



THE INFLUENCE OF DIABETES MELLITUS TYPE 1 IN THE DISEASE OF DENTAL CARDIAC AND OTHER ORAL AFFECTIONS

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ABSTRACT

There are several types of Diabetes Mellitus, type 1 is a metabolic disease, chronic and multifactorial resulting in serious consequences to the human organism and e intraoral as periodontal diseases, dental cavity, xerostomia and change in salivary pH decreasing its protective effect and favoring an acidogenic environment increasing the incidence of dental caries in patients with Diabetes Mellitus. This study aimed to evaluate the prevalence of caries disease and salivary flow alteration in this group of patients and to highlight the importance of the dental surgeon in multidisciplinary treatment, as well as to diagnose early and assist in the metabolic control and correct management of these patients. For this, a total of 25 articles were analyzed in their entirety, however, 19 were included and discussed in this study. The bibliographic revisions used and the observation of randomized studies were from the databases Bireme, Pub Med, SciELO, LILACS until August 2018. And it can be concluded in this survey the importance of the dental surgeon in the presence of chronic diseases such as diabetes in the early diagnosis, as well as the orientation of correct oral hygiene, controls in the office and the importance of maintaining glycemic control.

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INTRODUCTION

Diabetes mellitus is a common chronic disease that leads to hyperglycemia being classified into four general categories: type 1, in which the pancreas β -cells lose their ability to produce insulin; type 2, in which a defect in β -cells or a reduction in tissue sensitivity to insulin is required for the manifestation of the disease; gestational diabetes, defined as any degree of glucose intolerance with onset or first recognition during pregnancy; and specific types of diabetes due to other causes, for example, monogenic diabetes syndromes (FERIZI, 2018; COELHO, 2018 and YAMASHITA, 2013).

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Long-term complications of type 1 diabetes include several micro- and macrovascular changes combined with different risk factors, such as hyperglycemia, high glycemic variability, hypertension, and disease duration itself. These vascular alterations, especially the microvascular ones, have repercussions in several organs (COELHO, 2018). Different studies indicate that among intraoral complications, the most common are gingivitis, periodontal disease, acidic pH alteration, degenerative changes of the salivary glands (with lipid accumulation and consequent increase in viscosity and reduction of salivary flow), xerostomia (resulting from dehydration promoted by hyperglycemia), changes in salivary composition, dental caries, oral bacterial, viral and fungal infections (MACHADO, 2017; GARCIA, 2016; MUHAMMAD ASHRAF NAZIR, 2018; SINGH, 2016 and FAZLIĆ, 2016). In view of the information, was observed the

direct influence of hyperglycemia on oral health, altering salivary pH and increasing the incidence of dental caries among other oral conditions in patients with Diabetes Mellitus. Thus, this study aims to evaluate the prevalence of dental caries and salivary flow alteration in patients with Diabetes Mellitus described in the literature, and to point out the importance of the dental surgeon in the multidisciplinary treatment in these patients besides diagnosing early and metabolic control and correct management of these patients. A total of 78 articles were found involving diabetes mellitus, dental caries, and salivary pH alteration. Initially, a sieve was performed according to the interest described in this study, after this process, the abstracts were evaluated and a new analysis was performed. A total of 25 articles were evaluated in their entirety and 19 were included and discussed in this study. Were used bibliographic reviews and observation of randomized studies of the Bireme, Pub Med, SciElo, and LILACS databases were used until August 2018.

Literature Revision

Diabetes Mellitus: Definition and Classification: Diabetes mellitus consists of a metabolic disorder characterized by persistent hyperglycemia, due to the deficiency in insulin production or its action, or in both mechanisms, causing long-term complications (BRASIL, 2018). The World Health Organization (WHO) estimates that high glycemia is the third major factor in the cause of premature mortality, surpassed only by increased blood pressure and tobacco use. Unfortunately, many governments, public health systems, and health professionals have not yet become aware of the current relevance of diabetes and its complications. The classification of Diabetes Mellitus has been based on its etiology (Picture 1), (COSTA, 2016).

1	Type 1A Type 1 Diabetes: Insulin deficiency due to autoimmune destruction of β cells, as demonstrated by laboratory tests;- Tipo 1B: Insulin deficiency of idiopathic nature.
2	Diabetes mellitus type 2: progressive loss of insulin secretion combined with insulin resistance
3	Gestational diabetes mellitus: hyperglycemia of varying degrees diagnosed during pregnancy, in the absence of previous Diabetes Mellitus criteria
4	Other types of Diabetes Mellitus: - Monogenic (MODY); - Neonatal diabetes; - Secondary to endocrinopathies; - Secondary to diseases of the exocrine pancreas; - Secondary to infections; - Secondary to medications.

Source: Brazilian Society of Diabetes Guidelines. 2017-2018.

Picture 1. Etiologic classification of Diabetes Mellitus

In the long term, uncontrolled hyperglycemia can lead to complications in the human micro and macrovascular organs, such as ketoacidosis, coma, loss of vision, renal failure, coronary heart disease, among others. The oral cavity may exhibit the first clinical manifestations of an undiagnosed or poorly controlled diabetic condition (COSTA, 2016), can lead to periodontal disease, dental caries, salivary gland changes, erythematous candidiasis, xerostomia, lingual varicosity, gingivitis, periodontal diseases, and alveolar bone loss have been reported in these patients (MACHADO, 2017; LA and MOIN, 2015).

Similarly, another important consequence is an alteration of the salivary pH making it more acidic (low pH), reducing its protective effect and favoring an acidogenic environment, contributing to the growth of acidic bacteria increasing the risk of developing dental caries among other oral diseases (SEETHALAKSHMI, 2016). The knowledge of oral alterations is of paramount importance for the diagnosis and attention in the oral health of these patients (SEETHALAKSHMI, 2016). Laboratory diagnosis of diabetes mellitus can be performed by means of fasting glycemia, glycemia 2 hours after an oral glucose tolerance test (TOTG) and glycated hemoglobin (HbA1c). There are no other validated and recommended laboratory tests for this purpose. (BRASIL, 2018).

Chart 1. Diagnostic criteria for DM recommended by ADA and SBD

Exam	NORMAL	Pre Diabetes	Diabetes
Fastingglycemia (mg/ dL)	<100	100 a 125	≥ 126
Glucose 2 hours after	<140	140 a 199	≥ 200
TOTG with 75 glucose			
Glycatedhemoglobin	<5,7	5,7 a 6,4	$\geq 6,5$

Source: Guidelines Brazilian Society of Diabetes. 2017-2018.

The treatment of type 1 diabetes is currently based on intensive insulin therapy, which should mimic normal insulin secretion, the regular self-monitoring of specific metabolic biomarkers in the patient and the education of the patient and his / her family (NOVOTNA, 2015).

Dental Cavity

Dental caries is a multifactorial disease in which oral cariogenic bacteria are included, fermentable carbohydrate intake as a substrate for cariogenic bacteria and sufficient time for caries formation. Research has shown that levels of cariogenic bacteria, particularly *Streptococcus mutans*, are higher in patients with diabetes (FERIZI, 2018 and MACHADO, 2017). Modern concepts consider caries as an interaction between biological, social, behavioral and psychological factors, with dental biofilm being the key element (LA, 2017). However, change in the oral environment activates the pathogenic bacteria, damaging the hard and soft tissues of the oral cavity, leading to an increase in cariogenic activity and periodontal lesions where saliva has the function of providing a protective effect, and dental caries may develop when there is a clinically significant decrease in salivary functions. Other risk factors, such as increased blood glucose levels, reduced salivary flow rate, salivary buffering ability, poor dietary control, also increase the risk of dental caries in patients with type 1 diabetes mellitus (MUHAMMAD ASHRAF NAZIR, 2018; SINGH, 2016; SEETHALAKSHMI, 2016). Caries may be due to more frequent meals in diabetic patients and repeated intakes of even small amounts of carbohydrates may be cariogenic when combined with elevated blood glucose levels, which favors the propagation of microorganisms allowing accumulation on the surface of the tooth. These factors also decrease the performance of neutrophils, which accelerate microbial accumulation beyond hyposalivation, causing a very high prevalence of dental caries in diabetic patients compared to non-diabetic patients (SINGH, 2016; MALVANIA, 2016 and GUPTA, 2014).

In addition, the prevalence of periodontal inflammation was highly correlated with that of dental caries and fluoride treatment drastically attenuated the incidence and severity of periodontal inflammation, as well as preventing caries dental practice. It is probable that fluoride can't suppress the progression of caries, once the cariogenic bacteria penetrate the surface of the tooth (NAKAHARA, 2017 and NISHIMOTO, 2017). Alterations in diabetic microflora of inadequate glycemic control may significantly influence the prevalence of gingivitis and caries (NISHIMOTO, 2017) but the results presented clearly demonstrate that young patients with type 1 diabetes mellitus have a significantly higher frequency of caries than their healthy counterparts regardless of the degree of metabolic control (FAZLIĆ, 2016).

Salivary: It is known that diabetes may be significantly associated with salivary gland dysfunction (GARCIA, 2016), and that changes in saliva pH are often reported in patients with diabetes mellitus. Often there is a correlation between changes in pH on the plate and the clearance of sugar from saliva, where the low salivary pH provides an acidogenic environment for the growth of acidic bacteria, leading to tooth decay, which again further reduces the salivary pH, leading to a vicious cycle. According to research, the saliva of diabetics shows quantitative and qualitative changes. Regarding the qualitative parameters, the typical findings are a lower capacity of buffering and higher viscosity of salivary, higher levels of carbohydrates, glucose and total protein (MACHADO, 2017). Hyposalivation can adversely affect the quality of life of the patient, compromising his eating habits, nutritional status, speech and tolerance to dental prostheses. It may also increase the risk of oral infection, such as candidiasis, and increase patient susceptibility to dental caries, periodontal disease, and tooth loss. Reduction of salivary also decreases resistance to caries-producing bacteria (CARNEIRO, 2015 and MUHAMMAD ASHRAF NAZIR, 2018). It is notorious that salivary components (immunoglobulins, salivary protein, salivary calcium and levels of inorganic phosphorus and alkaline phosphatase), its flow rate, viscosity, buffering capacity, pH, etc., play an important role in the initiation and progression of dental caries, in which diabetes has a very negative impact on the sympathetic and parasympathetic nervous system, such as microangiopathy; also causes dehydration and hormonal changes that are responsible for the change in salivary flow rate (SINGH, 2016). Differences were also recorded among diabetic children in poor and good metabolic control: all pH parameters were more prone to caries risk in children with poor metabolic control than in good (LA, 2017 and MOIN, 2015). It is important to highlight that it may be associated with the use of medications that induce hyposalivation, such as antidepressants, diazepam and hypotensives, and may cause histological changes in the salivary glands due to the degenerative complications of the disease (angiopathy, neuropathy and metabolic disorder), which decreases activity of the enzymes present in the salivary glands, affecting their function (YAMASHITA, 2013).

Oral Hygiene: Many patients with diabetes mellitus are unaware of the relationship between diabetes and oral health, and there is a lack of awareness about the importance of maintaining oral health in patients with diabetes mellitus (MUHAMMAD ASHRAF NAZIR, 2018), these factors include poor oral hygiene, inadequate eating habits such as frequent consumption of refined carbohydrates, frequent use of

oral medications that contain sugars. In addition, people with diabetes also have poor oral hygiene encompassing high plaque rate, calculus, dental caries, gum swelling, and deep periodontal pockets. They are also more prone to infections, including dental abscesses that result from progressive dental caries (MOIN, 2015). Also regarding dental brushing habits, a considerable correlation was not found between these and the number of decayed, lost and restored teeth correlated to oral hygiene habits and education of diabetic patients who were shown to be similar or slightly better compared to healthy individuals, not being the main cause in the development of oral diseases (GARCIA, 2016 and NOVOTNA, 2015). However oral manifestations can be avoided through various approaches aimed at ensuring proper brushing and flossing by encouraging patients to visit the dentist for a routine check-up for salivary disinfection and the doctor to control blood glucose levels (GUPTA, 2014).

Divergence

The relationship between dental caries and type 1 diabetes has been the subject of study, where the results are inconsistent in relation to the prevalence of dental caries. Other studies report a higher incidence of cervical, interproximal or radicular caries in diabetics. These findings are considered due to a higher glucose content in saliva and gingival sulcus fluid in patients with diabetes (NOVOTNA, 2015). Some authors found an increase in this risk (translated by a higher prevalence), and others either did not find any significant relationship or reported risk reduction (MALVANIA, 2016). Although the patient with Diabetes presents some risk factors for dental caries, such as hyposalivation and high concentration of salivary glucose, they argue that dental caries was lower in these individuals, probably because of the restricted sucrose diet, which is recommended for Diabetes Control. They point out that studies that evaluate dental caries in patients with compensated and decompensated Diabetes, as well as measuring the flow and concentration of salivary glucose, are necessary to elucidate this issue (SEETHALAKSHMI, 2016). However, among the groups with type 1 diabetes mellitus, an increase in the prevalence of caries is observed in those with inadequate metabolic control, and they may present uncontrollable caries development, despite the extensive preventive efforts (CARNEIRO, 2015).

Role of the dentist surgeon

The involvement of oral health professionals in strategies for the recognition of individuals at risk for diabetes mellitus will strengthen the preventive and screening efforts required to prevent oral diseases (GUPTA, 2014). It explains that due to the complex etiology of xerostomia, its treatment implies an interdisciplinary approach that should focus on reducing possible complications and improving the quality of life, where every diabetic patient is considered at risk of periodontal disease and should be referred for periodontal screening and educated about the importance of oral health and regular dental consultations (MUHAMMAD ASHRAF NAZIR, 2018). Dentists should provide advice on the use of mouthwash with fluoride to prevent decay and anti-plaque mouthwash to prevent periodontal problems, dental brushing with fluoride toothpaste twice a day and dental floss once a day should be emphasized to ensure control of dental plaque. Reinforce that diabetic patients should visit the dentist regularly, every 3 months. It is up to the dental surgeon to

observe and alert the patient to the association between manifestations in the oral cavity and Diabetes Mellitus. The dentist surgeon is a professional able to identify the oral manifestations and to alert the patient about Diabetes, as well as treat them in patients already diagnosed (YAMASHITA, 2013; MUHAMMAD ASHRAF NAZIR 2018 and CARNEIRO, 2015). Joint action by both dental and non-dental health professionals is needed to increase awareness of the complications of oral health associated with diabetes, as well as the benefit of its inclusion in a multidisciplinary team (GARCIA, 2016 and MUHAMMAD ASHRAF NAZIR, 2018). Well-controlled diabetics can be treated in the dental office similarly to non-diabetics, but morning appointments are preferable, and patients should be instructed not to fast in order to reduce the risk of hypoglycaemia. The dentist surgeon should make sure that the medication used for glycemic control has been properly administered, with respect to dose and schedule. In longer consultations, there is a need to check the patient's blood glucose using a glucometer and to discontinue treatment in prolonged consultations for a quick meal and thus avoid a hypoglycemic crisis (COSTA, 2016).

Conclusion

Hyperglycemia influences the oral health of patients with type 1 diabetes. Being that the dental surgeon has an important role in the awareness of the periodicity of oral evaluation that should be part of the routine procedure in the dental care of these patients with a global vision directed to symptoms such as hyposalivation, salivary flow rate and frequency of dental caries. Stimulating and guiding the correct oral hygiene, salivary decontamination in sessions in the office besides awareness of the importance of glycemic control to avoid oral affections and future complications favoring a better quality of life for patients with Diabetes Mellitus

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