THE IMPACT OF PSYCHOLOGICAL STRESS MANAGEMENT ON DENTAL TREATMENT OUTCOMES IN CHILDREN WITH DIABETES

Cristina Stefanescu[1], Kamel Earar[1], Madalina Nicoleta Matei[1], Aurel Nechita[1]

[1]Faculty of Medicine and Pharmacy, University "Dunarea de Jos" Galati, Romania

[*]Corresponding authors: erar_dr.kamel@yahoo.com, madalina.matei@ugal.ro

Abstract

Diabetes in children is a chronic condition that involves rigorous blood sugar management to prevent complications. The psychological stress associated with this disease can worsen the general condition and oral health of diabetic children, causing xerostomia, oral infections and gum disease. This study explores the effectiveness of stress management strategies, including relaxation techniques, psychological counseling, family support, and behavioral interventions such as cognitive behavioral therapy (CBT) and mindfulness. Research shows that these methods reduce anxiety, improve blood sugar control and adherence to treatment, thus contributing to better oral health and an improved overall quality of life. The integrated approach to psychological stress is essential in the holistic treatment of diabetic children, to prevent long-term complications and promote healthy living.

Keywords: diabetes, children, psychological stress, oral health, cognitive behavioral therapy (CBT)

Introduction

Diabetes in children is a global health problem with an increasing prevalence, with long-term consequences on general and specific health, including oral health. Type 1 diabetes, an autoimmune condition in which the body stops producing insulin, is the most common type of diabetes in children. In recent years, there has also been an increase in cases of type 2 diabetes among children, mainly related to a sedentary lifestyle and obesity [1-3].

Both types of diabetes require rigorous blood sugar management to prevent long-term complications, including those related to oral health [1-3].

The oral health of diabetic children is particularly vulnerable due to the physiological and immunological changes induced by this disease. Diabetes can lead to an increased susceptibility to oral infections, such as candidiasis, and can exacerbate pre-existing conditions, such as periodontal disease [1-3, 39-42].

Also, xerostomia (dry mouth), caused by insufficient saliva production, is a common problem in diabetic patients and can lead to an increased risk of tooth decay. Another important aspect is the link between blood sugar levels and gum health, where poor blood sugar control can lead to inflammation and damage to gum tissue. In this context, the management of psychological stress becomes a crucial factor, as stress can affect blood sugar control and, implicitly, oral health [1-3].

Psychological stress, a common reaction to diagnosing and managing a chronic disease like diabetes, can have multiple sources, including fear of long-term complications, stigma associated with the disease, and difficulty adjusting to a strict treatment regimen [1-3].

DOI : 10.6261/RJOR.2024.3.16.67

In children, stress can be amplified by developmental factors and social and school pressures [1-4].

The impact of this stress on oral health is complex, involving biological and behavioral mechanisms. Stress can cause changes in the immune system, such as decreased NK cell activity and altered cytokine production, which can increase susceptibility to infection and inflammation [1-4, 43-48].

Stress can also lead to unhealthy behaviors, such as inadequate oral hygiene and neglecting visits to the dentist, which aggravate oral problems [1-4].

Effective stress management in diabetic children is essential not only for their overall health, but also for their oral health. Interventions aimed at reducing stress, such as relaxation techniques, psychological counseling, and family support, can help improve blood sugar control and reduce the incidence of oral problems [1-4].

Psychological stress and oral health

Definition of psychological stress

Psychological stress is a state of mental and emotional tension caused by the perception of an overwhelming threat, pressure, or demand. This state can occur as a result of stressful life events, such as health problems, school or social difficulties, and other challenging situations [2-4].

In the case of diabetic children, stress can be amplified by the need for constant management of the disease, including monitoring blood sugar levels, taking insulin and following a strict diet. Children may experience stress not only because of possible complications of diabetes, but also because of the perception of being different from their peers or fear of hypoglycemic episodes [2-5].

Physiological mechanisms

Psychological stress influences the body through a series of biological responses, in particular by activating the hypothalamic-pituitary-adrenal (HPA) axis. When a person perceives a stressor, the hypothalamus releases corticotropin-releasing hormone (CRH), which stimulates the pituitary gland to secrete adrenocorticotropic hormone (ACTH) [2-5].

This, in turn, stimulates the adrenal glands to release cortisol, also known as the stress hormone. High cortisol levels can lead to a number of effects, such as increased blood pressure and blood sugar, but also to suppression of the immune response. In the context of oral health, a weakened immune response can mean a decreased resistance to infection and inflammation, making the oral cavity more susceptible to various conditions [2-5].

DOI : 10.6261/RJOR.2024.3.16.67

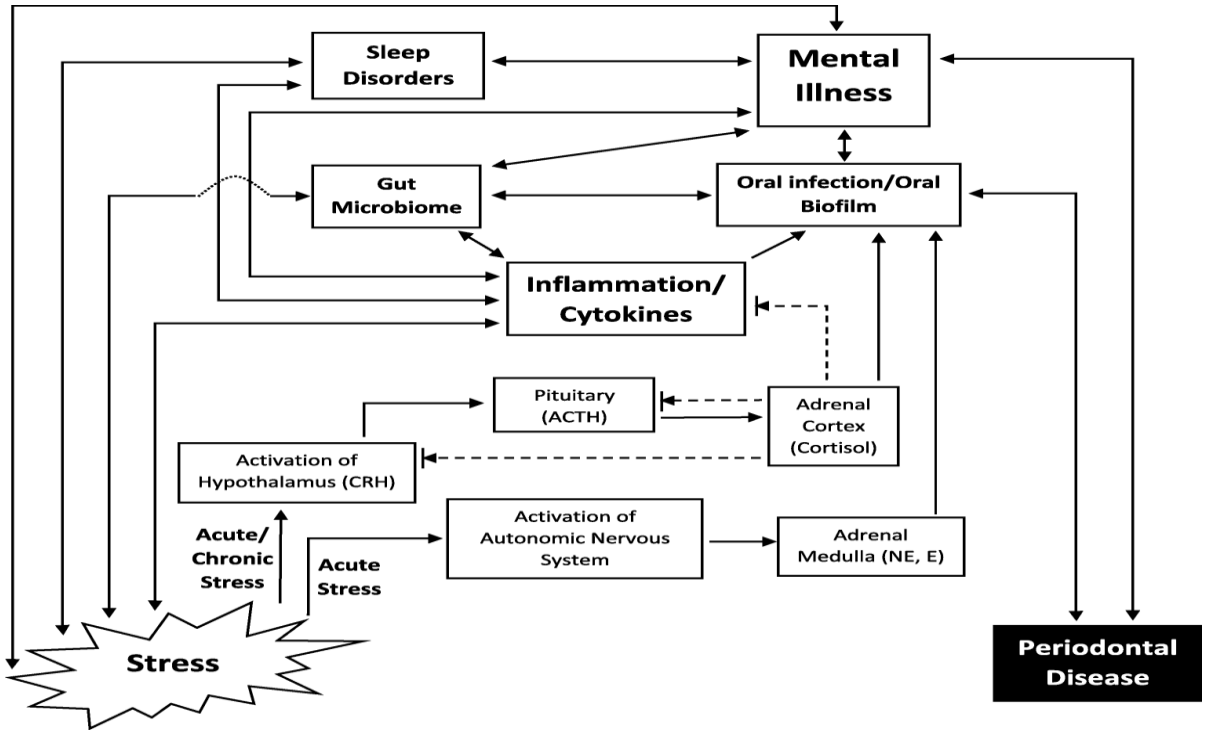

Fig 1. Stress influences periodontal health through a number of complex mechanisms, including activation of the hypothalamic-pituitary-adrenal (HPA) axis, stimulation of the autonomic nervous system, and triggering inflammatory responses. These processes can lead to pathological reactions to psychological stress, especially when there are no adequate coping and resilience strategies. In this context, hyperactivation of the HPA axis and the autonomic nervous system are frequently observed [5].

The mediators involved, such as cortisol, cytokines and catecholamines, can also influence the oral and intestinal microbiome, as well as the pathogenicity of microbes. In addition, mental illness and sleep disorders can intensify the effects of stress and periodontal disease through interconnected mechanisms. These interactions underscore the importance of integrated approaches in the treatment and prevention of periodontal disease, given the multiple pathways in which stress can affect oral health [3-5].

Direct and indirect effects on oral health

Psychological stress can have both direct and indirect effects on oral health. One of the direct effects is the development of xerostomia or dry mouth. Stress can reduce salivary flow, which is essential for protecting the teeth and oral mucosa from bacteria and acids. The lack of saliva increases the risk of tooth decay and oral infections, as saliva plays an important role in neutralizing acids and rinsing away food debris and bacteria [3-5].

Gum disease is another direct effect of psychological stress on oral health. Stress can exacerbate inflammation in the gum tissues through the compromised immune response, thus favoring the development of gingivitis and periodontitis. These conditions are manifested by bleeding gums, receding gums and, in advanced cases, tooth loss [3-6].

The indirect effects of stress on oral health include unhealthy behaviors

DOI : 10.6261/RJOR.2024.3.16.67

associated with stress, such as neglecting oral hygiene, excessive consumption of sugary foods, or adopting habits such as smoking. Children and adolescents under stress may be less likely to maintain a rigorous oral care routine, such as brushing and flossing, thus increasing the risk of plaque and cavities. Chronic stress can also contribute to behaviors such as bruxism, which involves teeth grinding, and can lead to premature tooth enamel wear and other complications [4-6].

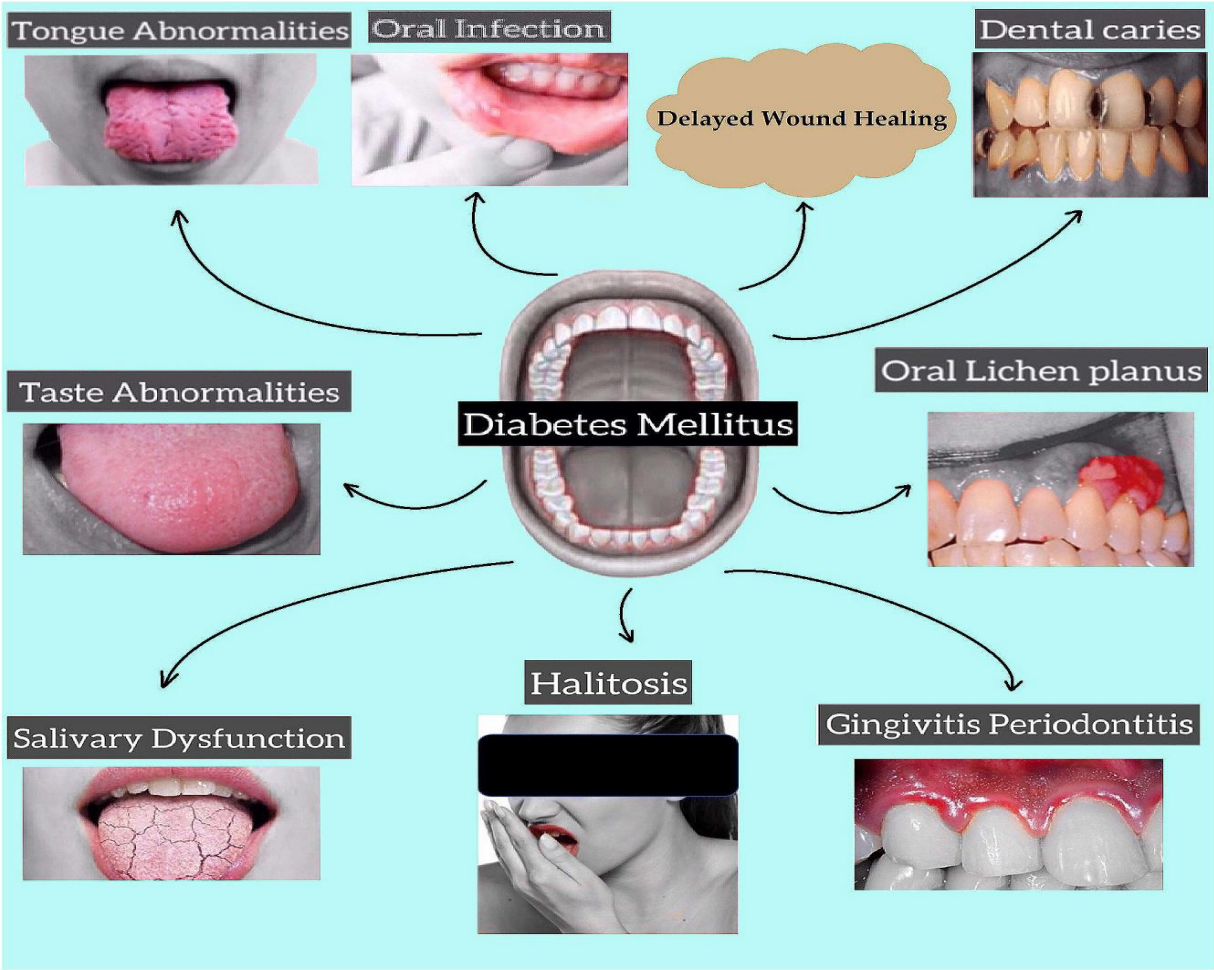

Fig 2. Probleme orale asociate cu diabetul zaharat [6].

Diabetes in children and oral health

Presentation of diabetes in children: Types of diabetes (Type 1 and Type 2) and the impact on children

Diabetes in children is a chronic condition in which the body cannot produce enough insulin or use it effectively, leading to high blood glucose levels. There are two main types of diabetes in children: type 1 diabetes and type 2 diabetes [6-8].

Type 1 diabetes is an autoimmune condition in which the immune system attacks and destroys beta cells in the pancreas, which produce insulin. This type of diabetes is most common in children and adolescents and requires daily insulin intake to control blood sugar. Children with type 1 diabetes need to manage the disease through constant monitoring of blood sugar levels, a balanced diet, and physical activity [6-8].

DOI : 10.6261/RJOR.2024.3.16.67

Type 2 diabetes, although less common in children, is becoming more common due to increased obesity rates and a sedentary lifestyle. In type 2 diabetes, the body becomes insulin resistant or the pancreas does not produce enough insulin. This form of diabetes can often be managed through lifestyle changes such as diet and exercise, but in some cases it may also require medication [6-8].

The relationship between diabetes and oral health

The impact of diabetes on children is significant, affecting not only physical health, but also emotional and social well-being. Diabetes imposes restrictions and can be a source of constant stress for children and their families, which can negatively influence quality of life [9-10].

Diabetes affects oral health by weakening the immune response and promoting inflammation, which can complicate traditional treatments. The use of delay-release essential oil nanocapsules in oral treatments is an innovative approach to managing these complications [9-14]. Nanocapsules protect the active ingredients of essential oils and allow the controlled release of bioactive substances directly into the affected area, thus providing increased therapeutic efficacy [15-17].

These nanocapsules can fight bacterial and fungal infections, reduce inflammation and promote healing in gum and periodontal diseases, commonly found in diabetic patients. By maintaining the therapeutic concentration for an extended period, the nanocapsules ensure a constant therapeutic effect, minimizing the need for repeated applications and improving treatment results. Thus, the use of delay-release essential oil nanocapsules may represent a promising method for improving oral care in patients with diabetes [12-17].

Orthodontic treatments in diabetic children require increased attention due to the risks associated with diabetes, such as delayed healing and increased susceptibility to infections. It is essential for these patients to maintain rigorous blood glucose control to prevent complications during treatment. Good oral hygiene is crucial to minimize the risk of gingivitis and other oral problems. Orthodontists should closely monitor the oral health of diabetic children throughout treatment. Also, collaboration between orthodontists and endocrinologists is important to tailor the treatment plan to the specific needs of patients with diabetes [18-25]

Also, the use of biocompatible materials is crucial to reduce the risk of side effects and inflammation, which is important for diabetic patients who have a reduced healing capacity[25-30]. Choosing materials such as titanium alloys or biocompatible ceramics can contribute to a safer and more effective treatment. Finally, the personalization of orthodontic treatment taking into account the child's general health is essential for its success [25-35].

Diabetes has a direct impact on oral health, causing a number of specific problems. One of the most common conditions is xerostomia, or dry mouth, which occurs when low saliva production levels can't neutralize acids and clean bacteria and food debris from the oral cavity. This increases the risk of tooth decay and oral infections [25-35].

Stress management in diabetic children

Relaxation techniques include deep breathing exercises, meditation, and progressive muscle relaxation. These

DOI : 10.6261/RJOR.2024.3.16.67

techniques help reduce anxiety and muscle tension, thus improving children's ability to manage stress. Regular practice of these techniques can help lower cortisol levels, reducing the negative impact of stress on the body [36-38].

Cognitive behavioral therapy (CBT): CBT is a form of psychological therapy that focuses on identifying and modifying negative thoughts and dysfunctional behaviors. In the context of diabetes, CBT can help children develop a more positive attitude towards the disease and reduce anxiety about managing diabetes. CBT may include techniques such as cognitive restructuring, which helps change the way children perceive and respond to stressors [36-38].

Mindfulness techniques: Mindfulness involves focusing attention on the present moment, without judgments or distractions. Practicing mindfulness can help children better manage their emotions and reduce stress reactions. This can include mindful breathing exercises, meditation, or mindful activities such as drawing or nature walks [36-38].

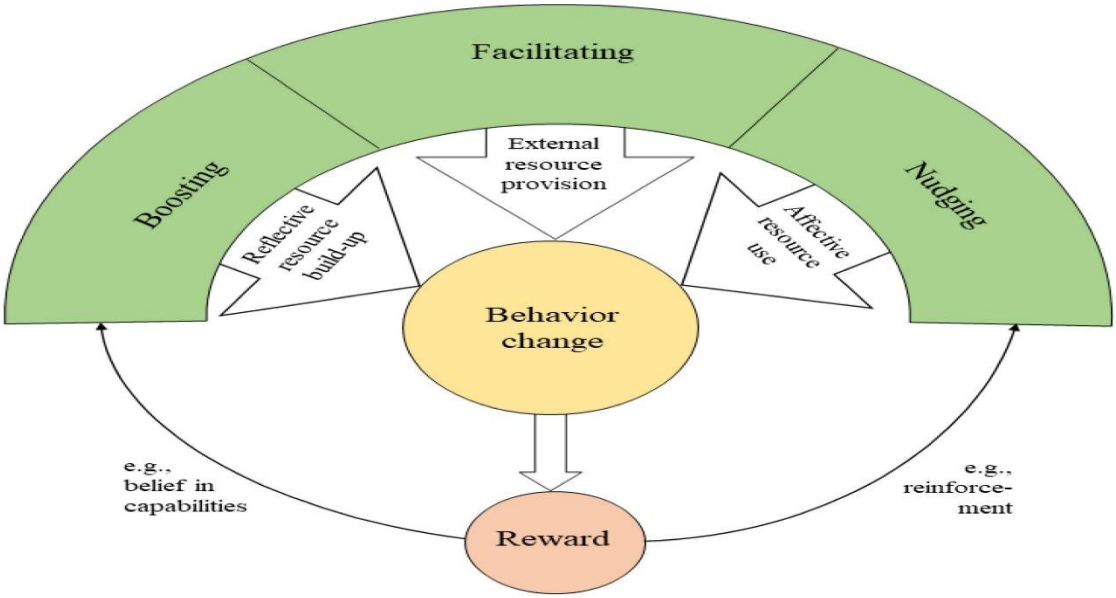

Fig 3. The resource model for behavior modification. Definitions for growth, facilitation and impulse techniques and how these behavioral changes influence reward processes [38].

Conclusions

Understanding and addressing the interaction between diabetes, psychological stress, and oral health are vital to improving the quality of life of diabetic children. This area of research not only highlights the need for more comprehensive management strategies, but also opens up new perspectives for clinical interventions that address all aspects of the health of these vulnerable patients.

Psychological stress has a profound and complex impact on oral health, especially in diabetic children, who are already vulnerable due to their medical condition. Recognizing and managing stress are essential for the prevention and treatment of oral conditions, and a holistic approach is needed in the care of these patients.

Diabetes in children has significant implications for oral health, making it

DOI : 10.6261/RJOR.2024.3.16.67

essential to carefully monitor and manage both conditions. Good oral hygiene, along with strict blood sugar control, are crucial for preventing complications and maintaining optimal oral health. It is important for children with diabetes to have access to specialized dental care and educational resources to maintain their oral and overall health.

Managing psychological stress is a crucial component in caring for diabetic children, having a significant impact on their overall and oral health. Stress can not only complicate blood sugar control, but it can also exacerbate oral health problems such as xerostomia, oral infections, and gum disease.

The implementation of stress reduction strategies, such as relaxation techniques, psychological counseling and family support, along with psychological and behavioral interventions such as cognitive-behavioral therapy and mindfulness, has proven effective in improving the well-being of these children. Research supports the effectiveness of these methods in reducing anxiety and depression, thus improving adherence to treatments and quality of life. Therefore, it is essential for healthcare professionals to include stress management in treatment plans for children with diabetes, thus addressing their holistic needs and helping to prevent long-term complications.

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