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Mental health screening in patients with type-2 diabetes mellitus

Abstract

Background: In the world, according to the World Health Organization (WHO), type-2 diabetes mellitus (DM) is very prevalent and causes a serious biological and psychosocial impact, for this reason, it is necessary to avoid its appearance and cardiovascular, metabolic, osteomuscular, joint and mental health complications, the latter has also become a public health problem.

Objective: this review article provide knowledge from the social determinants of health and risk factors for mental health in patients with type-2 DM, mental health screening tools and intervention strategies.

Methods: The literature search was carried out in Pubmed, Scopus, Google Scholar, Uptodate.

Results: It was found that the imbalance in the gut-brain-microbiota axis (MGBA) generates negative consequences on mental health in patients with type-2 DM and should be intervened early through the screening of tools such as the PH4, the DDS, the SRQ, AUDIT, the fagestrom test and the MOCA, which provide information on the state of mental health.

Conclusion: It is necessary to screen mental health in patients with type-2 diabetes mellitus with tools that are easy to implement in the outpatient, hospitalization, and institutionalization settings to make an early diagnosis, treatment and avoid the appearance of macro and microvascular complications.

Keywords: type-2 diabetes mellitus, mental health, brain-gut axis, nutrients, nutritional disorders

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Abbreviations: WHO, world health organization; DM, diabetes mellitus; SDOH, social determinants of health; MGBA, gut-brain-microbiota axis; PHQ, Patient Health Questionnaire; GAD-2, generalized anxiety disorder scale-2; DDS-17, diabetes distress scale; SRQ, self-report questionnaire; AUDIT, alcohol use disorders identification test; MMSE, mini-mental state examination score; MOCA, montreal cognitive assessment

Introduction

According to the WHO, type-2 DM is hyperglycemia due to depletion of insulin production by the beta cell, or peripheral resistance to insulin.[1,2] This disease has a negative impact at the global biological and psychosocial level and affects the indicators of health, well-being and the years of working life due to microvascular complications such as retinopathy, nephropathy, neuropathy, hepatic steatosis, immune dysfunction, skin and superinfected ulcers; and macrovascular complications such as transient ischemic attacks, strokes, atherosclerosis , angina pectoris, myocardial infarction and peripheral arterial disease.[1,4–6] Simultaneously, mental health problems have become a global public health problem; and it is known that people with type-2 DM are at risk of developing mental health pathologies (eg depression), which lead to therapeutic failure and the development of micro and macrovascular complications; therefore, it is necessary to apply practical screening tools for timely evaluation and management to promote quality of life.[1,3,6–8]

In the world, the races with the highest prevalence of type-2 DM are Asian (20.6%), Hispanic (22.6%), African American (21.8%) and non-Hispanic white (11.3%).[9] In 2021, 529 million people had type-2 DM, with an age-standardized global prevalence of 6.1%; In 2015, 1 in 11 people between the ages of 20 and 79 had type-2 DM according to the statistics of the International Diabetes Federation.[2,6,9] In addition, the researchers project an increase from 415 to 642 million people affected by 2040, mainly in low- and middle-income countries. Although there is no global characterization, it is reported that they have comorbidities in mental health; For example, 25% of patients with type-2 DM have clinically significant depression.[2,6,8–12] In United States, the prevalence of type-2 DM is 9% of the total population; of them, 25% are older than 65 years; and the National Diabetes Statistics Report shows a higher prevalence in women.[13] In economic terms, for 2017, the direct cost of care for patients with type-2 DM was $237 billion annually, and $90 billion due to a reduction in productive life years.[1,14–16] In Colombia, by the year 2021, 1,676,885 people were living with a diagnosis of type 2 DM and only 54% of them were in therapeutic goals according to the high cost account.[1,15–17] The objective of this review article is provide knowledge from the social determinants of health and risk factors for mental health in patients with type-2 DM, mental health screening tools and intervention strategies, considering that the diagnosis in mental pathologies is generally made in the symptomatic period of the disease. People with type-2 DM have several risk factors that trigger alterations in the gut-brain-microbiota axis (**MGBA**) and, secondarily, mental health. Therefore, early detection allows timely intervention and avoids negative outcomes; based on strategies such as primary health care.[1,4,8,15,18–23]

Search methodology

To identify publications on SDOH, and mental health screening, a literature search was conducted from march 1/2023 to august 30/2023, in Pubmed, Scopus, Google Scholar, Uptodate, with the

MeSH terms. The selection took into account: publications in humans, from the last decade, all kinds of studies, any language; 398 articles reviewed by abstract were found, 341 that did not have diagnostic tools were excluded, of these 22 articles were excluded because they were similar in the tools used, finally 35 articles remained. Resolutions, international guidelines, chapters of psychiatry and endocrinology books were included, which mentioned epidemiology, pathophysiology or complementary screening tools to the information collected.

SDOH and risk factors for mental illness in patients with type 2 DM

Currently, the high prevalence of type-2 DM and mental health pathologies is explained because both conditions share several avoidable risk factors, recognized as **structural SDOH**[1,15] such as investment in the population pyramid, the culture of globalization and industrialization that conditions excessive consumption of ultra-processed foods rich in simple carbohydrates and lipids, epigenetics, food insecurity in relation to low regional and national economic income, difficulties in the coverage of public health policies, unfavorable geopolitical and environmental conditions, poverty, illiteracy, unemployment, violence, inequality, climate crisis, unsafe risky environments, natural disasters and humanitarian emergencies.[1,3,24]

Interpersonal SDOHs include low-care family environments, with a low level of education and knowledge in nutrition; barriers to access to health, low technological coverage in some areas for the implementation of telemedicine, institutional deficit of human talent in health for a comprehensive approach to the model, barriers to access to medicines, polypharmacy, disarticulation in the information system network, inadequate follow-up to therapeutic plans, low patient education in strategies to maintain mental health.[1,24,29–33] Studies have found a relationship between emotional trauma in childhood and bipolar affective disorder, with an OR of up to 4.04 (95% CI 3.12–5.22).[24,34–36] Situations of chronic stress elevate serum levels of adrenaline and cortisol, trigger chronic pro-inflammatory states and eating disorders and increased risk of depression and anxiety. Some stressful family situations include intrafamily violence, abuse (physical, verbal, psychological, terrifying and/or neglect), childhood adversity and emotional trauma, normative crises (birth of a child, family opening, post-parental stage) and non-normative (unemployment, spousal separation, deprivation of liberty, abuse of psychoactive substances, alcohol).[35–40] Smoking and being exposed to cigarette smoke increases the risk of developing type-2 DM and mental health pathologies by 30-40%[41] because it causes insulin resistance, systemic inflammatory response, and greater abdominal adiposity, this risk is directly proportional to the index packs year and the time of exposure to smoke. Smokers with type-2 DM require higher doses of insulin, have less control of the disease, and are more likely to develop microangiopathic and macroangiopathic complications.[41–43]

Individual SDOHs include genetic factors; studies indicate that in people with first-degree relatives with type-2 DM, the risk is 5 to 6 times higher;[44] and in a family history of Schizophrenia[45] or first degree bipolar affective disorder, the OR is 7 (95% CI 5–10), with 85% heritability for bipolar affective disorder.[35] Other recognized factors are transmission of calcium signals, mitocondrial, micro-RNAs, histones and glutamatergic system dysfunction, disruption of myelination and maturation, hormonal-neuronal disregulation; personal history of depression, personality disorders and attempted suicide.[35,46–49] Other factors include old age due to a higher allostatic load,[1] childhood obesity, at puberty[50,51] and in <75 years, especially grade II (BMI >35 kg/m2); this risk increases by 50% in men and 100% in women,[10] although abdominal obesity (abdominal circumference >88 cm in women and >90 cm in men) generates a higher degree of insulin resistance and an incidence of type-2 DM. in men;[2] Some publications in Harvard indicate that abdominal obesity in people aged 40 triples the risk of frontoparietal, vascular and Alzheimer's dementia after the age of 50, and loss of frontotemporal and axonal gray matter.[52] Physical inactivity reduces energy expenditure and promotes obesity; however, a Swedish study found that low aerobic capacity and muscle strength at age 18 was associated with type-2 DM in adulthood, concluding that a sedentary lifestyle, regardless of BMI, increases the risk of type-2 DM.[50,53–55]

Insomnia (<7 hours a day) and hypersomnia (>9 hours a day) due to inappropriate melatonin secretion are related to obesity, nutricional disorders about what and how much eat: increased anxiety to eat simple carbohydrates in large amounts, increases appetite and reduces satiety, increase insulin resistance, immune system disfunction, raises blood pressure, depression and anxiety; also MGBA is regulated by circadian system; and time rest loss, disrupts circadian system coordination promotes the obesity and complications in type-2 DM.[56–59] Some patients with type-2 DM have MGBA and immune system disorders, and increased risk of viruses, prions, bacteria, fungi infection, which can affect the central nervous system; with oxidative stress, endothelial dysfunction, and metabolic disorders.[1,19,36] Other factors common to the onset of type-2 DM and mental illness include hormonal conditions of the life course such as adolescence, menopause due to decreased estrogen levels, andropause, gestational diabetes, postpartum depression[2,60] and polycystic ovary syndrome, with glucose intolerance (45%), insulin resistance (50%) due to defects in serine phosphorylation at the insulin receptor, excess adrenal androgen synthesis[1,2] and type-2 DM before the age of 40 (10%);[10,13] and a bad interaction between steroid hormones and the MGBA is related with type-2 DM.[24,61–67]

The patients with motor, cognitive, language, visual, and auditory sequelae due to the type-2 DM complications;[68–70] chronic pain (diabetic neuropathy) or living with the disease, such as heart failure, arterial hypertension, dyslipidemia, coronary artery disease[7] or abnormal carbohydrate metabolism for a long time (more than 10 years) have a higher mental health risk.[1,36,68] The imbalance of intestinal flora and MGBA damage in patients with type-2 DM is related to neurodegenerative diseases, such as loss of frontotemporal and axonal gray matter, frontoparietal dementia, vascular dementia, and Parkinson disease.[71–80] All these risk factors cause MGBA dysfunction, stress and a chronic pro-inflammatory state, and negatively affect the endocrine adipocyte, which is involved in the production of pro-inflammatory cytokines and angiotensin precursors.[50,51] This situation is perpetuated by eating disorders when the diet is based on high consumption of simple carbohydrates, lipids, and deficient in protein, complex carbohydrates, and micronutrients.[36,80,81] The harmony of the MGBA depends on a nutritional, mental and environmental balance, because the microbiota has many functions such as regulation intestinal, activation of immune responses, central regulator of metabolic and appetite through balance in leptin, neuropeptide Y, brain-derived neurotrophic factor and γ-amino butyric acid production; regulation of hepatic metabolism of lipid and glucose; and have pathways in the autonomic and enteric nervous system, the vagus nerve, the hypothalamic- pituitary-adrenal axis, the astrocyte axis and communication with the immune system, the enteroendocrine cells and microbial metabolites; so the microbiota influence host feeding behavior, the metabolic control and the pathological conditions.[71,82–85]

Subsequently, autonomic and neurohormonal deregulation occurs with structural damage to the cerebral amygdala, the amygdala-hippocampus-prefrontal cortex-limbic system pathways, difficulty in overcoming obesity (Edmonton scale) due to metabolic endocrine imbalance, dyslipidemia, irritable bowel syndrome, dyspepsia, cardiovascular disease, fibromyalgia, stress, anxiety, Alzheimer's disease, and neoplasms.[46,84–95] Finally, the diagnosis of type 2 DM can cause concern and rejection of treatment due to fear of hypoglycemia, anxiety due to decreased consumption of simple carbohydrates, increased eating disorders, depression, and suicidal ideation.[44,96]

Mental health screening tools for patients with type 2 DM

Patients with type 2 DM can have various mental health pathologies, however, screening should be aimed at locating the most frequent ones. The ADA 2023 considers detecting cognitive impairment and depressive symptoms in >65 years;[1] and psychologically assess patients with a recent diagnosis of Type 2 DM and poor medical adherence to support management with behavioral therapy.[1,15] The tools used to screen mental health by type of pathology and life course are described below and are summarized in Table 1.

Table 1 Mental health screening tools by life course suggested for patients with type 2 dm

Mental pathology	Screening test	Life course
1. Depression	Whooley	Pospartum, adulthood, Elderly
	Yesavage	Elderly
	PHQ-2	Youth, adulthood, elderly
2. Generalized anxiety disorder	GAD-2	Youth, adulthood, elderly
3. Depression and generalized anxiety disorder	PHQ-4	Youth, adulthood, elderly
	DDS-17	Adulthood, elderly
	SRQ	Youth, adulthood
4. Psychosis and Seizure disorder	SRQ	Youth, adulthood
5. Problematic alcohol use	SRQ	Youth, adulthood
	AUDIT	Youth, adulthood, elderly
6. Smoking	Fagerström test	Youth, adulthood, elderly
7. Cognitive decline	MMSE	Elderly
	MOCA	Elderly

Source: Own elaboration, adapted from[1,35,97–121]

Whooley questions: This tool allows screening for single or recurrent depressive episodes and consists of 2 questions. If the answer to either of the two questions is positive, the DSM-5 criteria should be used for the diagnosis of a single or recurrent depressive episode.[96–100] **Bosanquet's** (2015) meta-analysis found high pooled sensitivity (0.95, 95% CI 0.81-0.99) but moderate pooled specificity (0.60: 0.44-0.74) of the test.[101] These data are similar to the meta-analysis by **Smith** (2022) for pooled sensitivity (0.95; 95% CI: 0.88 -0.97) and pooled specificity (0.65; 95% CI: 0.56-0 .74) in the postpartum period; and suggests complementing the screening with a secondary evaluation tool to reduce the probability of diagnostic error.[102] In Colombia, Resolution 3280/2018 implemented Whooley questions for depression screening in adulthood and old age.[103]

Yesavage test: This scale screens depression disorders in older adults and has 30 evaluation items, which have 2 response options: yes or no; each question is given one point as appropriate. The final score is normal if it has 0-10 points, there is a probability of depression if it has 11-14 points: (sensitivity 84%; specificity 95%) and there is a high probability of depression if it has > 14 points (sensitivity 80%; specificity 100%) (35,99,100). **Sánchez** (2022), evaluated the effect of the 12-week Vivifrail exercise program in frail older adults with cognitive impairment and used the Yesavage scale for depression screening, and found improvement in the cognitive, motor, and vitality domains of this population, considering an effective strategy to improve the intrinsic capacity of each patient.[104]

PHQ-2: This tool allows screening for symptoms of depression, is validated for > 18 years and has 2 evaluation items. The score for each question is: 0: Not at all. 1: some days 2: more than half of the days. 3: almost every day; more than 3 points indicates the probable presence of depression and the DSM-5 criteria should be used for the diagnosis of anxiety.[35,100] **Firoj al-Ma'mun** (2023), in his study: Depression among Bangladeshi diabetic patients: a cross-sectional, systematic review, and meta-analysis study, used the Patient Health Questionnaire (PHQ-2) to screen for depression and found a prevalence of 25.9% and a combined estimated prevalence of 42% (95% CI: 32-52%); being more likely in women (OR = 1.12, 95% CI 0.99 to 1.25, $p < 0.001$) with low educational level and on insulin therapy; and less likely in physically active professional patients.[105]

GAD-2: This test allows screening for generalized anxiety disorders and the emotional and cognitive expression of generalized anxiety. It is validated for >18 years and has 2 evaluation items. The score for each question is: 0: Not at all. 1: some days 2: more than half of the days. 3: almost every day; more than 3 points indicates the probable presence of anxiety and the DSM-5 criteria should be used for the diagnosis of anxiety.[35,100] The United Kingdom, the National Institute for Health and Care Excellence endorses the use of the GAD-2 for detection of postpartum anxiety. The study by **James O'Carroll** (2023) in his systematic review of patient–reported outcome measures used in maternal postpartum anxiety, evaluated the use of GAD-2 in the postpartum period and concluded that despite having a class A recommendation, it does not fully evaluate the anxiety symptoms in this population.[106] Colombia implemented the GAD-2 in adulthood and old age.[103]

PHQ-4: This tool allows screening for generalized anxiety disorders and depression and is the result of joining the PH2 questions with the GAD-2 questions. The total score is 12, more than 6 points indicates the probable presence of depression or anxiety and more than 9 points very high probability; the DSM-5 criteria should be used to diagnose anxiety and depression.[35,100] **Zara** (2023), in her study of associations between childhood maltreatment and diabetes in adulthood and the mediating effect of personality functioning in the German population, used the PH2, GAD-2 and PH-4 and found acceptable reliability of

the tests. with McDonald's omega of ω = 0.85 (PHQ-2: ω = 0.77, GAD-2: ω = 0.78); and concludes that patients with Type 2 DM have symptoms of depression and anxiety more frequently compared to the population without DM.[107]

DDS-17: This scale has 17 questions referring to the last month, which evaluate 4 spheres of distress: 1. Emotional (5 questions) 2. Physical (4 questions) 3. Regime (5 questions) 4. Interpersonal (3 questions); each question gives a maximum score of 6 (1: it is not a problem, 2: it is a small problem, 3: it is a moderate problem, 4: it is a somewhat serious problem, 5: it is a serious problem, 6: it is a very serious problem). At the end, the answers for each item are added up and divided by the number of questions in each sphere of distress; if the result is 2-2.9 there is moderate distress, if it is greater than 3 there is high distress and intervention is needed.[35,100,108,109]

Qasir Abbas (2023), used in his randomized controlled clinical trial the PHQ scale and the DSS to evaluate the intervention of cognitive-behavioral therapy in the management of anxiety due to diabetes, depression and anxiety in patients with type 2 DM and concluded that the intervention improved depressive symptoms F(1.60) = 94.436, P < 0.001, and anxiety symptoms F(1.60) = 201.915, P < 0.001 (110)

SRQ: This scale allows screening for mental disorders from the age of 16, it has 30 questions; each question has a yes or no answer option. From question 1-20 they are associated with depression and anxiety and others; with 11 or more positives in this group determine a high probability of these pathologies. Question 21-24 evaluates psychosis, with a positive answer it is a possible case. A positive response to question 25 indicates a possible seizure disorder. Questions 26-30 indicate problems with alcohol; with a positive answer is high risk of suffering alcoholism.[35,100,111,112] In Colombia, Resolution 3280 of 2018 implemented SRQ for youth mental health screening.[103] **Jenifer J. Thomas** (2023), in her study on the influence of stress and coping on diabetes self-care activities among college students, applied the SRQ and found that acquiring coping skills and effective stress management improves self-care of the illness.[113] **Winkley Kirsty** (2023), in her randomized controlled clinical trial, carried out with a population in London, applied the SRQ test prior to carrying out the educational intervention to the experimental group to improve insulin self-control in patients with type 2 DM who were starting therapy with insulin and found this intervention to be useful and feasible.[114]

AUDIT: This scale allows early detection of problematic alcohol use, it has 10 questions, each one has a score from 0 to 4 points (0: Never, 1: One or less times a month, 2: 2 to 4 times a month; 3: 2 to 3 times a week; 4: 4 or more times a week). The maximum score is 40 points. It has 3 domains: alcohol use (from questions 1-3), alcohol dependence (questions 4-6) and problems related to alcohol use (questions 7-10). A score of 8-14 in men or 7-12 in women indicates probable harm; 15-19 in men and 13-19 in women indicates probable dependency and greater than 20 in both sexes indicates dependency. In Colombia, Resolution 3280 of 2018 implemented the AUDIT for screening problematic alcohol use in youth, adulthood and old age.[35,100,103]

Chia Jie Tan (2023), in her meta-analysis, used the AUDIT to compare the efficacy of psychosocial interventions in adults with harmful drinking, and found that applying psychosocial intervention in an intensive approach reduces harmful drinking behaviours.[115]

Fagerström Test: This scale allows the detection of nicotine dependence; it is applied in smoking patients. It consists of 6 questions, each one has a different score: question 1: from 0-3 points, question 2: from 0-1 points, question 3: from 0-1 points, question 4: from 0-3 points, question 5: from 0-1 points, question 6: from 0-1 points. The total score is 10 and allows the degree of nicotine dependence to be stratified: <4 points is low dependence; 5-7 points is medium dependency and 8-10 points is high dependency.[35,100] **Sanchez** (2023), in his multicenter clinical trial: Anti-smoking intervention in the acute phase of acute coronary syndrome, explored the benefit of the cardiac rehabilitation program through an early anti-smoking intervention for the experimental group in the acute hospitalization phase to improve the abstinence rate; used the fagestrom test and the pack-year index (37 ± 20) and found that the cessation rate was higher in the experimental group (69 vs. 44%; p 0.034; OR 2.84), but this statistical significance was not maintained at discharge (58 vs. 50%; p 0.478; OR 1.4).) nor at one year of follow-up (58 vs. 44%; p 0.24; OR 1.75); concluding that follow-up interventions are required to maintain the benefit.[116]

MMSE: This scale allows the detection of cognitive deterioration and is applied in older adults. It consists of 30 questions, grouped into categories of temporal-spatial orientation (day, place), immediate memory and retention (repetition and recall of three words), concentration and working memory (mental calculation), language (repetition of a sentence, realization of a written and a verbal order, writing a sentence and naming of objects) and graphic constructive praxis (copy of a geometric drawing). The maximum score is 30, and the dementia screening point usually is 24, but it depends on the degree of clinical and sociodemographic factors.[35,100]

Creavin ST, (2016) in his Systematic Reviews: Mini-Mental State Examination (MMSE) for the detection of dementia in clinically unevaluated people aged 65 and over in community and primary care populations, examined the MMSE of various studies and found that the accuracy summarized in a cut-off point of 24 (15 studies) had a sensitivity of 0.85 and a specificity of 0.90 and concludes that the MMSE can be used as screening, but the results must be analyzed according to the type of individual, in personality, behavior and degree of performance in the environments in which they live.[117] **Sanbao Chai** (2023) in his meta-analysis used the Minimental state to assess cognitive protection in patients with type 2 DM managed with incretins (experimental group) and found that the Mini Mental State Exam score increased 1.20 in the experimental group in comparison with control group (1.20, 95% CI: 0.39–2.01, no association); and concludes the cognitive protection in patients with type 2 DM managed with incretins.[118] **Meawad Elsayed** (2023) in his study used the MMSE to evaluate the effect of the combined exercise program on physical fitness, anxiety and depression in older adults with Type 2 DM; however, although there were no differences in the Minimental, there was a statistically significant improvement in the anxiety and depression disorder and in the physical fitness test.[119]

MOCA: This scale allows the detection of cognitive deterioration and is applied in older adults. It consists of 30 questions, grouped into categories similar to the mini-mental: executive visuospatial orientation, identification, memory, attention, language, abstraction, delayed memory and orientation. The maximum score is 30, and the cut-off point for normality is 26 points. 1 point is added if you have more than 12 years of schooling. As with MMSE, it is a screening and non-diagnostic test, so scores less than 26 points must be analyzed according to the patient and context.[35,100,120] **Sánchez** (2022), evaluated the effect of the 12-week Vivifrail exercise program in frail older adults with cognitive impairment and used the MOCA scale for cognitive screening, and found improvement in the cognitive, motor, and vitality domains of this population after the intervention, considering it an effective strategy for this population[121] Table 1.

Intervention strategies

Multidisciplinary evaluation: The MGBA axis should be evaluated by a multidisciplinary team, including psychology, psychiatry, family medicine, and endocrinology. It is necessary to explore personal emotional information, identify predictive and defense strategies triggered by emotional stress, as well as unconscious, impulsive, reactive and defensive behavior patterns, to advance to the self-critical level with decision to change and distancing from defensive strategies. The state depends on focusing on strengths and positive emotions; plan clear, measurable and achievable life goals in the short and medium term to reduce proinflammatory factors, inappropriate nutritional behaviors and improve the metabolic homeostasis.[22,24,36,67,77,122] In 2023, The ADA, indicates referral to mental health professionals trained to offer validated treatments, when the patient has mental health symptoms such as anxiety due to diabetes, depression, suicidal tendencies, anxiety, fear of drug related hypoglycemia, cognitive disorders and eating disorders.[1,3,55]

Cognitive-behavioral therapy: The randomized controlled clinical trial by **Qasir Abbas** (2023) evaluated the intervention of cognitive-behavioral therapy in patients with type II DM to control depression and anxiety due to the disease and concluded that the experimental group that received CBT reduced depressive symptoms. $P < 0.001$, health anxiety $P < 0.001$, discomfort due to diabetes $P < 0.001$), with improvement in quality of life $P < 0.001$, greater adherence to treatment $P < 0.001$, and the physical activity program $P < .001$, compared to the control group.[110] Two meta-analyses of randomized controlled clinical trials in patients with type 2 DM concluded that cognitive behavioral therapy improves glycemic control; and measures based on psychotherapy and antidepressants were moderately effective in intervening depression.[1,110,123]

MGBA intervention: required establishing therapeutic control goals based on nutritional elements, movement, rest, appropriate use of technology, avoiding exposure to toxins, health care education, psychological and family stability; appetite regulating drug such as antagonist-GPL1 and emerging therapies such as gut microbiota transplant.[1,15,20,24,36,41–49,52–57,65,85-87,100,122]

Conclusion

Mental pathologies are frequent in patients with type-2 DM, and are related to the imbalance in the MGBA, and must be intervened early with a comprehensive approach that includes the active search for risk factors, the application of screenings according to the life course, which are easy to apply in the outpatient, hospitalization and institutionalization settings such as the PH4, the DDS, the SRQ, AUDIT, the fagestrom and the MOCA-. Among the benefits of performing mental health screening are the provision of specific information on the state of mental health, guidance towards early diagnosis and timely treatment to achieve metabolic balance; which avoids complications such as dependency, high health costs, institutionalization, poor quality of life and mortality. Human talent must acquire skills for application and interpretation, considering the importance of avoiding therapeutic inertia and a comprehensive approach to this population.

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Conflicts of interest

The author declares there is no conflict of interest.

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