

Clinical  
Guidelines in  
Dentistry  
for Diabetes

2015



## INTRODUCTION

The World Health Organization (WHO) and the World Dental Federation (FDI) report that nearly 36 million people die of chronic diseases each year. It is known that non-communicable diseases such as diabetes, cardiovascular diseases or cancer, as well as tooth-decay and gingivitis, pose similar risks.

Diabetes is the most serious of all chronic diseases. The Ministry of Health of the Republic of Turkey estimates that there are 7.2 million people with diabetes in Turkey. Diabetes is a lifelong disease that can surface at any stage of life. Critical organ damage may occur in a short period of time if diabetic patients are left untreated or if their blood sugar is not regulated. Diabetes is the number one cause of high blood pressure, obesity, coronary heart disease, stroke (paralysis), chronic kidney failure, blindness over the age of 20 years and leg amputations with the exception of traffic accidents.

Clinical studies reveal oral and dental health problems in 80-100% of people with type 2 diabetes and in a significant number of people with type 1 diabetes.

Oral health problems are one of the most crucial obstacles preventing blood glucose regulation in diabetic patients. Thus, it is not possible to treat diabetes without first ensuring the oral and dental health of people with the disease.

Dentists thus play a critical role in controlling diabetes and improving the quality of life of patients with the disease.

In light of the FDI's Istanbul Declaration, the Turkish Dental Association argues that dentists can have a large impact on the health of their patients, and that the country's health system should take advantage of the potential dentistry service.

The Turkish Dental Association and the Turkish Diabetes Foundation are proud to present to you, our esteemed colleagues, the "Clinical Guidelines in Dentistry for Diabetes" which was created as a joint effort between these institutions in light of the aforementioned scientific and political approaches.

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THE NATIONAL DIABETES CONSENSUS GROUP AND  
TURKISH DENTAL ASSOCIATION COMMISSION FOR  
THE DEVELOPMENT OF COLLABORATION IN THE  
FIELD OF GENERAL HEALTH AND ORAL HEALTH**

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**DIAGNOSIS AND TREATMENT OF DIABETES**

# DIAGNOSIS AND TREATMENT OF DIABETES

## 1. Diagnosis, Diagnostic Criteria and Classification of Diabetes

### Description

Diabetes Mellitus (DM) is a chronic metabolic disease characterized by hyperglycaemia that arises due to abnormalities in insulin release or insulin effect or both.

### Clinical Symptoms and Signs

Dry mouth, polyphagia, polyuria, polydipsia, weight loss, fatigue, urinary tract infections, fungal infections, vulvovaginitis, blurred vision, itching, dry skin and numbness in feet.

### Criteria for the Diagnosis of Diabetes

(Any of the following criteria can be used for diagnosis)

Fasting Plasma Glucose (APG) 1.2	≥126 mg/dl
Random Plasma Glucose <sup>3</sup> + Diabetes symptoms	≥200 mg/dl
Oral Glucose Tolerance Test (OGTT) 2-Hour Plasma Glucose <sup>4,5</sup>	≥200 mg/dl
HbA1C 6.7	≥6.5%

- (1) The glucose oxidase in venous plasma method must be used as a reference in blood glucose measurement.
- (2) At least 8 hours of fasting is required for a fasting plasma glucose measurement.
- (3) Random plasma glucose can be measured at any time of the day regardless of food intake.
- (4) OGTT must be performed with 75 g oral glucose.
- (5) In comparison to plasma glucose measurement, results are 11% lower for whole-blood glucose measurement, 7% lower for capillary glucose measurement and 5% lower for serum glucose value.
- (6) HbA1C can be used as a diagnostic test only through internationally standardized methods. HbA1C measurement tests have not yet been standardized in our country, and as such, they cannot be used as diagnostic tests on their own.
- (7) An HbA1C test cannot be used as a diagnostic test in the presence of anemia, hemoglobinopathy or pregnancy.

# DIAGNOSIS AND TREATMENT OF DIABETES

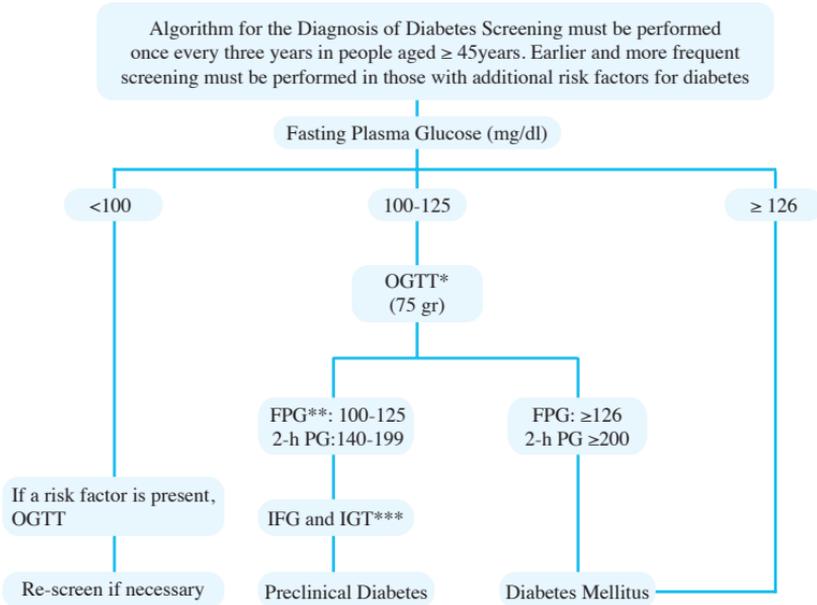
## Criteria for Testing Diabetes Mellitus in Asymptomatic Individuals

Patients with Body Mass Index (BMI)  $\geq 25$  kg/m<sup>2</sup> and additional risk factors:

- Physical inactivity
- Diabetes in a first degree relative
- High-risk races/ethnicities (e.g., African Americans and Latinos)
- Women who have given birth to babies who weighed  $\geq 4$  kg or were diagnosed with gestational diabetes
- Hypertension ( $\geq 140/90$  mmHg or on treatment for hypertension)
- HDL-cholesterol  $<35$  mmHg and/or triglyceride  $>250$  mg/dl

In the absence of the criteria above, screening is recommended at the age of 45. If the results are normal, tests must be repeated at least once every three years.

As there are no effective methods of preventing or delaying type 1 diabetes mellitus (T1DM), screening for this type is not recommended. Nevertheless, the presence of autoantibodies can be conducted in the first-degree relatives of T1DM patients can be tested.



\* Oral glucose tolerance test

\*\* Fasting plasma glucose

\*\*\* Impaired fasting glucose and impaired fasting glucose tolerance

# DIAGNOSIS AND TREATMENT OF DIABETES

## I - Type 1 diabetes mellitus (T1DM)

Presence of  $\beta$ - cell destruction that causes absolute insulin deficiency

## II - Type 2 diabetes mellitus (T2DM)

Insulin resistance, relative insulin deficiency

A progressive deficiency in insulin release due to insulin resistance

## III - Other Specific types

### A. Genetic Defects of Beta Cell Function

#### MODY

HNF-1  $\alpha$  (MODY 3)

Glucokinase enzyme deficiency (MODY 2)

HNF-4  $\alpha$  (MODY 1)

IPF-1 (MODY 4)

HNF-1  $\beta$  (MODY 5)

NeuroD1 (MODY 6)

Mitochondrial DNA

Others

### B. Genetic Disorders of Insulin Action

type A Insulin Resistance

Leprechaunism

Rabson-Mendenhall Syndrome

Lipoatrophic diabetes

Others

### C. Exocrine Pancreas Disease

Pancreatitis

Trauma/Pancreatectomy

Neoplasia Cystic Fibrosis

Hemochromatosis

Fibrocalculosis, Pancreopathy

Others

### D. Endocrinopathies

Acromegaly

Cushing Syndrome

Glucagonoma

Pheochromocytoma

Hyperthyroidism

Somatostatinoma

Aldosteronoma

Others

### E. Drug- and Chemical Substance- Induced Diabetes

Vacor

Pentamidine

Nicotinic acid

Glucocorticoids

Thyroid hormones

Diazoxide

B-adrenergic agonists

Thiazide diuretics

Dilantin

Interferon treatment and

Others

### F. Infections

Congenital rubella

Cytomegalovirus

Others

### G. Uncommon Forms of Immune - Mediated Diabetes

“Stiff-Person” Syndrome

Anti-insulin receptor antibody

Others

### H. Other Genetic Syndromes

Accompanying Diabetes

Down Syndrome

Klinefelter Syndrome

Turner Syndrome

Wolfram Syndrome

## IV - Gestational DM

Carbohydrate intolerance diagnosed during pregnancy

# DIAGNOSIS AND TREATMENT OF DIABETES

## Differential Diagnosis of type 1 and type 2 diabetes

Clinical Characteristics	T1DM	T2DM
Age of onset	Usually $\leq 30$ years	Usually $\geq 30$ years
Onset	Usually acute, symptomatic	Slow, mostly asymptomatic
Ketoacidosis	Frequent	Not frequent
Weight at onset	Usually underweight	Usually obese
Family history of diabetes	None or not significant	Positive
Autoimmune disease	Yes	No
C-peptide	Low	Normal / High/ Low
Autoantibody (ICA, AntiGAD, IA2Ab, IAA)	Usually positive	Negative

# DIAGNOSIS AND TREATMENT OF DIABETES

## Glycaemic Targets in Diabetes Monitoring in Adults <sup>(1)</sup>

HbA1C	<7%*
Preprandial capillary plasma glucose	80-130 mg/dl <sup>(2)</sup>
Postprandial capillary plasma glucose <sup>(3)</sup>	<180 mg/dl

- <sup>(1)</sup> For pregnant women: preprandial glycaemic target is  $\leq 95$  mg/dl, and 1-h postprandial glycaemic target is  $\leq 140$  mg/dl.
- <sup>(2)</sup> Targets can be strict or flexible depending on the duration of diabetes, age/life expectancy and concomitant diseases.
- <sup>(3)</sup> If preprandial glucose values reach the target but HbA1C does not, the postprandial glucose value must be checked. To determine the postprandial peak glucose value of a patient with diabetes, capillary plasma glucose must be checked a couple of hours after beginning the meal.

## Glycaemic Targets in Diabetes Monitoring for Adults<sup>(1)</sup>

- It reflects the glucose control during the last 8-10 weeks.
- Fasting is not required for measurement.
- This measurement is not affected by daily changes in glucose.
- It must be checked at least 2-4 times a year.
- Incorrect measurements may be taken in situations that shorten the life of erythrocytes, such as acute blood loss, chronic anaemia, haemoglobinopathies (HbS, C, and D), blood transfusion, and/or oral intake of Vitamins C and E.

## Estimated Mean PG Based on HbA1C (Estimated Mean PG: $28.7 \times \text{HbA1C} - 46.57$ )

HbA1C (%)	Mean PG (mg/dl)
6	126
7	154
8	183
9	212
10	240
11	269
12	298

# DIAGNOSIS AND TREATMENT OF DIABETES

## Factors that May Cause Errors in Glucosemeter Measurements

- Anaemia (false increase) and polycythaemia (false decrease)
- Low blood pressure, hypoxia, hypertriglyceridemia (false decrease)
- Very high (>500 mg/dl) or low (<70 mg/dl) blood glucose levels
- Changes in ambient temperature
- Expired test strips
- Improper use of the device
- Variance between glucometers

## The Importance of Home Glucose Monitoring in Diabetes

Education on blood-glucose measurement techniques should be given to all newly diagnosed patients with diabetes. Measurements must be planned so as to reflect three meals; both fasting and postprandial (two hours after the beginning of the meal) measurements must be taken, and in special circumstances, another measurement should be taken in the early morning.

For people with T1DM and for pregnant women using insulin, blood glucose monitoring at least three times per day is recommended.

In patients with T2DM who are using insulin and oral antidiabetics (OAD), fasting and postprandial blood glucose (PBG) monitoring should be performed at least once a week in order to monitor glucose increases arising from medication or lifestyles changes and the changes occurring during illness.

In gestational diabetes, glucose measurements are preferably performed one or two hours after fasting or meals. In cases of acute illnesses, blood glucose monitoring must be performed every 4-6 hours.

The education of patients' regarding glucose measurement skills, interpreting the test results and transferring these results into practice should be repeated once a year.

# DIAGNOSIS AND TREATMENT OF DIABETES

## 2. Treatment of Diabetes

### Glycaemic Targets in the Treatment of Diabetes

- HbA1C target values are 6.5% for young patients and those not at cardiovascular risk, <7.5% for children and adults and 7-8% for elderly patients and those with chronic illnesses such as cardiovascular disease.
- Achieving good glycaemic control early in the course of the disease reduces microvascular and macrovascular complications.
- Acute hypoglycaemia may increase the risk of mortality, especially in patients with high cardiovascular risk. For this reason, one of the main targets should be to avoid hypoglycemia in patients with such complications.

### 2.1. Treatment of Type 2 Diabetes

- Lifestyle change is an essential treatment component for all periods.
- No medicine can replace a change in lifestyle.
- Lifestyle changes have a positive impact not only on blood glucose but on all risk factors.
- Recommendations regarding lifestyle changes should be made during every medical checkup.
- Recommendations for nutritional habits and physical activity level, the two main components of lifestyle change, should be tailored to each patient's characteristics.
- The 5-10% body weight loss in 6 months (via lifestyle changes) should be recommended.

# DIAGNOSIS AND TREATMENT OF DIABETES

## 2.2. Treatment with Oral Antidiabetic Drugs

### 2.2.1. Treatment for Insulin Resistance

#### **METFORMIN** (No risk of hypoglycaemia)

**Active ingredient:** Metformin

**Indication for use:** T2DM (Presence of insulin resistance)

**HbA1C decreasing effect:** 1-2%

**Side Effects:** Gastrointestinal irritation, (side effects such as gas or bloating are usually temporary), cramps, diarrhea, metallic taste in mouth, Vitamin B12 deficiency, and lactic acidosis risk on rare occasions, especially in cases of tissue perfusion disorders.

**Contraindications:** Kidney function disorder (serum creatinine  $\geq 1.5$  mg/dl in men,  $\geq 1.4$  mg/dl in women), chronic alcoholism, liver disease, congestive heart failure, acute myocardial infarction, chronic lung disease, sepsis or decreased tissue perfusion. Medication should be stopped at least three days prior to major surgical operations or intravenous radiological contrast examinations.

	Commercial Form (tb, mg)	Dosage range (mg)	Maximum Dosage (mg)	Admin. Times
<b>Metformin</b>	850-1000	500-2550	2550	On a full stomach

**Active ingredient:** Pioglitazone

**Indication for use:** T2DM (Presence of insulin resistance)

**HbA1C decreasing effect:** 1-2%

**Side effects:** Weight gain, liquid retention, increased risk of osteoporotic fractures in postmenopausal women and in men.

**Contraindications:** History of bladder cancer, high risk of malignancy, cardiac failure and macroscopic haematuria.

Glitazone	Commercial Form (tb, mg)	Dosage range (mg)	Maximum Dosage (mg)	Admin. Times
<b>Pioglitazone</b>	15 - 30 - 45	15 - 45	45	Once a day

# DIAGNOSIS AND TREATMENT OF DIABETES

## ALPHA-GLUCOSIDASE INHIBITOR (No risk of hypoglycaemia)

**Active ingredient:** Acarbose

**Indication for use:** Postprandial hyperglycaemia

**HbA1C decreasing effect:** 0.5-1%

**Weight gain:** No

**Side effects:** Gastrointestinal symptoms, excessive gas

**Contraindications:** Liver and renal failure, pregnancy, anaemia

Drug Name	Commercial Form (tb, mg)	Dosage range (mg)	Maximum Dosage (mg)	Admin. Times
Acarbose	50 - 100	25 - 300 <sup>(1)</sup>	300	Chew the medication with the first bite of every meal

<sup>(1)</sup> Day 1: 25 mg when starting dinner, and then morning/noon/night.  
For 2-3 days: 50 mg when starting a meal, and then 3x1 100 mg every day.

## 2.2.2. Insulin Secretagogues

### GLINIDES

(Short-Acting Insulin Secretagogues) (Pose hypoglycaemia risk)

**Active ingredients:** Nateglinides, Repaglinides

**Indication for use:** Postprandial hyperglycaemia

**HbA1C decreasing effect:** 1-2%

**Major side effect:** Hypoglycaemia

Glinides	Commercial Form (tb, mg)	Dosage range (mg)	Maximum Dosage (mg)	Admin. Times
Repaglinides	0.5-1-2	0.5-4 with main meals	16 <sup>(1)</sup>	3 times right before meals
Nateglinides	120	60-120 with main meals	360 <sup>(1)</sup>	3 times before meals

<sup>(1)</sup> The patient should not take the medicine in case of a skipped meal.

# DIAGNOSIS AND TREATMENT OF DIABETES

## SULPHONYLUREAS

(Short- and Medium-Acting Insulin Secretagogues)

(Pose hypoglycemia risk)

**Active ingredients:** Gliclazide, Gliclazide MR, Glimepiride, Glibenclamide, Glipizide, Glibornuride

**Indication for use:** T2DM

**HbA1C decreasing effect:** 1-2%

**Side effects:** Hypoglycemia, weight gain, rare allergic reactions, hepatotoxicity, agranulocytosis, bone marrow aplasia

**Contraindications:** T1DM, liver and renal failure, pregnancy, stress, serious infection, trauma, surgical procedures, ketoacidosis, hyperglycemic hyperosmolar state.

Sulfonylureas preparations	Commercial Form (tb, mg)	Dosage range (mg)	Maximum Dosage (mg)	Admin. Times	Action Times (hour)
Glibenclamide (glyburide)	5	1,25-5	20	Once or twice a day on an empty stomach	16-24
Glibornuride	25	12.5-50	75	Once or twice a day on an empty stomach	24
Glipizide controlled release form	2.5-5-10	2.5-5	20	Once or twice a day on an empty stomach	12-24
Gliclazide	80	80-320	320	Once or twice a day on an empty stomach	12-18
Gliclazide modified release (MR) form	30	30-120	120		24
Gliclazide	1-2-3-4	1-16	8	Once or twice a day on an empty stomach	24

## Drug Interactions with Sulphonylureas

### Drugs that may cause hyperglycemia

**Antagonizer of insulin effect:** diuretics,  $\beta$ -blockers, nicotinic acids, steroids

**Suppressors of insulin release:** diuretics,  $\beta$ -blockers, hypopotassemia, phenytoin

**Enhancers of sulphonylurea metabolism:** barbiturates, rifampin

### Drugs that may cause hypoglycemia

**Those binding to sulphonylurea albumin binding sites:** aspirin, fibrates, trimethoprim

**Renal excretion suppressors:** probenecid, allopurinol

**Insulin secretagogues:** low dose aspirin, prostaglandin-like agents

**Gluconeogenesis suppressor:** alcohol

**Endogenous counterregulatory hormone suppressors:**  $\beta$ -blockers

**Competitive suppressors:** H2 receptor suppressors, alcohol

# DIAGNOSIS AND TREATMENT OF DIABETES

## 2.2.3. Drugs with Incretin-Effect

**Active ingredients:** Exenatide, Liraglutide, Sitagliptin, Vildagliptin, Saxagliptin

**Indication for use:** Postprandial hyperglycaemia (HbA1C < 8%)

**HbA1C decreasing effect:** 1-2%

**Weight gain:** Incretin mimetics cause weight loss. DPP-IV inhibitors are neutral

**Side effects:** No data on long-term safety

**Contraindications:** Acute or chronic pancreatitis risks

### GLP-1 Analogues (Incretin mimetics) (No risk of hypoglycaemia)

GLP-1 Analogues	Commercial (cartridge, µg)	Dosage range (µg)	Maximum Dosage (µg)	Administration Method
Exenatide (Mimetic)	5-10	5-10	10	Before meals, SC Once a day
Liraglutide (Analogue)	0.6-1.2-1.8	0.6-1.8	1.8	Independent of meals, SC

### DPP-4 Inhibitors (No risk of hypoglycaemia)

DPP-4 Inhibitors	Commercial Form (tablet, mg)	Dosage range (mg)	Maximum Dosage (mg)	Administration Method
Sitagliptin	100	100	100	Once a day on an empty or full stomach
Vildagliptin	50	50-100	100	Once in the morning and in the evening
Saxagliptin	5	5	5	Once a day on an empty or full stomach

<sup>(1)</sup> Start with a single 50-mg dose, especially for patients using sulphonylureas, then increase the dose to twice a day.

# DIAGNOSIS AND TREATMENT OF DIABETES

New-Onset Diabetes HbA1C

Target HbA1C > 7.5

## 2.2.4. type 2 diabetes TREATMENT ALGORITHM

6.5	STEP I	Lifestyle Change and Metformin ±				↑↑
8	STEP II	Lifestyle Change and/or Metformin ±	Sulphonylurea ±	Pioglitazone ±	Based	↑↑
		Lifestyle Change and Metformin Treatment ±	Sulphonylurea Piog+ azone ±	Pioglitazone + Sulphonylurea ±	Incretin-Based Treatment ±	Combination Treatment 1
11	STEP IV	Lifestyle Change and Metformin Treatment ±	Long-Acting Analogue Insulin Treatment ±	Long-Acting Analogue Insulin Treatment Glinid ±	Premixed Insulin Treatment ±	↑↑
		Lifestyle Change and Metformin Treatment ±	With Frequent Intervals Insulin Treatment ±	Insulin Pump Infusion Treatment ±		Combination Treatment 2
	STEP V					↑↑

- Acarbose can be used in all steps.
- If HbA1C is over 7.5% at the end of a maximum three-month treatment, then the next step can be started.
- For new-onset type 2 diabetes, dynamic monitoring must be continued after establishing glycemic regulation, and if necessary, the previous step must be repeated by reducing the medications and dosages.
- Combination Treatment-1: In selected cases, sulphonylurea+incretin-based treatment and a pioglitazone trio combination can be administered.
- Combination Treatment-2: In selected cases, an oral antidiabetic combination can be administered with insulin.

# DIAGNOSIS AND TREATMENT OF DIABETES

## 2.3. Insulin Treatment

### 2.3.1. Basal Insulins

Controls the fasting plasma glucose

Makes up nearly 50% of daily total requirement

- Intermediate-Acting (NPH) Insulins
- Long-Acting (Analogue) Insulins

Insulin Glargine, Insulin Detemir

#### Basal Insulin Action Times

Preparation name	Onset of action (hour)	Peak of action (hour)	Duration (hour)
NPH insulin	1-2	5-7	13-16
Glargine insulin	1-2	None	20-24
Detemir insulin	2-4	None	16-24

### 2.3.2. Bolus Insulins

Controls postprandial glycemia

Makes up 10-20% of total daily insulin requirement per meal

- Short-Action (Regular) Insulins
- Fast-Acting (Analogue) Insulins

Insulin Aspart, Lispro, Glulisine

#### Bolus Insulin Action Times

Preparation name	Onset of action (minute)	Peak of action (hour)	Duration (hour)
NPH insulin	5	1.25-5	20
Glargine insulin	25	12.5-50	75
Detemir insulin	2.5-5-10	2.5-5	20

### 2.3.3. Premixed Insulins

#### Regular + NPH Insulins

Regular Human 30%, NPH Insulin 70%

#### Analogue Premixed Insulins

Biphasic Insulin Aspart    Insulin Aspart 30%    Insulin ProtaminAspart 70%

Biphasic Insulin Lispro 25    Insulin Lispro 25%    Insulin ProtaminLispro 75%

Biphasic Insulin Lispro 50    Insulin Lispro 50%,    Insulin ProtaminLispro 50%

# DIAGNOSIS AND TREATMENT OF DIABETES

## 2.3.4. Basic Principles in Insulin Treatment

- Basal and bolus insulins control fasting and postprandial blood glucose, respectively. Thus, basal or bolus insulin dosages should be adjusted, depending on whether preprandial (fasting) blood glucose or postprandial (postmeal) blood glucose is high.
- Generally, changes in bolus insulin dose should not exceed two units in one meal. Changes can be made in special cases (i.e., acute hyperglycemia). Insulin titration based on blood glucose values must be performed after a minimum three-day monitoring.
- Firstly, hypoglycaemias should be controlled.
- For each hyperglycaemic attack, presence of prior hypoglycaemia should be checked.
- For patients with a fasting blood glucose of 65-80 mg/dl, a half dosage of bolus insulin must be administered after a meal. Bolus insulin dosage must not be applied for those with a fasting blood glucose of under 65 mg/dl.

If allowed, the planned preprandial bolus dose should be administered first, followed by the meal. Preferably, oral and dental treatments of the patient should be performed afterwards. However, bolus insulin should not be administered if the patient will not be taking food orally during the treatment. Basal insulin should be continued at the same dosage. Premixed insulins contain bolus insulin as well, therefore, oral and dental procedures should be performed after the patient eats a post-injection meal. Blood glucose must be checked prior to and after the patient eats a meal.

## 2.4. Treatment of type 1 diabetes

Treatment of T1DM is based on the administration of “basal-bolus” insulin. Medical Nutrition Therapy (MNT) and an exercise program must be applied to all patients.

## 2.5. Treatment of Gestational Diabetes

MNT is applied if fasting blood glucose (FBG) > 95 mg/dl and/or post-meal 1-h >140 mg/dl. Insulin treatment is started if target values are not achieved.

## 2.6. Drug Interactions

Drugs that may cause hyperglycemia: corticosteroids, rifampicin, INH, calcium channel blocker, diuretics, nicotinic acid derivatives

Drugs that may cause hypoglycemia: Sulfamethoxazole, ciprofloxacin, miconazole, MAO inhibitors, SSRI

# DIAGNOSIS AND TREATMENT OF DIABETES

## 3. Complications of Diabetes

### 3.1. Acute Complications of Diabetes

#### 2.3.4. Basic Principles in Insulin Treatment

**Causes:** Absolute insulin deficiency (at the onset of type 1 diabetes, or with incorrect dose or use of insulin) and relative insulin deficiency (infection, trauma, emotional stress, some medications and endocrine reasons) can cause ketoacidosis.

**Clinical Symptoms and Signs:** Blood glucose usually  $>250$  mg/dl, polyuria, polydipsia, stomach ache, nausea/vomiting, dehydration, warm and dry skin, hyperpnoea, acetone breath, tachycardia and exhaustion.

**Treatment:** Preferably, oral and dental treatment of the patient should be performed afterward. However, bolus insulin should not be administered if the patient will not be taking food orally during the treatment. Basal insulin should be continued at the same dosage. Premixed insulins contain bolus insulin as well; therefore, oral and dental procedures should be performed after the patient eats a meal. Blood glucose must be checked prior to and after the procedure.

#### 3.1.2. Hyperglycaemic Hyperosmolar State

**Causes:** Usually mistakes in oral antidiabetic and insulin administration in patients with type 2 diabetes (especially in older patients), chronic diseases, infections and the addition of some medications (i.e., thiazides, propranolol, corticosteroid, phenytoin).

**Clinical Symptoms and Signs:** Serious hyperglycaemia (blood glucose  $>600$  mg/dl), polyuria, polydipsia, tachycardia, hypotension, dehydration, confusion, neurological symptoms and signs.

**Treatment:** At hospital according to clinical and laboratory test results.

## DIAGNOSIS AND TREATMENT OF DIABETES

### 3.1.3. Hypoglycaemia

**Causes:** Insulin dose, method of administration; timing mistakes; incorrect choice of insulin; use of long-acting sulphonylurea, especially in older patients; insufficient carbohydrate intake during meals; long-term exercise or alcohol consumption.

**Clinical Symptoms and Signs:** In mild hypoglycaemia blood glucose is around 70 mg/dl. Patient may have cold and moist skin, feelings of hunger, palpitations, tremors, and perspiration.

With a blood glucose of 50-70 mg/dl, additional symptoms may appear, such as headache, loss of attention, sleepiness, blurred vision and changing behaviors.

Blood glucose is <50 mg/dl in a severe hypoglycaemia. Loss of consciousness and coma develops.

#### **Treatment:**

**For mild hypoglycaemia:** 15 g of carbohydrates (fruit juice, sugar or glucose tablet) are given; if blood glucose is <70 mg/dl and symptoms still persist after 15 minutes, 15 g of carbohydrates are given again.

If blood glucose is >70 mg/dl and there is less than 30 minutes before a main meal or snack, that meal is given without waiting. If there are more than 30 minutes until meal time, a carbohydrate- and protein-containing meal is given.

**For a more severe hypoglycaemia:** 30 g of fast-acting carbohydrates (fruit juice, sugar or glucose tablet) are given.

**For severe hypoglycaemia:** Glucagon 1 mg SC, IM can be administered. Emergency services are called. 20% of dextrose 50 ml or 5-10% of dextrose 100 ml IV is administered.

# DIAGNOSIS AND TREATMENT OF DIABETES

## 3.2. Chronic Complications of Diabetes

### 3.2.1. Macroangiopathy

Diabetes and cardiovascular diseases pose equal amounts of risk. Diabetic patients suffer from accelerated atherosclerosis. Lipid metabolism is also compromised in these patients. Cardiovascular diseases are seen 2-5 times more often in diabetic patients, and they appear earlier in both men and women. The risk of cerebrovascular and peripheral artery diseases is higher as well. Nearly half of diabetic patients suffer from high blood pressure.

### 3.2.2. Microangiopathy

Microangiopathy mainly causes neuropathy, retinopathy and nephropathy in diabetic patients.

### 3.2.3. Diabetic Neuropathy

Diabetic neuropathy is a mainly axonal degeneration in which motor, sensory or autonomic nerve fibers become stiff and which is associated with damage to small vessels that nourish neurons. Stiffness of autonomic fibers causes patients to complain of burning and freezing sensations, numbness, tingling and prickling of the feet. Weakness, exhaustion and gait disorder are the main complaints associated with motor fiber stiffness. When the autonomic nervous system is affected, orthostatic hypotension, resting tachycardia, painless myocardial infarction, urine retention, urinary incontinence, perspiration disorders, impotence, hypoglycaemia unawareness, night vision problems, decreased saliva and gastroparesis may be experienced.

## DIAGNOSIS AND TREATMENT OF DIABETES

### 3.2.5. Diabetic Nephropathy

The worsening of the renal function that develops mostly due to damaged intraglomerular arteriols. It is the most common cause of end-stage renal disease. In patients with type 1 diabetes, it usually develops 5-15 years after diagnosis. It can be detected even at the time of diagnosis in type 2 diabetes.

### 3.2.6. Diabetic Foot

Poor metabolic state (poor glycaemic control, high blood pressure, dyslipidaemia), musculoskeletal system and neurological problems, alcoholism, smoking, inadequate daily care and hygiene, athlete's foot infections, calluses and walking barefoot can cause diabetic foot. Lower limb amputations are related to diabetes 40-60% of the time.



**2**

**ORAL HEALTH IN  
PATIENTS WITH  
DIABETES**

**ORAL HEALTH IN PATIENTS WITH DIABETES**

# ORAL HEALTH IN PATIENTS WITH DIABETES

## 1. The Relationship between Diabetes and Oral Health

- Oral health is essential to a healthy life. It must be remembered that educating patients is crucial to protecting and maintaining their oral and dental health.
- Dentists can help with early diagnosis by assessing oral symptoms of diabetes and resulting complications.
- Preventive measures and dental treatments, as well as approaches during the monitoring process, make it easier to maintain oral and dental health and to keep diabetes in metabolic control.
- In addition to systemic complications, oral and dental complications are also experienced frequently in diabetic patients. The oral health of every patient with diabetes must be assessed, as must the likely associated complications in the oral cavity.
- Although not much of a difference exists between the oral health options for diabetic patients with good metabolic control and systemically healthy people as a general view, the management and monitoring of the process need to be case sensitive.
- During the treatment of patients with diabetes, HbA1C reference values may vary depending on the person, age and presence of other contaminant systemic disease(s). This value must be accepted as <6.5 for young people and as 7.0-7.5 for adults or for those with systemic diseases
- Surgical interventions that are performed under general anaesthesia or procedures lasting longer than two hours are considered major surgical operations. Prior to the procedure, the patient's renal and hepatic functions must be assessed, and any existing electrolyte imbalances must be replaced.
- The level of periodontal destruction is affected directly or indirectly by glycaemic control and by the individual's immune system capacity in diabetes. There are a couple of mechanisms explaining the changes diabetes causes in the organs and tissues (including periodontium).

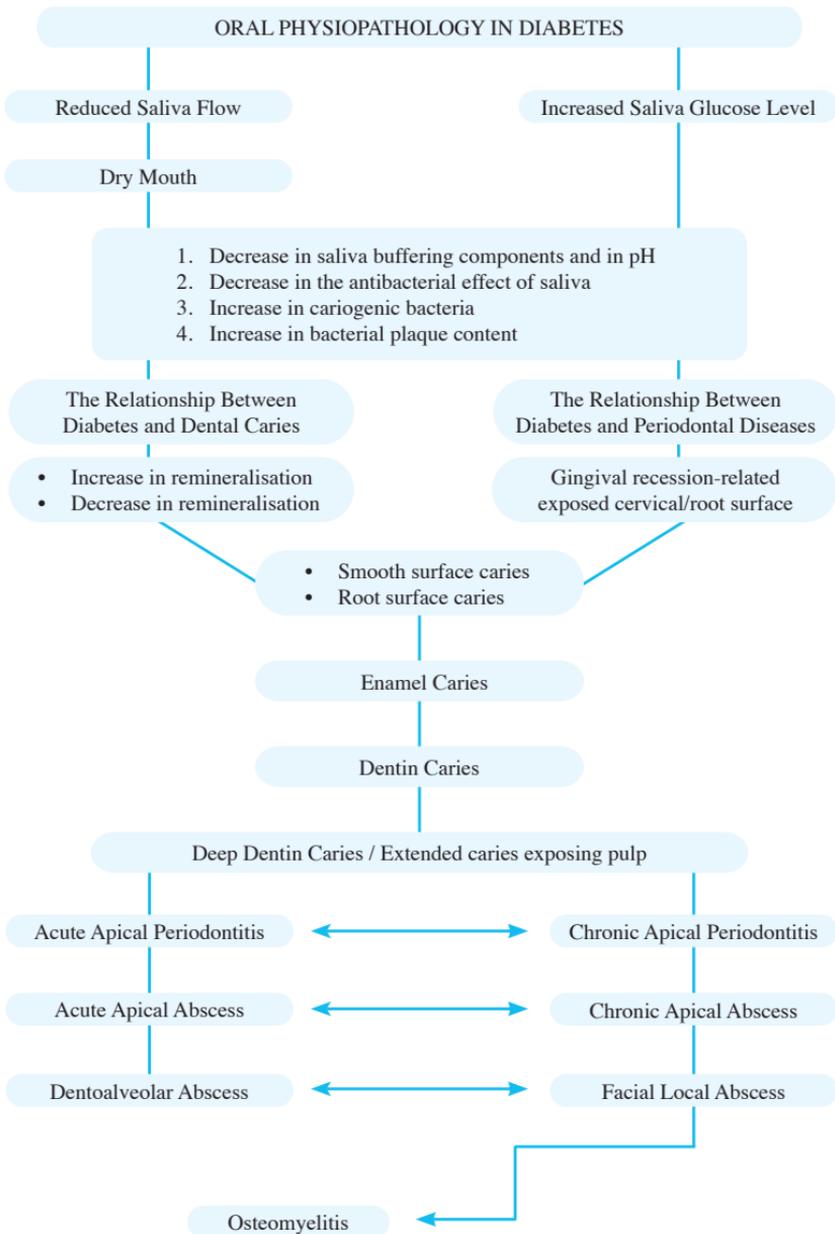
According to these mechanisms, AGEs (advanced glycation end-products) that are synthesized as a result of hyperglycaemia can be transformed into macrophage-destroying phenotype cells. Meanwhile, high levels of IL-1 $\beta$ , IL-6 and TNF- $\alpha$  are released. Moreover, AGEs have the capacity to increase the endothelial permeability and to expose high levels of molecular adhesion receptors. These variables may explain susceptibility to infections and impaired wound healing in diabetic patients. There is no clear evidence regarding whether treatment of periodontal diseases provide any contribution in the management of glycaemic control in patients with type 1 and type 2 diabetes. Nevertheless, it is known that diabetic patients who have their disease under metabolic control respond to periodontal treatment considerably different from those who do not.

# ORAL HEALTH IN PATIENTS WITH DIABETES

## Dry Mouth in Diabetes

- Xerostomia can develop in diabetic patients due to various reasons: polyuria, glandular disorder in salivary glands or the use of antihypertensive drugs.
- As a result, oral mucosa may become traumatized during eating or speaking, or there may be an increase in stomatitis and candida infections.
- Patients using removable dentures should be informed about oral care as well as about maintenance of the dental prostheses and the need to renew them.
- In diabetes, burning mouth syndrome, which develops due to peripheral neuropathy, causes xerostomia, candidiasis and taste disturbance in the mouth. These adversely affect the patient's food intake and create a negative effect on metabolic control of diabetes.

# ORAL HEALTH IN PATIENTS WITH DIABETES



# ORAL HEALTH IN PATIENTS WITH DIABETES

## 2. Planning Prior to Dental Treatment

### 2.1. Oral Disease Symptoms, Signs and Complications in Patients Prone to Diabetes

The patient needs to be assessed in case of the following symptoms and signs are found during the clinical examination.

#### Oral Symptoms and Signs of Diabetes

- Increased risk of infection
- Enlargement of salivary glands
- Taste disturbances
- Orofacial pain
- Hyperkeratosis, erythroplakia, leucoplakia
- Oral lichen planus
- Ulceration
- Fibromatous developments, herpetic lesions
- Lesions that affect the tongue (median rhomboid glossitis, geographic tongue, fibroma, leucoplakia, pseudomembranous glossit)
- Dry mouth
- Increase in dental caries
- Increase in periodontal diseases
- Gingival hyperplasia
- Recurrent periodontal abscess
- Increase in saliva glucose level
- Attachment and bone loss
- Burning mouth syndrome
- Oral candidiasis
- Impaired wound healing
- Acetone-like breath odor

#### Oral Complications in Diabetes

The following oral complications may develop in diabetes as a result of susceptibility to infections, peripheral neuropathy and vascular and immunological deficiency.

- Bacterial plaque accumulation related to increased Ca<sup>2+</sup> and glucose level in saliva
- Lichenoid lesions
- Ulcer
- Pulpitis
- Alveolitis
- Dry mouth
- Increased risk of dental caries
- Increase in periodontal diseases
- Gingival hyperplasia
- Recurrent periodontal abscess
- Increase in saliva glucose level
- Attachment and bone loss
- Burning mouth syndrome
- Oral candidiasis
- Impaired wound healing

Dentists can play a crucial role in the early diagnosis of diabetes through the checking of oral symptoms during clinical examinations

# ORAL HEALTH IN PATIENTS WITH DIABETES

## 2.2.Pretreatment Approaches in Patients with Diabetes

- A related physician must assess the diabetes medical consultation form in detail.
- Prior to dental treatment, the type and treatment of diabetes must be considered.
- Information must be gathered regarding action times and mechanisms of the drugs used, as well as their interaction with other drugs.
- Morning appointments should be preferred.
- Prior to restorative treatments and minor surgical procedures, diabetic patients are requested to take their morning medications and have their routine meal.
- Necessary measures must be taken with regard to hypoglycemia risk/ episodes.
- Antibiotic treatment must be administered in case of an infection.
- Risk of acute exacerbation must be taken into consideration in chronic infections.
- Slowing down of the gastrointestinal system tract can increase vomit reflexes and aspiration. A diabetic patient's physician must be consulted about drugs such as H2 blockers and prokinetic agents in order to reduce the risk of aspiration caused by slowing down of the gastrointestinal system.
- Regarding general anaesthesia and major surgical treatment procedures, oral antidiabetic agents must be stopped 48 hours prior to treatment in consultation with the patient's physician.
- Risk of hypoglycaemia must be checked in the event of delay in food intake.
- Patients must not be kept waiting for a long period of time, and attention must be paid to pain control.
- Pregnant patients must be assessed with regard to their pregnancy and diabetes prior to treatment.
- Patients with gestational diabetes must be warned of the possibility of postnatal diabetes and the continuation of yearly endocrinological check-ups must be recommended.

# ORAL HEALTH IN PATIENTS WITH DIABETES

## 2.3. Diabetes Consultation Form Sample for Dental Treatments

### MEDICAL CONSULTATION FORM FOR PATIENTS WITH DIABETES

The patient, named ....., age ..... (Female / Male), has acknowledged having Type ....DM disease. I kindly request that you assess the patient and make recommendations in order to ensure that the following treatments are performed under optimal conditions and that any likely complications are prevented.

Thank you for your cooperation.

Signature

Diabetes type Type 1 Type 2

Fasting Blood Glucose ..... Date :.....

HbA1C ..... Date :.....

#### Diabetic Complications

	Yes	No
High Blood Pressure	<input type="checkbox"/>	<input type="checkbox"/>
Cardiovascular Disease *	<input type="checkbox"/>	<input type="checkbox"/>
Diabetic Foot	<input type="checkbox"/>	<input type="checkbox"/>
Retinopathy	<input type="checkbox"/>	<input type="checkbox"/>
Nephropathy	<input type="checkbox"/>	<input type="checkbox"/>
Neuropathy	<input type="checkbox"/>	<input type="checkbox"/>

(\*If yes, explain .....) )

Patient's diagnosis and treatment planning (by the dentist):

.....  
.....

Your recommendations (by consulting physician):

.....  
.....  
.....

# ORAL HEALTH IN PATIENTS WITH DIABETES

## SAMPLE

### MEDICAL CONSULTATION FORM FOR PATIENTS WITH DIABETES

The patient, named .....*Deniz Gur*....., age .....*56*.. (Female / Male), has acknowledged having Type ..... DM disease. I kindly request that you assess the patient and make recommendations in order to ensure that the following treatments are performed under optimal conditions and that any likely complications are prevented.

Thank you for your cooperation.

Signature

	Type 1	Type 2
Diabetes type	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Fasting Blood Glucose ..... *148 mg/dl* ..... Date : *14.11.2014* .....

HbA1C ..... *7.8%* ..... Date : *21.10.2014* .....

#### Diabetic Complications

	Yes	No
High Blood Pressure	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Cardiovascular Disease *	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Diabetic Foot	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Retinopathy	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Nephropathy	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Neuropathy	<input checked="" type="checkbox"/>	<input type="checkbox"/>

(\*If yes, explain .....*Diabetic Complications*.....)

Patient's diagnosis and treatment planning (by the dentist):  
*1st and 2nd molar tooth extraction is planned for the patient under local anaesthesia with antibiotic prophylaxis*.....

Your recommendations (by consulting physician):  
*Blood pressure control as the first patient. There is no harm in performing minor surgical procedure*.....

# ORAL HEALTH IN PATIENTS WITH DIABETES

## 3. Risk Groups in Dental Practices with Regard to the Metabolic Control State of Diabetes

Patients with diabetes at Low-Risk Group	Treatment Plan
Fasting blood glucose level < 180 mg/dl HbA1C value < 8%	<ol style="list-style-type: none"> <li>1. Medical consultation may be required.</li> <li>2. Any kind of dental treatment can be performed under optimum conditions</li> </ol>

Patients with diabetes at Medium-Risk Group	Treatment Plan
Fasting blood glucose level < 180-240 mg/dl HbA1C level < 8-10%	<ol style="list-style-type: none"> <li>1. Medical consultation is required.</li> <li>2. All restorative treatments can be performed.</li> <li>3. Simple surgical procedures can be performed.</li> <li>4. Detailed medical consultation is required for complicated surgical procedures.</li> </ol>

Patients with diabetes at High-Risk Group	Treatment Plan
Fasting blood glucose level > 240 mg/dl HbA1C level > 10% DM with complications Risk of ketoacidosis and hypoglycaemia	<ol style="list-style-type: none"> <li>1. Medical consultation is required.</li> <li>2. All restorative treatments must be performed only in the presence of glycaemic controls.</li> <li>3. Acute infections must be treated by administering antibiotics and abscess drainage when they disrupt diabetes regulation.</li> <li>4. Detailed medical consultation is required for complicated surgical procedures.</li> </ol>

# ORAL HEALTH IN PATIENTS WITH DIABETES

## 4. Management Considerations in the Oral Treatment Process

### 4.1. Restorative Treatments and Minor/Major Surgical Procedures under Local Anaesthesia for Patients with type 1 diabetes

- The blood glucose level must be measured before the procedure (see: measurement with glucose meter). The procedure can proceed if blood glucose is between the values of 100 and 200 mg/dl; if it exceeds 200 mg/dl, a specialist must be consulted.
- In the case that treatment continues for a longer-than-expected period of time, the blood glucose value must be monitored every hour.
- Since infection is likely, antibiotics must be used as prophylactic measure prior to procedures such as intraligamentary anaesthesia, tooth extraction, biopsy, endodontic treatment, subgingival curettage and other surgical operations.
- Atraumatic methods must be used due to the high probability of fracture or complications during tooth extractions performed to prevent the risk of osteoporosis

### 4.2. Restorative Treatments and Minor/Major Surgical Procedures under Local Anaesthesia for Patients with type 2 diabetes

- No special measures are required for diabetic patients (HbA1C 6-8%) with (regulated) metabolic control.
- Caution must be taken against infection and (impaired) wound healing.
- Concerning nonregulated patients, intervention needs to be delayed until metabolic control is achieved

## ORAL HEALTH IN PATIENTS WITH DIABETES

### 4.3. Surgical Procedures under Local Anaesthesia on Patients with type 1 and type 2 diabetes

- Glycemic controls and cardiac/neurological/renal evaluations must be performed; ECG, lung radiography and blood electrolyte values must be determined
- All diabetic patients must be assessed the presence of the autonomic neuropathy.
- The procedure pre and post general anaesthesia (operation) must be determined beforehand and implemented along with the general anaesthesiologist and the related specialist who is monitoring and treating the patient's diabetes.

#### 4.3.1. Surgical Procedures under Local Anaesthesia on Patients with type 1 diabetes

- The patient must be hospitalized 2-3 days prior to the operation
- Glycaemic control must be achieved
- The operation should be scheduled as the first one in the morning
- The patient must arrive on an empty stomach and should not administer insulin
- Using the different ways method during the procedure, 10% of dextrose 500 cc (100 ml/hr) is administered through one vein and 50 IU regular insulin in 50 ml of 0.9% isotonic solution through the other vein, at 2-4 IU/hour speed according to the patient's plasma glucose level.

#### 4.3.2. Surgical Procedures under Local Anaesthesia on Patients with type 2 diabetes

- The patient must be hospitalized 2-3 days prior to the operation
- Metformin and sulphonylurea must be suspended one week and one day before, respectively
- 0.3-0.5 units/kg/day dosage of insulin must be administered
- The operation should be scheduled as early in the morning as possible.
- The patient must arrive without eating a regular meal (unfed) and must not take any oral antidiabetics.
- Administered fluids must not contain lactate.
- Other procedures from this point on must be monitored in the same manner followed for patients with type 1 diabetes, explained previously.

# ORAL HEALTH IN PATIENTS WITH DIABETES

## 5. Follow-Up Considerations of Postsurgical Treatment Procedures for Patients with Type 1 and Type 2 Diabetes

- Following surgical treatment under local anaesthesia, the patient's diabetes protocol must be continued without any changes
- After eating carbohydrate- and protein-containing foods, the patient must continue with the pre-procedure diabetes treatment protocol.
- Glucose and serum electrolyte (Na and K) values must be monitored for as long as GIK solution is administered in the postoperative period following treatments under general anaesthesia.
- Following the first postoperative meal, subcutaneous insulin treatment must be administered.
- After the patient becomes stable, previous treatment protocols must be continued

## 6. Prophylactic Approaches with regard to Oral Health in Patients with Diabetes

- Remind patients and care-givers that daily and regular oral and dental care is essential for the treatment and metabolic control of diabetes.
- Diabetic patients must be educated regarding the impact of oral hygiene on the treatment of diabetes
- Diabetic patients without metabolic control must be informed of the increased periodontal disease and caries risk related to raised saliva glucose levels
- Nutrition plays a crucial role in the regulation of diabetes, so any oral rehabilitation that the patient needs for a healthy diet must be promoted/induced immediately.
- Patients at risk of developing diabetes who have not been diagnosed yet must be referred to a related specialist.

**Cessation of smoking is a prerequisite to the control and treatment of diabetes as well as to ensure and maintain oral and dental health.**

# ORAL HEALTH IN PATIENTS WITH DIABETES

## 6.1. Prophylactic Measures with Regard to Oral Health in Patients with Diabetes

Preventive measures against dry mouth, gingivitis, dental caries, oral candidiasis and intraoral hard and soft tissues affected by the “burning mouth” syndrome.

### 6.1.1. Measures to Increase Saliva Flow

- Xylitol chewing gum: 3 times/20 minutes a day after meals.
- Sodium carboxymethyl cellulose-containing preparations
- Saliva supplements and oral mucosa moisturizers

### 6.1.2. Controlling Bacterial Plaque

- Oral hygiene instruction
- Alcohol-free antiplaque and anti-tartar mouthwashes
- Chlorhexidine-containing mouthwashes (not to be used for more than 14 days)

### 6.1.3. Increasing Remineralisation Capacity

- Fluoride-containing gels, varnishes and mouthwashes
- Calcium phosphate-containing preparations CPP-ACP (Casein phosphopeptide-amorphous calcium-phosphate), ACP (Amorphous calcium-phosphate)- TCP (Tricalcium phosphate)-containing preparations (Tooth Mousse, MI Paste Plus, Clinpro TCP White varnish etc.)
- Chlorhexidine-containing gels and varnishes
- Xylitol chewing gum: 3 times (after meals)/20 minutes a day

### 6.1.4. Dietary Consultation/Advice

- Oral hygiene must be maintained after snack meals. If not possible, xylitol gum must be chewed 3 times/20 minutes a day
- Fiber-rich carbohydrates with low glycaemic index and cariogenic characteristics are recommended to consume
- Sweeteners like sorbitol, xylitol and mannitol are sugar alcohols. They contain calories and can be fermented. Therefore, they should only be consumed as recommended.
- Non-metabolic and non-calorie-containing synthetic sweeteners like sodium cyclamate, aspartame or saccharine should be preferred

# ORAL HEALTH IN PATIENTS WITH DIABETES

## 7. Risk Assessment, Prevention and Management Protocols of Dental Caries and Periodontal Diseases

### 7.1. Risk Assessment, Prevention and Management of Dental Caries

	DEFINITION	PREVENTIVE AND RESTORATIVE TREATMENT ADMINISTRATION FLOW	MONITORING PROCESS
<b>LOW CARIES RISK</b>	<ul style="list-style-type: none"> <li>• Saliva pH <math>\geq 6</math></li> <li>• Saliva flow rate normal (<math>\geq 1.0</math> ml/hr)</li> </ul>	<ul style="list-style-type: none"> <li>• Oral hygiene motivation/ instructions</li> <li>• Fluoride Toothpaste</li> </ul>	Annual dental check-up
<b>MODERATE CARIES RISK</b>	<ul style="list-style-type: none"> <li>• Saliva pH 4.5-5.5</li> <li>• Saliva flow rate low (0.7-1.0 ml/hr)</li> <li>• Medium-level oral hygiene</li> <li>• Gingival sulcus</li> <li>• Initial decays</li> </ul>	<ul style="list-style-type: none"> <li>• Oral hygiene motivation/ instructions</li> <li>• Fluoride Toothpaste</li> <li>• Restoration of cavitated lesions</li> <li>• Fissure sealant treatment</li> <li>• Remineralisation of initial lesions</li> <li>• Diet Regulation</li> <li>• Fluoride Mouthwashes, gel and varnishes treatment</li> </ul>	Dental check-up every 6-12 months
<b>HIGH CARIES RISK</b>	<ul style="list-style-type: none"> <li>• Saliva pH <math>\leq 4</math></li> <li>• Saliva flow rate normal (<math>\geq 1.0</math> ml/hr)</li> <li>• Poor oral hygiene</li> <li>• Periodontitis</li> <li>• Cavitated lesions</li> <li>• Missing teeth</li> <li>• Worn prostheses / dentures</li> </ul>	<ul style="list-style-type: none"> <li>• Oral hygiene motivation/ instructions</li> <li>• Fluoride Toothpaste</li> <li>• Restoration of cavitated lesions</li> <li>• Fissure sealant treatment</li> <li>• Remineralisation of initial lesions</li> <li>• Diet Regulation</li> <li>• Mouthwashes with fluoride, and fluoride, gel and lac treatment</li> <li>• CHX-containing mouthwashes (Once a day for 14 days every 6 months)</li> <li>• Analyzing saliva flow rate and bacteriological tests, and taking prophylactic measures</li> </ul>	Dental check-up every 3-6 months

# ORAL HEALTH IN PATIENTS WITH DIABETES

## 7.2. Risk Assessment, Prevention and Management of Periodontal Diseases

	DEFINITION	PREVENTIVE AND PERIODONTAL TREATMENT ADMINISTRATION FLOW	MONITORING PROCESS
<b>LOW RISK*</b>	<ul style="list-style-type: none"> <li>• 10% &gt; bleeding surfaces on probing</li> <li>• 4 mm &lt; maximum 4 pockets</li> <li>• Loss of maximum 4 teeth</li> <li>• Periodontal bone loss (%) / Patient's age <math>\leq 0.5</math></li> <li>• No systemic/genetic diseases</li> <li>• Non-smoker/Not smoking for last 5 years</li> </ul>	<ul style="list-style-type: none"> <li>• Oral hygiene motivation/instructions</li> <li>• If necessary, regular dental prophylaxis</li> </ul>	Annual dental check-up
<b>MODERATE RISK**</b>	<ul style="list-style-type: none"> <li>• 10-25% <math>\geq</math> bleeding surfaces on probing</li> <li>• 4 mm &lt; 4-8 pockets</li> <li>• Loss of 4-8 teeth</li> <li>• Periodontal bone loss / Patient's age <math>\leq 0.5-1</math></li> <li>• No systemic/genetic diseases</li> <li>• Maximum of 10/10-19 cigarettes per day</li> </ul>	<ul style="list-style-type: none"> <li>• Oral hygiene motivation/instructions</li> <li>• Determining periodontal disease risk factors</li> <li>• If necessary, regular dental prophylaxis and subgingival curettage (scaling and root planning)</li> </ul>	Dental check-up every 6-12 months
<b>HIGH RISK***</b>	<ul style="list-style-type: none"> <li>• 25% bleeding surfaces on probing</li> <li>• 4 mm &lt; minimum 8 pockets</li> <li>• Loss of minimum 8 teeth</li> <li>• Periodontal bone loss / Patient's age <math>&gt;1</math></li> <li>• Systemic/genetic diseases present</li> <li>• Smoking one or more packs of cigarettes per day</li> </ul>	<ul style="list-style-type: none"> <li>• Oral hygiene motivation</li> <li>• Determining and eliminating periodontal disease risk factors</li> <li>• Consultation with periodontist</li> </ul>	Dental examination every 3-6 months

\* Individual with Low Periodontal Risk Profile: All parameters are in low-risk category or at least one parameter is in medium-risk category

\*\* Individual with Medium Periodontal Risk Profile: At least two parameters are in medium-risk category and a maximum of 1 parameter is in high-risk category

\*\*\* Individual with High Periodontal Risk Profile: At least two parameters are in high-risk category



**3**

**MANAGEMENT  
OF DIABETIC  
PATIENTS WITH  
COMPLICATIONS**

**MANAGEMENT OF DIABETIC PATIENTS WITH COMPLICATIONS**

# MANAGEMENT OF DIABETIC PATIENTS WITH COMPLICATIONS

## 1. Management of Patients with Diabetes and Cardiovascular Diseases

### 1.1. Management of Patients with Diabetes and High Blood Pressure

In diabetic patients, desired blood pressure values are lower than normal, and target value is < 140/90 mmHg.

- High blood pressure appears with increased cardiovascular mortality.
- Dentists must measure blood pressure, be aware of the values (Table-1) and take into consideration the side effects of antihypertensive drugs as well as of oral symptoms.

Category	Systolic BP		Diastolic BP
Optimum	<120	and	<80
Normal	120-129	and/or	80-84
High Normal	130-139	and/or	85-89
Stage 1 High Blood Pressure	140-159	and/or	90-99
Stage 2 High Blood Pressure	160-179	and/or	100-109
Stage 3 High Blood Pressure	≥180	and/or	≥110
Isolated Systolic High Blood	≥140	and	<90

### Blood Pressure Measurement at the Clinic

Blood pressure must be measured at each session in hypertensive patients. Allow the patient to rest for five minutes, then have him/her sit in a chair with his/her arm at heart level. Blood pressure must be measured and recorded at the first appointment. Blood pressure must be measured twice a year, if blood pressure is <120/80 mmHg; once a year if 120-139/80-89 mmHg; and at each session in hypertensive patients, in patients with a value of >135/85 mmHg and in patients with coronary artery disease, diabetes mellitus (DM) or renal disease.

# MANAGEMENT OF DIABETIC PATIENTS WITH COMPLICATIONS

## Management in Hypertensive Patients

### Remarks for the First Appointment:

1. What is the degree of blood pressure elevation?
2. What are the patient's antihypertensive blood pressure measurements?
3. Are there any problems/side effects with regard to antihypertensive drugs?
4. Has there been any change in medication?

- Adequate blood pressure must be established. Appointments must be kept short and should be scheduled first thing in the morning.
- Especially for people with anxiety, 5-10 mg diazepam can be administered on the eve of or a couple of hours before the procedure. Alternatively, sedation can be established by using nitrogen dioxide.
- Sudden position changes must be avoided during treatment as orthostatic hypotension may develop.
- All dental procedures can be performed on people with optimum and prehypertension levels of blood pressure. If high blood pressure is under control, the patient can be administered a maximum of two cartridges of local anaesthesia (LA) with epinephrine (1:100,000). At least 10 minutes must pass. If more anaesthetics are required, use of non-epinephrine containing LA is recommended.
- A general assessment must be performed in patients with a blood pressure of between 140-180/90-110 mmHg. Sedation may be considered, or elective procedures may be postponed until blood pressure is under control.
- If blood pressure is >180/110 mmHg, elective procedures must be postponed until it is under control.
- In emergency hypertensive cases (KB > 210/120 mmHg), 40 mg oral furosemide must be administered and emergency services must be requested to transfer the patient to the nearest hospital.
- Use of nonselective beta blockers such as propranolol and nadolol may potentiate the effect of epinephrine. Therefore, the dosage must be reduced.

# MANAGEMENT OF DIABETIC PATIENTS WITH COMPLICATIONS

## 1.2. Management of Patients with Diabetes and Ischemic Cardiovascular Diseases

Dental procedures create problems, especially in people with inadequate medical controls: Sudden death may occur due to acute myocardial infarction (AMI) or arrhythmia.

### Remarks for the First Appointment:

1. When was the first diagnosis made and was the patient hospitalized because of it?
  2. What drugs are being used?
  3. Is the patient suffering from shortness of breath or palpitations or does he/she tire easily?
  4. Is the patient using anticoagulant or antithrombotic drugs?
- The safest time to perform a procedure on a patient who has had an AMI is after six months. Nevertheless, a period of 4-6 weeks may be sufficient as well. During this period, procedures such as painful tooth extractions, abscess drainage or pulpectomies must be avoided, and procedures must be performed under hospital conditions
  - Sessions must be kept shorter than 30 minutes. Early morning (most frequent) and afternoon (due to high level of tiredness and stress) appointments are not preferred.
  - If the patient is using a nitrate, he/she must bring it to every appointment.
  - A medication of 5-10 mg diazepam must be administered on the eve of and a couple hours before the procedure on patients suffering from stress and anxiety. Sedation can be established through inhalation of nitric oxide/oxygen.
  - The patient must be placed in a comfortable position (half supine) on the couch to prevent development of orthostatic hypotension.
  - Injection into the veins must be avoided during anaesthesia and a maximum of two cartridges of local anaesthesia with epinephrine must be used. If more anaesthetics are required, use of non-epinephrine containing local anaesthetics is recommended.
  - If the patient is taking an anticoagulant, the INR value must be <2.5 under clinic conditions and <3.5 under hospital conditions, and local haemostasis must be considered during treatment.
  - If chest pain develops in the patient during dental treatment, the procedure must be postponed immediately, emergency medical response support must be requested, and nasal oxygen 3 lt/hr must be administered along with a sublingual nitrate (0.4-0.8 mg). If the pain does not subside in five minutes, a second dose of diluted nitrate must be administered, and if it does not go away in 15 minutes, the patient must be transferred to the hospital for suspicion of AMI.

# MANAGEMENT OF DIABETIC PATIENTS WITH COMPLICATIONS

## 1.3. Management of Patients with Diabetes and Cardiac Insufficiency

### Remarks for the First Appointment:

1. What causes cardiac failure?
  2. Does effort create chest pain or dyspnoea?
  3. Is the patient able to walk up the stairs without developing chest pain or effort dyspnoea?
- Appointments must be scheduled for the mornings.
  - Anxiety and stress must be avoided during the appointment, and it should be kept to less than 30 minutes.
  - Dentistry procedures are limited to stable patients. If congestive heart failure is under control, no special measures are required.
  - If a congestive heart failure episode (angina pectoris) is present, dentistry procedures must be postponed.
  - If angina pectoris develops during treatment, treatment must be stopped, 3 lt/hr oxygen must be administered, and one must wait until the pain subsides and the stress is minimized. Treatment must be completed if the patient feels better.
  - If arrhythmia develops during the procedure, treatment must be paused.
  - Procedures for patients with a history of cardiac failure and complaints of dyspnea, palpitation and asthenia must be performed under hospital conditions.
  - Emergency medical support must be requested in cases of emergencies.

# MANAGEMENT OF DIABETIC PATIENTS WITH COMPLICATIONS

## 2. Management of Patients with Diabetes and Cardiac Insufficiency

Cerebrovascular cases rank third in causes of death following heart problems and cancer in developed countries.

### Dentistry Practices in Stroke Patients

#### Remarks for the First Appointment:

1. When and what type of stroke did the patient have?
2. Is there any loss of function after stroke?
3. Are there improvements in functions over time?

- Emergency dental treatment is allowed six months after stroke.
- Morning appointments must be scheduled for stroke patients. Appointments must be kept short.
- Anaesthetic solution must be used at a minimal amount, and the epinephrine level must be low (1:100,000 or 1:200,000). Gingival retraction flosses with epinephrine must be avoided.
- Metronidazole and tetracycline cause clotting; thus, they must not be used.
- Anticoagulants such as heparin must be stopped 6-12 hours before the procedure, and heparin must be started again since clotting occurs six hours after bleeding. Acetylsalicylic acid up to 100 mg is continued in simple extractions. Warfarin is continued as well; however, INR must be checked within 24 hours before the procedure. If INR <2.5, a maximum 3 extractions can be made in one session. The patient must be checked for haemorrhage and discharged after haemostasis is established.

## MANAGEMENT OF DIABETIC PATIENTS WITH COMPLICATIONS

### 3. Management of Patients with Diabetes and Nephropathy

In haemodialysis and peritoneal dialysis cases, oral/dental health is not in a good state.

#### Remarks For the First Appointment:

1. Which type of kidney problem is present? Does it affect daily life?
2. Is haemodialysis or peritoneal dialysis being used?
3. What drugs are being used?

- Drugs that are discharged from the kidneys must be used carefully, and their dosage must be reduced. Toxic agents to the kidneys such as acetaminophen must be avoided.
- Endocarditis prophylaxis is recommended if prophylactic antibiotic is needed.
- If there is a history of kidney transplantation, protocols for patients using immunosuppressives must be used in invasive procedures such as tooth and root extraction. If leucocyte count is  $\text{mm}^3 < 2000$  and thrombocyte count  $< 60,000$ , elective procedures must be postponed. If the patient is at risk of hemorrhage and emergency treatment is required, the procedure must be performed with thrombocyte suspension.
- Especially for hypertensive patients, a local anesthetic with lower epinephrine must be used.
- Dental treatment must be planned with heparinization without suspending the treatment. If the procedure is performed during the period after hemodialysis, hemorrhage tendency is minimized.

## STEPS IN BLOOD GLUCOSE MEASUREMENT

### Dentistry Practices in Stroke Patients

- One blood glucose measurement device
- One test strip
- Lancing device



- 1 Make sure the patient washes and dries his/her hands before beginning the measurement.

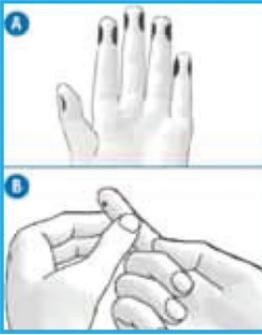


- 2 Put the code chip that comes out of the device test strip in its place in the device (this step is not required for devices that do not need coding).



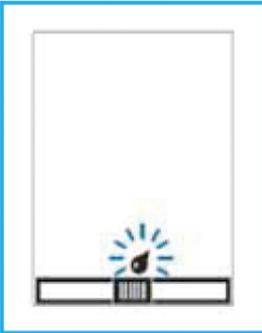
- 3 Take out one strip from the test strip box and carefully place it in its socket in the direction of the arrow without bending it.

## STEPS IN BLOOD GLUCOSE MEASUREMENT



- 4 Prick the finger from the side and obtain a drop of blood (the drop of blood must not be small).

- 5 When the measurement device indicates that you can apply blood, (i.e. blinking drop symbol) place the blood drop on the test strip. The blinking sand timer indicates the start of measurement.



- 6 The screen shows the measurement result in approximately five seconds.
- 7 The blood glucose measurement device memory displays previous blood glucose values

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TÜRKİYE DİYABET VAKFI

