Diabetes can be easily controlled with a combination of diet, drugs and exercise. Ignorance is not bliss if you are a diabetic.

Diabetes mellitus is spreading rampantly across the globe, especially so in India. WHO has issued a strong warning that India will soon be the “Diabetes capital of the world!” According to WHO projections, the number of diabetics in India will go up to 40 million by 2010 and 74 million by 2025."

Diabetes should not be taken lightly as it can result in conditions like coma (due to untreated hypoglycemia) and serious complications like blindness, kidney damage and loss of limb due to foot amputation. Every year many diabetes patients lose limb and life due to life-threatening complications like nerve damage and vascular disease affecting lower limbs.

However, the silver lining is that diabetes can be controlled through proper management right from the time it is diagnosed. Lack of knowledge in the area of diabetes management poses significant emotional, psychosocial and financial burden on the patient discouraging him from taking his condition seriously.

Risk Factors for Diabetes
There are various factors responsible for diabetes. Some major risk factors are as follows:

• Genetic predisposition/family history: A first degree relative like parent or sibling having diabetes.

Among the various factors that may lead to diabetes are: genetic predisposition, sedentary lifestyle, faulty eating habits, obesity and stress
Obesity: Being overweight/obese, especially fat around the waist (abdominal obesity), increases the risk of diabetes by causing insulin resistance (inability of insulin to help glucose enter the body cells).

Aging: People above 45 years of age are at an increased risk of diabetes and must go for a health check up regularly.

Sedentary lifestyle/lack of exercise/physical inactivity: People who are inactive and do not exercise.

Poor eating habits: Having a diet low in fibre and high in refined and fatty foods.

Stress: It is a major cause of diabetes nowadays. Stress causes secretion of certain hormones in the body which elevate blood sugar levels. If stress is chronic then it may exhaust the pancreas which may not be able to produce enough insulin to lower blood sugar levels.

Diabetes Complications
Diabetes is a metabolic disorder which results in elevated blood glucose levels due to impairment of insulin secretion or action. When a person develops diabetes, her/his pancreas either fails to produce sufficient insulin or produces too much insulin which is ineffective in carrying out its function. Due to insufficiency or ineffectiveness of insulin, glucose builds up in the bloodstream and is unable to enter the cells of the body which remain starved of energy.

Persistently high blood glucose levels damage vital organs of the body leading to complications like cardiovascular disease, peripheral vascular disease affecting lower limbs, diabetes nephropathy (kidney damage), diabetes retinopathy (eye disease), diabetes neuropathy (nerve damage), periodontal disease (tooth decay and gum problems), diabetes foot complications, etc.

Self-managing Diabetes
Managing diabetes may seem to be a Herculean task in the initial stages, but with determination and continuous effort along with the support of family, friends and your healthcare team, you can incorporate diabetes self-management into your daily life.

Diet and insulin adjustment: Diet plays a pivotal role in diabetes management as the food that we eat is finally converted to glucose, which raises the blood glucose levels. Individuals with diabetes must be educated about balancing food intake with insulin/oral hypoglycemic agents for good glycemic control. This could be achieved by maintaining a food diary or a logbook to record the food intake and the subsequent rise in blood glucose levels which will determine the efficacy of insulin dose and any adjustments required in the dosage to maintain the sugar levels.

Self-monitoring of blood glucose (SMBG): Since it is difficult to gauge one’s blood glucose level from the way a person feels, it is essential for a diabetic individual to monitor his/her blood glucose levels regularly. This facilitates right glycemic control and could be achieved by using a glucometer device. This also helps to control portion sizes of food and aids in better dietary management.

Diabetes management during illness: Diabetes should not be ignored during an episode of illness. Sick-day management involves continuous monitoring of
blood glucose as glucose levels fluctuate dramatically during illness and can result in conditions such as ketoacidosis (presence of ketones in blood and urine) or hypoglycemia (low blood glucose).

To combat hypoglycemia or ketoacidosis (low blood glucose levels: <70mg/dl), the patient must carry sugar/glucose or candies and should check blood glucose whenever hypoglycemia is suspected.

In case of ketoacidosis, which results due to severe hyperglycemia (high blood glucose levels: >300mg/dl), there is a need to check for urine ketones. Since, hyperglycemia (high blood glucose) is common during illness, there maybe a need to increase insulin dose, which may be done in consultation with the doctor.

Food intake should be adequate to prevent weakness and the patient must not stop eating even if there is hyperglycemia. If solid foods are not well tolerated, liquids containing carbohydrates should be taken at regular intervals. Exercise should be avoided during sickness.

**Safe Exercise Guidelines**

Exercise is the cornerstone in the management of diabetes. It certainly confers an array of benefits to diabetes patients besides helping them to manage their blood sugar levels better, but ill-considered exercise can pose risks and worsen existing diabetes complications. Therefore, exercise caution before starting an exercise programme.

Physical exercise has varying effects on insulin-treated and non-insulin treated diabetes patients. Research has shown that physical exercise has beneficial effects on the metabolic control in non-insulin treated Type-2 diabetes patients:

1. Reduces insulin requirements and medication dose.
Exercise needs to be undertaken according to each patient’s needs

2. Improves insulin sensitivity and reduces insulin resistance in type-2 diabetes.
3. Promotes weight loss in obese and overweight individuals. (May not occur in all cases as sometimes fat mass is replaced by muscle mass).
4. Improves blood circulation and cardiac efficiency in at-risk patients.
5. Improves mood and general well-being.
6. Relieves stress and reduces any chance of depression which is common in diabetes.
7. Prevents development of diabetes complications by controlling blood glucose, blood pressure and lipid levels (HDL-c, LDL-c, triglycerides).
8. Prevents worsening of complications when done with due care.

However, diabetes patients who develop complications need to be extra cautious while exercising. With the presence of complications, it becomes more crucial to avoid certain forms of exercises and to take precautions to prevent any mishap and avoid worsening of existing complications. Diabetics, therefore, need to consult their doctors before embarking on any exercise programme.

Some such complications are:

• Coronary heart disease or CHD: Patients with existing heart problem must check with their doctor/cardiologist before starting any exercise. Vigorous or high intensity exercises must be avoided by heart patients. Suitability of other forms of exercise depends upon the extent to which the heart has been damaged. Medical screening may be necessary before starting any exercise.

Heart patients must avoid strenuous activities, lifting heavy weights or other heavy objects. People with risk of underlying heart disease can suffer from coronary events during exercise irrespective of age. It is not essential to join a gym to exercise or stay fit. Simple walking can be more beneficial and less likely to result in casualty if done with care and caution. Moreover, “being regular and doing less but more often” is more important than short bursts of intense activity done irregularly.

• Peripheral Neuropathy: Nerve damage results in loss of protective sensation in the extremities. This increases the likelihood of diabetic foot complications. With the presence of both neuropathy and PVD the risk increases further. Hence, patients with neuropathy must avoid weight-bearing exercises.

Walking is contraindicated in this condition as pressure exerted on the feet while walking can result in foot ulcers and foot fractures. Prolonged walking, jogging and running must be avoided and feet should be checked regularly for any ulcers or undesirable changes. Instead, non-weight bearing exercises like bicycling or swimming, arm and chair exercises can be done to control blood sugar.

• PVD: Patients with existing peripheral vascular disease have reduced blood supply to their feet. Along with the presence of diabetes, it becomes even more important to exercise carefully as any injury to the feet may not heal quickly due to poor blood supply and if the blood sugar is not under control. But patients with PVD should not get discouraged as exercise is important for improving blood circulation to the feet to prevent further progression of the disease.

• Nephropathy: Patients with kidney disease may not be in a condition to exercise as lethargy is very common in such patients but those who are in early stages of nephropathy, may experience proteinuria (increased protein losses in urine), as a result of exercise.

• Retinopathy: Patients with retinopathy must consult their doctor before exercising, as in proliferative diabetic retinopathy (a progressed stage of retinopathy), vigorous or moderate intensity exercise may worsen the condition. It can lead to vitreous haemorrhage (bleeding in the eye) and retinal detachment due to exercise-induced increase in arterial blood pressure.

Precautions to be taken by diabetes patients while exercising:
1. Do not exercise when you are ill (fever, infection, etc.).
2. Keep yourself well-hydrated before, during and after exercise.
3. Monitor blood glucose level to prevent hypoglycemia (common in insulin-treated diabetes patients).
4. Do not exercise if blood glucose is >250mg/dl. Check urine for ketones using ketostix. This is particularly important for type-1 diabetes patients.
5. In type-2 diabetes, if blood glucose level is >250mg/dl without ketones in urine before exercise, then exercise for 15 minutes. Check blood glucose again. If blood glucose drops, continue exercising as it will help in controlling blood glucose but if it increases further, then stop exercising. Check with your diabetologist to adjust insulin dose.
6. Do not exercise in very hot or cold environment.
7. Early morning is the best time before taking insulin injection. Exercising after insulin has been taken needs caution as the risk for hypoglycemia increases especially if exercise is done when the insulin is at its peak activity. In such a case, either reduce insulin dose before exercising or if insulin has been injected, check blood glucose before exercise. If blood glucose is <100 mg/dl, take 15 gm of readily absorbed carbohydrate (3 tsp of glucose/sugar, 3-4 glucose biscuits, a glass of fruit juice, etc.) to prevent hypoglycemia. Keep some carbohydrate snacks (like sandwiches, poha, bananas, etc.)
However, the silver lining is that diabetes can be controlled through proper management right from the time it is diagnosed.

available while exercising, in case you need more.
8. Always carry an ID card stating you have diabetes. Mention if you are on insulin along with important information like contact numbers of your doctor and family members in case of emergency. This is useful not only if you are exercising outdoors, but also when you are driving or traveling.
9. Carry some easily absorbable source of carbohydrates like glucose, sugar, toffees, candy, sweetened beverages like fruit juices, cold drinks (not diet cola) to raise blood sugar when feeling hypoglycemia.
10. Wear proper footwear and cotton socks which help to absorb sweat.

Do not exercise bare foot especially when neuropathy and PVD are present.
11. Check your feet after exercise for any cuts, bruises or blisters.
12. Start slowly and build up gradually.

Those who are only on medications are less likely to have hypoglycemia but those who are on insulin secretagogues (a class of medicines that stimulate pancreas to produce more insulin e.g. sulphonylureas) might need to reduce dosage when exercising. Diabetics on insulin are more likely to have hypoglycemia during exercise and even several hours after exercise depending on the intensity and duration of exercise. Hence, these individuals may have to reduce the number of units of insulin they usually take as exercise reduces insulin requirements. However, do not change the dosage on your own, consult your diabetologist.

This is particularly useful when you stick to a routine. If you exercise for a specific duration, at a given time every day and for a given intensity, then it is easier to adjust insulin dose and maintain blood glucose levels. Keeping a record of your blood glucose before and after exercise will help you and your doctor in managing diabetes better.

Usually aerobic exercise (walking, jogging, swimming, etc.) is recommended for better diabetes control, but now it is recognized that resistance (strength-training) exercises such as weight lifting can also be beneficial in managing diabetes. In such cases, its best to use light weights with more frequent repetitions rather than using heavy weights.

Strength exercises help increase muscle mass and reduce fat mass. They help to increase upper body strength. Not all individuals can take up weight-lifting especially if they are senior citizens, have diabetes complications, have been sedentary or inactive for a long time, have a history of cardiac disease or are at an increased risk of developing cardiac problems. Hence, resistance exercises must be done with caution and only under the supervision of a qualified and trained fitness expert.

It is best to rule out any possibility of developing any complications by undergoing a complete medical examination before beginning any exercise that is vigorous/moderate in intensity or resistance training exercises. Vigorous exercises or high-intensity exercises like jogging, running, skipping, and weight-lifting should never be started suddenly after a long period of inactivity. Exercise or yoga must be started under the supervision of a professional trainer or an aerobic or yoga instructor as it can cause more harm than good to begin without taking adequate precautions or by simply reading books.

Walking is the safest and simplest form of all exercises and can be done as a part of daily routine. People with busy schedules, which leave no time for a structured exercise programme, can easily incorporate walking in their schedules.

According to the American Diabetes Association, “a graded exercise test may be helpful if a patient, about to embark on a moderate to high-intensity exercise programme, is at a high risk for underlying cardiovascular disease, based on one of the following criteria:

• Age >35 years
• Type-2 diabetes of >10 years duration
• Type-1 diabetes of >15 years duration
• Presence of any additional risk factor for CAD.
• Presence of microvascular disease (proliferative retinopathy or nephropathy including microalbuminuria).
• Peripheral Vascular Disease
• Autonomic Neuropathy.”

Exercise needs to be individualized according to each patient’s needs and circumstances.

Foot Care in Diabetes
Diabetic neuropathy develops as a result of uncontrolled blood sugars which damage nerves of the body. Wide fluctuations in blood glucose levels may precipitate nerve damage over a period of time. Development of neuropathy depends on many factors such as age, duration of diabetes, smoking and alcohol consumption.

Neuropathy is divided into two categories: Peripheral Neuropathy, which affects the limbs or extremities and Autonomic Neuropathy in which damage occurs to the nerves of internal organs.

Peripheral Neuropathy is the most common form of diabetic neuropathy. It affects mainly toes, feet and legs followed by arms, hands and fingers. Symptoms of peripheral neuropathy include:

1. Loss of protective sensation in arms, hands, legs and feet.
2. Sharp pain which may not be relieved by painkillers.
4. Tingling, burning or prickling sensation.
5. Insensitivity to hot and cold temperatures, and no feeling of vibration.
6. Extreme sensitivity to touch. Even the slightest touch of a bed sheet may be unbearable.

These symptoms may get worse at night. Peripheral neuropathy may result in muscular weakness due to degeneration of muscles (muscle atrophy) in the lower limbs and feet. Along with this, loss of reflexes especially near the ankles may affect the way a person walks. Foot deformities like hammertoes, bunions and claw toes may affect the shape of feet and require special footwear.

Any blisters and sores or even a minor injury to the feet of a neuropathic patient may not be felt and ulcers may develop, which if left untreated may cause foot infections and lead to gangrene. If the infection spreads to the bone, then amputation (surgical removal of limb) may become essential in order to save life! However, if treated on time this can be prevented.

Nerve damage may not present any symptoms initially and remains undiagnosed till it significantly affects the daily activities. As it progresses, it can reduce one’s ability to work and lead a normal life. Hence, it is best to nip the problem in the bud by getting treated early for diabetes neuropathy. Timely diagnosis and regular treatment helps prevent any disability by reducing the progression of neuropathy. The only way to prevent neuropathy is by controlling the levels of blood glucose, blood fats (cholesterol and triglycerides) and blood pressure.

Discuss the target blood glucose range with your doctor as it varies depending upon the individual’s condition. Very strict blood glucose control is not advisable for older people, people with a history of frequent episodes of hypoglycemia, those with multiple complications or with reduced life expectancy.

Exercising after insulin has been taken needs caution as the risk for hypoglycemia increases especially if exercise is done when the insulin is at its peak activity. In such a case, either reduce insulin dose before exercising or if insulin has been injected, check blood glucose before exercise.
**Tips for Foot Care**

1. Smoking increases the risk of diabetic foot complications as it reduces blood supply to the feet leading to circulatory problems. Hence, one must seek professional help to quit cigarette/tobacco smoke.
2. Check your feet daily for any cuts, bruises, corn or callus formation. Do not use any corn cap as it may cause infection. Corn or calluses should never be cut using blades, razors or callus removers. Consult a doctor for more advice.
3. Wash your feet daily with warm (not hot) water and a mild soap. Gently rub a pumice stone to smoothen corn or callus. Never rub it vigorously as it can tear out skin.
4. Do not soak your feet in warm/hot water. Do not add any antiseptic liquid to the water used for cleaning feet. Soaking feet for long can cause dryness of skin.
5. Inspect the bottom of your feet using a mirror. If you have poor vision, then ask your family members or friends to assist you in checking for any sores, cuts or injury to feet which may otherwise go unnoticed.
6. Check your feet, toenails and skin for any undesirable changes. Autonomic neuropathy is responsible for dryness of feet. Any redness or warmth felt on touching must be reported to the doctor. Dry, shiny and fragile skin with loss of hair indicates poor blood supply to the feet.
7. Fissures and cracks may develop in feet and legs due to dryness. These may further increase your risk for getting infections as dry skin is susceptible to bacterial invasion. Hence, a regular bathing or washing feet, dry skin gently with a soft towel and moisturise it using a good moisturising lotion. Keeping your legs and feet well-moisturized helps to reduce any chances of fungal infection. Keeping feet moisturized doesn’t mean keeping them wet or moist as this will only favour fungal growth. Also do not use lotion between toes as it favours bacterial growth.
8. Fungal infections are common in people who have diabetes or poor blood circulation especially in the extremities. Hence toenails must be checked for any fungal infection which may manifest as white or yellow streaks on the nails, brittle nails, pain and swelling in toes. Same symptoms can occur in fingernails also. Consult your doctor for appropriate medications for anti-fungal treatment.
9. Dry feet well after a shower or cleaning. Make sure to dry skin between the toes using a soft towel and by dusting talcum powder to prevent any bacterial/fungal infection.
10. Avoid walking barefoot even in your home. While visiting temples avoid going barefoot. Wear thick socks to avoid any injury to the feet and also to absorb sweat. Always check the inside of shoes for any stones or sharp objects before putting them on to avoid any injury.
11. People with peripheral neuropathy should NOT use hot water bottle/heating pads in winters as their feet loses protective sensation which may make it difficult to feel any temperature changes and can cause burn.
12. Trim toenails straight across and smooth them with a nail file or emery board. Never cut into the corners of toenails. If you have difficulty cutting nails due to vision problem or if the nails are thick or yellow, take help of a family member or caregiver.
13. Wear shoes that fit well, are comfortable, protect your feet, and also allow your feet to "breathe". Never wear shoes with pointed ends or high heels which put too much pressure on your toes.
14. Consult a podiatrist if any cut, bruise, blister or sore does not heal in a day.
15. When blood supply to the feet is reduced, make sure circulation is not obstructed. For this keep your feet up resting on a stool while sitting.
16. Do not cross your legs for a long time. Do not wear tight socks or elastic bands around your legs which may obstruct blood flow.
17. Check your feet often in winters to prevent frostbite. Wear woolen socks at all times if feet remain cold.
18. Wiggle your toes and move your ankles up and down to improve blood flow to the feet. Do this at least 2-3 times in a day.

**The risk doubles when the patient with diabetes neuropathy also has PVD (peripheral vascular disease).**

Peripheral vascular disease (PVD) reduces blood supply to the feet which reduces the chances of healing any injury caused to the foot. Patients with neuropathy must avoid weight-bearing exercises. Neuropathy increases your risk for getting foot infections and ulcers as there is loss of feeling or any sensation in the feet which may leave any cut, bruise or injury undetected. Any non-healing ulcer must be brought to the notice of a podiatrist (foot care specialist) to prevent foot amputation.

The risk doubles when the patient with diabetes neuropathy also has PVD (peripheral vascular disease). PVD reduces blood supply to the feet which reduces the chances of healing any injury caused to the foot. When blood supply to the feet is diminished due to poor circulation, any wound does not heal properly as blood nourishes the cells in the feet with oxygen and nutrients required for repair and regeneration of worn out cells.

Every diabetes patient must therefore make it a ritual to inspect feet daily for any cuts, bruises, corn or callus formation.

Diet, drugs and exercise are cornerstones in diabetes management. When it comes to diabetes, ignorance is not bliss. Being aware of your diabetes, gives you the power to control it. So, take charge of your diabetes now!

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