

RISK FACTORS FOR DEPRESSIVE SYMPTOMS IN ELDERLY DIABETES

Maria Vieira de Lima Saintrain

PhD in Collective Health - Universidade de Fortaleza

Luana Camelo Oliveira

Degree in medicine from: Universidade de Fortaleza

Carina Bandeira Bezerra

Professor of the Medicine course, Doctor of the Graduate Program in Collective Health - Universidade de Fortaleza

Anna Cecília Nunes dos Santos

Student of the Medicine Course at: Universidade de Fortaleza, scholar: Funcap - Universidade de Fortaleza

Camila Bandeira de Sousa

Student of the Medicine Course at: Universidade de Fortaleza, scholar: PROBIC/FEQ - Universidade de Fortaleza

Isadora Dione Fernandes Nogueira

Student of the Medicine Course at: Universidade de Fortaleza

All content in this magazine is licensed under a Creative Commons Attribution License. Attribution-Non-Commercial-Non-Derivatives 4.0 International (CC BY-NC-ND 4.0).



Abstract: Worldwide, more than 425 million people have Diabetes Mellitus, one third of whom are over 65 years of age, and 79% live in low- and middle-income countries, as well as more than 300 million have depression. The relationship between diabetes, other comorbidities and depression represents one of the challenges in public health in the next decade. Furthermore, diabetes and depression seem to have a complex association, and there may be a bidirectional relationship. In this context, the research aims to identify risk factors for depressive symptoms in elderly people with Type 2 Diabetes Mellitus. Cross-sectional, descriptive and analytical study. Participants aged 65 and over, with type 2 diabetes Mellitus, followed at a specialized center for diabetics and hypertensives in Northeast Brazil were included. Sociodemographic data were collected and the Yesavage Geriatric Depression Scale was applied, suggestive of depression when scores greater than 5. The age of the elderly ranged from 65 to 94 years. Regarding income, 56.3% of participants who earn less than 1 minimum wage and 49.4% of those who earn 1 to 2 wages have depressive symptoms ($p=0.011$). There was a relationship between the number of comorbidities and depressive symptoms ($p=0.049$). Diabetic elderly with symptoms of depression had an average of 2.2 ± 1.6 comorbidities against 1.8 ± 1.4 of the others. The probability of an elderly person with depression having other associated chronic conditions is greater. In addition, patients with multimorbidities relate the onset of depression to events such as the appearance of physical symptoms and functional limitations. There was an important relationship between depressive symptoms and cognitive problems ($p<0.001$), where 76.6% of participants with cognitive impairment have scores suggestive of depression. This association between cognitive problems and depressive symptoms

has already been observed in the literature, and there seems to be evidence supporting both early depression as a risk factor for dementia, and depression being a prodromal sign of dementia. A strong relationship was found between elderly diabetics and depressive symptoms when associated with low socioeconomic status, dementia and multiple comorbidities. This shows the relevance of multidisciplinary care, which can have a positive impact on preventing the development of depression and improving the quality of life of this population.

Keywords: Elderly, Diabetes Mellitus, Depressive Symptoms

INTRODUCTION

In the world, more than 425 million people have *Diabetes Mellitus*, with one third of this population aged over 65 years, and about 79% live in low- and middle-income countries (IDF, 2017). Meanwhile, data indicate that more than 300 million have Major Depressive Disorder, corresponding to 4.4% of the population (World Health Organization, 2017), it is also estimated that, in 2035, the worldwide prevalence of Type 2 Diabetes Mellitus will increase 35 % (GUARIGUATA; WHITING; HAMBLETON; BEAGLEY; LINNENKAMP; SHAW, 2014). Furthermore, if growth continues with this trend, by 2045 about 629 million people aged 20 to 79 will have diabetes (IDF, 2017).

According to the systematic review carried out by Mendenhall, Norris, Shidhaye, Prabhakaran (2014), Brazil has a prevalence of depression in diabetics of around 20%, reaching 32% when analyzing an urban population.

Due to low- and middle-income countries such as India, Brazil, China and Mexico being the most affected by diabetes, the relationship between this condition, other comorbidities and depression represents one of the

challenges in public health in the next decade (MENDENHALL; NORRIS; SHIDHAYE; PRABHAKARAN, 2014)

At this juncture, the association between diabetes and depression seems to be complex, not following a cause and effect pattern (TABÁK; AKBARALLY; BATTY; KIVIMÄKI, 2014), and there may be a bidirectional relationship between Type 2 Diabetes Mellitus and depression (MOULTON; PICKUP; ISMAIL, 2015), with depression adversely impacting the course of diabetes and its complications and increasing the risk and worsening the course of depression (SEMENKOVICH; BROWN; SVRAKIC; LUSTMAN, 2015).

Type 1 and type 2 diabetes show important differences in the association with depression, which suggests that the association between each type is due to different mechanisms (MOULTON; PICKUP; ISMAIL, 2015). Given that a high degree of adiposity is associated with increased levels of inflammation, which, in turn, is related to an increased risk of depression and type 2 diabetes. (2017).

Consequently, the management of diabetes and depression simultaneously remains a challenge for patients and health professionals, constituting difficulties due to the fact that the importance of concomitant treatment of mental and physical disorders is often neglected by specialists (PETRAK BAUMEISTER; SKINNER; BROWN; HOLT, 2015).

Authors justify two hypotheses for the association between diabetes and depression, the first one stating that these pathologies share common antecedents, resulting in a non-causal association between these conditions. The second hypothesis is that clinical and preclinical *Diabetes Mellitus* may increase the likelihood of participants reporting depressive symptoms, consistent with a reverse causality explanation (TABÁK; AKBARALLY; BATTY;

KIVIMÄKI, 2014).

On the other hand, another hypothesis that tries to disregard the explanation that there is no causal relationship between depression and diabetes, takes into consideration, that this association can still be accounted for due to confounding factors, such as physical inactivity and obesity (TABÁK et al., 2014), with all these concepts simultaneously contributing to the co-occurrence of depression and type 2 diabetes.

A study shows that depression is common among elderly people with physical illnesses, as it is a complex problem with depression characteristics easily confused with nonspecific symptoms of advanced age, making it difficult for doctors to identify these depressed patients (MITCHELL; HARVEY, 2014). In addition, it was observed that other conditions such as institutionalization, loneliness and lack of social interaction seem to be an important risk factor for depression (SAINTRAIN et al., 2018). Advanced age was also a risk factor for depression in a study conducted in India, as it found a higher prevalence of depression in people over 50 years of age (KANWAR, SHARMA, SHARMA, RAMESH, MOKTA, MOKTA, 2019). It is important to mention that depressed diabetics have greater functional disability, which can further compromise their well-being and quality of life, contributing to the chronicity of depressive symptoms (VALLADARES-GARRIDO, SORIANO-MORENO, RODRIGO-GALLARDO, MONCADA-MAPELLI, PACHECO-MENDOZA, TORO-HUAMANCHUMO, 2020).

Given these considerations, this study aimed to identify risk factors for depressive symptoms in elderly diabetics, in order that the results may contribute to the development of public policies, facilitating primary care to act preventively in the development of depressive symptoms in diabetic patients.

METHODOLOGY

Cross-sectional, quantitative, descriptive and analytical research that is part of a larger project called "Functionality and autonomy of elderly people with diabetes Mellitus".

It was carried out at the Integrated Center for Diabetes and Hypertension (CIDH), in Fortaleza -Ceará, Brazil. The CIDH is a reference center for the State of Ceará, specialized in assisting people with Diabetes and Hypertension, being a reference for the State of Ceará.

Inclusion criteria, due to the multicenter research with France, include people aged 65 years and over, with type 2 diabetes mellitus followed at the CIDH with diagnosis for at least one year and who gave their agreement. Patients with type 1 diabetes or secondary diabetes (for example: chronic use of corticosteroids) and type 2 diabetes treated with insulin within less than six months of the clinical diagnosis of the disease were excluded.

For the development of the research, the data were collected in two stages: initially, data were extracted from the medical records of the diabetic elderly who are part of the aforementioned project, thus constituting secondary data, namely: sociodemographic (age, gender, schooling, income, marital status, race, occupation, retirement, origin), general health data, such as self-assessed health, systemic disease, duration of illness and deleterious habits, these being alcoholism and smoking.

Regarding general health data, the following comorbidities were evaluated: Coronary Insufficiency, Stroke, Arteriopathy Obliterans of the lower limbs, Retinopathy, Nephropathy, Peripheral Neuropathy, Wound in the current foot, Amputation, Arterial Hypertension, Congestive Heart Failure and Self-reported Cognitive Problems - considering patients with cognitive impairment those who were already followed up on an outpatient basis

with such a condition - and, as for acute complications, those that were ongoing for six months before the assessment: Hypoglycemia, Ketotic decompensation, Hyperosmolarity and Infectious episodes.

In the second stage, the Geriatric Depression Scale (GDS) was personally applied to all the aforementioned patients, used to screen for depressive conditions in the elderly. This scale is easy to apply, through which the elderly person answers the questions with dichotomous yes or no answers. The version validated in Brazil and the most used in the country is the simplified one, with 15 questions, adapted from Yesavage and Brink (1983). If the scale score is greater than 5, the patient has symptoms suggestive of depression.

The sample, regarding the application of the GDS test, considered the total number of elderly people in 2012 (N=242,430) in the city of Fortaleza, a number extracted from the DATASUS Report (2012). A minimum sample size was considered to estimate the population proportion of elderly diabetics with a maximum expected proportion of 20%, a significance level of 5% (95% confidence interval) and a maximum permissible error of 5%.

For this, the population formula was considered, obtaining a sample size of 246 elderly people. The CIDH has a total of 1978 elderly people aged 65 and over who have been diagnosed with diabetes for at least one year. The patients' records were selected by non-probabilistic sampling based on their original numbers, with one out of eight records being selected.

The organization and consolidation of the results occurred through the Statistical Package Program for the Social Sciences, Co. Chicago IL USA (SPSS) for Windows (version 20.0).

Statistical measures were used to allow

data interpretation, seeking to respond to the research objectives, calculating absolute and relative frequencies for qualitative variables, as well as mean, median, standard deviation, quartiles, minimum and maximum for quantitative ones. Bivariate analyzes were performed using the Mann-Whitney test when comparing quantitative characteristics, Chi-square or Fisher's exact tests for comparisons involving qualitative characteristics and Spearman's Correlation test. In this step, the magnitude of the associations was expressed using crude prevalence ratios with a 95% confidence interval and a 5% significance level.

With no conflict of interest, the research, with the consent of the CIDH, was submitted to the appreciation of Plataforma Brasil and approved under opinion no. 1,666,717, as dictated by Resolution Number 466/12 of the National Health Council, of December 12, 2012 (BRAZIL, 2013). Study participants were informed about the research objectives and guarantee of anonymity. The terms of Free and Clarified Consent and Post-Cleared Consent were presented to them, whose participants signed.

RESULTS

The mean age of the elderly was 73.2 ± 6.4 years, ranging from 65 to 94 years. Elderly with suggestion of depression had a median age of 73.5 ± 6.6 years and the others 72.9 ± 6.2 years. There was no significant difference between the age of the elderly suggestive of depression and those without depressive symptoms ($p = 0.481$) (Table 1).

Regarding monthly income, elderly diabetics with an income of up to 1 minimum wage (SM) had a prevalence ratio (PR) of 2.5 times for depressive symptoms than elderly people earning 2-5 SM ($p = 0.011$), (Table 1).

Among the fifteen questions on the geriatric depression scale applied in the research, the

items with the highest percentage of responses suggestive of depression were: "Have you reduced most of your activities and interests?" (87; 83.5%); "would you rather stay at home than go out and do new things?" (167; 67.3%) and "do you think there are a lot of people in a better situation?" (188; 75.8%) (Table 2).

The average number of comorbidities found in patients was 2.2 ± 1.6 and median 2.0 (1.0 - 3.0). There was a significant difference between the number of comorbidities between patients with suggestion of depression and those without suggestion ($p = 0.002$). Elderly with suggestion of depression had an average of 2.5 ± 1.7 comorbidities against 1.9 ± 1.4 of those without suggestion of depression. In addition, a positive correlation of weak magnitude ($r=0.156$), but significant ($p=0.014$) was detected between the score of the Depression Scale and the number of comorbidities of the elderly (Table 3).

An important relationship was detected between depressive symptoms and self-reported cognitive problems ($p < 0.001$), and it was observed that there are twice as many chances of developing depressive symptoms when you have cognitive problems. In addition, 36 (76.6%) of the participants who have cognitive problems have scores suggestive of depression on the EDG scale, while 121 (62.1%) of those who do not have cognitive problems have a score of five or less on this scale (Table 4).

There was no significant difference ($p=0.509$) between the duration of DM of those with suspected depression (14.4 ± 9.5) and those without suspicion (13.9 ± 9.7). Likewise, there was no significant relationship between deleterious habits, in this case smoking and alcohol consumption, and depressive symptoms. Insulin use was also unrelated to a geriatric depression scale score suggestive of depression (Table 4).

The report of hypoglycemia or ketotic

Variables	Suggestive of Depression			RP (IC 95%)	Value p
	Yes	Not	Total		
	n (%)	n (%)	n		
Age (years) *	73.5 ± 6.6	72.9 ± 6.2	73.2 ± 6.4	-	0.481 ²
Marital Status † (n=243)					0.110¹
Single	3 (23.1)	10 (76.9)	13	1	
Married	61 (43.0)	81 (57.0)	142	1.86 (0.68 - 5.11)	
Divorced	8 (50.0)	8 (50.0)	16	2.17 (0.72 - 6.55)	
Widower	40 (55.6)	32 (44.4)	72	2.41 (0.87 - 6.63)	
Race †					0.659 ²
White	47 (42.0)	65 (58.0)	112	1.12 (0.45 - 2.81)	
Black	3 (37.5)	5 (62.5)	8	1	
Dark skinned	61 (49.6)	62 (50.4)	123	1.32 (0.53 - 3.29)	
Others	1 (50.0)	1 (50.0)	3	1.33 (0.26 - 6.94)	
Gender †					0.110 ¹
Masculine	43 (39.8)	65 (60.2)	108	1	
Feminine	70 (50.0)	70 (50.0)	140	1.26 (0.94 - 1.67)	
Scholarity †					0.063 ¹
None	17 (32.7)	35 (67.3)	52	1	
Gymnasium	76 (47.2)	85 (52.8)	161	1.44 (0.95 - 2.20)	
High schooling	20 (57.1)	15 (42.9)	35	1.75 (1.08 - 2.84)	
Retired †					0.880 ¹
Yes	106 (45.7)	126 (54.3)	232	1.04 (0.59 - 1.85)	
Not	7 (43.8)	9 (56.3)	16	1	
Income † (n=238)					0.011²
Less than 1 SM	9 (56.3)	7 (43.8)	16	2.53 (1.2 - 5.35)	
Up to 2 SM	87 (49.4)	89 (50.6)	176	2.22 (1.19 - 4.17)	
From 2 to 5 SM	8 (22.2)	28 (77.8)	36	1	
More than 2 SM	3 (30.0)	7 (70.0)	10	1.35 (0.44 - 4.17)	
Previous and/or current occupation † (n=237)					0.093 ²
Autonomous	18 (34.0)	35 (66.0)	53	1.02 (0.5 - 2.08)	
Public service	13 (59.1)	9 (40.9)	22	1.77 (0.88 - 3.56)	
Service Provided	7 (33.3)	14 (66.7)	21	1	
Others	69 (48.9)	72 (51.1)		1.47 (0.78 - 2.75)	

Table 1 - Sociodemographic characteristics of elderly diabetics evaluated for depressive symptoms

* Data expressed as mean ± standard deviation; † Data expressed in relative and absolute frequency;

n= number of individuals; SM= minimum wage; %= percentage.

¹ Chi-square test; ² Fisher's exact test; ³ Mann-Whitney test

Questions from the Geriatric Depression Scale (GDS)	Suggestive of Depression		Not suggestive	
	n	%	n	%
1. Are you satisfied with your life?	28	11.3	220	88.7
2. Have you cut back on most of your activities and interests?	207	83.5	41	16.5
3. Do you feel that life is empty?	108	43.5	140	56.5
4. Do you get bored often?	129	52.0	119	48.0
5. Do you feel good about life most of the time?	31	12.5	217	87.5
6. Afraid that something bad might happen to you?	148	59.7	100	40.3
7. Are you happy most of the time?	51	20.6	197	79.4
8. Do you often feel helpless?	45	18.1	203	81.9
9. Would you rather stay at home than go out and do new things?	167	67.3	81	32.7
10. Do you think you have more memory problems than most?	108	43.5	140	56.5
11. Do you think it's wonderful to be alive now?	15	6.0	233	94.0
12. Is it worth living as you live now?	25	10.1	223	89.9
13. Do you feel full of energy?	81	32.7	167	67.3
14. Do you think your situation has a solution?	46	18.5	202	81.5
15. Do you think there are many people in a better situation?	188	75.8	60	24.2

Table 2. Frequency of responses suggestive of depression per GDS question.

Source: survey data

EDG	Comorbidities		Value p
	Mean ± standard deviation	Median (1st - 3rd quartile)	
Suggestive of depression	2,5 ± 1,7	2,0 (1,0 - 3,0)	0,002
Normal	1,9 ± 1,4	2,0 (1,0 - 3,0)	
General	2,2 ± 1,6	2,0 (1,0 - 3,0)	

Table 3 - Average of comorbidities among the diabetic elderly in the research

Mann-Whitney test

Variables	Suggestive of Depression			RP (IC 95%)	Value p
	Yes n (%)	Not n (%)	Total n		
Coronary Insufficiency (n=245)					
Yes	39 (52.0)	36 (48.0)	75	1.21 (0.92 - 1.6)	0.190 ¹
Not	73 (42.9)	97 (57.1)	170	1	
Stroke (n=247)					
Yes	17 (54.8)	14 (45.2)	31	1.23 (0.87 - 1.76)	0.277 ¹
Not	96 (44.4)	120 (55.6)	216	1	
AOMI (n=233)					
Yes	12 (54.5)	10 (45.5)	22	1.24 (0.82 - 1.87)	0.348 ¹
Not	93 (44.1)	118 (55.9)	211	1	
Retinopathy (n=85)					
Yes	29 (56.9)	22 (43.1)	51	1.49 (0.91 - 2.43)	0.092 ¹
Not	13 (38.2)	21 (61.8)	34	1	

Nephropathy (n=83)					
Yes	27 (50.9)	26 (49.1)	53	1.39 (0.81 - 2.38)	0.210 ¹
Not	11 (36.7)	19 (63.3)	30	1	
Peripheral neuropathy (n=224)					
Yes	47 (50.0)	47 (50.0)	94	1.16 (0.87 - 1.54)	0.305 ¹
Not	56 (43.1)	74 (56.9)	130	1	
Foot wound (n=245)					
Yes	14 (56.0)	11 (44.0)	25	1.24 (0.85 - 1.81)	0.296 ¹
Not	99 (45.0)	121 (55.0)	220	1	
Amputation (n=243)					
Yes	4 (26.7)	11 (73.3)	15	1	0.119 ¹
Not	108 (47.4)	120 (52.6)	228	1.78 (0.76 - 4.16)	
Arterial Hypertension (n=245)					
Yes	97 (46.4)	112 (53.6)	209	1.11 (0.74 - 1.68)	0.598 ¹
Not	15 (41.7)	21 (58.3)	36		
Heart Failure (n=244)					
Yes	19 (59.4)	13 (40.6)	32	1.35 (0.98 - 1.87)	0.101 ¹
Not	93 (43.9)	119 (56.1)	212	1	
Cognitive Problems (n=242)					
Yes	36 (76.6)	11 (23.4)	47	2.02 (1.59 - 2.56)	<0.001 ¹
Not	74 (37.9)	121 (62.1)	195	1	
Insulin					
Yes	59 (44.4)	74 (55.6)	133	0.94 (0.72 - 1.24)	0.682 ¹
Not	54 (47.0)	61 (53.0)	115	1	
Smoking					
Yes	7 (35.0)	13 (65.0)	20	0.75 (0.41 - 1.39)	0.322 ¹
Not	106 (46.5)	122 (53.5)	228	1	
Use of alcoholic beverage					
Yes	15 (48.4)	16 (51.6)	31	1.07 (0.72 - 1.59)	0.736 ¹
Not	98 (45.2)	119 (54.8)	217	1	

Table 4 - Comorbidities associated with the elderly with type 2 diabetes mellitus in the survey.

¹ Chi-square test; ² Fisher's exact test

Variables	Suggestive of Depression			RP (IC 95%)	Value p
	Yes	Not	Total		
	n (%)	n (%)	n		
Hypoglycemia 6 months ago (n=245)					0.350 ¹
Yes	21 (40.4)	31 (59.6)	52	1	
Not	92 (47.7)	101 (52.3)	193	1.18 (0.82 - 1.69)	
Keto decompensation 6 months ago (n=245)					0.691 ²
Yes	2 (33.3)	4 (66.7)	6	1	
Not	110 (46.0)	129 (54.0)	239	1.38 (0.44 - 4.32)	
Hyperosmolarity 6 months ago (n=246)					0.117 ¹
Yes	12 (63.2)	7 (36.8)	19	1.42 (0.98 - 2.06)	
Not	101 (44.5)	126 (55.5)	227	1	
Infectious episodes 6 months ago (n=244)					0.381 ¹
Yes	23 (52.3)	21 (47.7)	44	1.16 (0.84 - 1.6)	
Not	90 (45.0)	110 (55.0)	200	1	

Table 5 - Complications related to Type 2 diabetes Mellitus

¹ Chi-square test; ² Fisher's exact test

decompensation in the six months prior to data collection showed no association with positive screening for depressive symptoms in the elderly in the research ($p=0.350$ and $p=0.691$ respectively). Although there was no statistical significance, 63.2% (12) of the elderly diabetics who reported hyperosmolarity in the six months prior to data collection and 52.3% (23) of the elderly who reported infectious episodes in the six months prior to data collection were screened as positive for depressive symptoms (Table 5).

DISCUSSION

Diabetic elderly people showed an association between depressive symptoms and low family income, cognitive problems and multiple comorbidities.

Depression in elderly people is a reality, however, this study presents the differential of identifying different risk factors for depressive symptoms in elderly people with Diabetes *Mellitus type 2*, may constitute a public health problem.

The fact that an important relationship was found between participants earning less than two minimum wages and signs suggestive of depression can be portrayed by the characteristics of the study population, confirmed by the low salary level detected.

These findings allude to research carried out by medical anthropologists regarding syndemics, a term used to point out synergistic health problems that affect the health of a population within the context of persistent social and economic inequalities, and is also used to analyze comorbidities and multimorbidities, including diabetes and depression in low- and middle-income countries (MENDENHALL; KOHRT; NORRIS; NDETEI; PRABHAKARAN, 2017).

In the literature, Mendenhall, Norris, Shidhaye, Prabhakaran (2014) point out that, among diabetic people from different low-

and middle-income countries, the prevalence of depression was, on average, 35.7%, showing that one in three people with diabetes from developing countries have depression. In addition, an important relationship with the increased incidence of developing diabetes is observed *Mellitus type 2* among people of low socioeconomic status who work more than 55 hours a week (KIVIMÄKI; VIRTANEN; KAWACHI; NYBERG; ALFREDSSON; BATTY et. al, 2015). The relationship between depressive symptoms and low wage income seems to be constant among the elderly in general, a reality found in a population-based study in southern Brazil, a region of the country with a different socioeconomic reality than the northeast (GULLICH; DURO; CESAR, 2016).

In this study, the fact that participants who presented scores suggestive of depression on the geriatric depression scale had a higher average of comorbidities than the others without this symptom, seems to be due to the influence of chronic diseases, with their progression, on the limitations of activities, both physical and mental.

The literature corroborates these findings by detecting that the probability of an elderly person with depression having other associated chronic conditions is greater than in elderly people who do not have the disorder, as well as having other coexisting diseases by itself already complicates the management of depression (TAYLOR, 2014). In this context, researchers emphasize that the presence of depressive symptoms in the diabetic population was associated with an increased risk of death from acute coronary disease, as well as an increased incidence of stroke (Cummings, Kirian, Howard, Howard, Yuan, Muntner, Kissela, Redmond, Judd and Safford, 2015)

According to Mitchell and Harvey (2014), there is a complex relationship between

depression and Coronary Artery Disease (CAD), with evidence for both an increase in CAD in those with depression and an increase in CAD morbidity and mortality in patients who become depressed. In addition, the study carried out by Huang, Hsieh, Hou, Liu, Jeng, Tsai (2013) observed that people who have depression as an underlying disease were more likely to have a new coronary event than those without depression.

There is evidence that patients with coronary artery disease, stroke and diabetes are more likely to have depressive symptoms (JANI; CAVANAGH; BARRY; DER; SATTAR; MAIR, 2014). Likewise, it was observed that patients with multimorbidities reported the emergence of depression from events that caused a change in their lives, such as the appearance of physical symptoms and functional limitations (STANNERS; BARTON; SHAKIB; WINEFIELD, 2014).

In this circumstance, it is important to note that in this study a significant association was found between cognitive problems and symptoms suggestive of depression, seeming to be evidence that elderly people with a moderate to high pattern of depressive symptoms are more likely to develop dementia than those who consistently are not. suggestive of depression (KAUP et al., 2016). Therefore, there is convincing evidence to support both early depression as a risk factor for dementia, and depression in the elderly as a prodromal sign of dementia (BENNETT; THOMAS, 2014).

In the cohort study that followed women in their ninth and tenth decades of life carried out by Hazzouri et al. (2014) showed that persistent depressive symptoms over a 20-year period was strongly associated with worse cognitive functioning and a greater likelihood of developing dementia. The persistence of depressive symptoms for a long period seems to be relevant as a risk factor for cognitive

decline, as the same relationship is not found when depressive symptoms fluctuate over the same period (GOVEAS et al., 2014).

The existing association between depressive symptoms and the number of comorbidities in diabetic people reinforces the need for a more person-centered follow-up focused on preventive medicine, in order to try to reduce the incidence of depression in elderly people with multimorbidities, being reinforced in the literature by the study by Xia, Feng and Wang (2017), which showed the need for prevention programs against depression that involve lifestyle changes for psychological well-being and not just physical well-being, as well as Cummings et al. (2015) reinforces the need for more careful integration of screening and behavioral management in primary care settings, where many patients with type 2 *Diabetes Mellitus* are followed.

Stanners et al. (2014) also demonstrated the importance of patients with multimorbidities with functional and social losses being approached by their physician in relation to their mood, aiming to identify depressive symptoms and suggest psychotherapy, being beneficial in these cases, despite rarely being a proposed therapeutic approach. Evidently, if there is no correct diagnosis of depression in this group of patients, the consequences can be dramatic in their quality of life, even being associated with poorer physical health outcomes (MITCHELL; HARVEY, 2014).

In terms of diabetes risk, some questions about the association between depression and type 2 diabetes remain unanswered, including the relevance of subtypes of depression, such as melancholic, atypical and seasonal (TABÁK et al., 2014). According to the authors, it is still unclear whether this association is attributed only to depressive symptoms or whether there is also a relationship with Major Depressive Disorder in fact. In this context, more accurate methods are needed to assess different profiles

of depression and stress in diabetes, which can be done through the interdisciplinary collaboration of professionals specializing in diabetes and mental health (SNOEK; A BREMMER; HERMANNNS, 2015).

As a limitation of the study, the fact that it is a cross-sectional evaluation is presented, so that the analysis of the patient's depressive symptoms does not have a follow-up to assess whether the diabetic elderly progress to Major Depressive Disorder or if their depressive symptoms improve. Even if the research does not explain the mechanisms that lead to the association between depressive symptoms and socioeconomic status, cognitive problems and multimorbidities found, the findings can serve as indicators for public policy actions, since multidisciplinary care is important, especially psychotherapy, due to its relevance

in positively impacting the prevention of the development of depression and improving the quality of life of this population.

CONCLUSION

In view of the findings, it is possible to draw attention to the fact that patients with type 2 *diabetes mellitus* expressed an intense association with depressive symptoms when associated with low socioeconomic status, cognitive problems and multiple comorbidities.

They constitute indicators for the elaboration of public policies and the importance of multidisciplinary care, facilitating the actions of the primary health care system in order to act preventively in the development of depressive symptoms in diabetic patients.

REFERENCES

- BENNETT, S.; THOMAS, A. J. Depression and dementia: Cause, consequence or coincidence? *Maturitas*, v. 79, n. 2, p. 184–190, 2014.
- BRASIL. Ministério da Saúde, 2013. **Resolução nº 196, de 10 de outubro de 1996**. Aprova diretrizes e normas regulamentadoras de pesquisas envolvendo seres humanos. Diário Oficial da União no. 201, 16 out. 1996.
- CUMMINGS, D.M.; KIRIAN, K.; HOWARD, G.; HOWARD, V.; YUAN, Y.; MUNTNER, P.; KISSELA, B.; REDMOND, N.; JUDD, S.E.; SAFFORD, M.M. Consequences of Comorbidity of Elevated Stress and/or Depressive Symptoms and Incident Cardiovascular Outcomes in Diabetes: Results from the Reasons for Geographic And Racial Differences in Stroke (REGARDS) Study. *Diabetes Care*, v. 39, n. 1, p.101-109, 17 nov. 2015. American Diabetes Association.
- FEDERATION, International Diabetes. **IDF Diabetes Atlas**. 8. ed. Brussels: International Diabetes Federation, 2017.
- GOVEAS, J.S. et al. Depressive Symptoms and Longitudinal Changes in Cognition. *Journal of Geriatric Psychiatry And Neurology*, [s.l.], v. 27, n. 2, p.94-102, fev. 2014. SAGE Publications.
- GUARIGUATA, L.; WHITING D.R.; HAMBLETON L.; BEAGLEY J.; LINNENKAMP U.; SHAW J.E. Global estimates of diabetes prevalence for 2013 and projections for 2035. *Diabetes Research and Clinical Practice*, v. 103, n. 2, p. 137–149, 2014.
- GULLICH, Inês; DURO, Sueli Manjourani Silva; CESAR, Juraci Almeida. Depressão entre idosos: um estudo de base populacional no Sul do Brasil. *Rev. bras. epidemiol.*, São Paulo, v. 19, n. 4, p. 691-701, Dec. 2016. Available from <http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1415-790X2016000400691&lng=en&nrm=iso>. access on 08 July 2019. <http://dx.doi.org/10.1590/1980-5497201600040001>.
- HAZZOURI, A.Z.A. et al. Long-term Cumulative Depressive Symptom Burden and Risk of Cognitive Decline and Dementia Among Very Old Women. *The Journals Of Gerontology Series A: Biological Sciences and Medical Sciences*, [s.l.], v. 69, n. 5, p.595-601, out. 2014. Oxford University Press (OUP).

- HUANG, C. J.; HSIEH, M.H.; HOU, W.H.; LIU J.C.; JENG, C.; TSAI, P.S. Depression, antidepressants, and the risk of coronary heart disease: A population-based cohort study. **International Journal of Cardiology**, v. 168, n. 5, p. 4711–4716, 2013.
- JANI, B. D.; CAVANAGH, J.; BARRY, S.; DER, G.; SATTAR, N.; MAIR F.S. Association between cardiovascular risk factors and concurrent depressive symptoms in cardiometabolic disease: a cross-sectional study. **The Lancet**, [s.l.], v. 384, p.40-40, nov. 2014.
- KAN, C.; COLEMAN, J.; MCCARTHY, M.; BREEN, G.; ISMAIL, K.; LEWIS, C. Effect of waist-to-hip ratio on the association between type 2 diabetes and depression: an exploratory study using the polygenic scores approach in the UK Biobank. **The Lancet**, v. 389, p. S53, fev. 2017.
- Kanwar, Neeraj & Sharma, RaviC & Sharma, DineshD & Ramesh, & Mokta, Kiran & Mokta, JatinderK. (2019). Prevalence of Psychiatric Comorbidity among Patients of Type 2 Diabetes Mellitus in a Hilly State of North India. *Indian Journal of Endocrinology and Metabolism*. 23. 602. 10.4103/ijem.IJEM_521_19.
- KAUP, A.R. et al. Trajectories of Depressive Symptoms in Older Adults and Risk of Dementia. **Jama Psychiatry**, [s.l.], v. 73, n. 5, p.525-541, maio 2016. American Medical Association (AMA).
- KIVIMÄKI, M. et al. Long working hours, socioeconomic status, and the risk of incident type 2 diabetes: a meta-analysis of published and unpublished data from 222 120 individuals. **The Lancet Diabetes & Endocrinology**, v. 3, n. 1, p.27-34, jan. 2015. Elsevier BV.
- MENDENHALL, E.; NORRIS S. A.; SHIDHAYE R.; PRABHAKARAN D. Depression and type 2 diabetes in low- and middle-income countries: A systematic review. **Diabetes Research and Clinical Practice**, v. 103, n. 2, p. 276–285, 2014.
- MENDENHALL, E.; KOHRT, B. A.; NORRIS, S. A.; NDETEI, D.; PRABHAKARAN, D. (2017). Non-communicable disease syndemics: poverty, depression, and diabetes among low-income populations. *Lancet (London, England)*, 389(10072), 951–963. doi:10.1016/S0140-6736(17)30402-6
- MITCHELL, P. B.; HARVEY, S. B. Depression and the older medical patient - When and how to intervene. **Maturitas**, v. 79, n. 2, p. 153–159, 2014.
- MOULTON, C. D.; PICKUP, J. C.; ISMAIL, K. The link between depression and diabetes: the search for shared mechanisms. **The Lancet Diabetes & Endocrinology**, v. 3, n. 6, p. 461–471, jun. 2015.
- PETRAK, F.; BAUMEISTER, H.; SKINNER, T. C.; BROWN, A.; HOLT, R. I. G. Depression and diabetes: treatment and health-care delivery. **The Lancet Diabetes & Endocrinology**, v. 3, n. 6, p. 472–485, jun. 2015.
- SAINTRAIN, M.V.L. et al. Idosos com depressão: uma análise dos fatores de institucionalização e apoio familiar. **Revista Brasileira em Promoção da Saúde**, [s.l.], v. 31, n. 4, p.1-17, dez. 2018. Fundacao Edson Queiroz.
- SNOEK, F. J.; BREMMER, M. A.; HERMANNNS, N. Constructs of depression and distress in diabetes: time for an appraisal. **The Lancet Diabetes & Endocrinology**, v. 3, n. 6, p. 450–460, jun. 2015.
- STANNERS, M. N.; BARTON, C.A.; SHAKIB, S.; WINEFIELD, H.R., 2014 Depression diagnosis and treatment amongst multimorbid patients: A thematic analysis. **BMC Family Practice**, v. 15, n. 1, 2014.
- SEMENKOVICH, Katherine, BROWN, Miriam, SVRAKIC, Dragan, LUSTMAN, Patrick. (2015). Depression in Type 2 Diabetes Mellitus: Prevalence, Impact, and **Treatment. Drugs**. 75. 10.1007/s40265-015-0347-4.
- TABÁK, A. G.; AKBARALLY T. N.; BATTY G. D.; KIVIMÄKI M. Depression and type 2 diabetes: a causal association? **The Lancet Diabetes & Endocrinology**, v. 2, n. 3, p. 236–245, mar. 2014.
- TAYLOR, W. D. Depression in the Elderly. **New England Journal of Medicine**, v. 371, n. 13, p. 1228–1236, 25 set. 2014.
- VALLADARES-GARRIDO et al. **Diabetes & Metabolic Syndrome: Clinical Research & Reviews**, 14 (2020) p.141e146.
- WHO. **Depression and Other Common Mental Disorders: Global Health Estimates**. Geneva: World Health Organization, 2017. 24 p.

XIA, N.; FENG, S.; WANG, L. D.-L. Depressive symptoms and healthy lifestyle behaviours in soon-to-be old and older adults in China: an analysis of data from a nationwide cross-sectional survey. **The Lancet**, v. 390, p. S15, dez. 2017.

YESAVAGE, J. A. et al. Development and validation of a geriatric depression screening scale: A preliminary report. **Journal of Psychiatric Research**, v. 17, n. 1, p. 37-49, jan. 1983.