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Comorbidity of Depression and Anxiety: Association with Poor Quality of Life in Type 1 and 2 Diabetic Patients

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Abstract: *Background:* Diabetes is associates with depression and impairment in Quality of Life (QoL). *Objective:* The objective is to define the frequencies of depressive and anxiety symptoms in a sample of patients diagnosed with type 1 and 2 diabetes, the amount of impairment of QoL and the weight of depression and anxiety in determining the QoL in such of patients. *Methods:* A total of 210 patients were divided into two groups (type 1 and type 2). Patients completed the HADS and WHOQoL-bref. *Results:* Groups showed a high prevalence of anxiety (type 1 = 60%, type 2 = 43.8%) and depression (type 1 = 52.4%, type 2 = 38.1%), both measures were significantly higher ($p < 0.05$) in diabetes type 1 patients. Type 1 patients also showed a QoL in the overall assessment and the physical, psychological and social relations domains. In both Type 1 and 2 diabetes poor QoL was found associated by anxiety and depression comorbidity. *Conclusion:* In overall diabetes patients depression and anxiety seems to be a determinant of poor QoL.

Keywords: Anxiety, depression, quality of life, type 1 and type 2 diabetes.

INTRODUCTION

Some studies have linked anxiety and depression in diabetes mellitus [1]. Moreover, controlled studies suggest that treatment of depression may improve glycemic control [1-3]. Thus, it is important to estimate the depression and anxiety prevalence to manage the potential impact of these disorders in type 1 and 2 diabetes patients. However, despite the literature on this subject has expanded considerably, the findings are unclear about the relationship among depression and anxiety with diabetes. Some recent studies have also established that diabetes can worsen the quality of life (QoL) of affected patients [4]. Until now, very few data are known about the role that comorbid anxiety or depressive disorders may have in determining a low QoL in patients with diabetes [3].

Hyperglycemia, common observed in diabetes mellitus, causes great emotional and physiological interference in patients [1, 2], and then, a direct relationship can be observed between mood/anxiety and glycemic control [3]. In addition, the inappropriate treatment of diabetes favors the occurrence of physiological, emotional and social problems [2].

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Therefore, the prevalence of anxiety and depression in diabetic patients is relevant to our public health authorities; due to the great search for additional treatments and consequently an impairment in QoL was supposed [1-4].

Up to 76% of diabetic patients show reduction in the use of insulin when combine psychotherapy for depression and appropriate diet[5]. In addition, 9-16% of diabetic patients hospitalized present depression, and 33% reported chronic pain [5].

It is well-known that as much depression as anxiety may modify the clinical course of *diabetes mellitus,* worsening the prognosis and thus it can impairing the QoL [6]. On the other hand, when depression is treated an improvement in diabetes is observed [7]. Anxiety, in turn, is an important factor for reduction of course of illness, more than age or time of illness [8, 9].

It is well-known that subjective perception of the quality of life is of great relevance for the measures of outcome in chronic diseases [10], particularly in patients with multiple sclerosis and frequent co-morbidity with mood disorders and depression. These conditions heavily impact the daily life of the affected patients and their families [11, 12].

The objective of this study is to measure the prevalence of depressive and anxiety symptoms in a sample of patients with diabetes of type 1 and 2, to define the amount of im-

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pairment of QoL in patients with diabetes of type 1 and 2 and the extent of this impairment due to depressive or anxiety symptoms in such a patients.

METHODOLOGY

Study Design

We conducted a cross-sectional observational study.

Sample

Sample was composed of 210 diabetic outpatients (mean = 59.37, SD = 12.96; 81 male and 129 female), from a public health clinic with diagnoses of diabetes mellitus who were under the medical supervision of an endocrinologist. Patients were divided in two groups, type 1 and type 2 diabetes, with 105 patients each one. Inclusion criteria: have medical monitoring; have attended the initial interview and have it carried out in full; have sufficient cognitive capacity to understand the instructions given; have aged 18 years. Patients signed a consent form and were aware of the experimental protocol (approved by the Ethics Committee at Federal University of Rio de Janeiro) before participation commenced.

Study Tools

The patients were evaluated with *Mini International Neuropsychiatric Interview* [13] an instrument with a standard model of a brief structured interview (approximately 25 minutes) for the evaluation of the existence of Axis I psychiatric disorders according to the DSM-IV and *Hospital Anxiety and Depression Scale* (HADS) [14] this one is an instrument with is a brief (14-item), self-report measure of anxiety and depression. It was developed for use in general medical out-patient clinics but is now widely used in clinical practice and research [14]. At present, interpretation of the HADS is based primarily on the use of cut-off scores, although there is no single, generally accepted, cut-off score for the HADS. The test's authors recommended that, for the Anxiety and Depression scales alike, raw scores of between 8 and 10 identify mild cases, 11–15 moderate cases, and 16 or above, severe cases and *The World Health Organization Quality of Life* (***WHOQOL-BREF***) [15-17]. The WHOQOL-Bref is a relatively new instrument, used to measure QoL. It is an abbreviated version of the WHOQOL-100 QoL instrument, developed by the WHOQOL group [17]. The WHOQOL Bref adopts the following definition of health-related QoL: "the value assigned to duration of life as modified by the impairments, functional states, perceptions, and social opportunities that are influenced by disease, injury, treatment, or policy". This instrument is being field-tested at present and, according to the WHOQOL group provides an adequate alternative to the WHOQOL-100. It produces scores for four domains related to QoL (physical health, psychological, social relationships and environment). The items are rated on a 5-point Likert scale, reflecting intensity, capacity, frequency or evaluation. The items inquire "how much," "how completely," "how often," "how good" or "how satisfied," with possible answers ranging, from very satisfied to not at all satisfied [16]. The range of scores in each domain is from 4 to 20, where a higher score indicates a better QoL. The cut-off scores at the overall scale indicating good or impaired QoL [15-17].

Descriptive data from participants diagnosed as having type 1 diabetes, including sex, age, education, occupation, religion, children, and the use of psychotropic drugs were also verified. We define "depressive and anxiety" patients with the results of HADS.

Statistical Analysis

We used descriptive statistics for sociodemographic data, considering the raw data and percentage or mean and standard deviation. In line with this, WHOQOL-BREF and HADS data followed this model of presentation, and the classification will be presented as percentage. Contingency tables will be analyzed with Chi-square test, Fisher's exact test and student t-test. The difference between the groups was evaluated by Multivariate Analysis of Variance (MANOVA). For the assumption of homogeneity of variance-covariance matrices test we used M Box and to ensure that the hypothesis of equal variance between groups were not violated we used the Levene's test. We adopted an alpha p-value = 0.05 to establish statistical significance, considering the total of 210 patients. Thus, the power of our study is by 0.90.

RESULTS

In our study, 210 diabetic patients were evaluated and divided in two groups, type 1 and 2 diabetes, with 105 patients each one. We show according to descriptive data from participants diagnosed as having type 1 and 2 diabetes data related to sex, age, education, occupation, religion, children, and the use of psychotropic drugs. Our study showed no significant difference in the sociodemographic data (Table **1**).

As noted, the groups can be considered similar because there was not statistically significant difference to any variable respect to characterization of groups. In addition the total number of patients with diabetes who presented each of the psychiatric disorders identified in the sample, with percentages in decreasing order. We have descriptive data about mean and standard deviation for anxiety, depression, QoL, and for other domain of QoL (Table **2**).

Moreover, our results of anxiety and depression prevalence in type 1 and 2 diabetic patients were obtained, according to the classification of HADS. We used as cut-off score 8 to detect possible anxiety and depression symptoms. Both presented higher prevalence in type 1 diabetes, with significant statistical difference (Table **3**).

Our study showed with regard the comparison between groups for anxiety and depression (considering the score obtained in the HADS), to four domains of QoL (physical, psychological, social relations and environment) and to the QoL on the whole. We use the M Box test for the assumption of homogeneity of variance-covariance matrices with no significant results (F= 1,20; p =0,20), demonstrating that the condition has not been violated. The Levene test was performed to ensure that the hypothesis of equal variance between groups were not violated and was not significant for any dependent variable. The Wilks Lambda value was significant (F= 2,67; p = 0,01), showing there were not any difference between groups. The effect among subjects for QoL and its domains physical, psychological and anxiety have significant difference into groups (Table **4**).

Table 1. Characteristics of Type 1 and 2 Diabetic Patients

	Patients with Type 1 Diabetes	Patients with Type 2 Diabetes	df	t-test or χ^2	p-value
Sex			1	1,62	0,20
Female	60 (57,1%)	69 (65,7%)			
Male	45 (42,9%)	36 (34,3%)			
Age	58,38 (±14,60) Minimum=18; Maximum=82	60,36 (±11,32) Minimum=31; Maximum=81	208	-1,1	0,27
Marital status			3	2,64	0,45
Single	17 (16,2%)	13 (12,4%)			
Married	55 (52,4%)	66 (62,9%)			
Divorced	11 (10,5%)	7 (6,7%)			
Widow/Widower	22 (21%)	19 (18,1%)			
Occupation			4	5,17	0,27
Student or housewife	22 (21%)	23 (21,9%)			
Unemployed	3 (2,9%)	4 (3,8%)			
Working	31 (29,5%)	44 (41,9%)			
On leave	5 (4,8%)	3 (2,9%)			
Retired	44 (41,9%)	31 (29,5%)			
Religion			4	4,96	0,29
Atheist	4 (3,8%)	0			
Catholic	72 (68,6%)	73 (69,5%)			
Evangelic	22 (21%)	27 (25,7%)			
Other	5 (4,8%)	4 (3,8%)			
	2 (1,9%)	1 (1 %)			
Education			3	3,71	0,29
Elementary school	48 (45,7%)	50 (47,6%)			
High school	23 (21,9%)	16 (15,2%)			
College or Higher education	24 (22,9%)	33 (31,4%)			
	10 (9,5%)	6 (5,7%)			
Children			1	1,69	0,19
Yes	90 (85,7%)	96 (91,4%)			
No	15 (14,3%)	9 (8,6%)			
Use of Psychotropics			1	0,12	0,72
Yes	20 (19%)	18 (17,1%)			
No	85 (81%)	87 (82,9%)			

Table 2. Descriptive Data (Mean and Standard Deviation) for Anxiety, Depression, Quality of Life, and for other Domain of Quality of Life

	Diabetes	
Domains	**Type 1**	**Type 2**
Anxiety	9,10 (±4,61)	6,93 (±3,86)
Depression	7,70 (±4,64)	6,19 (±4,34)

Table 2. contd…

	Diabetes	
Domains	**Type 1**	**Type 2**
Physical	22,67 (±6,27)	25,50 (±5,67)
Psychological	21,68 (±4,75)	23,25 (±3,53)
Social relationship	10,83 (±2,48)	11,65 (±2,57)
Environment	27,77 (±5,68)	28,86 (±5,15)
Quality of life	88,70 (±15,30)	95,50 (±13,34)

Table 3. Anxiety and Depression Prevalence in Type 1 and 2 Diabetic Patients

	Type 1	Type 2	Df	χ^2	p-value
Anxiety	63 (60%)	46 (43,8%)	1	5,51	0,02
Depression	55 (52,4%)	40 (38,1%)	1	4,32	0,04

Table 4. Effects among Subjects for Quality of Life and its Domains, Anxiety and Depression

	Type III Sum of Squares	Df	Mean Square	F	Sig.
Quality of life	2427,60[a]	1	2427,60	11,78	< 0,01
Physical	420,04[b]	1	420,04	11,77	< 0,01
Psychological	129,64[c]	1	129,64	7,40	< 0,01
Social relationships	35,22[d]	1	35,22	5,50	0,02
Environment	61,89[e]	1	61,89	2,11	0,14
Anxiety	245,37[f]	1	245,37	13,58	< 0,01
Depression	118,88[g]	1	118,88	5,88	0,02

Legend: [a.] R Squared = ,054 (Adjusted R Squared = ,049); [b.] R Squared = ,054 (Adjusted R Squared = ,049); [c.] R Squared = ,034 (Adjusted R Squared = ,030); [d.] R Squared = ,026 (Adjusted R Squared = ,021); [e.] R Squared = ,010 (Adjusted R Squared = ,005); [f.] R Squared = ,061 (Adjusted R Squared = ,057); [g.] R Squared = ,027 (Adjusted R Squared = ,023)

Table 5. Anxiety and Depression and Quality of Life in Patients with Diabetes

Diabetes Patients	% with Impaired QoL (= no Good QoL at WHOQOL)	Odds Ratio (Vs Similar Diabetes Without Condition)	X2	P	CI%
Type 1 with depression	67.3%	10.27	28.11	0.0001	3.86-31.24
Type 2 with depression	52.3%	8.42	22.27	0.0001	2.98-24.32
Type 1 with anxiety	60.3%	19.60	7.20	0.0001	2.69-22.30
Type 2 with anxiety	52.1%	18.19	6.95	0.0001	2.48-20.07

It was observed that patients with type 1 diabetic patients have a higher prevalence of anxiety and depression than the type 2 diabetic patients. However, these patients presented decreased QoL, whether in their overall assessment or in any of their specific domains. Statistically significant difference was found for all variables, except for the domain "environment", showing that this difference is not due to chance and that should be considered for the better understanding of these specific populations. Finally our study showed that, despite the differences in the frequency of symptoms of anxiety and depression in type 1 diabetes and type 2 diabetes, both anxiety and depressive symptoms are associated with impaired QoL in diabetes type 1 as in type 2 diabetes. Our study found highly significant differences in both types of diabetes (Table **5**).

DISCUSSION

The present study aimed to investigate the prevalence of depression and anxiety in patients diagnosed as type 1 and 2 diabetes and to examine the QoL in these patients, verifying the role of the anxiety and depressive symptoms as determinants of QoL.

The sample consisted of 105 patients with type 1 diabetes and 105 with type 2 diabetes, showed homogeneity (no statistically significant difference) between the groups for all variables (i.e., age, sex, religion, education, marital status, occupation, children and use of psychotropic drugs). Thus, we make sure differences found between groups for depression, anxiety and QoL are not influenced by these factors.

The results show that patients with type 1 diabetes had higher prevalence of anxiety (60%) than patients with type 2 diabetes (43%), showing a statistically significant difference ($p<0.01$). The possible increase in glucose, which has been indicated as predictive of increased anxiety in these patients [4-7], as well as the need for constant self-monitoring and possible application of injectable insulin depending on the glucose level [18, 19], may collaborate to this higher prevalence of anxiety observed in type 1 diabetic patients. Anxiety as a remarkable feature of diabetic patients draws attention for further medical care, resulting in a more rigorous treatment during the chronic course of the disease, with the purpose of preventing other physiological and emotional comorbidities over patients' lifetime [4-8].

Others studies showed that diabetic patients with comorbid depression or anxiety improve when treated with psychotherapy techniques, such as mindfulness [20]. Despite the direct relationship between psychiatric disorders and blood glucose, psychotherapy did not demonstrate any influence on glucose level of patients, thus, more studies should be conducted to clear this issue [20,21].

Type 1 diabetic patients also showed statistically significant results ($p<0.05$) for depression (52%) compared to type 2 diabetic patients (38%). Thus, this finding suggests that type 1 diabetes is more related to mood than type 2 diabetes [22]. Due to type 1 diabetes lead to more clinical complications [1-4], it is understood that these patients present lower levels of mood.

Despite the greater prevalence of anxiety and depression in type 1 diabetic patients, as observed in other studies [21-24], the findings related to type 2 diabetic patients (i.e., anxiety [43%] and depression [38%]), even though lower should not be neglected. These findings arouse interest in medical and psychological areas [22, 23], since the increase in glucose level also influence on type 2 diabetic patients, leading to changes in emotional and physiological processes, such as elevated blood pressure, cardiac alterations, impairing their QoL [21].

In addition, type 2 diabetes demonstrate moderate correlation with anxiety (r=0.63) and strong correlation with depression (r=0.95) with regard to increase of blood glucose [9]. Regarding the psychosocial factors in type 1 diabetes, while the illness can lead to impoverished relationships [9]; it is observed that those who receive family support have a better QoL, greater social participation and even greater interest in the practice of physical activities [8-10]. Concerning there are differences between types 1 and 2 diabetic patients, not only regarding their clinical features, but also their strategies developed to deal with the illness and the treatment implemented to them, we aim to investigate the prevalence of depression and anxiety in patients diagnosed as type 1 and 2 diabetes. In addition, we aim examine the QoL in these patients, verifying if there is difference between them.

We identified that impairments related to QoL are also higher in patients of type 1 than type 2 diabetes. This difference was statistically significant in physical, psychological and social relationship areas ($p<0.01$). With regard to social domain, which play an important role in our lives; when there is negative influence by depression and anxiety, many impairments in social relationships may occur, mainly due to glycemic control [18, 19, 23, 24].

In the physical domain, we observed the biggest difference between the groups. Thus, we must to take into account that most patients with type 1 diabetes may be overweight or even obese, leading to several impairments, such as locomotion, and in addition, causing further losses in physical domain [25-27]. Limitations arising from the glycemic control can also collaborate in this regard.

The QoL in diabetic patients is compromised, especially in older patients (> 60 years), age group of our sample, which suffers greater interference of pain [25-30]. Our study, however, shows that the depressive symptoms as well as those anxious are a determinant closely associated with the low QoL of diabetic patients whether they are of type 1 or type 2. This fact, by itself, defines the importance of a correct recognition of symptoms of anxiety and depression in diabetes and the need for patients with diabetes to receive correct treatments for depressive and anxiety disorders when they occur in comorbidity with diabetes.

Nevertheless, the use of antidepressants may improve 70% of cases [18], which confirms that aspects of the psychological domain effectively compromise the QoL of these patients [18-30]. In addition, type 1 diabetic patients had lower results, proving greater commitment. Therefore, as QoL is associated with freedom and well being for activities of daily living, the patients are negatively influenced by physical and emotional impairments as a result of diabetes.

CONCLUSION

The constant need to check blood glucose, correct use of prescribed medication, which in patients with type 1 diabetes means the application in injectable form of insulin several times a day, and recurring concern with the possible increased levels of blood glucose collaborate to develop anxiety. Physiological changes that accompany illness and impose behavioral changes in the subject lifestyle, and the chronicity that can lead to dysfunctional thoughts, collaborate to existence of psychopathological picture.

Considering that depression and anxiety are factors known to greater morbidity for clinical, just as the illness contributes to the onset of psychiatric disorders, these may contribute negatively worsening the patient's clinical status or even compromise their ability to adhere to medical treatment, critical to disease control.

Diabetic patients, in general, show high prevalence of anxiety and depression, as well as reduced QoL, and anxiety and depression were shown as determinant of QoL in diabetes patients in both type 1 and type 2.

On the other hands subjects with type 1 diabetes have greater involvement in aspects of mental health and well-being compared with those who have type 2 disease.

In addition to making clear the need for training of health professionals for the recognition of psychopathological pictures in diabetic patients, the recognition that a significant difference exists for mental health aspects and QoL between types 1 and 2 diabetes points to the need to search for ways

to see these populations considering their specificities for both prophylactic and for new therapeutic approaches.

CONFLICT OF INTEREST

The authors confirm that this article content has no conflicts of interest.

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LIST OF ABBREVIATIONS

HADS	=	Hospital Anxiety and Depression Scale
MANOVA	=	Multivariate Analysis of Variance
QoL	=	quality of life
WHOQOL-BREF	=	The World Health Organization Quality of Life

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