

## **8. Diabetes & Kidney Disease**

### **8.1. What is Diabetes?**

Your body converts carbohydrates to glucose. Glucose is the simple sugar that is the main source of energy for the body's cells. To enter cells, glucose needs the help of insulin. Insulin is a hormone produced by the pancreas. When a person does not make enough insulin, the body can't utilise glucose. The glucose builds up in the blood. High levels of glucose in the blood or urine lead to a finding of diabetes.

Diabetes mellitus is a disorder where the pancreas does not make enough insulin or the insulin is not effective. This insulin imbalance causes the body's blood sugar level to rise, and eventually many unhealthy changes can occur in different body organs.

The normal and target blood glucose ranges are:

<b>Normal blood glucose levels in people who do not have diabetes</b>	
Fasting	4.4 – 6.1mmol/L
Non-fasting	4.4 - 8.0mmol/L
<b>Target blood glucose levels in people who have diabetes</b>	
Fasting	5.0 – 7.2mmol/L
Non-fasting	<10.0mmol/L

Ref: American Diabetes Association Guidelines & The Malaysia Clinical Practice Guidelines 2005

There are more than 1 million people in Malaysia have diabetes. Many times the disease can lead to kidney damage and even kidney failure. Diabetes is the most common cause of kidney failure in Malaysia.

Latest statistics indicated that 57% of kidney failure was due to diabetes. Most people's diabetes does not damage the kidneys enough to cause kidney failure. Proper control of diabetes and blood pressure, together with certain medications may prevent the onset of kidney complications or reduce further kidney damage if that has already occurred.

### **8.2. What are the symptoms of Diabetes?**

People who think they might have diabetes must visit a physician for diagnosis. They might have SOME or NONE of the following symptoms:

- Frequent urination
- Excessive thirst
- Unexplained weight loss
- Extreme hunger
- Sudden vision changes
- Tingling or numbness in hands or feet
- Feeling very tired much of the time
- Very dry skin
- Sores that are slow to heal
- More infections than usual.

Nausea, vomiting, or stomach pains may accompany some of these symptoms in the abrupt onset of insulin-dependent diabetes, namely Type1 Diabetes.

### **8.3. What are the types of Diabetes?**

Type 1 Diabetes, also called insulin-dependent diabetes mellitus (IDDM) or juvenile-onset diabetes, accounts for 5% to 10% of all diagnosed cases of diabetes. Occurs mainly in young people below 30 years and is caused by an inability of the pancreas to produce enough insulin. These people need insulin injections.

Type 2 Diabetes, also called non-insulin-dependent diabetes mellitus (NIDDM) or adult-onset diabetes usually develops in people older than 40 years, accounts for about 90% to 95% of all diagnosed cases of diabetes. The abnormal blood sugar in these people is usually controlled with diet and / or medications.

Gestational diabetes is a type of diabetes that only pregnant women get. If not treated, it can cause problems for mothers and babies. Gestational diabetes develops in 2% to 5% of all pregnancies but usually disappears when a pregnancy is over.

### **8.4. What are the risk factors for Diabetes?**

Risk factors for Type 2 Diabetes include old age, obesity, a family history of diabetes, prior history of gestational diabetes, impaired glucose tolerance, physical inactivity, and race/ethnicity.

Risk factors are less well defined for Type 1 Diabetes than for Type 2 Diabetes, but autoimmune, genetic, and environmental factors are involved in developing this type of diabetes.

Gestational diabetes occurs more frequently in people with a family history of diabetes than in other groups. Obesity is also associated with higher risk. Women who have had gestational diabetes are at increased risk for developing Type 2 Diabetes in the later part of their life.

Studies have shown that nearly 40% of women with a history of gestational diabetes developed diabetes later. Other specific types of diabetes, which may account for 1% to 2% of all diagnosed cases, result from specific genetic syndromes, surgery, drugs, malnutrition, infections, and other illnesses.

### **8.5. What is the treatment for Diabetes?**

Healthy eating, physical activity, and insulin injections are the basic therapies for Type 1 Diabetes. The amount of insulin taken must be balanced with food intake and daily activities. Blood glucose levels must be closely monitored through frequent blood glucose testing.

Healthy eating, physical activity, and blood glucose monitoring are the basic therapies for Type 2 Diabetes. Most people will require oral medications and eventually will require a combination of oral medications and insulin or a switch to insulin to control their blood glucose levels. People with diabetes must take responsibility for their day-to-day care, and keep blood glucose levels from going too low or too high.

People with diabetes should see a health care provider who will monitor their diabetes control and help them learn to manage their diabetes. In addition, people with diabetes may see endocrinologists (specialist deals with diseases that affect organs that make hormones), who may specialize in diabetes care; ophthalmologists for eye examinations; podiatrists (specialist deals with disorders of lower limbs) for routine foot care; and

dietitians and diabetes educators who teach the skills needed for daily diabetes management.

### **8.6. Is there a cure for Diabetes?**

In response to the growing health burden of diabetes, the diabetes community has three choices: prevent diabetes; cure diabetes; and improve the quality of care of people with diabetes to prevent devastating complications. All three approaches are actively being pursued by the Ministry of Health Malaysia.

Several approaches to "cure" diabetes are being pursued overseas:

- Pancreas transplantation
- Islet cell transplantation (Islet cells produce insulin)
- Artificial pancreas development
- Genetic manipulation (fat or muscle cells that don't normally make insulin have a human insulin gene inserted — then these "pseudo" islet cells are transplanted into people with Type 1 Diabetes).

Each of these approaches still has a lot of challenges, such as preventing immune rejection; finding an adequate number of insulin cells; keeping cells alive; and others. But progress is being made in all areas.

### **8.7. What causes Type 1 Diabetes?**

The causes of Type 1 Diabetes appear to be much different than those for Type 2 Diabetes, though the exact mechanisms for developing both diseases are unknown. The appearance of Type 1 Diabetes is suspected to follow exposure to an "environmental trigger," such as an unidentified virus, stimulating an immune attack against the beta cells of the pancreas (that produce insulin) in some genetically predisposed people.

### **8.8. Can Diabetes be prevented?**

A number of studies have shown that regular physical activity and moderate weight loss can significantly reduce the risk of developing Type 2 Diabetes. Type 2 Diabetes also appears to be associated with obesity.

Researchers are making progress in identifying the exact genetics and "triggers" that predispose some individuals to develop Type 1 Diabetes, but prevention remains elusive.

### **8.9. When should I be tested for Diabetes?**

Anyone aged 45 years and above should consider getting tested for diabetes, especially if you are overweight. If you are younger than 45, but are overweight and have one or more additional risk factors (see below), you should consider testing.

### **8.10. What are the risk factors which increase the likelihood of developing Diabetes?**

- Being overweight or obese
- A parent, brother, or sister with diabetes
- Prior history of gestational diabetes or giving birth of at least one baby weighing more than 9 pounds
- High blood pressure measuring 140/90 or higher
- Physical inactivity, exercise less than three times a week

### **8.11. How does body weight affect the likelihood of developing Diabetes?**

Being overweight or obese is a leading risk factor for Type 2 Diabetes. Being overweight can keep your body from making and using insulin properly, and can also cause high blood pressure.

### **8.12. What is Pre-diabetes?**

People with blood glucose levels that are higher than normal but not yet in the diabetic range have "pre-diabetes." Doctors sometimes call this condition impaired fasting glucose (IFG) or impaired glucose tolerance (IGT), depending on the test used to diagnose it.

IFG is a condition in which the blood sugar level is high (6.1 to 7.0mmol/L) after an overnight fast but not high enough to be classified as diabetes. IGT is a condition in which the blood sugar level is high (7.8 to 11.1mmol/L) after a two-hour oral glucose tolerance test, but is not high enough to be classified as diabetes.

Insulin resistance and pre-diabetes usually have no symptoms. You may have one or both conditions for several years without noticing anything.

If you have pre-diabetes, you have a higher risk of developing Type 2 Diabetes. Studies have shown that most people with pre-diabetes go on to develop Type 2 Diabetes within 10 years, unless they lose weight through modest changes in diet and physical activity. People with pre-diabetes also have a higher risk of heart disease.

### **8.13. Effects of Diabetes**

Diabetes can affect any part of your body. The good news is that you can prevent most of these problems by keeping your blood glucose (blood sugar) under control, eating healthily, being more physically active, and working with your health care provider to keep your blood pressure and cholesterol under control and getting necessary screening tests.

### **8.14. Monitoring of kidney in Diabetic Patients**

It is very important for kidney function to be monitored in diabetic patients. This is done both by monitoring blood pressure and a special test for protein in the urine. It should be done at least once a year.

### **8.15. How can Diabetes affect cardiovascular health?**

Cardiovascular disease is the leading cause of early death among people with diabetes. Adults with diabetes are two to four times more likely than people without diabetes to have heart disease or experience a stroke. At least 65% of people with diabetes die from heart disease or stroke. About 70% of people with diabetes also have high blood pressure.

### **8.16. How are cholesterol, triglyceride, weight, and blood pressure problems related to Diabetes?**

People with Type 2 Diabetes have high rates of cholesterol and triglyceride abnormalities, obesity, and high blood pressure, all of which are major contributors to higher rates of cardiovascular disease. Many people with diabetes have several of these conditions at the same time. This combination of problems is often called metabolic syndrome. The metabolic syndrome is often defined as the presence of any three of the following conditions:

- excess weight around the waist
- high levels of triglycerides

- low levels of HDL, or "good" cholesterol
- high blood pressure
- high fasting blood glucose levels

If you have one or more of these conditions, you are at an increased risk for having one or more of the others. The more conditions you have, the greater the risk to your health.

### **8.17. How can I be “heart healthy” and avoid cardiovascular disease if I have Diabetes?**

To protect your heart and blood vessels, eat right, get physical activity, don't smoke, and maintain healthy blood glucose, blood pressure, and cholesterol levels.

- Choose a healthy diet, low in salt. Work with a dietitian to plan healthy meals.
- If you're overweight, talk about how to safely lose weight. Ask about a physical activity or exercise programme.
- Quit smoking if you currently do.
- Get a hemoglobin A1C test (HbA1c) at least twice a year to determine what your average blood glucose level was for the past 2 to 3 months.
- Get your blood pressure checked at every doctor's visit, and get your cholesterol checked at least once a year. Take medications if prescribed by your doctor.

### **8.18. How can Diabetes affect the eyes?**

In diabetic eye disease, high blood glucose and high blood pressure cause small blood vessels to swell and leak liquid into the retina of the eye, blurring the vision and sometimes leading to blindness. People with diabetes are also more likely to develop cataracts – a clouding of the eye's lens, and glaucoma – optic nerve damage. Laser surgery can help these conditions.

### **8.19. How can I keep my eyes healthy if I have Diabetes?**

There's a lot you can do to prevent eye problems. A recent study shows that keeping your blood glucose level closer to normal can prevent or delay the onset of diabetic eye disease. Keeping your blood pressure under control is also important. Finding and treating eye problems early can help save sight. It is best to have an eye doctor give you a dilated eye examination at least once a year. The doctor will use eye drops to enlarge (dilate) your pupils to examine the back of your eyes. Your eyes will be checked for signs of cataracts or glaucoma, problems that people with diabetes are more likely to get.

Because diabetic eye disease may develop without symptoms, regular eye examinations are important for finding problems early. Some people may notice signs of vision changes. If you're having trouble reading, if your vision is blurred, or if you're seeing rings around lights, dark spots, or flashing lights, you may have eye problems. Be sure to tell your health care provider or eye doctor about any eye problems you may have.

### **8.20. How can Diabetes affect the kidneys?**

Over many years diabetes affects the small blood vessels throughout the body. Damage may be caused to the kidneys as well as the eyes, skin, nerves, muscles, intestine and heart.

The kidneys contain tiny filters made up of small blood vessels and as these become damaged, protein leaks into the urine and the kidneys are less able to filter (purify) the blood properly.

The normal removal of excess salt and water from the body is reduced and toxic substances build up in the blood. Kidney failure caused by diabetes is called “diabetic nephropathy”.

If the nerves in the body are damaged by diabetes, it is called neuropathy, and this can affect bladder control, resulting in difficulty in emptying the bladder.

Urine can remain in the bladder and the pressure that builds up can back-up and damage the kidneys. In addition, if urine stays in the bladder for long periods of time, infection may develop because of the rapid growth of bacteria in urine that has high sugar content. In diabetic kidney disease (also called diabetic nephropathy); cells and blood vessels in the kidneys are damaged, affecting the organs’ ability to filter out wastes. Wastes build up in your blood instead of being excreted. In some cases this can lead to kidney failure. When the kidneys fail, a person has to have his or her blood filtered through a machine (a treatment called dialysis) several times a week, or has to get a kidney transplant.

### **8.21. How can I keep my kidneys healthy if I have Diabetes?**

There’s a lot you can do to prevent kidney problems. A recent study shows that controlling your blood glucose can prevent or delay the onset of kidney disease. Keeping your blood pressure under control is also important. Diabetic kidney disease happens slowly and silently, so you might not feel that anything is wrong until severe problems have developed.

Therefore, it is important to get your blood and urine checked for kidney problems each year. Your doctor can learn how well your kidneys are working by testing every year for micro-albumin (a protein) in the urine. Micro-albumin in the urine is an early sign of diabetic kidney disease. Your doctor can also do a yearly blood test to measure your kidney function. Go to the doctor if you develop a bladder or kidney infection; symptoms include cloudy or bloody urine, pain or burning when you urinate, an urgent need to urinate often, back pain, chills, or fever.

### **8.22. What are the early signs of kidney disease in Diabetes?**

The finding of excess amounts of protein in the urine is an early sign of diabetic kidney disease.

This usually occurs after 10 to 15 years of diabetes. If the protein loss should become heavy, the amount of protein in the blood decreases. This low blood protein level results in fluid retention causing swelling of the legs.

High blood pressure usually develops or worsens as the disease progresses. People with diabetes should have their blood, urine and blood pressure checked regularly by their doctor.

This will lead to better control of the disease and early treatment of high blood pressure, if present.

### **8.23. What are the late signs of kidney disease in Diabetes?**

As the kidney's function declines (this is shown by the results of progressive blood tests), non-specific symptoms may develop such as nausea, vomiting, loss of appetite, weakness, tiredness, itchiness, muscle cramps and anaemia.

The need for insulin may decrease. If any of these symptoms occur you should consult your doctor.

#### **8.24. What happens if the kidneys fail completely?**

If the kidneys become so damaged that only about 10% of overall kidney function remains, it is called End-Stage Kidney Failure.

The average time between the onset of diabetic kidney damage and End-Stage Kidney Failure is about 5 to 7 years, but it can vary from person to person.

For diabetics in a reasonable state of health, End-Stage Kidney Failure can be treated by dialysis or transplantation.

#### **8.25. Can a person with Diabetes have a kidney transplant?**

Yes, a kidney transplant can come from a deceased person (cadaver transplant) or from a close blood relative (living related transplant). However, it is important for the recipient not to have other organ damage due to diabetes, for example, to the heart, brains and eyes. If these are already present, a transplant may not be suitable.

#### **8.26. Important points about Diabetes and the kidney**

- Severe kidney failure is much more common in Type 1 (juvenile-onset) than Type 2 (adult-onset) Diabetes;
- Diabetes may affect small blood vessels in the kidney and cause permanent kidney damage (Diabetic Nephropathy) and kidney failure;
- Early diabetic kidney damage (Diabetic Nephropathy) can be detected by a urine test. The most practical way to follow the condition of the kidneys is with blood tests;
- Maintaining normal blood pressure is the most effective method for slowing the rate at which kidney function is lost;
- End-Stage Kidney Failure can be treated by kidney transplantation, haemodialysis or peritoneal dialysis.

#### **8.27. How can Diabetes affect nerve endings?**

Having high blood glucose for many years can damage the blood vessels that bring oxygen to some nerves, as well as the nerve coverings. Damaged nerves may stop sending messages, or send messages too slowly or at the wrong times. Numbness, pain, and weakness in the hands, arms, feet, and legs may develop. Problems may also occur in various organs, including the digestive tract, heart, and sex organs.

Diabetic Neuropathy is the medical term for damage to the nervous system from diabetes. The most common type is peripheral neuropathy, which affects the arms and legs. An estimated 50% of those with diabetes have some form of neuropathy, but not all with neuropathy have symptoms. People with diabetes can develop nerve problems at any time, but the longer a person has diabetes, the greater the risk. The highest rates of neuropathy are among people who have had the disease for at least 25 years. Diabetic Neuropathy also appears to be more common in people who have had problems controlling their blood glucose levels, in those with high levels of blood fat and blood pressure, in overweight people, and in people over the age of 40.

#### **8.28. How can I prevent nerve damage if I have Diabetes?**

You can help keep your nervous system healthy by keeping your blood glucose as close to normal as possible, getting regular physical activity, not smoking, taking good care of your feet each day (see below), having your health care provider examine your feet at least 4 times a year, and getting your feet tested for nerve damage at least once a year.

### **8.29. Why is it especially important to take care of my feet if I have Diabetes?**

Nerve damage, circulation problems, and infections can cause serious foot problems for people with diabetes. Sometimes nerve damage can deform or misshape your feet, causing pressure points that can turn into blisters, sores, or ulcers. Poor circulation can make these wounds slow to heal. Sometimes this can lead to amputation of a toe, foot, or leg.

### **8.30. What should I do on a regular basis to take care of my feet?**

- If you have corns and calluses, ask your doctor or podiatrist (specialist deals with disorder of lower limbs) about the best way to care for them.
- Wash your feet in warm (not hot) water and dry them well
- Cut your toenails once a week or when needed. Cut toenails when they are soft from washing. Cut them to the shape of the toe and not too short. File the edges with an emery board.
- Rub lotion on the tops and bottoms of feet (but not between the toes) to prevent cracking and drying.
- Wear shoes that fit well. Break in new shoes slowly, by wearing them 1 to 2 hours each day for the first 1 to 2 weeks.
- Wear stockings or socks to avoid blisters and sores.
- Wear clean, lightly padded socks that fit well; seamless socks are best.
- Always wear shoes or slippers, because when you are barefoot it is easy to step on something and hurt your feet.
- Protect your feet from extreme heat and cold.
- When sitting, keep the blood flowing to your lower limbs by propping your feet up and moving your toes and ankles for a few minutes at a time.
- Avoid smoking, which reduces blood flow to the feet.
- Keep your blood sugar, blood pressure, and cholesterol under control by eating healthy foods, staying active, and taking your anti-diabetic medicines.

### **8.31. How can Diabetes affect the digestion?**

Gastroparesis, otherwise known as delayed gastric emptying, is a disorder where, due to nerve damage, the stomach takes too long to empty itself. It frequently occurs in people with either Type 1 or Type 2 Diabetes.

Symptoms of gastroparesis include heartburn, nausea, vomiting of undigested food, an early feeling of fullness when eating, weight loss, abdominal bloating, erratic blood glucose levels, lack of appetite, gastroesophageal reflux, and spasms of the stomach wall.

### **8.32. How can Diabetes affect my sexual performance?**

Many people with diabetic nerve damage have trouble having sex. For example, men can have trouble maintaining an erection and ejaculating. Women can have trouble with sexual response and vaginal lubrication. Both men and women with diabetes can get urinary tract infections and bladder problems more often than average.

### **8.33. How can Diabetes affect my mood?**

Several studies suggest that diabetes doubles the risk of depression, although it's still unclear why. The psychological stress of having diabetes may contribute to depression, but the metabolic effect of diabetes on brain function may also play a role. At the same time, people with depression may be more likely to develop diabetes.

The risk of depression increases as more diabetic complications develop. When you are depressed, you do not function as well, physically or mentally; this makes you less likely to eat properly, exercise, and take your medication regularly.

Psychotherapy, medication, or a combination of both can treat depression effectively. In addition, studies show that successful treatment for depression also helps improve blood glucose control.

#### **8.34. How does Diabetes affect how I respond to a cold or flu?**

Being sick by itself can raise your blood glucose. Moreover, illness can prevent you from eating properly, which further affects blood glucose.

In addition, diabetes can make the immune system more vulnerable to severe cases of flu. People with diabetes who come down with flu may become very sick and may even have to go to a hospital. You can help keep yourself from getting flu by getting a flu shot every year. Everyone with diabetes, even pregnant women, should get a yearly flu shot.

#### **8.35. What should I do when I am sick?**

Be sure to continue taking your anti-diabetic medications or insulin. Don't stop taking the medications even if you can't eat.

Your health care provider may even advise you to inject more insulin during sickness.

Test your blood glucose every four hours, and keep track of the results.

Drink extra (calorie-free) liquids, and try to eat as you normally would. If you can't, try to have soft foods and liquids containing the equivalent amount of carbohydrates that you usually consume.

Weigh yourself every day. Losing weight without engaging on a weight loss programme is a sign of high blood glucose.

Check your temperature every morning and evening. A fever may be a sign of infection.

Call your health care provider or go to an emergency room if any of the following happens to you:

- You feel too sick to eat normally and are unable to consume any food for more than 6 hours.
- You're having severe diarrhea.
- Excess weight loss within a short period of time
- Your temperature is over 38 degrees Celsius
- Your blood glucose is lower than 4.0mmol/L or remains over 15mmol/L
- You have moderate or large amounts of ketones in your urine.
- You're having trouble breathing.
- You feel sleepy or can't think clearly.

#### **8.36. Why is it important for Diabetics to be physically active?**

Physical activity can help you control your blood glucose, weight, and blood pressure, as well as raise your "good" cholesterol and lower your "bad" cholesterol. It can also help prevent heart and blood flow problems, reducing your risk of heart disease and nerve damage, which are often problems for people with diabetes.

### **8.37. How much and how often should Diabetics exercise?**

Experts recommend moderate intensity physical activity for 30 minutes for at least 3 times a week. Some examples of moderate intensity physical activities are walking briskly, mowing the lawn, dancing, swimming, or bicycling.

If you are not accustomed to physical activity, you may want to start with a little exercise, and work your way up. As you become stronger, you can add a few extra minutes to your physical activity. Do some physical activities every day. It's better to walk 10 or 20 minutes each day than one hour once a week.

Talk to your health care provider about a safe exercise plan. He or she may check your heart and your feet to be sure you have no special problems. If you have high blood pressure, eye, or foot problems, you may need to avoid some kinds of exercise.

### **8.38. What are some good types of physical activities for Diabetics?**

Walking vigorously, hiking, climbing stairs, swimming, aerobics, dancing, bicycling, tennis, basketball, volleyball, or other sports are just some examples of physical activities that will work your large muscles, increase your heart rate, and make you breathe harder – important goals for fitness.

In addition, strength training exercises with hand weights, elastic bands, or weight machines can help you build muscle. Stretching helps to make you flexible and prevent soreness after other types of exercise.

Do physical activities you really like. The more fun you have, the more likely you will do it each day. It can be helpful to exercise with a family member or friend.

### **8.39. Are there any safety considerations for Diabetics when they exercise?**

Exercise is very important for diabetics to stay healthy, but there are a few things to watch out for.

You should avoid some kinds of physical activities if you have certain diabetic complications. Exercise involving heavy weights may be bad for people with blood pressure, blood vessel, or eye problems. Diabetes-related nerve damage can make it hard to tell if you've injured your feet during exercise, which can lead to more serious problems. If you do have diabetic complications, your health care provider can tell you which kinds of physical activities would be best for you. Fortunately, there are many different ways to get exercise.

Physical activity can lower your blood glucose too much, causing hypoglycemia (low blood glucose), especially in people who take insulin or certain oral medications. Hypoglycemia can happen at the time you're exercising, just afterward, or even up to a day later. You can get shaky, weak, confused, irritable, anxious, hungry, tired, or sweaty. You can get a headache, or even lose consciousness.

To help prevent hypoglycemia during physical activity, check your blood glucose before you exercise. If it's below 5.6mmol/L, have a small snack. In addition, bring food or glucose tablets with you when you exercise just in case. It is not good for people with diabetes to skip meals at all, but especially not prior to exercise.

After you exercise, check to see how it has affected your blood glucose level. If you take insulin, ask your health care provider if there is a preferable time of day for you to exercise, or whether you should change your dosage before physical activity, before beginning an exercise regimen.

When you exercise, wear cotton socks and athletic shoes that fit well and are comfortable. After you exercise, check your feet for sores, blisters, irritation, cuts, or other injuries.

Drink plenty of fluids during physical activity, since your blood glucose can be affected by dehydration