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Diabetes Mellitus**

A gentleman from Orissa attended our outpatient, late one Monday afternoon. He was 55 years old and had been a patient of diabetes mellitus for 6 years. He followed a diet “free of sugar” and took a tablet of Daonil before breakfast.

For the last 6 months he complained of burning of the soles of his feet, particularly excruciating at night. He noticed some puffiness around his eyes on rising from bed in the morning. He had last checked his blood sugars 9 months ago. On investigation, he was found to have a fasting blood sugar of 210mg% (normal <140mg%) and a post-breakfast level of 240 mg% (normal <200mg%). On examining his eyes with an ophthalmoscope, there were changes indicating early involvement of the retina, without causing impairment in eyesight. He was losing about 1.5 grammes of protein in his urine per day (normal <300mg)

This gentleman, like many others presents with uncontrolled blood sugars and an advanced phase of diabetes mellitus with damaged nerves, eyes and kidneys. These complications were largely preventable, though at present they are irreversible in part (like the kidney involvement in this case).

What is Diabetes Mellitus?

It is a disorder that involves the hormone producing part of the pancreas, leading to a partial or complete deficiency of insulin. There are essentially two varieties:

Type I and Type II. Type I is much less common in India (<5% of the total number of diabetic patients) and is associated with a near total lack of insulin at the time of presentation. It is characterized by a dramatic onset usually below the age of 30 years. Type II is the dominant form and usually comes on after the age of 30 years, though exceptions aren't infrequent. It is associated with urbanization, modern lifestyle and obesity. About 4% of rural adult Indians have Type II diabetes mellitus in contrast to 8-15% of urbanites. Type II diabetics have an incomplete insulin deficiency to start with and an additional element of 'insulin resistance', where the body's own insulin does not perform its function properly.

What are the symptoms of Diabetes Mellitus?

Thirst	Excessive passage of urine
Excessive hunger	Weight loss
Non-healing wounds	Increased propensity for infection (eg. urinary)
Weakness	Burning feet

Asymptomatic / Incidental: this group is ever increasing; in fact, above the age of 35 years one should be routinely screened for raised blood sugar at least once in 2 years.

What does the management of Diabetes Mellitus involve?

One needs to undergo a significant lifestyle modification to maintain good diabetic control. This involves a crucial triad of:

- Diet**
- Exercise**
- Drugs**

An absence or irregularity in one of these three leads to treatment failure. To protect the heart, kidney and eyes from damage, in addition to good blood sugar control, one needs to maintain these other parameters under control: -

	Therapeutic Modality
Cholesterol	Diet +/-Drugs (Simvastatin, Lovastatin, Atorvastatin)
Blood Pressure (<140/85 mmHg)	Drugs (‘ACE-inhibitors’: Enalapril, Lisinopril, Ramipril)
Smoking	Stop Smoking!!!

Once again, adherence to treatment reduces the complications of diabetes mellitus. Some physicians no longer refer to diabetes mellitus as a disease, *but call a combination of diabetes (blood sugar elevation), high blood pressure, cholesterol, truncal obesity (‘the paunch!’) and minimal urine protein leak:*

The Metabolic Syndrome.

Annual screening for complications should be done: -

- Eyes** - Ophthalmologist.
- Kidney** - check: Serum Creatinine, urine microalbumin (Laboratory tests).
- Nerve** - check: vibration sensation and ankle reflexes (Physician’s examination).

How often should one check blood sugars?

Following detection, as diet control is established and the dosage of tablets increased, the physician monitors sugars frequently, till tight control is achieved. Thereafter, *if sugar control and other components of the metabolic syndrome are satisfactory, monitoring once in three months is adequate.*

Monitoring blood sugar control.

A special test called *glycosylated haemoglobin (HbA1C)* indicates the average control over three months, this is useful since on the given day of checking blood sugars, the sugars themselves may be normal and may not give the true picture of happenings over the last three months.

Patients on several medications and especially those on insulin can check their own blood sugars at home using an instrument called a **glucometer**. This measurement can be obtained at any time of the day. In case of symptoms of a low blood sugar, an approximate confirmation can be obtained. Alternatively, **strips with a colour coding system** can be utilized, this being much cheaper. Urine sugars that are commonly used for monitoring diabetes, are unfortunately very often inaccurate and frequently misleading.

What are the tablets utilized in treating diabetes mellitus?

<i>Tablets (Oral hypoglycemic agents)</i>			
<i>Group</i>	<i>Example</i>	<i>Advantages</i>	<i>Side Effects</i>
Biguanides	Metformin	May induce weight loss No hypoglycemia	Nausea, diarrhoea (in <10%)
Sulphonylureas	Glybenclemide Glipizide Gliclazide		Hypoglycemia Mild Weight gain
	Glimepiride	Weight neutral Less Hypoglycemia	
Metaglinides	Repaglinide Nateglinide	Minimal Hypoglycemia Can use in renal failure	
Alphaglycosidase Inhibitors	Acarbose	No hypoglycemia	Diarrhoea/bloating
Thiazolidinediones	Rosiglitazone Pioglitazone	No Hypoglycaemia Can use in renal failure	Leg swelling Mild Weight gain Precaution : Avoid in Liver disease

What are the symptoms of a low blood sugar (“Hypoglycemic attack”)?

When on medications like insulin or sulphonylureas, blood sugars may drop below normal, especially when diet and exercise are incompletely balanced against the medication dosage. The patient may have:

- Weakness*
- Perspiration*
- Palpitations*
- Light-headedness*
- Hunger*
- Drowsiness*
- Coma/convulsions (rarely)*

A mild attack of hypoglycemia, once in two weeks is common in well-controlled diabetes mellitus, but more frequent attacks may go unrecognized. A diabetic on medications or insulin should always carry some sweet foodstuffs on his/ her person to counter a hypoglycemic attack.

When should insulin be used?

Inability to control sugar with the maximum dose of tablets. Advanced complications of diabetes (eye, kidney, nerves, heart). Before a surgical procedure in the presence of an infection. Pregnancy

How should insulin be administered?

Hygienic precautions should be employed. A disposable syringe and needle is best utilised. An instrument resembling a ballpoint pen with a much finer needle is now available, Novopen / Humapen reducing the discomfort and minimizing pain. Injection can be injected over the front of the abdomen, arm or thigh. But the abdomen is best utilised since there is a wider area to use, absorption is more predictable and absorption is rarely altered by physical activity. Most patients on insulin require a twice-daily dosage. Only a few can be managed with a single dose.

What extra attention does the feet require in diabetes mellitus?

The feet are prone for injury and infection in a diabetic patient for a number of reasons: -

- Decreased sensation* - due to nerve damage
- Decreased circulation* - due to blocked blood vessels
- Poorer immunity*
- Loss of the normal arch of the foot* - due to loss of 'joint sensation' causing subconscious damage
- Decreased moisture* - due to impairment of nerves supplying the sweat glands.

To prevent infection and severe damage to the feet it is important to: -

Wear *soft footwear* with a proper fit and sole. (Eg. Microcrepe Rubber Footwear)

Keep the feet *clean and dry* at all times

Examine the feet daily in *between the toes* to look for fungal infestation

Cut nails carefully and *horizontally* without injuring the adjacent nail bed.

Conclusion

Diabetes mellitus is a disorder that has reached epidemic proportions in the community. Good control of blood sugars in association with weight, blood pressure and cholesterol ensures a healthier and longer life.

The Importance of Foot Care in Diabetes Mellitus

Diabetes mellitus is a major public health problem and this goes without saying, the people's awareness is increasing in leaps and bounds.

When one talks in terms of poor blood sugar control- a high blood sugar by itself is surprisingly responsible for symptoms only in a small segment of the population. You are probably aware of this by now: too much urine, excessive thirst and excessive hunger.

However, it is often understated, that more pressing problems emerge in a silent fashion rather than in a sudden catastrophic manner. The complications of diabetes that occur in a gradual manner are in the form of three "pathies":-

Retinopathy (the eyes), nephropathy (the kidneys), vasculopathy (the blood vessels: thereby the heart, the brain and blood vessels to the legs) and neuropathy which involves the nerves.

Let me tell you how the feet are involved in diabetes. As I mentioned above, there may be involvement of the nerves in diabetes and this in fact the most common complication. The onset is silent initially and subtle and may be picked with the doctor checking for vibration sensation with a tuning fork or a special instrument called a biothesiometer which is available in large institutions like CMC, Vellore and/or with a special monofilament fiber.

Symptoms may occur only later on; these may be in the form of a sensation of 'pins and needles in the limbs, or a burning sensation or numbness with a loss of normal sensory perception in the feet.

The nerves which supply the sweat-producing glands in the skin also get involved and this leads to dryness of the skin and loss of the normal lubrication.

Picture things in the right perspective now: if sensation is lost and the skin is dry, if you were to walk around barefoot, you are more likely to have injury to the soles of your feet without knowing about it.

Diabetes also affects your ability to handle germs and infection, as a result of impairing the body's immune system. Thus, if you develop a non-healing wound under the sole of your foot and if a minimal amount of dirt contaminates it, you are more likely to develop a serious infection which may take a long time to heal- even the response to antibiotics may be slower than normal. The infection may spread up the leg and may get into the blood stream, endangering not only the limb, but also life.

Additionally, in some diabetic patients, circulation may pose a problem to the limbs, further impairing the ability for an ulcer to heal. If circulation is extremely poor, one of the problems encountered is that of progressive death of the limbs leading to what is known in common terms as gangrene.

I am not telling you all this just to scare you! It is the right of the individual to know as to what potential problems he or she may encounter when he has a certain disease. It is also important to know as how to prevent complications, before they occur, since prevention is better than cure.

One of the cardinal recommendations is to avoid walking barefoot at all times when a person has diabetes- even when inside the house. This will reduce the risk of ulceration multifold. If there is even early impairment in nerve function in the feet, it may be necessary to recommend footwear made out of a special material called microcellular rubber (MCR). One has to be very cautious while purchasing microcellular rubber footwear- there are a lot of imitation products in the market. The problem with these imitation products is that they are extremely soft and even though they appear to feel very comfortable while walking, since they are so soft, the foot actually makes more contact with the hard ground, increasing the liability for trauma to the sole.

Maintaining moisture over the surface of the limbs is also important. Soaking the feet twice a day for 15 minutes in cool or lukewarm water is a good practice. Drying the feet after this is important. It is important not to use hot water which may result in blister formation especially if sensory perception is lost.

Self-examination of the feet is also important on a routine basis, checking in between the toes and looking for fungal infestation is a simple process, the infestation if present is easily treatable with application of an antifungal cream for a period of 6 weeks.

Cutting the toenails and keeping them clean is important. While cutting the edges of the toenails, it is important not to cut them too close to the skin as it may lead to injury and also the tendency to develop in-growing toenails later on.

If, perchance, corns or callosities develop on the undersurface of the feet, it is better to have them attended to by a skilled dermatologist or a diabetic foot specialist or a surgeon. Self treatment is not advisable since it may lead to injury, ulceration and infection.

In conclusion, proper foot care is an important part of good diabetes management- as important as diet, exercise and medications.

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