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Neurocognitive Disorders and Diabetes Mellitus

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Summary

Diabetes mellitus (DM) represents a set of metabolic disorders related to hyperglycemia, a biochemical state that can influence emotional and psychosocial state by encouraging the onset of neurocognitive disorders.

People with diabetes require ongoing adherence-oriented care to metabolic control goals and lifestyle changes, by virtue of not only affecting physical condition, but also affecting the clinically expressed emotional and affective state in mild, moderate cognitive impairment, dementia and Alzheimer's disease.

Objective: To analyze neurocognitive disorders in the DM patient.

Key words: *Diabetes mellitus; neurocognitive disorders; self-care; therapeutic education*

Introduction

Diabetes is considered a set of metabolic disorders related to hyperglycemia, the product of the defect in secretion and/or the action of insulin (1,2). The global outlook shows that, in recent years, there has been a significant increase in the incidence of diabetes mellitus (DM), taking on a global epidemic dimension. According to the report of the International Diabetes Federation (IDF, 2019)(3), 3 out of 4 people living with diabetes (352 million) are of active age; there are 111 million people over the age of 65, or 1 in 5 people have diabetes. There is evidence that DMT2 among children and adolescents is on the rise in some countries. Additionally, 1.1 million children under the age of 20 have type 1 diabetes.

By 2045, if preventive programs are not activated, the projection is 629 million people affected, indicating that one in ten adults in the world's population will have diabetes. The largest increase will take place in regions where economies are moving from medium to low income levels; to support the development that DM2 is a real public health problem. The report (3) that the Region of South and Central America with 26 million people with diabetes, would have an increase of 62% by 2045, when the total number of people with diabetes was close to 42 million.

The WHO World Diabetes Report in 2016(4) revealed that in Venezuela with a total population of 31,108,000, an estimated prevalence of 8.8% was recorded in 2014, with 9.1% for men and 8.5% for women.

On the other hand, according to Nieto (5), 12.4% of Venezuelans over the age of 20 have diabetes; i.e. the disease affects 2.5 million Venezuelans, the prevalence has increased from 7.7% in 2010 to 12.4% in 2017, and people at risk went from 22% to 34.3%, with these entities being a very high potential to continue to increase the prevalence of diabetes in the country.

According to IDF(3), the comparative national prevalence of diabetes, adjusted by age between 20 and 79 years by 2019 was 7%, noting that there is a proportion of 51.8% of adults aged 20 to 79 with undiagnosed diabetes

Chronic hyperglycemia is associated with secondary damage to different organs causing nephropathy, retinopathy, neuropathy and cardiovascular disease; however, given the clinical and epidemiological complexity of diabetes and from a holistic view of the disease, different biopsychosocial factors that can influence this chronic entity bidirectionally should be taken into account. (6)

According to Chew., *et al*.(7), and Naicker., *et al*.(8), people with DM have been shown to be at increased risk of affective disorders such as depression and anxiety compared to healthy adults, with the higher prevalence of depression relative to anxiety and appreciating itself as a major factor in increasing the risk of mortality.

Additionally, DM is associated with increased cognitive decline by 19% and a 60% increase in the risk of dementia and a 56% risk of hemorrhagic stroke are expected to increase. (3) The incidence of stroke in patients with DM is two to four times that of the general population. Diabetes has also been linked to a worse prognosis in patients suffering from stroke, and an increased risk of recurrence with it.

Depression and anxiety in people with diabetes

Diabetes in a condition that affects the quality of life of the patient especially if it coexists with chronic complications typical of the entity. The WHO group on quality of life, in its report People and Health, defines quality of life as "how the individual perceives his place in his cultural environment and in the value system in which he lives, as well as the relationship to his objectives, expectations, criteria and concerns"(9). All this accompanied by your physical health, your psychological state, your degree of dependence, your social relationships, environmental factors and your social beliefs. On the other hand, the health-related quality of life includes aspects that affect the physical or mental life of the individual (10).

Non-communicable diseases (NSAs), such as diabetes, increase the likelihood that the patient will develop mood disorders" (including depression, bipolar disorder) and "anxiety disorders" (including generalized anxiety disorders, phobias, obsessive-compulsive disorder, among others) in accordance with THE DSM-V. In addition, diabetes requires lifestyle changes, so it not only affects fitness, but requires modifications that can influence the psychological and psychosocial state, which poses a challenge not only for the individual but also for the family environment. Therefore, in people with diabetes, pharmacological treatment alone should include changes in diet and exercise, where stress levels and blood management may affect the blood glucose value [10-12].

Proper diabetes care requires emotionally healthy, however, people with diabetes experience a high emotional burden associated with lifestyle changes and prolonged treatment. And it is usually patients with a negative perception and beliefs about the disease, the most vulnerable to affective disorders. In addition, depression increases the risk of diabetes, as it is associated with compulsive eating and sedentary people. [7,8]

The person's ability to deal with problems, and in this case diabetes, will influence patients' ability to internalize and accept the new changes needed for treatment. Patients with diabetes and people closest to their environment often have a variety of feelings, such as outrage, guilt, and depression themselves, but they may also experience acceptance. All of these feelings can greatly influence the condition of diabetes, as they can lead the patient to avoid and reject treatment, thus the lack of self-control that is usually associated with ignorance of aspects related to the clinical entity. [12]

Of affective disorders, depression and anxiety are often the most common in patients with type 2 DM. Patients with diabetes and depression often have high levels of glycosylated hemoglobin (HbA1c) and increased chronic complications, as well as an increased risk

of neurocognitive impairment, so treatment costs are often higher [13,14].

Depression usually occurs at different stages of the disease and of different severity. This has a detrimental impact on quality of life, which can lead to worsening the comorities associated with DM. Depression may occur at the time of diagnosis, associated with the bereavement period that entails, and can subsequently occur when complications associated with the disease occur or if you have an irregular control of blood glucose [11,13,15].

Depression can have a significant impact on treatment, and thus inadequate treatment compliance, leading to greater difficulties in achieving optimal health and adequate blood glucose levels. Therefore it is considered necessary to diagnose depression early in people with diabetes, and to initiate treatment as this will lead to improving health status, greater self-care, better adherence to treatment and thus achieving the prevention of complications of diabetes, therefore lower economic costs of treatment [13].

On the other hand, work is needed in conjunction with psychologists and psychiatrists, as depression in addition to influencing the comorities associated with diabetes also increases the risk of infections, dementia, chronic obstruction, lung disease and arthritis [10].

Anxiety, defined by the American Psychological Association (APA) as the emotion characterized by feelings of tension, thoughts of concern and changes at the physiological level such as blood pressure, should be seen as a basic emotion of the organism that generates an adaptive response to states of tension, danger or threat [16]. In patients with DM, anxiety is often correlated with insulin use and co-existing inflammatory processes. [17]

In studies conducted by Molina, [18] and Rivas-Acuña, [19], elevated levels of anxiety influenced the self-care of the DM patient, as stressors occurred that led to poor adherence to treatment. In addition anxiety can influence blood glucose levels, since it itself involves thoughts of concern that can lead to self-efficacy, which will generate an adaptive response and with it an adherence to treatment, and by having proper management of anxiety this helps to maintain optimal blood glucose levels and in turn will improve the patient's perception of their health condition. Therefore, depression can be seen as a risk factor, while low levels of anxiety can be seen as a protective factor.

Pathophysiology

Mood disorders" (including depression, bipolar disorder), "anxiety disorders" and neurocognitives have their seats in structural modifications in brain microcirculation and non-vascular modifications enhanced by chronic hyperglycemia.

Co-existing vascular comority (HTAS, Dyslipidemia and Obesity) are factors that directly interact on the thin walls of the brain capillaries to modify the delivery of oxygen and nutrients generating structural and functional disorders in the cell membranes of neurons conditioning Infarctions and micro-infarthes, white matter disease and decreased threshold of necessary accumulation of amilio.

In addition, lipolysis, insulinoresistance, hyperglycemia and oxidative stress are the trigger for non-vascular modifications observed in patients with DM and neurocognitive disorders. Excessive oxidative activity is closely related to various sources of oxidative stress: the enzymatic pathway, non-enzymatic pathways and mitochondrial pathways. Glucose self-oxidation results in the development of advanced glycosylation end products and free radical formation. Added to this is the role of lipids by deficiency of the enzyme lipoprotein lipase which promotes the production of very low density lipoproteins (VLDLs) enriched in cholesterol esters, LDL enriched in triacylglycerides and increase in small and dense LDL and the production of reactive oxygen species (ERO).

These biochemical events increase oxidative stress, mitochondrial dysfunction and Tau hyperphosphorylization (prionoid microtubular proteins produced in the central nervous system) conditioning important modifications in the patient's cognitive domains.

Education as a therapeutic strategy in Neuro cognitive disorders

People with diabetes when having a chronic illness require ongoing medical care focused on the control of symptoms and especially

self-care that allows them to maintain their physical and mental functionality, autonomy and well-being of the individual. At this point depression and anxiety are important factors to consider due to the negative effects they can have on glycaemic control, adherence to treatment, quality of life, and risk of complications [20,21,22].

As IT is known the treatment of DM requires lifestyle changes, including regular physical activity and an adequate diet. When non-drug treatment is omitted and the expected targets are not met or unsatisfactory adhesion occurs, disease control becomes more complicated. Therefore it is necessary that the person is responsible for his treatment, and that he is an active participant in the therapeutic process, as well as it is also necessary to understand that not only the individual requires change, since there are other aspects that influence his behaviour, such as family members, the environment where he lives, work, among others [23,24].

Among the factors associated with non-adherence to treatment according to Durán., et al.[25] are ignorance of the disease, distrust of the capacity of the health care professional, duration of the consultation less than five minutes, lack of compression of medical indications, low schooling, marital status and intolerance to medicines. So diabetes is not always easy to treat, in part because treatment depends on the role of the patient. It is there that therapeutic education becomes necessary to achieve goals, and health personnel must pass on the knowledge to patients, whether by audiovisual or print media, websites, telephone assistance, group sessions, among others [20,26,27].

OMS defines therapeutic education as the set of educational activities essential for the management of chronic diseases, carried out by health professionals trained in the field of education, created to help the patient or groups of patients and family members carry out their treatment and prevent avoidable complications, while maintaining or improving quality of life[28]. Therapeutic education is considered essential to obtain adequate adherence to treatment and thereby reduce the possible onset of associated complications. Better results have been seen with group treatment, as in addition to being more efficient than individual education, it is more cost-effective [29].

Al Hayek A, [21] through a diabetes education program based on 12 sessions demonstrated significant improvement in depression symptoms at 6 months (P x 0.03) compared to baseline levels. This study also found lower levels of anxiety at 6 months of the education program, although this difference was not statistically significant. Other aspects evaluated such as adherence to treatment, HbA1c levels, dietary plan, physical exercise and self-monitoring of glycemia also showed statistically significant improvement to the 6 months of the diabetes education program.

The first-line treatment for depression and anxiety are drugs, previous studies [29] have shown that comprehensive treatment (pharmacological, psycho-educational and nutritional intervention) in depressed or anxious patients with type 2 diabetes mellitus achieves reduction in the percentage of HbA1c and psychoaffective symptoms. Individualized pharmacological adjustment, based on strategies attached to international recommendations, nutritional therapy and psychoaffective education contributed to a better biopsychosocial approach, which allowed to develop a broader view of the context of each patient, thus facilitating their participation in the health-disease process and their adherence to treatment [30].

Strengthening even short-term diabetes education programs have shown improved self-control, of psychological districts and glycemic control in patients with type 2 DM, as demonstrated by Zhen F *et al*. [31] who reinforced the regular diabetes education program with 2 extra sessions of self-management education of diabetes of 45 minutes each, showed statistically significant improvement ($P < 0.001$) of the psychological distres parameters in the intervention group vs the control group.

RA although therapeutic education has been shown to play an important role in diabetes control and patient quality of life, it is important to consider that education should be geared towards managing the self-management of the disease, as it has been associated with better metabolic control[31,32]. Educators should offer the patient and his environment the necessary knowledge, skills, attitudes and support that allow him to have the self-control that lead him to produce the necessary changes in the behavior and his attitude related to his clinical condition, thus he will have a better quality of life and therefore less chance of developing depression or anxiety [33,34].

Conclusions

There is evidence that participation in structured diabetes education programs not only improves metabolic profile, adherence to diet and exercise, but has also been shown to improve symptoms associated with depression and anxiety and neurocognitive disorders.

It is important to consider routinely performing neuropsychological tests in patients with DM in clinical practice to diagnose these clinical entities early and thus contribute to reducing symptoms of psychological dysr.

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