



## DENTAL MANAGEMENT AND CONSIDERATIONS IN DIABETIC PATIENT-A REVIEW

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**ABSTRACT** Current epidemiological data suggest that the prevalence of diabetes in India is increasing. Patients with poor glycemic control are more prone to oral manifestations of diabetes ,which includes periodontal diseases, salivary gland dysfunction, halitosis, burning mouth sensation, delayed wound healing and increased susceptibility to infections. Diabetic patients are also at risk of experiencing an intraoperative diabetic emergency at dental office. Therefore, dentists must analyse and implement important dental management considerations while providing care and treatment to diabetic patients. In this article, we discuss the diagnosis, oral findings, dental care and emergency management of diabetic patient.

**KEYWORDS :****Diabetes Mellitus**

Diabetes Mellitus (DM) refers to a group of metabolic disorders in which the body's ability to produce or respond to insulin is impaired. This results in abnormal carbohydrate metabolism that eventually leads to elevated blood glucose levels. Therefore Diabetes Mellitus represents a condition in which the body's homeostasis is disturbed.

In India, the prevalence of diabetes is increasing. In 2019, an estimated 72.96 million cases of diabetes in adult population were reported with the prevalence of 10.9% to 14.2% in urban areas whereas 3.0% to 7.8% in rural areas (according to International Diabetes Federation IDF). The incidence of diabetes is highest in elderly population.

**Classification and Etiology of DM**

Most cases of DM can be classified as type 1 (T1DM) or type 2 (T2DM). Prediabetes refers to condition in which blood glucose levels are elevated, but not high enough to warrant a diagnosis of diabetes. People with prediabetes have increased risk of developing DM in the future. To manage patients with DM, a clinician should be able to understand and differentiate between T1DM and T2DM.

**Type 1 Diabetes Mellitus**

Approximately 5-10% of all DM cases are T1DM, formerly known as insulin-dependent diabetes mellitus. The condition is characterised by hyperglycemia secondary to cell-mediated autoimmune destruction of insulin producing beta cells in the pancreas. The etiology is unknown, but is thought to be resulted from combination of genetic and environmental factors. The autoimmune process can start in infancy, and, although most cases present in children or young adults, the disease can manifest at any age.

Clinical Manifestations: Patients may present with polyuria, polydipsia and polyphagia and in many cases, absolute insulin deficiency and subsequent ketoacidosis is seen. Despite increased hunger, weight loss is expected in T1DM. This can be attributed to a compromised cellular glucose-uptake mechanism which is a feature of individuals with impaired insulin function.

**Type 2 Diabetes Mellitus**

T2DM, which accounts for 90-95% of all known cases, is characterised by chronic hyperglycemia that results from a variable defect in insulin secretion, action or both. The risk of developing T2DM is increased in obesity, increasing age and lack of physical activity. There is an overall decrease in life expectancy which is secondary to increased risk of cardiovascular disease, stroke, peripheral neuropathy and renal insufficiency in T2DM patients.

**Pathophysiology and complications:**

Insulin is a peptide hormone that regulates blood glucose. It is secreted into the blood in response to changes in blood sugar. During elevated blood sugar levels, the hormones promote cellular uptake and storage of glucose as glycogen in liver. In patients with DM, insulin dependent cells are unable to use blood glucose as energy source, so to compensate, the body breakdowns stored triglyceride as alternative

fuel source and ketoacidosis may result. This explains the fruity smell of breath in some diabetic patients.

As hyperglycemia proceeds, the body will get rid of excess glucose by excreting it in urine, resulting in polyuria. Increased fluid loss from body results in dehydration, therefore polydipsia is another classical sign. Because the glucose-starved diabetic patients are deprived of adequate fuel, polyphagia results. DM is also associated with increased incidence of microvascular and macrovascular complications. Some longterm sequelae include neuropathy, nephropathy and retinopathy. Obesity, hypertension, dyslipidemia and atherosclerosis are common in diabetic patients and also experience an increased susceptibility to infection and delayed wound healing.

**Diagnosis**

Several diagnostic tools are available to clinicians to assess their patient's blood glucose control. The fasting blood glucose (FBG) test measures blood glucose level following a period of zero caloric intake for atleast 8 h. An FBG level of 5.6 mmol/L is considered normal. The haemoglobin A1C (HbA1C) test provides information about average blood glucose levels over past 3 months. This test which is reported as percentage, is used by clinicians to assess control and management of DM. In a healthy non-diabetic patient, an Hb1AC of 5.7% is considered normal.

**Table 1: Diagnostic criteria for diabetes.**

TEST	FUNCTION	NORMAL VALUE	DIABETIC VALUE
Fasting Plasma Glucose Test	Measures blood glucose following zero caloric intake for atleast 8 h	≤ 5.6 mmol/L	≥ 7.0 mmol/L
Haemoglobin A1C Test	Provides information about glycemic control over the past 3 months Is the gold standard for assessing diabetes management and control	≤ 5.7 mmol/L	≥ 6.5 mmol/L

**Diabetes Management**

At the core of every DM management or treatment plan is an attempt to restore blood glucose levels to as close to normal as possible. Notably, if blood glucose levels can be adequately managed, progressions to complications can be delayed or even prevented. DM management becomes quite complex with intensive treatment plans; therefore, patient compliance is an important factor in predicting success. The dentist should be aware of their patient's treatment plans and should reinforce the importance of compliance.

Studies have shown that physical exercise has resulted in benefits, such as decreased insulin resistance and increased glucose uptake. Further, the administration of exogenous insulin is seemingly the most obvious treatment for T1DM. Commonly used insulin preparations and their properties are summarized.

**Table 2: Commonly used insulin preparations.**

Insulin preparation	Generic Name	Onset of action	Peak value In hour/s	Effective duration in hour/s
Rapidly Acting	Lispro Aspart Glusine	< 15 mins < 15 mins 15 – 30 min	~ 1 1 – 3 0.5 - 1	3 – 5 3 – 5 4
Short Acting	Regular	1 h	2 – 4	5-8
Intermediate Acting	Neutral Protamine Hagedorn	1-2 h	4 - 10	14+
Long Acting	Detemir Glargine	3 – 4 h 1.5 h	6 – 8 —*	20-24 24

**Source: Adapted from Donner and Sarkar.**  
**Drugs**

The major classes of oral hypoglycemic drugs are listed below. These pharmacologic agents are most commonly used to treat T2DM and, through various mechanism of action, aim to lower blood glucose levels. The common classes of these drugs are listed below.

**Table 3: Common classes of oral hyperglycemic drugs.**

Class	Drugs	Mechanism of action
Sulfonylureas	Glimeperide Glipizide Glyburide	Increases insulin secretion
Meglitinide	Repaglinide Nateglinide	Increases insulin secretion
Bisguanides	Metformin	Insulin sensitizer Inhibits hepatic glucose production
Dipeptidyl peptidase-4 inhibitor	Sitagliptin Saxagliptin Vidagliptin Linagliptin Alogliptin	Exacerbates the effect of intestinal hormones (incretins) involved in blood glucose
Thiazolidinedione	Rosiglitazone  Pioglitazone	Increases tissue sensitivity to insulin
Sodium-glucose cotransporter inhibitor	Canagliflozin Dapagliflozin Empagliflozin	Enhances glucosuria by blocking glucose reabsorption in renal proximal convoluted tubule

**Source: Adapted from Chaudhry et al.,2017**

**Oral Complications and Manifestations**

The effects of DM on the oral cavity have been studied extensively. Complications, such as periodontal disease, salivary gland dysfunction, halitosis, burning mouth sensation and taste dysfunction, have associated with DM in scientific literature. People with DM are also more prone to bacterial and fungal infections, oral soft tissue lesions, compromised oral wound healing processes, dental caries and tooth loss. The degree of a patient’s glycemic control appears to a significant factor in predicting severity and likelihood of oral complications. Therefore, it is important that dentists should take an active role in educating patients about DM control and the adverse impact of lack of control in their oral well-being.

**Table 4: Prevalence of oral manifestations in controlled diabetes**

ORAL COMPLICATION	PREVALENCE IN CONTROLLED T2DM-%
Salivary Gland Dysfunction	68
Halitosis	52
Periodontitis	32
Burning Mouth Sensation	32
Candidiasis	28
Taste Disturbance	28

**Source: Adapted from Indurkar et al.**

Numerous studies have identified a link between DM and periodontal disease. Although mechanisms are not entirely understood, increased periodontal tissue destruction is thought to result from reduced

polymorphonuclear leukocyte function that is secondary to the formation of advanced glycation end products and changes in collagen metabolism.

Salivary gland dysfunction is another widely reported oral manifestation of DM. Although the mechanism is unknown, some have hypothesized that it is related to polyuria and polydipsia. Xerostomia in a diabetic patient may lead to halitosis, taste disturbances, exacerbated periodontal disturbance, dental caries and tooth loss.

Susceptibility to bacterial and fungal infections in diabetic patients can be attributed to impaired host defence mechanisms associated with poor glycemic control. Further, oral soft tissue regeneration and osseous healing processes are compromised in a diabetic patient. This is thought to result from delayed vascularisation, reduced blood flow, decreased growth factor production, weakened innate immunity and psychological stress. Thus, dentists must anticipate, prevent and promptly treat infections in diabetic patients especially during invasive procedures.

**Management**

Before initiating treatment of a diabetic patient, dentists must appreciate important dental management considerations. In doing so, dentists can help to minimize the risk of an intraoperative diabetic emergency and reduce the likelihood of an oral complication of the disease.

Effective management of a diabetic patient begins with the dentist taking a thorough medical history and carrying out a review of system. Dentist should collect data of patient's recent blood glucose levels, frequency of HbA1C tests and their readings and the frequency of hypo- or hyper-glycemic periods. Of note, a variety of medications that are taken for reasons other than DM may interact with and potentiate the effect of oral hypoglycemic agents. Therefore, dentists should be mindful of their patient's medication list.

Dental Management considerations for the diabetic patient	
•	Consult with patient's physician to assess diabetes control
•	Update medical history and medications and review systems at each appointment
•	Confirm that patient has eaten and taken medications before initiating treatment
•	Anticipate and be prepared to manage hypoglycaemia
•	Prevent, treat and eliminate infections promptly
•	Do not use or recommend aspirin related compounds
•	Achieve profound local anaesthesia
•	Ensure good oral hygiene and provide profound preventive care
•	Reinforce regular diet and medication regimen before and after dental appointments
•	Take glucometer readings if patient is at high risk on insulin or undergoing any surgical procedure

Cortisol is an endogenous hormone that increases glucose levels in blood. Because cortisol levels are higher typically in the morning and during times of stress (e.g., a dental procedure), it is advisable that diabetic patients are scheduled for morning appointments. This reduces the risk of hypoglycemic episode. In case of patients receiving exogenous insulin therapy, appointment must be avoided at the time of peak insulin activity when risk of hypoglycaemia is highest. During surgical or invasive procedures, dentist should consult their physician regarding adjustment of insulin doses.

If blood glucose is low, the patient should consume a source of oral carbohydrates before treatment is initiated. If blood glucose is high, treatment should be postponed, and the dentist should refer the patient to their physician to re-assess glycemic control. Electronic blood glucose monitors are expensive and quite accurate.

**Table 5: Borderline values for diabetic patients.**

	HbA1C	Fasting blood glucose	Blood glucose 2h after eating
Target Value	≤7.0%	4.0–7.0 mmol/L	5.0 – 10.0 (5.0-8.0 if HbA1C targets are not met)

Because of the prolonged onset of symptoms, diabetic ketoacidosis and hyperosmolar hyperglycemic state are unlikely to present as acute emergencies in dental office. Since hyperglycemic patients may present with hunger, nausea, vomiting, weakness or abdominal pain, dentists may struggle to differentiate between hypo- and

hyperglycemic state. Given that a small amount of added sugar will cause no significant harm in an already hyperglycemic patient, the dentist should assume a hypoglycemic emergency and immediately administer an oral source of carbohydrates. A true hyperglycemic emergency requires medical intervention and insulin administration.

**Table 6: Management for intraoperative hypoglycemic emergency.**

Sign and symptoms	Emergency management
<b>Mild</b> <ul style="list-style-type: none"> <li>• Hunger</li> <li>• Fatigue</li> <li>• Sweating</li> <li>• Nausea</li> <li>• Abdominal pain</li> <li>• Headache</li> <li>• Tachycardia</li> <li>• Irritability</li> </ul>	Terminate dental treatment immediately <b>Awake/alert patient</b> Administer 15 g oral carbohydrate i.e. glucose tablet, 180ml orange juice, 15-25ml sugar Monitor blood glucose and repeat carbohydrate dosing as necessary
<b>Moderate</b> <ul style="list-style-type: none"> <li>• Incoherence</li> <li>• Uncooperative</li> <li>• Belligerence</li> <li>• Resistive behaviour</li> </ul>	<b>Uncooperative patient</b> Seek emergency medical assistance Administer glucagon 1mg via subcutaneous or intramuscular injection followed by oral glucose supplement Administer 20-50ml of 50% dextrose solution intravenously
<b>Severe</b> <ul style="list-style-type: none"> <li>• Unconscious</li> <li>• Seizure</li> </ul>	<b>Unconscious patient</b> Seek emergency medical assistance Administer 20-50ml of 50% oral dextrose solution

**Source: Adapted from McKenna.**

Following treatment, the dentist must keep in mind that diabetic patients are prone to infections and delayed wound healing. Therefore, some consideration should be given in providing antibiotic coverage. Notably, salicylates are known to potentiate the effects of oral hypoglycemic agents by increasing insulin secretion and sensitivity. To avoid unintended hypoglycaemia, aspirin-containing compounds should be avoided in patients with DM.

## CONCLUSION

Recent estimates suggest that 463 million people are living with DM worldwide. In India, estimated population is 77 million. Undoubtedly any dentist practicing in India will encounter many patients with DM throughout their career. Given the numerous possible oral manifestations of DM and the risk of an intraoperative diabetic emergency, it is important for dentists to recognise and appreciate the impact of this disorder in dental care. With a meticulous knowledge of DM and its dental management considerations, the dental health practitioners can work effectively to provide excellent oral health care to diabetic patients.

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