

Diabetes A Dire Straits For Oral Health: A Review

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Abstract

Diabetes mellitus is group of metabolic diseases characterized by hyperglycaemia resulting from defects in insulin secretion, Type 2 diabetes mellitus (T2DM) has been described as a new epidemic. It is one of the leading causes of mortality and morbidity worldwide. The goal of this article is to review oral health in patients with diabetes and to create awareness in dental patients receiving routine oral care and to enhance the quality of life for patients with this incurable disease.

Keywords : Diabetes Mellitus, World Health Organization , National Diabetes Clearing House, Type I Diabetes Mellitus (insulin dependent), Type II Diabetes Mellitus(non insulin dependent), Gestational Diabetes

How to cite this Article: Maddheshiya N. Diabetes A Dire Straits For Oral Health: A Review. HTAJOCD.2018;11(2):44-46

Introduction

Oral health is an integral part of systemic and nutritional health and plays a significant role in the maintenance of optimum general health status. Several factors affect oral health including metabolic disorders such as diabetes mellitus.

Diabetes mellitus represents a group of metabolic diseases that are characterised by hyperglycaemia due to a total or relative lack of insulin secretion and insulin resistance or both. The metabolic abnormalities involve carbohydrate, protein and fat metabolism. Diabetes mellitus affects all age groups, but is more common in adults. The World Health Organization (WHO) has recently declared it to be a pandemic.(World Health Organization. 2000) Its prevalence has increased dramatically over the past few decades and it is expected to triple in the next decade. Diabetes mellitus is considered a leading cause of death due to its microvascular and macrovascular complications (Moore PA, et al. 2003,Shelesh J, Swarnlata S.2010)

Diabetes is classified as type I diabetes mellitus (insulin dependent), type II Diabetes mellitus (non insulin dependent), gestational diabetes and other specific types. Most frequent oral manifestations include gingivitis, periodontitis, recurrent periodontal abscess, delayed healing after extraction, dry socket, oral infections like candidiasis, xerostomia, neurosensory disorder which results in glossodynia, stomatopyrosis or burning mouth syndrome', hypogeusia and other oral dysesthesias. Most diabetic patients can easily manage on an outpatients basis in dental office. (Reeta Jha, Preeti Kalyani, Riddhi Bavishi 2014)

History

Diabetes is a Greek word that means siphon; it was named and described by Aretaeus of Cappadocia. He described it as a great flow of wonderfully sweet urine. The cardinal symptoms of the disease such as polyuria, polyphagia, polydipsia and loss of weight were described by Celsus. The ancient noticed that ants were attracted by the sweetness of urine. Thomas Willis found the urine of diabetics as wondrous sweet, as if imbued with honey, and a century later William Dobson realized that the serum of diabetic patients was also sweet. Cullen added the word mellitus to the name

diabetes which means honey'.(Khalid A. Bin Abdulrahman 2006)

Classification (Reeta Jha, Preeti Kalyani, Riddhi Bavishi.2014)

Diabetes mellitus is classified as follows:

- Type I Diabetes Mellitus (insulin dependent)
- Immune-mediated
- Idiopathic
- Type II Diabetes Mellitus (non-insulin dependent)
- Gestational diabetes.

Primary diabetes mellitus :(E.Nandakumar. 2015,)

- Insulin dependent diabetes mellitus
- Non-insulin dependent diabetes mellitus.
- Secondary diabetes mellitus :
- Pancreatic disease
- Insulin receptor abnormalities
- Endocrinopathies.
- Malnutrition
- Complication if the surgery.

Gestational Diabetes: (Ojehanon PL, Akhionbane O.. 2006)

It is defined as the any degree of the abnormalities that mainly occur during the pregnancy women and it is due to the glucose tolerance Etiologic classification of diabetes mellitus by the American.

Diabetes Association 1997⁴ (Burket's 11th ed)

Classification	Characterics
Type 1 diabetes mellitus	Beta cell destruction, usually leading to insulin deficiency immune mediated idiopathic
Type 2 diabetes mellitus	Insulin resistance with relative insulin deficiency
Other specific types of diabetes mellitus	Heterogenous group in which etiology is established or partially known Genetic defects of beta cell function Genetic defects in insulin action Diseases of exocrine pancreas Endocrinopathies Drug or chemical induced Infections Uncommon forms of immunmediated diabetes Other genetic syndromes sometimes associated with diabetes
Gestational diabetes	Any degree of glucose tolerance with onset or first recognition during pregnancy

Etiology (National Diabetes Clearing house (NDIC) Retrieved 22 April 2014.)

Type I diabetes mellitus affects people at a very young age, hence is also known as juvenile diabetes. The defect lies in the insulin producing beta cells of the islets of Langerhans in the pancreas, as they undergo autoimmune destruction. This results in lack of insulin secretion, leading to the disease. Type II diabetes mellitus affects adults. It is primarily caused due to lifestyle factors and genetics. It results from insulin resistance. Insulin secretion may also reduce with age, thus leading to the onset of diabetes. Gestational diabetes mellitus is similar to type II diabetes mellitus in that, there is a combination of relatively insufficient insulin secretion and responsiveness. It occurs in about 2-10% of pregnancies and may improve or disappear after delivery

Prevalance

Diabetes mellitus affects more than 140 million people worldwide and presently considered as one of the most frequent chronic disease(Arrieta-Blanco JJ et al 2003). Diabetes mellitus is increasing world-wide at an alarming rate with a global prevalence of 4% in 1995 and an expected rise to 5.4% by the year 2025, representing an estimated 300 million affected individuals, compared with 135 million in 1995 .(King H, Aubert RE, Herman WH 1998). Some other reports indicate that this rate is expected to be rise at 9% by the year 2025 (Committee report,diabetic care 2002). Although diabetes has a worldwide distribution, it is seen more commonly in the developed European countries, US and Middle-East countries (Khan LA.1999). Recent estimates suggest that more than 100,000, inhabitants in the Middle-East suffer from type I diabetes and 6000 individuals in the region develop the disease each year. The prevalence rate is higher in Saudi Arabia compared to other Arab countries such as United Arab Emirates, Yemen, Qatar, Oman, Bahrain, Jordan and Libya'. The most probable reason of the high incidence in Saudi Arabia is the economical development over the last 20 years; this has resulted in the adaptation of Western life style with respect to nutritional habits and physical activity (Green, A. 1999).

Diagnostic Criteria (Burkitts 11 Th Ed) Oral Manifestation

1. Periodontal disease



Maddheshiya.: Diabetes A Dire Straits For Oral Health: A Review

Diagnostic criteria for diabetes mellitus *†			
	Normal	Impaired fasting glucose	Diabetes mellitus
Fasting glucose #	<110 mg/dl	110-126mg/dl	>126 mg/dL
2h postprandial plasma glucose	<140 mg/dl	140- 200 mg/dl	>200 mg/dL
OGTT+ (not recommended for routine clinical use)			Plasma glucose at 2 h >200mg/dL

* These criteria should be confirmed by repeat testing on a different day.
 † Fasting = no caloric intake for at least 8 hours.
 ‡ OGTT = oral glucose tolerance test performed using an oral load of 75g

2. Fungal disease
3. Dental caries
4. Xerostomia
5. Burning mouth sensation
6. Premature tooth loss
7. Delayed healing
8. Osteomyelitis.

Periodontal

Diabetes especially (Lamster B, Lalla E, Borgnakke WS, Taylor GW, 1992) if it is not well controlled brings with it a greater risk of periodontal disease, which is the most frequent complication. (meady BL cates TW, 2000) Chronic periodontal disease results in progressive destruction of the supporting tissues of the teeth as well as pocket formation, recession or both, which may lead to tooth loss because of extensive destruction of alveolar bone. It is well documented that periodontal disease is considered to be one of the main reasons for tooth loss among individuals with diabetes(Al-Shammari KF 2005,Kapp JM 2007, Oliver RC, Tervonen T 1993,Kaur G 2009)

A meta-analysis of four studies with a total of 3,524 adults (>18 years old) showed those with diabetes have a two-fold higher risk of developing periodontal disease compared to those without diabetes(6) (Papapanou 1996). Additionally, there are considerable racial disparities regarding the rates of periodontal disease within patients with diabetes and periodontal disease. National prevalence estimates of periodontal disease for African Americans with T2DM have been reported at 59.7%(Eke PI 2009 & 2010) whereas, Fernandes et al.2009(8) reported significantly higher rates for African Americans of Gullah ancestry with T2DM (70.6%).

Oral Candidiasis:

Candidiasis may also affect the palatal, buccal, or labial mucosa. Denture stomatitis is a diffuse redness of the mucosa occurring under upper dentures in edentulous patients particularly when patients complain that their

dentures do not fit well (Reamy BV,Derbyr,bunt CW 2010). The most common symptom is a burning sensation, although patients may also be asymptomatic.

Oral fungal infections, such as oral candidiasis (Guggenheimer et al. 2000).These associations may be due to chronic immunosuppression, delayed healing and/or salivary hypofunction (Kadir T et al. 2002). They additionally represent an opportunity to coordinate diabetes care between physicians and oral health care providers.

Salivary Dysfunction

The oral mucosa is normally protected by saliva when it is adequate in amount and quality. Saliva provides lubrication, cleansing, pH buffering, antimicrobial proteins such as secretory IgA, and aggregation and clearance of bacteria (whelton H 2004.)These disorders are related to chronic salivary hypofunction and to the generalized immune dysfunction seen in diabetic patients. (De Souza Bastos A, 2011, moore PA, 2000, Saini R,Al-maweri SA,2010)

Salivary function is essential for the maintenance of oral and systemic health (Fox PC, 1985 , Longman LP, Higham 1995). It is important for digestion, mastication, taste, speech, deglutition, and preservation and protection of mineralized and mucosal tissues. Xerostomia is a subjective sensation of oral dryness, so a systematic approach should be employed to determine the etiology of this condition, with distinction made between subjective complaints alone and those with measurable salivary gland dysfunction. Xerostomic complaints may be due to thirst (a common manifestation of DM), oral sensory dysfunctions, dehydration, decreased salivary flow (hyposalivation), and/or altered saliva composition. Chavez et al. (Chavez EM, 2001)found trends toward decreased salivary flow rates as HbA1c values increased, while other studies have reported that the use of one or more xerostomic medications resulted in significantly lower flow rates (Longman LP, 1995 , Loesche WJ, Abrams J, 1995).While many medications and treatment modalities list xerostomia as a possible side effect, very few have been tested for objective changes in salivary flow (Napenas JJ, Brennan MT, Fox PC. 2009).

Taste Disturbances

Taste is an essential component of oral health. It is adversely affected in patients with diabetes. According to a report, more than one-third of all adults suffering from diabetes had hypogeusia (Stolbova K, Hahn A, 1999) i.e. diminished taste perception. Because of this, patients tend to eat more, leading to obesity. This symptom, known as hyperphagia, would prevent the patient from maintaining a proper diet and this would subsequently result in poor glycemic regulation.

Oral Mucosal Diseases

Diabetes is also associated with the

development of certain oral soft tissue lesions, although these associations are not consistently reported across different diabetic populations. There are reports of greater prevalence of fissured tongue, irritation fibroma, traumatic ulcers (Guggenheimer J, 2000), lichen planus (Petrou-Amerikanou C, 1998), recurrent aphthous stomatitis (Lorini R, 1996)

Both lichen planus and recurrent aphthous stomatitis have been reported to occur in patients with diabetes. (Amerikanou CP, 1998; Torrente-Castells E, 2010). Oral lichen planus (OLP) is a skin disorder that produces lesions in the mouth. OLP is reported to occur more frequently in patients with type1 diabetes compared to type 2 diabetes.(Amerikanou CP, 1998) The reason for this is that type 1 diabetes is considered an autoimmune disease, and OLP has been reported to have an underlying autoimmune mechanism. Patients with diabetes are subjected to a prolonged state of chronic immune suppression especially in type 1 diabetes. In addition, acute hyperglycaemia causes alteration in the immune responsiveness in diabetes mellitus. Atrophicerosive oral lesions are more common in patients with diabetes with OLP (Torrente-Castells E, 2010) .

Recurrent Infections of Oral Cavity

Diabetic patients are more prone to suffer from multiple and recurrent infections because of increased blood glucose level and compromised host immune response. Recurrent periodontal abscess is typically seen in patients with uncontrolled diabetes. They form owing to the predominance of gram negative anaerobic rods and the presence of fungi such as Candida species which are secondary invaders in the area of pre-existing infection, resulting in candidiasis. (Reeta Jha, 2014)

Dental Caries

Dental caries are common chronic disease conditions that cause pain and disability across all age groups. If left untreated, dental caries can lead to pain, infection, tooth loss, and, eventually, edentulism. The presence of these oral manifestations can hinder quality of life, nutrition, and, potentially, glycemic control. It is important to know that patients with DM are susceptible to other oral conditions, such as periodontal and salivary disorders (dry mouth), which could increase their risk of developing new and recurrent dental caries. A review of the literature indicates that there is no clear association between DM and dental caries, but several studies have reported a greater history of dental caries in people with DM (Moore PA, et al. 2001, Lin BP, Taylor GW, Allen DJ, Ship JA. 1999) Decreased salivary secretion, increase of carbohydrate in the parotid gland saliva, growth of oral yeasts, increased counts of Mutans streptococci and lactobacilli are some of the factors implicated to be responsible to predispose diabetics to higher incidence of dental caries. (Karjalainen KM, Knuutila ML,

Kaar ML. 1996)

Dry Socket

It is a complication of extraction which occurs due to dislodgement of blood clot formed postoperatively. It is most common after mandibular teeth extractions because of reduced blood supply to the mandible caused by atherosclerosis caused by long standing diabetes [7]. Use of epinephrine in local anesthetics' further reduces blood supply to the area, thereby increasing the likelihood of dry socket. (Prakash Vhatkar, 2016).

Poor Oral Wound Healing

Poor soft tissue regeneration and delayed osseous healing in patients with diabetes are known complications during oral surgery. Therefore, the management and treatment of patients with diabetes undergoing oral surgery is more complex. It was reported that delayed vascularisation, reduced blood flow, a decline in innate immunity, decreased growth factor production, and psychological stress may be involved in the protracted wound healing of the oral cavity mucosa in patients with diabetes. (Abiko Y, Selimovic D. 2010)

Grinspan Syndrome

When diabetes mellitus is associated with lichen planus and hypertension, it is known as grinspan syndrome. It usually occurs as a result of medications for diabetes and hypertension. Patients taking sulphonylureas are more prone to suffer from this syndrome. (Reeta Jha et al 2014)

Neuropathy Consequencies in the Oral Cavity

A common complaint among DM patients is burning mouth syndrome, an orofacial neurosensory disorder of unknown cause, characterized by a bilateral burning sensation of the oral mucosa usually in the absence of clinical and laboratory findings (Vesterinen M, 2012). Management of burning mouth syndrome should have an interprofessional approach to improve patient's well being and quality of life. The treatment protocol for xerostomia is frequently used for the treatment of burning mouth syndrome, allowing for the palliative care of the symptoms. Taste detection is determined hereditarily, but it can be influenced also by occurrence of neuropathy (Stolbova K, 1999). This sensory dysfunction can inhibit the ability to maintain a proper diet and can lead to poor glycaemic control. Taste impairment has also been associated with the development of obesity (39), and it has been reported during the course of diabetes (Le Floch JP, 1992) The use of oral hygiene devices may be impaired by peripheral neuropathies and by diabetic retinopathy, which may impair daily oral hygiene. The use of an electric toothbrush as well as other alternative hygiene methods and a strict dental maintenance schedule are important in the long-term oral health of these patients.

Conclusion

Several studies have indicated deficiencies in oral health awareness among patients with diabetes. Additionally, most of these studies showed that a very low number of patients diagnosed with diabetes visit the dentist regularly for periodontal checkups, and many patients were unaware of the effect of diabetes on oral health. Allen et al. (Allen EM, 2008) reported that awareness of periodontal diseases among diabetes patients is very low compared to their reported knowledge of increased risks for heart disease, eye disease, kidney disease, and circulatory problems.

Periodontal disease is the main oral manifestations in diabetic patients and non-diabetic patients. Furthermore, burning mouth syndrome, the sensation of a dry mouth and sialadenosis have been attributed to the disease. people should aware of this and should take care of their health (E.Nandakumar 2015)

Evidence-based care emphasizes the importance of clinically relevant preventive and therapeutic measures for the management of DM and periodontal diseases. The involvement of oral health care professionals in strategies to identify individuals at risk for diabetes will extend preventive and screening efforts necessary to slow the development of these diseases and, notably, provide a portal for individuals who do not see a physician on a regular basis to enter into the general health care system. (Khalid A. Bin Abdulrahman June 2006)

There are several clinical implications (Awatif Y. Al-Maskari, 2011) from this review. These include: 1) a lack of awareness of oral complications among both diabetics and health providers; 2) an understanding of the way diabetes affects oral health is necessary for both clinicians and patients, therefore research in this field should be encouraged; 3) the need for regular follow-up of patients with diabetes mellitus by both dentist and physicians; 4) the major role that dentists should play in recognising the signs and symptoms of diabetes and their oral complications; 5) advice and counselling for diabetic smokers regarding smoking cessation, and 6) vigorous treatment of oral infection either bacterial or fungal in these patients, especially if they have poor glycaemic control.

References

1. Arrieta-Blanco JJ, Bartolome-Villar B, Jimenez-Martinez E, Saavedra-Vallejo P, Arrieta-Blanco FJ. Bucco-dental problems in patients with Diabetes Mellitus: Index of plaque and dental caries. *Med Oral* 2003; 8 (2): 97-109.
2. Al-Shammari KF, Al-Khabbaz AK, Al-Ansari JM, Neiva R, Wang HL. Risk indicators for tooth loss due to periodontal disease. *Journal of periodontology*. 2005; 76(11):1910-8. [PubMed: 16274310]
3. Awatif Y. Al-Maskari, Masoud Y. Al-Maskari, Salem Al-Sudairy ISQU Medical Journal, May 2011, Volume 11, Issue 2
4. Allen EM, Ziada HM, O'Halloran D, Clerehugh V, Allen PF. Attitudes, awareness and oral health related quality of

life in patients with diabetes. *Journal of oral rehabilitation*. 2008; 35(3):218-23. [PubMed: 18254800]

5. Abiko Y, Selimovic D. The mechanism of protracted wound healing on oral mucosa in diabetes: Review. *Bosn J Basic Med Sci* 2010; 10:186-91.
6. Amerikanou CP, Markopoulos AK, Belazi M, Karamitsos D, Papanayotou P. Prevalence of oral lichen planus in diabetes mellitus according to the type of diabetes. *Oral Dis* 1998; 4:37-40.
7. Burket's oral medicine 11th ed
8. Committee report, Report of the expert committee on the diagnosis and classification of diabetes mellitus. *Diabetic Care* 2002; 25 (1): S5-S20.
9. Chavez EM, Borrell LN, Taylor GW, Ship JA. A longitudinal analysis of salivary flow in control subjects and older adults with type 2 diabetes. *Oral surgery, oral medicine, oral pathology, oral radiology, and endodontics*. 2001; 91(2):166-73.
10. De Souza Bastos A, Leite AR, Neto R, Nasser po, orrico SR: Diabetes mellitus and oral mucosa alterations: prevalence and risk factors. *Diabetes Res clin pract* 92:100-105, 2011.
11. Eke PI, Dye BA, Wei L, Thornton-Evans GO, Genco RJ. Prevalence of Periodontitis in Adults in the United States: 2009 and 2010. *Journal of dental research*. 2012; 91(10):914-20. [PubMed: 22935673]
12. E.Nandakumar. *J. Pharm. Sci. & Res.* Vol. 7(7), 2015, 482-484
13. Fox PC, van der Ven PF, Sonies BC, Weiffenbach JM, Baum BJ. Xerostomia: evaluation of a symptom with increasing significance. *J Am Dent Assoc*. 1985; 110(4):519-25. [PubMed: 3858368]
14. Guggenheimer J, Moore PA, Rossie K, Myers D, Mongelluzzo MB, Block HM, et al. Insulin-independent diabetes mellitus and oral soft tissue pathologies: II. Prevalence and characteristics of Candida and Candidal lesions. *Oral surgery, oral medicine, oral pathology, oral radiology, and endodontics*. 2000; 89(5):570-6.
15. Green, A. Epidemiology of type 1 (Insulin dependent) Diabetes mellitus: Public Health implications in the Middle East. *Acta Paediatr* 1999; (Suppl) 427: 8-10.
16. Kadir T, Pisiirciler R, Akyuz S, Yarat A, Emekli N, Ipbuker A. Mycological and cytological examination of oral candidal carriage in diabetic patients and non-diabetic control subjects: thorough analysis of local aetiologic and systemic factors. *Journal of oral rehabilitation*. 2002; 29(5):452-7. [PubMed: 12028493]
17. Karjalainen KM, Knuutila ML, Kaar ML. Salivary factors in children and adolescents with insulin-dependent diabetes mellitus. *Pediatric dentistry*. 1996; 18(4):306-11. [PubMed: 8857659]
18. Kaur G, Holtfreter B, Rathmann W, Schwahn C, Wallaschofski H, Schipf S, et al. Association between type 1 and type 2 diabetes with periodontal disease and tooth loss. *Journal of clinical periodontology*. 2009; 36(9):765-74. [PubMed: 19622096]
19. Kapp JM, Boren SA, Yun S, LeMaster J. Diabetes and tooth loss in a national sample of dentate adults reporting annual dental visits. *Preventing chronic disease*. 2007; 4(3):A59. [PubMed: 17572963]
20. King H, Aubert RE, Herman WH. Global burden of Diabetes, 1995-2025. *Diabetes Care* 1998; 21 (9): 1414-1431.

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