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wjbmedsc@gmail.com/wjbms.lko@gmail.com

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Diabetes – Its Relation to Oral Health: An Updated Overview

Manu Rathee, Mohaneesh Bhoria and Madhuri Dua

Department of Prosthodontics and Crown and Bridge, Post Graduate Institute of Dental Sciences, Pt. B. D. Sharma University of Health Sciences, Rohtak, Haryana, India

ABSTRACT

Diabetes mellitus (DM) is an endocrine disease characterized by erratic metabolism of glucose, fat, and protein resulting from decreased insulin secretion or insulin resistance, or both. Hyperglycemia is the most important characteristic feature in Diabetes Mellitus. Diabetes Mellitus and chronic hyperglycemia are associated with certain complications like ophthalmic, renal, cardiovascular, cerebrovascular, peripheral neurological disorders and associated dental and perioral problem. This article discussed the dental and perioral problem associated with the diabetes and management consideration at general and specific level.

Keywords: *Diabetes, Xerostomia, Candidiasis, Periodontitis and insulin.*

INTRODUCTION

Diabetes is fast gaining the status of a potential epidemic in India. The aetiology of diabetes in India is multifactorial and includes genetic factors coupled with environmental influences such as obesity associated with rising living standards,

steady urban migration, and lifestyle changes. The prevalence of diabetes is predicted to double globally from 171 million in 2000 to 366 million in 2030 with a maximum increase in India. (Kaveeshwar et al 2014) Diabetes mellitus is a complex and pernicious syndrome that result

either from impairment of insulin secretion, due to autoimmune destruction of the insulin-producing pancreatic beta cells (type 1, or insulin-dependent diabetes mellitus), or from insulin resistance, related commonly to obesity (type 2, or non-insulin-dependent diabetes mellitus). (Burden et al 2001) Type 1 diabetes represents approximately 5 percent of primary diabetes cases, whereas type 2 represents the remaining. (Moore 2003) There is no definitive cure for diabetes. Without a proper diagnosis, these people are at an increasing risk of developing life-threatening complications. These include increased susceptibility to infection and delayed healing; neuropathy, retinopathy and nephropathy (microvascular disease); accelerated atherosclerosis with associated myocardial infarction and coronary artery disease; stroke; atherosclerotic aneurysms (macrovascular disease); and amputation. (Vernillo et al 2003) Hyperglycemia (elevated blood glucose) is a hallmark of diabetes mellitus—as are its chronic metabolic complications which are generally more severe in the patient with type 1 diabetes mellitus. (Peled et al 2003)

Oral Complications of Diabetes

The oral complications of uncontrolled diabetes mellitus include gingivitis and periodontal disease, salivary gland dysfunction and xerostomia, increased susceptibility to bacterial, viral and fungal infections; caries; periapical abscesses; loss of teeth; impaired ability to wear dental prostheses (related in part to salivary dysfunction); taste impairment; lichen planus; and burning mouth syndrome. (McKenna et al 2006)

Gingivitis and periodontal disease

The susceptibility to periodontal disease—often called the “**sixth complication of**

diabetes mellitus”—is the most common oral complication of diabetes. The patients with uncontrolled diabetes are at an increasing risk of developing periodontal disease and show a tendency towards higher gingivitis scores. Patients with type 1 diabetes and retinopathy tend to exhibit more loss of periodontal attachment by the fourth and fifth decades of life. Thus, good oral hygiene and regular dental check-ups are extremely important for patients with type 1 diabetes. Periodontal disease is more common in patients with type 2 diabetes. A history of chronic periodontal disease can also disrupt the glycemic control, suggesting that periodontal infections may have systemic repercussions. (Vernillo et al 2003) This complex relationship between periodontal disease and the diabetes mellitus is not clear, but there is evidence that dental infections in patients with diabetes may exacerbate problems with metabolic control and the management of periodontal infections in the poorly controlled patient with diabetes may help improve glycemic control. A careful evaluation of glycemic control, including the patient’s diet, HbA1c and postprandial glucose levels, is critical in determining the risk assessment for progression to the oral complications, especially periodontitis. The complications in patients with uncontrolled diabetes occur due to the altered response to increased glucose concentrations in the saliva (salivary hyperglycemia) and gingival crevicular fluid, infection and microvascular changes. Increased salivary glucose results in additional bacterial substrate and plaque formation. Increased gingival crevicular fluid glucose may diminish the ability of periodontal fibroblasts to contribute to periodontal healing. Thus, preventive periodontal therapy must be included in the

comprehensive care of the patient with diabetes which includes a preliminary assessment of the risk of oral disease progression, oral hygiene instructions, dietary assessment and frequent periodic dental examinations. (de Lima et al 2008)

Salivary gland dysfunction and xerostomia

There are reports of dry mouth (xerostomia) and salivary hypofunction in patients with diabetes, which may be due to polyuria, or due to an already existing metabolic or endocrine disorder. As a result of decrease in salivary flow or alteration in salivary composition, a healthy mouth becomes increasingly susceptible to dental caries and tooth deterioration resulting in dry, atrophic and cracking oral mucosa associated with mucositis, ulcers and desquamation, as well as an inflamed, depapillated tongue. (Vernillo AT 2003) Difficulty in masticating, tasting and swallowing are among the most common complications resulting from salivary dysfunction and may contribute to impaired nutritional intake. An increase in the dental caries rate has been reported in young patients with diabetes and may be related to salivary dysfunction. An association existed between older adults with diabetes and active caries and tooth loss; this was even more significant in patients with poor glycemic control. Topical treatments such as fluoride-containing mouthrinses and salivary substitutes may help to prevent caries and minimize discomfort. (Sykes et al 2008)

Candidiasis

Oral candidiasis is an opportunistic fungal infection commonly associated with hyperglycemia and is a frequent complication of uncontrolled diabetes. Oral lesions associated with candidiasis include median rhomboid glossitis,

atrophic glossitis, angular cheilitis, denture stomatitis and pseudomembranous candidiasis (thrush). *Candida albicans* is a constituent of the normal oral microflora that rarely infects the oral mucosa without the underlying causative factors which include immunologically compromised conditions, the wearing of dentures without maintaining proper oral hygiene and the long-term use of broad-spectrum antibiotics. (Vernillo et al 2003)

Burning mouth syndrome

Patients with burning mouth or burning tongue syndrome usually exhibit no other clinically detectable lesions but the symptoms of pain and burning can be severe. The etiology of burning mouth is varied in uncontrolled or marginally controlled diabetes, the etiologic factors include, candidiasis, neurological abnormalities such as depression and salivary dysfunction. Neurological dysfunction may lead to oral symptoms of paresthesias and tingling, numbness, burning pain caused by pathological changes involving the nerves in the oral region. Diabetes is generally associated with oral burning symptoms however; neuropathy from diabetes is typically associated with pain and burning in other parts of the body, such as the feet. (Vernillo et al 2003) Symptoms of burning mouth or tongue have been found in undiagnosed cases of type 2 diabetes. Improvement in glycemic control has a major role in reducing the occurrence of complications such as xerostomia and candidiasis which may contribute to the resolution of the symptoms associated with burning mouth syndrome in patients with diabetes. (De Lima et al 2008).

Lichen planus

Lichen planus is a common, chronic mucocutaneous disease of with unknown

etiology which is due to an immunologically mediated process that involves a hypersensitivity reaction on the microscopic level characterized by an intense T lymphocytic infiltrate (CD4+ and especially CD8+ cells) located at the epithelial–connective tissue interface. Other immune-regulating cells such as macrophages, dendritic cells, Langerhans' cells are seen in increased numbers in lesions of lichen planus. No relationship between lichen planus and either hypertension or diabetes mellitus (Grinspan's syndrome) has been found. Improvement in glycemic control has a major role in reducing the occurrence of complications such as xerostomia and candidiasis. (De Lima et al 2008, Sykes et al 2008, Kapellas et al 2008).

Acute oral infections

Representative examples of acute oral infections—such as recurrent bouts of herpes simplex virus, a periodontal abscess or a palatal ulcer—represent the severity of these conditions, particularly in uncontrolled diabetes. It is possible that the same pathogenic mechanisms associated with the increased susceptibility to periodontal infections (for example, impaired wound healing, diminished chemotaxis and PMN function) may play a role in the greater likelihood of developing acute oral infections. Glycemic control in diabetes management is the key to reducing the impact of acute oral infections. (de Lima et al 2008, Nakata et al 2008, Sykes et al 2008, Kapellas et al 2008)

Management of the diabetic dental cases

Dental management of the diabetic patient is associated with an understanding of the patient's diabetic health history. A historical background which includes details of the current diabetic regimen and an assessment of

the adequacy of blood sugar control should be undertaken. An HbA1c level provides useful information regarding the adequacy of plasma glucose control. Information regarding the status of the complications like diabetic retinopathy and nephropathy should also be obtained and regarding the comorbidities of hypertension, obesity, lipid disorders, and smoking are important because of their role in the development of cardiovascular disease. (McKenna et al 2006) Measures to decrease myocardial oxygen demand should include steps to reduce stress, and elevate endogenous catecholamines through the use of sedation techniques and the reduction in the administration of catecholamines. An increased risk of periodontal disease occurs in DM, so preventive periodontal therapy is an important component in the comprehensive dental management of the diabetic patient which includes careful assessment of patient's periodontal status and oral hygiene instructions. (Vernillo et al 2003) (Fig 1)

Scheduling of dental appointment should consider the importance of nutritional consistency and the appointments that overlap with or prevent scheduled meals should be avoided. This is of increasing significance in patients receiving insulin, oral hypoglycemic agents like sulfonylurea, or meglitinide because of the risk of hypoglycemia. If an appointment is likely to lead to a delayed or missed meal, the diabetic regimen may have to be modified with the assistance of the patient's diabetologist. Elective surgical procedures must take into consideration the anesthetic needs of the diabetic. If, for example, a diabetic patient must fast in preparation for parenteral anesthesia, the diabetic regimen must be modified accordingly to minimize the risk of perioperative hypoglycemia. Intraoperative hypoglycemia must be

avoided because the signs and symptoms of hypoglycemia may be masked by the parenteral anesthetic technique. (McKenna et al 2006)

Similarly, rapid-onset oral hypoglycemic agents may be stopped to avoid perioperative hypoglycemia. Patient's blood glucose must be assessed both before and after the period when sedation or general anesthesia may mask the symptoms of hypoglycemia. Intraoperative blood glucose must be evaluated for prolonged procedures if there is encroachment on the mealtime. Type-1 diabetics mostly experience episodes of hypoglycemia when there is a relative excess of administered insulin resulting from missed or inadequate meals. Symptoms of hypoglycemia may range from mild anxiety, sweating, tachycardia, and tremors, severed mental status changes, seizure, and coma. The early symptoms of hypoglycemia occur due to epinephrine and glucagon release in response to hypoglycemia. (Moore et al 2003) The serum glucose threshold for release of epinephrine and glucagon may decrease with time, degrading this important response to hypoglycemia. Such "hypoglycemic unawareness" may present with mental status changes without a prodrome of symptomatic increased autonomic activity (eg, sweating, tachycardia). Hypoglycemic unawareness is an important element of a diabetic patient's history that should be recognized by the dentist. Severe hypoglycemia is a medical emergency. Should the dental patient become hypoglycemic, prompt treatment is necessary. Even a few minutes of severe hypoglycemia (serum glucose 40–50 mg/dL) can be harmful, possibly causing cardiac arrhythmias and transient cognitive deficits. Early hypoglycemia should be promptly treated with 15 g of oral carbohydrate, equivalent to 6 oz

orange juice, 4 oz cola, 3 to 4 teaspoons of table sugar, five Life Savers, or three glucose tablets. Chocolate may delay absorption and should be avoided. If the patient is unable to cooperate or swallow, glucagon 1 mg may be administered by subcutaneous or intramuscular injection. This should be followed by oral carbohydrates when the patient is able take them.

Side effects of glucagon include nausea, vomiting, and headache. Alternatively, and in the unresponsive diabetic, hypoglycemia should be aggressively corrected with the administration of intravenous dextrose. (McKenna et al 2006).

The well-controlled diabetic is probably at no greater risk of postoperative infection than is the nondiabetic. Therefore, routine dentoalveolar surgical procedures in well-controlled diabetics (HbA1c <8%) do not require prophylactic antibiotics. However, when surgery is necessary in the poorly controlled diabetic, prophylactic antibiotics should be considered. Notwithstanding the importance of the preoperative glucose control, surgery and general anesthesia can cause a state of insulin resistance and decreased insulin secretion to the extent that the otherwise well-controlled diabetic may become hyperglycemic in the postoperative period. Antibiotics in these situations should be administered pre-operatively and, for procedures longer than 3 to 4 hours, intraoperatively. Finally, delayed alveolar healing following dentoalveolar surgery should raise the dentist's suspicion of osteomyelitis, for which prompt surgical consultation should be arranged. (Peled et al 2003).

Prosthodontic management of Diabetes Mellitus

The residual alveolar ridges are increasingly susceptible to resorption in

case of Diabetes Mellitus. The mucosa is more fragile and resistance of the tissues to tolerate load is decreased. Henceforth, an increasing number of prosthetic options are being practiced with the main aim of decreasing the load on the mucosa. Eradication of any disease/s that will affect the prognosis of any dental prosthesis will be the first line of action. (Lpez et al 2003) Teeth requiring restoration must be restored by appropriate restorative procedures like filling, endodontic treatment etc. Restoration and the maintenance of good oral hygiene is mandatory before starting any prosthodontic procedures. On first visit, assessment of the patient should be done which include proper history and examination. Radiographic evaluation must also be carried out. Before the initiation of any dental procedure, the blood glucose level must be assessed. The patient's physician must be consulted regarding the change of medication. If the removable partial denture is planned for the patient, then restoration and maintenance of good oral hygiene by any means including the root planning or scaling must be accomplished. (Kansal et al 2013) Health of abutment is very important. All the components of removable partial denture must be tissue friendly by making appropriate design of the prosthesis. As diabetic patients are more prone to develop periodontal disease, therefore in certain cases, splinting of the periodontally compromised teeth is a good option. Selection of the particular type of RPD is also important. If the acrylic denture is a preferred option, then the design must incorporate the features of the "Every Denture" with wider self cleansing interdental areas and embrasure spaces,

uncovered marginal gingival, point contact between the natural abutment teeth and the denture, free gliding occlusion, maximum retention following complete denture making principles. When complete denture is fabricated for the patient, then tissue friendly material must be used and impression making may be done by mucostatic technique. Occlusal vertical dimension must be properly maintained. The occlusal scheme must be such that a narrow buccolingual occlusal table is selected so as to reduce the stress on the underlying tissues. Neutral zone concept can also be employed. Denture flanges must be smooth and polished. (Kansal et al 2013) There should be no working or non-working occlusal interferences. The patient must be motivated regarding the maintenance of oral hygiene and regular follow up visits so that the conditions like denture stomatitis and denture hyperplasia could be avoided. If a fixed dental prosthesis is advised for the patient, then the margins of the finish line should be supra-gingival. Chamfer finish line is preferred to shoulder finish line since shoulder finish line accumulates more stresses as compared to the chamfer finish line. Ante's law must be obeyed. A narrow occlusal table, group function or mutually protected occlusal scheme is better for periodontally compromised teeth. Certain procedures, like the crown lengthening, periodontal surgery or orthodontic extrusion may improve the quality of fixed dental prosthesis in diabetic patients. Implant supported prosthesis can be planned for a patient with controlled blood sugar levels after taking proper history and radiographic evaluation. (Alves et al 2009, Rathee et al 2014)

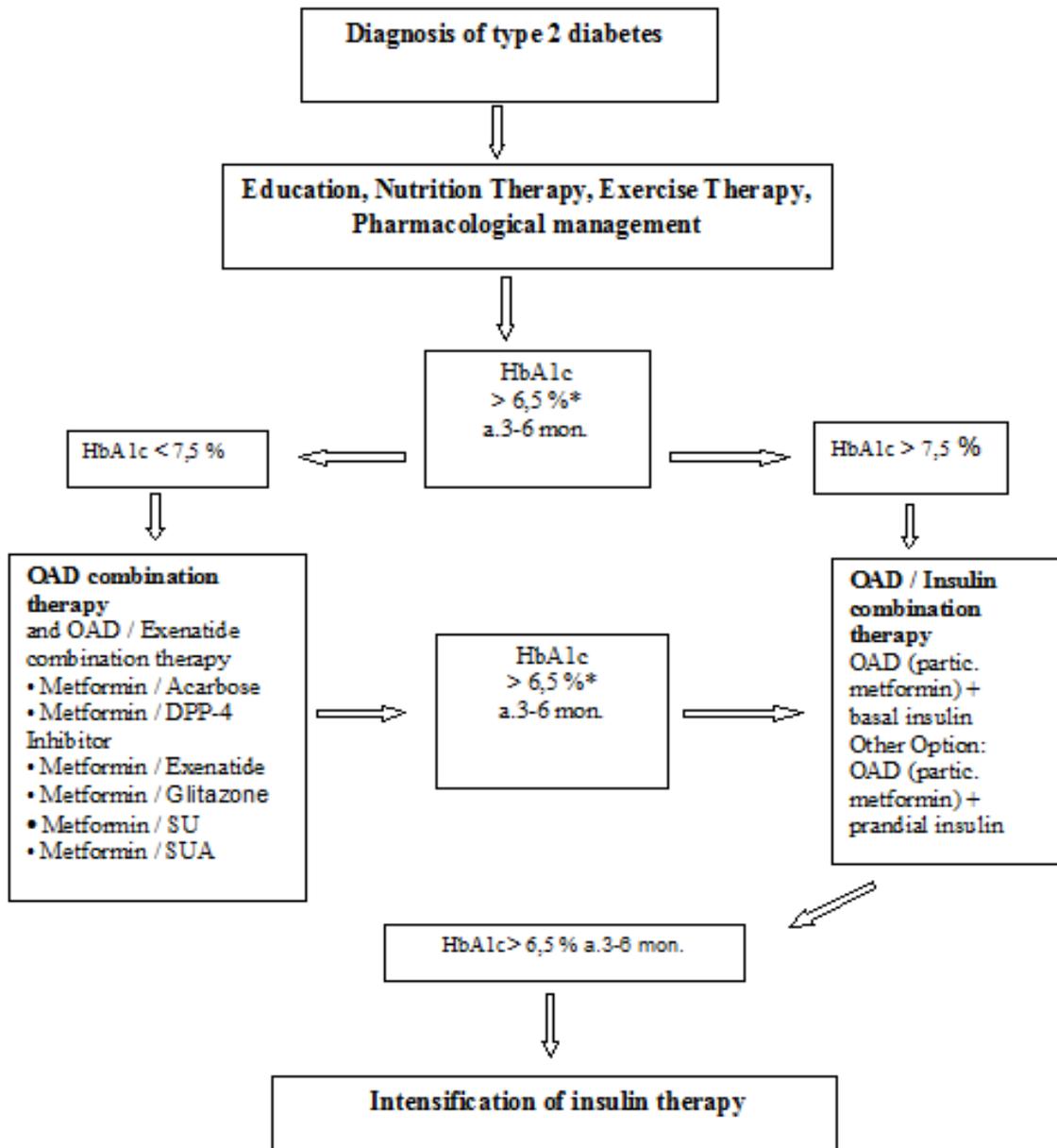


Figure 1. Management strategies for diabetes.

CONCLUSION

Diabetes is a common metabolic disorder associated with glucose intolerance and long-term complications (retinopathy, nephropathy, and neuropathy). Central to the management of diabetes is the intensive regulation of plasma glucose along with management of comorbidities comprising the “metabolic syndrome.” Management of the diabetic dental patient should focus on periodontal health and the delivery of comprehensive dental care with minimal disruption of

metabolic homeostasis and recognition of diabetic comorbidities.

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REFERENCES

Alves, C., Brandao, M., Andion, J. and Menezes, (2009). Oral Health Knowledge and Habits in Children with Type 1 Diabetes Mellitus. *Braz Dent J*, 20(1):70-3.

- Burden, D., Mullally, B. and Sandler, J., (2001).** Orthodontic treatment of patients with medical disorder. *European J Orthod*, 23:363-72.
- De Lima, D.C., Nakata, G.C., Balducci, I. and Almeida, J.D., (2008).** Oral manifestations of diabetes mellitus in complete denture wearers. *J Prosthet Dent*, 99:60-5.
- Kaveeshwar, S.A. and Cornwall, J., (2014).** The current state of diabetes mellitus in India. *Australas Med J*, 7(1): 45-48.
- Kapellas, K. and Slade, G., (2008).** The relationship between diabetes and oral health among Australian adults. *Australian Dental Journal*, 53: 93-6.
- Kansal, G. and Goyal, D., (2013).** Prosthodontic Management of Patients with Diabetes Mellitus. *J Adv Med Dent Scie Res*, 1(1):38-44.
- Lopez, M.E., Colloca, M.E., Paez, R.G., Schallmach, J.N., Koss, M.A. and Chervonagura, A., (2003).** Salivary Characteristics of Diabetic Children. *Braz Dent J*, 14(1):26-31.
- McKenna, S.J., (2006).** Dental Management of Patients with Diabetes. *Dent Clin N Am*, 50: 591-606.
- Moore, P.A., Zgibor, J.C. and Dasanayake, A.P., (2003).** Diabetes a growing epidemic of all ages. *J Am Dent*, 134:11S-5.
- Peled, M., Ardekian, L., Tagger-Green, N., Gutmacher, Z. and Machtei, E.E., (2003).** Dental Implants in Patients with Type 2 Diabetes Mellitus: A Clinical Study. *Implant Dentistry*, 12(2): 116-9.
- Rathee, M. and Tamrakar, A., (2014).** Limited prosthesis wear in geriatric diabetes edentulous patients: A social morbidity. *J. Soc. Health Diabetes*, 2:112-3.
- Sykes, L.M. and Sukha, A., (2001).** Potential risk of serious oral infections in the diabetic patient: A clinical report. *J. Prosthet Dent.*, 86:569-73.
- Vernillo, A.T. (2003).** Dental considerations for the treatment of patients with diabetes mellitus. *J. Am. Dent.*, 134:24S-33.

Corresponding author: Prof. Dr. Manu Rathee, Department of Prosthodontics and Crown and Bridge, Post Graduate Institute of Dental Sciences, Pt. B. D. Sharma University of Health Sciences, Rohtak, Haryana, India
Email: ratheemanu@gmail.com