin resistance due to cortisol counter-regulation [46]. Despite the growing evidence of this finding, psychiatric disorders such as depression and anxiety often remain unrecognized and untreated in diabetic patients [47]. For example, one study reported that primary care physicians fail to detect depression in approximately 35-70% of cases [48]. Another study noted that only one-third of patients with diabetes are treated with antidepressant therapy by their diabetologist [49]. Lustman and Clouse conducted another meta-analysis regarding the relationship between depression and glycemic control. The results showed that diabetic patients with depression had poorer glycemic control and less compliance with diabetic medication and dietary management. According to Lustman and Clouse, depression is commonly associated with hyperglycemic diabetes and has an impact on the disease and its complications. Similarly, poor glycemic control could increase depression and decrease the response to antidepressants [50].

There is evidence that the prevalence of depression is moderately increased in prediabetic patients and in undiagnosed diabetic patients, and markedly increased in the previously diagnosed diabetic patients compared to normal glucose metabolism individuals. The prevalence rates of depression could be up to three-times higher in patients with type 1 diabetes and twice as high in people with type 2 diabetes compared with the general population worldwide. Anxiety appears in 40% of the patients with type 1 or 2 diabetes. Several experimental studies conducted in animal have demonstrated the effect of alternative therapy in the management of some diseases including diabetes [51-59].

In human, the numerous studies of the prevalence of depression in diabetics all show that it is more important in diabetics than in non-diabetics. Diabetes increases the risk of depression since, according to several meta-analyses and systematic reviews carried out in recent years, the risk of developing depression is 3 times higher in diabetic patients (regardless of type, 1 or 2, of diabetes. 20 to 60% of diabetics, depending on the study. The presence of depression and anxiety in diabetic patients worsens the prognosis of diabetes, increases the non-compliance to the medical treatment [60,61], decreases the quality of life and increases mortality [62,63].

5. CONCLUSION

The diagnosis of diabetes can cause psychological disorders in people with diabetes. The announcement of the disease can also exacerbate those that already exist. It is important to detect these disorders so that they do not lead to poor adaptation to treatment. We can find: generalized psychological anxiety disorders and depressive disorders. These disorders can lead to poor glycemic control and thus to medical complications. The frequency of anxiety and depressive disorders indicates the need to integrate mental health as an integral part of the management of people with diabetes. Diabetes is a major risk factor for depression.

The risk of developing depression is three times higher in type 1 diabetic patients and about twice as high in type 2 diabetic patients than in non-diabetic patients. Finally, the following therapeutic measures should be integrated into primary care and diabetes self-management education to facilitate adaptation to the disease, reduce diabetes-related distress and improve clinical outcome: motivational interventions, stress management strategies, coping skills training, family therapy and collaborative case management. Diabetes and depressive disorders are public health issues in terms of their prevalence and cost. Epidemiological data show that diabetes doubles the risk of developing depression. The literature emphasizes the importance of recognizing and treating depressive disorders in diabetes from both a psychiatric and a metabolic disease management perspective.

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