Course Objective
At the completion of this course, the participant will be able to:

• Describe what diabetes is.
• Identify the different types of diabetes and the most common types found in patients living with diabetes.
• How diabetes affects our dental hygiene planning.

Test Your Knowledge

Which of the following statements about the epidemiology of diabetes in the United States is most accurate?

a) Diabetes affects only 1% of US adults  
b) More than 90% of patients with Type 2 Diabetes are receiving some form of treatment  
c) Twenty-six percent of adults have impaired fasting blood glucose levels or impaired blood glucose tolerance 
d) There is virtually no preclinical phase associated with Type 2 Diabetes

Which is the most common form of diabetes?

a) Diabetes Insipidus  
b) Diabetes Mellitus  
c) Gestational Diabetes  
d) Pre- Diabetic Syndrome

Approximately ________ million of women over the age of 20 years old in the United States have diabetes.

a) Over 8 million  
b) Over 10 million  
c) Over 15 million  
d) Over 25 million

Which race/ethnicity in the United States has a prevalence to diabetes?

a) White  
b) Native American, Eskimos  
c) African American  
d) Asians
The Epidemic

Merriam-Webster cites the word *epidemic* as: affecting or tending to affect a disproportionately large number of individuals within a population, community or region at the same time.

- The statistics show: The United States is experiencing an epidemic of diabetes.
- If the present trends continue, one in three Americans and one in two minorities born in 2000 will develop diabetes in their lifetime.
- Daily, approximately over 4000 people are newly diagnosed.
- In 2005, 1.5 million new cases of diabetes were diagnosed in people age twenty years or older.
- Diabetes mellitus is estimated at an annual cost of over $14 billion.

**Diabetes: Statistical Overview**

**Age**

- Approximately 8.8 million of all women, over age 20 in the United States, have diabetes, however more than one third of these do not know it.
- Approximately 10.5 million of all men, over age 20 in the United States, have diabetes and one third of these patients do not know they have it.
- Age 60 years or older, accounts for 10.3 million or 20.9 percent of all people in this age group that have diabetes.

**Race**

- Estimated age-adjusted total of prevalence of diabetes age 20 or older by race/ethnicity in the United States has American/ Indians and Alaska Natives leading this category followed by Non-Hispanic Blacks, Hispanic/Latino Americans and Non-Hispanic Whites last.
- The prevalence of diabetes among Black Americans is 70 percent higher than White Americans.
- For every six White Americans who has diabetes, ten Black Americans have diabetes.

**Fatality**

- Diabetes is the *fifth* leading cause of death.
- The risk of death with diabetes is about twice that of people without diabetes of a similar age.
- Since 1987, the death rate due to diabetes has increased by 45 percent, while the death rates due to heart disease, stroke and cancer, have declined.

**So What EXACTLY is Diabetes?**

- Diabetes is a group of diseases marked by high levels of blood glucose resulting from defects in insulin production, insulin action or both.
- Diabetes is a chronic disease that has no cure.
- While an estimated 14.6 million have been diagnosed with diabetes, unfortunately, 6.2 million people are not aware they have this condition.
Different Diabetes Types

- Diabetes Insipidus – (Un-sweetened Urine)
- Diabetes Mellitus Type 1 (DMT-1)
- Diabetes Mellitus Type 2 (DMT-2) – (Sweetened Urine)
- Diabetes Mellitus Type 3, Gestational (DMT-3)

**Diabetes Insipidus (Un-sweetened Urine)**

- Diabetes Insipidus is most commonly associated with the term “diabetes” but it is however a condition characterized by excretion of large amounts of severely diluted urine.
- It denotes the inability of the kidneys to concentrate urine.
- Diabetes Insipidus is caused by a deficiency of antiduretic hormone (ADH), vasopressin, or by an insensitivity of the kidneys to that hormone.
- Diabetes Insipidus is a relatively rare form of diabetes that does not affect blood sugars.

**Diabetes Mellitus (Sweeten urine)**

- Diabetes Mellitus is a disorder on which blood glucose levels are abnormally high because the body does not produce enough insulin.

**Diabetes Mellitus (Sweeten Urine)**

- This course will concentrate on the three most common types of Diabetes Mellitus:
  - Diabetes Mellitus Type-1 (DMT-1)
  - Diabetes Mellitus Type-2 (DMT-2)
  - Diabetes Mellitus Type-3 (DMT-3)

**Insulin**

- Insulin is a hormone that is released by the pancreas.
- Insulin controls the amount of glucose (sugar) in the blood.
- An individual with DMT-1 has high blood sugar levels either because the pancreas produces little or no insulin.
- In patients with DMT-2 their body is insensitive (resistant) to the amounts of insulin.
- In either case, the amount of Insulin available is not sufficient for the body needs.

**Diabetes Mellitus Type 1 (DMT-1)**

(formally known as juvenile-onset diabetes)

- It is estimated that as many as 3 million Americans have DMT-1 Diabetes.
- DMT-1 diabetes is most often diagnosed in children, adolescents and young adults. For this reason, it is sometimes called, “juvenile diabetes”.
- This form of diabetes is also called "insulin dependent" diabetes because the pancreas no longer produces any insulin.
- DMT-1 diabetes is characterized by a rapid onset of symptoms.
  - Common symptoms – extreme weight loss, thirst, hunger, tiredness, and excessive urination.
Individuals diagnosed with DMT-1 diabetes must place insulin into their system.

This can be accomplished with injections or an insulin pump.

In DMT-1 diabetes, insulin does not cure diabetes, it is life support.

**DMT-1 and Insulin Balance**

- It is a constant challenge to know how much insulin the body needs.
- There are many factors that impact the amount of insulin the body requires at any given time of the day.

**Factors Affecting Blood Sugar**

- Food intake
- Food absorption
- Stress
- Exercise
- Illness
- Medications
- Normal physical growth
- Hormonal fluctuations
- All impact the equation

**Affects of Un-Balanced Blood Sugar**

- If too much insulin is injected, the individual may experience hypoglycemia (low blood sugar).
- If too little insulin is injected, the person may experience hyperglycemia (high blood sugar).

**Hypoglycemia**

- Initial Symptoms – shakiness, sweating, extreme hunger, blurred vision, confusion, mood shifts.
- Hypoglycemia should be treated immediately.
- If left untreated, the patient may go into a diabetic coma resulting in death.

**Hyperglycemia**

- Initial symptoms (varies by patient) – extreme thirst, hunger, tiredness, excessive urination, dry mouth.
- Over a period of time, high blood sugar levels impact the entire organ systems of the body resulting in devastating effects such as kidney failure, blindness, nerve damage, amputations, heart attack and stroke.

**Diabetes Mellitus Type 2 (DMT-2)**

(formally called non-insulin dependent diabetes or adult-onset)

- A person diagnosed with DMT-2 is usually obese, diagnosed after 30 years of age, and not prone to ketoacidosis except under periods of extreme stress.
- The pancreas continues to produce insulin.
- While the patient living with DMT-2, may possess normal, high or low blood levels of insulin, insulin resistance (decreased tissue sensitivity or responsiveness to insulin) is always present.
Treating DMT-2

Glucose control is initially attempted with:

- diet and exercise programs
- oral hypoglycemic agents
- or insulin if adequate control is not achieved.

DMT-2 - Treatment Trends and Outcomes

- The number of patients with DMT-2 treated with insulin appear to be increasing.

- Oral hypoglycemic medications have effectively lowered glucose levels in approximately 60 percent to 70 percent of newly diagnosed patients with DMT-2.

- According to epidemiology of diabetes in the United States, twenty-six percent of adults have impaired fasting glucose levels or impaired glucose tolerance.

Screening for DMT-2

- The US Preventive Services Task Force (USPSTF) has issued a statement that limited evidence exists to recommend screening adults for DMT-2 but that screening may be helpful in those with hypertension, according to a report published in the June 3 issue of the *Annals of Internal Medicine*.

- The US Preventive Services Task Force USPSTF recommends routine screening for diabetes among asymptomatic adults with a sustained blood pressure of 135/80 mm Hg or more, but there was insufficient evidence to recommend screening for diabetes among adults with lower blood pressure levels.

Closer Look at Symptoms

- The two types of diabetes have very similar symptoms.

- The first symptoms patients experience (pre-diagnosis) are related to the direct effects of high blood sugar levels.

  **Symptoms - High Blood Sugar (Hyperglycemia)**

- When the blood sugar level rises above 160 to 180 mg/dL, sugar spills into the urine.

- When the level of sugar in the urine rises even higher, the kidneys excrete additional water to dilute the large amount of sugar.

- Because the kidneys produce excessive urine, a person living with diabetes urinates large volumes frequently (polyuria).

- The excessive urination creates abnormal thirst (polydipsia).

- Because excessive calories are lost in the urine, the person loses weight.

- To compensate, the person often feels excessively hungry.

- Other symptoms include blurred vision, drowsiness, nausea, and decreased endurance during exercise.

  **Symptoms - Low Blood Sugar (Hypoglycemia)**

- Hypoglycemia is a major concern when considering insulin preparation amounts in DMT-1; however, the reaction is concern for people with DMT- 2 as well.

- Too much insulin injected or too much exercise can cause a hypoglycemic episode.
Symptoms - Low Blood Sugar (Hypoglycemia)

- Hypoglycemic reactions are characterized by a sudden onset of central nervous system, respiratory, gastrointestinal, and skin changes.

- Patients exhibit fatigue, weakness, nervousness, headache, confusion, nausea and hunger.

- Sympathetic nervous system-induced tachycardia, tremor and sweating may result.

- Balancing all of these factors can be very difficult and the formula is not always the same.

- It requires constant calculating of food to insulin ratio, accounting for the impact of exercise and monitoring of blood sugar levels.

- Hypoglycemia may be life-threatening if severe and prolonged.

- There are some oral hypoglycemic medications that can produce low effects as well.

Drug-Induced Hypoglycemia

- Elderly patients with diabetes who may be susceptible to improper nutrition habits and some memory disturbance or confusion related to non-compliance with the appropriate treatment regimens are at greater risk for this effect.

- Treatment of drug-induced hypoglycemia involves raising the blood glucose level as quickly as possible with a form of oral glucose (e.g. candy or juice) if the patient is conscious.

- Unconscious patients are treated with intravenous glucose (also known as parenteral glucagon).

Oral Antihyperglycemic Drugs

- These medications are used for controlling blood sugar in DMT-2.

Drugs in this family include:

- Acarbose (Prandase, Precose)
- Acetohexamide (Dymelor)
- Chlorpropamide (Diabinese)
- Glimepiride (Amaryl)
- Glipizide (Glucotrol, Glucotrol XL)
- Glyburide or glibenclamide (DiaBeta, Glynase, Micronase)
- Metformin (Glucophage)
- Miglitol (Glyset)
- Phenformin
- Pioglitazone (Actos)
- Rosiglitazone (Avandia)
- Repaglinide (Prandin)
- Tolazamide (Tolinase)
- Tolbutamide (Orinase)
- Troglitazone (Rezulin)

Hemoglobin A1c (HbA1c)

- A critical factor in managing diabetes is knowledge of your HbA1c level.

- HbA1c, also known as the Glycosylated Hemoglobin or GHB and Fast Hemoglobins, stands for Hemoglobin A1c.

- The HbA1c test is a simple blood test undertaken by individuals with diabetes usually on a quarterly basis.

- The HbA1c, is not a substitute for daily urine and/or blood glucose determinations used to regulate insulin doses.

- Rather the test is used as a complement to these standard daily glucose-monitoring tests to assure proper diabetes management control over longer time periods.
Hemoglobin A1c (HbA1c)

• Hemoglobin A1C (HbA1C) levels are strongly associated with subsequent mortality in both men and women without a previous diabetes diagnosis, according to the results of the largest study to date of A1C levels and subsequent mortality risk, reported in the June issue of *Diabetes Care*.

• HbA1c results are quoted by a laboratory via a normal range.

• These reference ranges vary between laboratories. Patients and Health Care Provider must be careful comparing result levels.

• Below 5% is considered a normal level. For people living with diabetes the goal is to get the level at the high end of the normal range.

Gestational Diabetes Type 3 (DMT-3)

• Gestational diabetes DMT-3 is similar to DMT-2 in that it involves insulin resistance.

• Fifteen to twenty percent of pregnancies result in gestational diabetes.

• During pregnancy the hormones can cause insulin resistance in women genetically predisposed to developing diabetes.

• Gestational diabetes usually resolves with the delivery of the child, whereas DMT-1 and DMT-2 are chronic conditions.

• However 5-10% of women with gestational diabetes is found to have DMT-2.

• Women who have had gestational diabetes have a 20-50% chance of developing diabetes in the next 5-10 years.

Complications of Diabetes

• People living with diabetes may experience many serious, long-term complications.

• Most complications of diabetes develop over a period of years.

• Most of the complications are progressive.

• The more a person with diabetes is able to control the levels of sugar in the blood, the less likely it is that these complications will develop or become worse.

• High sugar levels cause narrowing of both the small and large blood vessels.

• Complex sugar-based substances build up in the walls of small blood vessels, causing them to thicken and leak.

• As they thicken, they supply less blood, especially to the skin and nerves.

• Poor control of blood sugar levels also tends to cause the levels of fatty substances in the blood to rise, resulting in atherosclerosis and decreased blood flow in the larger blood vessels.

• Atherosclerosis is between two and six times more common in people with diabetes than in people who do not have the disease and tends to occur at younger ages.

• Over time, elevated levels of sugar in the blood and poor circulation can harm the heart, brain, legs, eyes, kidneys, nerves, and skin.

• Resulting in angina, heart failure, strokes, claudication (*cramplike pains in the legs*), poor vision, renal failure, damage to nerves (*neuropathy*), and skin breakdown.
Complications

• Poor circulation to the skin can lead to ulcers and infections, and all wounds heal slowly.
• People with diabetes are particularly likely to have ulcers and infections of the feet and legs.
• Too often, these wounds heal slowly or not at all, and amputation of the foot or part of the leg may be needed.
• People living with diabetes often develop bacterial and fungal infections, typically of the skin.
• When the levels of sugar in the blood are high, white blood cells cannot effectively fight infections.
• Any infection that develops tends to be more severe.
• The kidneys can malfunction, resulting in kidney failure that may require dialysis or kidney transplantation.
• Doctors usually check the urine of people with diabetes for abnormally high levels of protein (albumin), which is an early sign of renal damage.
• This can be done through a routine urine analysis or “24 hour catch” to check for proteins.
• At the earliest sign of renal complications, the person is often given angiotensin-converting enzyme (ACE) inhibitors, drugs that slow the progression of kidney disease.
• Damage to the blood vessels of the eye can cause loss of vision (diabetic retinopathy).
• Laser surgery is able to seal the leaking blood vessels of the eye and prevent permanent damage to the retina.
• Therefore, people with diabetes should have yearly eye examinations to check for retinal damage.

• Damage to nerves can manifest in several ways.
• If a single nerve malfunctions, an arm or leg may suddenly become weak.
• If the nerves to the hands, legs, and feet become damaged (diabetic polyneuropathy), sensation may become abnormal, and tingling or burning pain and weakness in the arms and legs may develop.
• Damage to the nerves of the skin makes repeated injuries more likely because the person cannot sense changes in pressure or temperature.
## Complications

### Long-Term Complications of Diabetes

<table>
<thead>
<tr>
<th>Tissue or Organ Affected</th>
<th>What Happens</th>
<th>Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood vessels</td>
<td>Atherosclerotic plaque builds up and blocks large or medium-sized arteries in the heart, brain, legs, and penis. The walls of small blood vessels are damaged so that the vessels do not transfer oxygen normally and may leak</td>
<td>Poor circulation causes wounds to heal poorly and can lead to heart disease, stroke, gangrene of the feet and hands, erectile dysfunction (impotence), and infections</td>
</tr>
<tr>
<td>Eyes</td>
<td>The small blood vessels of the retina become damaged</td>
<td>Decreased vision and ultimately, blindness</td>
</tr>
<tr>
<td>Kidney</td>
<td>Blood vessels in the kidney thicken; protein leaks into the urine; the blood is not filtered normally</td>
<td>Poor kidney function; kidney failure</td>
</tr>
<tr>
<td>Nerves</td>
<td>Nerves are damaged because glucose is not metabolized normally and because the blood supply is inadequate</td>
<td>Sudden or gradual weakness of a leg; reduced sensations, tingling, and pain in the hands and feet; chronic damage to nerves</td>
</tr>
</tbody>
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### Long-Term Complications of Diabetes

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<tr>
<td>Autonomic nervous system</td>
<td>The nerves that control blood pressure and digestive processes become damaged</td>
<td>Swings in blood pressure; swallowing difficulties and altered digestive function, with bouts of diarrhea</td>
</tr>
<tr>
<td>Skin</td>
<td>Poor blood flow to the skin and loss of feeling result in repeated injury</td>
<td>Sores, deep infections (diabetic ulcers); poor healing</td>
</tr>
<tr>
<td>Blood</td>
<td>White blood cell function is impaired</td>
<td>Increased susceptibility to infection, especially of the urinary tract and skin</td>
</tr>
<tr>
<td>Connective tissue</td>
<td>Glucose is not metabolized normally, causing tissues to thicken or contract</td>
<td>Carpal tunnel syndrome; Dupuytren's contracture</td>
</tr>
</tbody>
</table>
The Importance of Oral Health in Patients with Diabetes

Emerging research suggests that the relationship between serious periodontal disease and diabetes is two-way:

- Not only are people with diabetes more susceptible to serious periodontal disease,
- but, serious periodontal disease may have the potential to affect blood glucose control and contribute to the progression of diabetes.

The Importance of Oral Health in Patients with Diabetes

Research suggests that people with diabetes are at higher risk for oral health problems, such as gingivitis (an early stage of periodontal disease) and periodontitis (serious periodontal disease).

People with diabetes are at an increased risk for serious periodontal disease because they are generally more susceptible to bacterial infection, and have a decreased ability to fight bacteria that invade the gingival tissues.

Diabetes and Dental Problems

- If a patient’s blood glucose is poorly controlled, it is more likely serious periodontal disease will develop and the loss of teeth is greater as compared to those patients without diabetes.
- Like all infections, serious periodontal disease may be a factor in causing blood sugar to rise and may make diabetes harder to control.

Other oral health problems associated with diabetes include:
- Thrush - an infection caused by fungus that grows in the mouth
- Dry mouth (Xerostomia) - (often caused by high blood sugar levels) which can cause soreness, ulcers, infections and caries

Preventing Dental Problems Associated with Diabetes

It is important for patients living with diabetes to:

- Control blood glucose levels.
- Take good care of their teeth and gingival tissues, along with regular checkups every six months.
- To control thrush, a fungal infection, maintain good diabetic control, avoid smoking and, if they wear dentures, remove and clean them daily.
- Good blood glucose control can also help prevent or relieve dry mouth caused by diabetes.

Patient Assessment

In assessing patients with diabetes, it is important to engage the patient in dialogue to gain as much information as possible to understand their individual history. It is recommended to include the following questions.

- Determine the patient’s diabetes treatment protocol:
  - Name and type of medication?
  - If patient is on insulin, type of delivery (injections, insulin pen, insulin pump)?
  - Frequency of medication?
  - How often does the patient check their blood glucose using their glucometer?
  - Do they have their glucometer with them in case of emergency?
  - How often do they have their HbA1c monitored and what was their most recent HbA1c?
Patient Assessment

History of hypoglycemia:
- Is there a pattern to your hypoglycemic episodes? (i.e. early morning, 2 hours after eating)
- What symptoms do you normally experience when you have hypoglycemia?
- What does the patient use to treat hypoglycemia?
- Do they carry this on them?
- Would they like to have it readily available in case they need it?

Does the patient have a history of management of diabetes prior to dental or medical procedures that has worked well for them in the past?

Your Role as a Diabetes Advocate

• For a patient living with diabetes, it is important that health care providers be aware in general of the latest developments in diabetes management.

• Exhibiting a knowledge of the different types of diabetes, treatment protocols, treatment options and diabetes devices will equate to a level of trust that you care about the patient and you will assist them in case of an emergency.

• Secondly, it is very important that health care providers show an interest in the patient’s treatment protocol and yet reserves any judgment.

• Every patient has different levels of support from their family, friends and doctors.

• There is also a variance in treatment protocols recommended by physicians, as well as different protocols for DMT-1.

• The health care provider should ask questions with a curious mind and withhold any comments or commentary about testing protocol and monitoring protocol.

• If a health care provider is concerned that the patient is developing complications or showing symptoms of uncontrolled diabetes, it would be most appropriate to express concern and recommend that they consult their physician.

• It may be necessary for the attending dentist to consult with the patient’s physician on their behalf.

• It is important to ask the patient prior to beginning treatment when they last ate, when they last tested their blood sugar and what were their results.

• It is also helpful to ask the patient if they would like to have their monitor and a form of treatment for hypoglycemia readily available in case they experience hypoglycemia.

• Lastly, when discussing, the patient’s oral hygiene regimen, it is important to be respectful of the amount of time and energy that is involved in monitoring and managing diabetes.

• When discussing the patient’s oral hygiene regimen remember this is one more thing the patient has to do that is directly related to their overall diabetes care...and it can be overwhelming.
CE Accreditation

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This presentation provides 2 CEUs

Please take the post-test to earn your CE credit

References
http://www.merriam-Webster.com/dictionary/epidemic
http://www.JDRF.org
http://www.diabetes.org

Further Reading
For further reading on this topic go to:
http://www.adha.org/publications/research_into_practice.htm


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