Module 7: Obesity & Diabetes

By the end of this module, you will know about:

- What obesity is
- What diabetes is
- About the link between obesity and diabetes
- How they are best treated

7.1: The link Between Obesity and Diabetes

It has been observed that there is a close connection between obesity and type 2 diabetes.

Our diet today is rich in all the wrong kinds of food which is causing us to put on weight and contract lifestyle diseases like diabetes. Though both diabetes and obesity are associated with race, family history and age, the surge in the number of cases is because of our changing lifestyles.

Sedentary lifestyle coupled with energy-rich food that is loaded with fat and carbohydrates is creating fat people who are at high risk of diabetes and other related diseases. Let us first study the two problems separately and then find why they are linked to each other.
7.2: Obesity

A person who is extremely fat will be called an obese person and he or she is suffering from obesity.

It is a condition, which could be caused by a medical problem or by eating too much, where a person puts on huge amounts of weight, which can cause a negative effect on a person’s health.

A person who has a weight that is 20% higher than the ideal is considered as obese.

Obesity is measured by BMI and also through the ratio of the measurement of waist to hip.

**BMI or Body Mass Index**

BMI is a system of deriving measurement of body weight where the person’s weight is divided by the square of his or her height.

\[
\text{Weight} / \text{Height}^2 = \text{BMI} \text{ kg/m2}
\]

If the BMI is under 18.5, the person is considered underweight and this comes with its own set of problems. A BMI between 18.5 – 25 is considered normal weight. A person with BMI that is between 25 and 29.5 is considered to be fat or overweight. If the BMI is over 30 then a person is considered obese and needs to lose weight to maintain a healthy lifestyle.

**Classification of Obesity**

Obesity can be classified into three categories based on the measurement of BMI.
Any person with a BMI of over 30 is obese.
Any person with a BMI of between 30 and 35 has what is termed as Class I obesity. This is considered borderline obesity.
A BMI of between 35 and 40 is considered severe obesity or Class II obesity.
A BMI of over 40 is considered Class III obesity. This is super obesity.
A Person who has a BMI of 35 – 45 and is experiencing health problems related to obesity is suffering from morbid obesity.

A point that needs to be noted is that people of Asian descent experience health problems at lower BMI than Caucasians. As a physical trainer, you should keep this in mind while evaluating the level of obesity.

**Obesity and Health**

Obesity can be the cause of several diseases including type 2 diabetes, heart diseases, sleep apnoea, osteoarthritis and also certain kinds of cancers.

Obese people experience hyperventilation and their life expectancy is lower than that of people with normal weight.

**Obesity is related to:**

- Mortality: it is the leading preventable cause of premature death in the world.
- Poor Health: Obesity causes several diseases, and is detrimental to health, this includes both mental and physical health.

**Causes of Obesity**

The leading cause of obesity is pretty clear to anyone – too many calories consumed, too few burnt out.

In most cases people eat way too much of rich and high calorie
food and do not have enough physical exercise to burn off all
the calories that they consume.

So, the excess calories are converted into fat and stored into
the adipose tissues of the body to be used in an emergency
such as extreme physical activity or starvation.

**Causes of obesity are:**

1. **Diet:** calorie and fat rich food that cannot be fully
   utilized by the body is one of the leading causes of
   obesity.
2. **Sedentary Lifestyle:** We do not exert ourselves
   physically. We have cars and other mechanical aids to
   make our lives less physically active than ever before.
3. **Insufficient Sleep:** Obesity has been linked with lack of
   proper sleep. Insufficient sleep is stressful and can
   cause obesity and overeating.
4. **Endocrine Inhibitors:** These can be caused by, amongst
   other things, pollution and causes a disruption in the
   metabolism of fat in the body.
5. **Temperature Controlled Environment:** We live in air-
   conditioned and climate controlled environment and do
   not have to suffer through changes of temperature. Our
   lack of variation to temperatures has made our bodies to
   slow down in burning calories.
6. **Less Smoking:** Smoking is known to suppress appetite, so
   when people give up smoking, they often find that they
   eat more and, therefore, gain weight.
7. **Use of Medicines:** A relationship has been established
   between increased use of certain types of medicines and
   obesity.
8. **Genetics:** Ethnicity and race are also responsible for
   obesity. Certain racial groups are genetically prone to
   obesity which passes through the generations.
9. **Late Pregnancies:** Children born of mothers who are older
   are more susceptible to becoming obese.
10. **Medical Conditions:** Certain physical and mental diseases
as well as medicines to treat them can cause obesity. Certain infections can also cause obesity.

Though there is evidence suggesting that these factors influence body weight, a lot more study needs to be done before any substantive claim can be made.

Looking at the factors above, it is pretty clear that obesity is becoming a global problem and most of it is lifestyle related.

7.3: Diabetes

The scientific term is Diabetes Mellitus but it is commonly known as diabetes.

It is a metabolic disorder where the blood sugar levels remain high for a prolonged period of time.

If the blood sugar levels remain elevated for long, it can cause many health problems such as diabetic coma, heart problems, kidney failure, and a host of other diseases.

So, diabetes is a complex health condition which can have a variety of causes.

People who suffer from hyperglycaemia are said to be diabetic. It is a metabolic disorder, which is related to the way food is broken down and absorbed for nutrition and energy.

The food that we eat is broken down into glucose, which is then used to fuel all the activities of our body.

Insulin, which is a hormone produced by the pancreas, is
required to synthesize the glucose and convert it into energy. When the body is not able to produce enough insulin, or unable to utilize it properly, then the glucose in the blood is not converted to energy and causes diabetes.

**Reasons for and Types of Diabetes**

Diabetes is caused by two conditions – either the pancreas cannot produce enough insulin or the cells in the body do not respond to insulin.

There are many types of diabetes but the two most common types are:

- **Type I:** This is caused when the body is unable to produce enough insulin to synthesize all the glucose in the body. This was earlier referred to as insulin dependent diabetes or juvenile diabetes. The cause of Type I diabetes is generally concerned with genes and ethnicity.

- **Type II:** This is caused by the body developing resistance to insulin and its inability to respond to the hormone properly. This was previously referred to as non-insulin dependent diabetes, or adult onset diabetes. The cause of this type of diabetes is generally sedentary lifestyle and weight.

Then there is gestational diabetes that develops only during pregnancy.

**Symptoms of Diabetes**

The symptoms of diabetes include:

- Excessive urination
- Weight loss
- Excessive thirst
- Blurred vision
- Headache
- Fatigue
• Longer healing time
• Sores
• Itchy and dry skin
• Eye and vision problems

If a person has any of these problems, then he or she must get a blood sugar test done to determine whether they suffer from diabetes or not.

Causes of Type I Diabetes

It is caused by the destruction of insulin producing beta cells in the pancreas.

Type I diabetes is one of the many autoimmune diseases in which the body’s immune system starts attacking healthy cells of the body. This cell destruction can continue for several years before any symptoms appear. But once the symptoms manifest, it develops pretty quickly. This type of diabetes is observed mostly in children and young adults, but it can manifest itself later in life too.

Type I diabetes has a lot to do with genetics, and the gene is passed from parents to children. It is also believed that food, pollutants, toxins and viruses may also have an influence in the onset of Type I diabetes.

Causes of Type II Diabetes

This is the most common form of diabetes. It is caused by a number of factors.

The major cause is that the body becomes insulin resistant. The cells of the body do not synthesize insulin properly and that raises the level of blood sugar in the body.

The body, over a period of time, stops producing enough insulin for the body and the symptoms of diabetes appear. The type II diabetes develops slowly over years, and can remain undetected for a long time. This type of diabetes affects
mostly older people and middle aged people, especially if they are obese or overweight.

Type II diabetes used to be very rare in children or younger people but the trend is changing now and can be observed in obese children and young adults. The triggers for Type II are believed to be genetic propensity and environmental factors.

The causes can be listed as follows:

**Genetic Propensity:**

Genes have an important influence on development of type II diabetes. Certain racial and ethnic groups are more disposed to it than others. Hispanic, African-Americans, Indians, are ethnic groups that are more inclined to develop type II diabetes than others.

**Obesity and Lack of Physical Exercise:**

We will study this in more detail later in this module. Let us suffice by saying that there is a direct link between diabetes and obesity. Obesity is caused by too much to eat and too little exercise and so is diabetes.

**Insulin Resistance:**

This is a problem that is observed in overweight and obese people who are not very physically active. The muscles, liver cells and fat cells stop responding to the insulin in a proper manner.

**Too Much Glucose Production in the Liver:**

Sometimes the liver does not function properly and produces too much glucose, which the body cannot synthesize properly.

Other causes can be beta cell dysfunction, problem with cell signalling and regulation.
Type II Diabetes Risk Factors

People who are most at risk for type II diabetes conform to the following profile:

- Overweight/Obese
- Middle aged, 45 or above
- Sedentary lifestyle
- Family history of diabetes
- Ethnicity that is from a group that has high incidence of diabetes
- Women who have delivered babies that are over 9 lbs in weight
- Women who have suffered from gestational diabetes
- High blood pressure
- Lipid profile with low HDL and high LDL
- Women suffering from polycystic ovary syndrome
- Dark rash around the armpit and neck
- People suffering from cardiovascular diseases

FACT

There are 3.6 million people who have been diagnosed with diabetes in the UK

Source: diabetes.org.uk 2016
7.4: Relationship between Diabetes and Obesity

Although there are a lot of factors that determine the onset of diabetes and obesity which include race, age and ethnicity, it is becoming increasingly clear to researchers that modern sedentary living is the biggest contributor to the increase in the incidences of diabetes in recent decades.

It is well known fact that overly rich food and little physical activity is the leading cause of obesity, but we do wonder whether obesity actually contributes to diabetes.

What has been observed is that a majority of people who have been diagnosed with type II diabetes are also overweight or obese. These figures support the theory that obesity and diabetes are interrelated or even co-dependent. The factors that cause the onset of diabetes are similar to the ones that cause obesity.

Though the relationship between the two diseases is clear, what is not clear is how this happens.

The scientists believe that the body produces enough insulin in obese people but the tissue cells in the body are too stressed out to synthesize the insulin.

It has been observed that the endoplasmic reticulum, when it is under stress, suppresses signals from insulin receptors, thus making the cell resistant to insulin. When this condition exists over a period of time, it impairs the ability of the pancreas to produce insulin, causing type II diabetes.

Our bodies have inbuilt responses to conditions of over-nourishment as well as under-nourishment. When we overeat, our body is flushed with excessive amounts of nutrients which need
to be processed, then used or stored. This makes the digestive system go into overdrive. As the system overloads on nutrients, it sends out distress signals to control the amount of insulin released.

The insulin receptors are dampened to prevent too much synthesis of nutrients. This is just an emergency measure that the body possesses to prevent overload of nutrition in normal humans.

In obese people, the body is constantly overloaded and what is an emergency measure becomes the normal and triggers the insulin receptors to become permanently dampened. The body becomes insulin resistant and stops producing enough insulin causing type II diabetes.

Take a Quick Recap Test

7.5: Treatment for Diabetes and Obesity

It important to prevent and control the rate of growth of obesity and diabetes.

The best way to control the growth is to take preventative measures. One of the best ways to treat both obesity and diabetes is through physical activity.

Since both obesity and diabetes have been found to respond well to exercise, this is then the best way to prevent as well as control the two diseases.
New studies and research suggest that the effect of exercise in control of the amount of glucose present in the blood is pretty significant. Clinical studies on large groups suggest that lifestyle changes like dieting and exercise have a beneficial effect on people with insulin resistance. Since diet and exercise also help in reducing weight, it then helps to reduce the level of stress on muscles and tissues and helps to combat insulin resistance.

Other treatments for diabetes include oral and injected medicines. For obesity, the treatment could include oral medication, injections and, the most severe of all, bariatric surgery.

You as a physical trainer have to ensure an exercise regimen for your client based on their level of obesity and whether they suffer from diabetes or not. It is important to know the medical history of your clients before preparing an exercise plan for your client and to ensure that the exercise is regular and consistent, especially if the client is obese and diabetic.

**Module Summary**

**Lessons Learned**

- Why diabetes and obesity are linked
- The definition of “obese”
- How obesity effect health
- What the causes of obesity are
- About the symptoms and treatment for diabetes

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