

The Pancreas, Pancreatitis and Pancreatic Diabetes

This article aims at providing the readers a general idea about the important organ in our body, the pancreas, and some of the diseases that commonly affect this organ. To give clarity to the ideas and to dispel common misconceptions about these diseases, I am trying to present the information in a questions and answers format.

What is the pancreas?

The pancreas is a small organ, deeply seated in the posterior part of the abdomen, across the vertebral column at the level of the upper abdomen. It is approximately the size of a finger.

What are the main functions of this organ?

The pancreas is composed mainly of two types of tissues, the acinar tissue and the islets of Langerhans. The acinar tissue secretes a fluid, which is commonly known as the pancreatic juice. The pancreatic juice contains certain chemical substances known as enzymes. These enzymes mix with the food in the upper small intestine and break it down to simpler substances that are easy to absorb into the blood stream. In other words, the pancreatic juice has an important function in the digestion and absorption of the food we take.

The islets of Langerhans (named so after the scientist who first described these), secrete certain other chemicals by name hormones. The most important of these hormones are insulin and glucagon. Insulin helps to keep the blood sugar levels within normal limits when they go up and glucagon opposes this action by raising the blood sugar levels when they fall below normal. Maintenance of normal blood sugar levels is very vital for the optimal performance of the brain and other organs.

If the pancreas does not function effectively, what will happen?

From what was said earlier, it is clear that when the pancreas malfunctions, two events would result. Firstly, due to deficient production of digestive enzymes, the food we take is not properly digested and assimilated. Secondly, due to relatively lower levels of insulin secreted by the pancreas compared to the secretion of glucagon, the blood sugar tends to rise high. This state of high glucose values in the blood is known as diabetes mellitus.

What are the causes for malfunctioning of the pancreas?

There are a few causes for this. The commonest among these is a disease known as pancreatitis. Another important cause is cancer of the pancreas.

How serious are these diseases?

Pancreatitis may be acute, or chronic. That is, in acute pancreatitis, the patient develops an attack of pancreatitis rapidly, and it lasts for a few days to weeks, and then the disease subsides. After the acute attack, the pancreas returns to normal, healthy state. However, in a small number of patients, the disease can become serious and can, even lead to death. Occasionally, the acute attacks could recur. Chronic pancreatitis, on the other hand, is an ongoing, progressive disease, in which the pancreas does not return to normalcy.

What are the symptoms, or manifestations of pancreatitis?

In acute pancreatitis, there is sudden inflammation or destruction of the pancreatic tissue, leading to pain in the upper abdomen. The pain is usually moderate to severe. It is usually continuous and lasts for a few days. In the vast majority, the pain subsides after a few days and the patient makes a full recovery. In complicated cases, there may be fever, vomiting, fall of blood pressure, respiratory and urinary problems, or even heart failure. Fortunately, such complications are not common.

In chronic pancreatitis too, there will be pain. But this pain is more chronic, mild to severe, usually in the upper abdomen, radiating to the back, and is aggravated by food. There may be episodes of pain over several days, with pain-free intervals of weeks to months, or even years.

In addition, due to the destruction of pancreatic tissue and deficiency of insulin secretion, the patient may develop diabetes mellitus. The symptoms of diabetes mellitus are weakness and fatigue, infections, excessive thirst and urination and a dry tongue, etc. Uncontrolled diabetes can lead to weight loss. Uncontrolled diabetes could produce, over the years, complications such as eye and kidney damage, or even increased proneness to heart disease.

Deficiency of digestive enzymes secreted, as a result of damage to the pancreatic acinar (glandular) tissue could cause maldigestion and malabsorption, leading to diarrhoea, wasting, tiredness, and vitamin deficiencies.

What are the causes of pancreatitis?

In developed countries such as U.S.A., European countries, Japan and others, the predominant cause of chronic pancreatitis is the abuse of alcohol. A common cause for acute pancreatitis, apart from alcohol, is gallbladder stones that may come down and block the opening of the pancreatic duct, that is, the small tube that carries the pancreatic juice into the intestine.

There are some less common causes of pancreatitis such as the adverse effects of some drugs, increased calcium level in the blood, markedly raised triglycerides (a fraction of fat) in blood, trauma, hyperparathyroidism, etc. In certain number of

patients in these developed countries, say about 20 to 30 per cent, no obvious cause may be there to explain the pancreatitis. This group is known as idiopathic pancreatitis.

You did not tell us about the common causes of pancreatitis in our country and other developing countries?

Yes, I am coming to that. We do have gallstones as the cause of acute pancreatitis, but this is much commoner in northern India, compared to the south. Alcohol is certainly a cause for chronic pancreatitis in India and the developing world, but not as common as in the developed world.

We encounter in our country another form of pancreatitis that is not seen in the western world, which is generally known as “tropical pancreatitis”.

Sounds interesting. Could you elaborate?

Certainly. For that, I will have to take you back to about fifty years. Around the late fifties, a doctor named Zuidema in Indonesia noticed a few young people with diabetes mellitus, who were severely malnourished and who had calcification or stones in their pancreas.

How do you detect stones? And what does it mean?

During those days, stones in the pancreas could be detected only by X-Rays. However, later, ultrasound scan and CT scan came in vogue and these are far more sensitive than X-Rays to detect stones that contain calcium. To answer the second part of your question, stones are never seen in a normal pancreas. If you see stones in the pancreas, that means it is a diseased pancreas, usually as a result of a chronic pancreatitis.

The patients Zuidema described were special in that none of them were alcoholic. Similar patients were described, within a short period, from some of the African countries. Towards the early sixties, a large number of such young subjects with malnutrition, diabetes mellitus, pancreatic stones and pain from pancreatitis were described from the state of Kerala by the late Dr. P.J. Geevarghese, whose contributions in this field were outstanding. Over the next few years, cases resembling these were reported from many other countries such as Sri Lanka, Indonesia, Thailand, Malaysia, African countries such as Uganda, Kenya, and Brazil in South America. The peculiarities of these patients were that they were all young (children or adolescents) unlike the middle-aged alcoholic patients), non-alcoholic, without gallstones, and malnourished and severely diabetic needing large doses of insulin for diabetic control. Many of them used to die from diabetic complications in their thirties and forties. Because all the countries affected came within the tropical region, this disease was nicknamed “tropical pancreatitis”, and because there was gross undernutrition, many doctors called this “nutritional pancreatitis” (caused by nutritional deficiency).

However, though there is a strong association of the disease with undernutrition, the latter as a cause of the disease has not been proven yet.

You said that large numbers of patients were described from Kerala. How about the disease occurring in other parts of India?

Most of the patients described in the first few years were from Kerala. There were more than one member affected by the disease in some families. This gave speculation that the disease has a familial occurrence and that probably it has a genetic predisposition. However, the tools for genetic studies had not been developed yet, and only a few family pedigree studies were done.

Subsequently, cases were reported from Orissa, some parts of Tamilnadu, Karnataka and Andhra Pradesh. However, the disease used to be very rare in North India. In recent years there have been reports from many North Indian states as well.

Are there any other peculiar factors described to explain the high prevalence of the disease in the Kerala population?

An interesting early observation was that many of the patients who developed this disease were from poor socioeconomic status and that they often consumed tapioca as a staple diet. We should remember that in India, Kerala is the state where there is the highest consumption of tapioca. Further, the disease of tropical pancreatitis had a high predilection for countries where tapioca was being consumed as a major food item, for example, Indonesia, Thailand, African countries and Brazil. The hypothesis was that tapioca contains very little protein, thus causing protein deficiency and also the toxins (cyanogens) it contains might be injurious to the pancreatic cells. However, the few human and animal studies conducted have not been able to substantiate this hypothesis.

One of the current hypothesis is that the deficiency of some of the essential vitamins such as Vit. A, Vit. E and trace elements such as selenium, copper and zinc might have a contributory role in the causation of the disease.

Has the disease a genetic background?

During the last few years, with the availability of genetic testing methods, some genetic mutations have been linked with the disease in the West. There are a few early reports of a genetic mutation observed in patients with tropical pancreatitis (SPINK 1 gene and CASR genes). However, present indications are that these genetic mutations are unlikely to cause the disease by themselves, and are more likely to do so as a result of interaction with certain environmental factors.

Has there been any change in the pattern of the disease over the years?

Yes. Over the past few decades, the disease occurrence has shifted to adults, rather than children and adolescents. It is slower in progression, and malnutrition is not universal. The disease has been described even in other states in India where tapioca is not consumed. We do not know yet whether there are other food toxins operative in these regions.

How do you diagnose chronic pancreatitis?

The typical history of pain, the demonstration of pancreatic changes and stones on X-Ray, ultrasound scan, CT scan, MRI, or by a test known as ERCP, endoscopic ultrasound (EUS) and also pancreatic function tests help to diagnose the disease. In addition, a large number of these patients may be diabetic. This can be diagnosed by blood sugar tests.

Are there any complications for this disease?

There are some complications such as a cyst formation (pseudocyst), bile duct block, or rarely, even cancer of the pancreas. Cancer of the pancreas may complicate chronic pancreatitis of long duration in a small minority of patients. It is then a serious condition with rapid progression.

What is the treatment for pancreatitis?

For acute pancreatitis, we give medications and injections for pain, intravenous fluids and nutrients, antibiotics for infections and other supportive measures.

For chronic pancreatitis, again, medicines orally, or by injections for severe pain, are given. Diabetes has to be treated with dietary regime, regular exercise, oral antidiabetic drugs or insulin injections. Diabetic complications have to be looked for, detected and promptly treated. Good control of diabetes is essential.

The deficiency of digestive enzymes has to be corrected by giving enzyme supplements, which have to be taken regularly with meals.

Regular consultation with a doctor is essential.

What is the place for surgery?

Surgery is reserved for patients with severe, intractable pain not responding to medication and when it interferes with day to day life and also when there are complications such as pseudocysts, bile duct obstruction, or suspicion or presence of pancreatic cancer.

There are two types of operations – one is creating a drainage of the pancreatic duct by creating a by-pass, and another is resection of a portion of the pancreas.

Can removal of stones by surgery cure the disease?

No. There are many causes for the pain, and obstruction by stone is only one of them. So, mere removal of stones may alleviate the pain for sometime but will not cure the disease.

Are there any alternate methods of treatment?

In certain selected patients, endoscopic treatment is advised. Many of the stones are removed endoscopically and a tube (stent) is placed in the pancreatic duct for better drainage. This brings relief for some time.

In some patients, pain relief for short periods are obtained by doing a nerve block or nerve resection.

Are there any research studies being undertaken in this field?

Our group and many other groups have been engaged in research about the various aspects of tropical pancreatitis including its causation for many years and have published several scientific papers. We are currently doing research on this disease at Amrita institute of Medical Sciences, Kochi, and have a few ongoing research projects in this area. We conducted a National Workshop on Tropical Pancreatitis/FCPD in December 2004 at Amrita Institute in which pancreatologists, diabetologists and pancreatic surgeons from all over India and a few from abroad participated where various aspects of the disease were discussed. A national prospective multicenter study on Pancreatitis in India was started, the "Indian Pancreatitis Study". The Indian Pancreatitis Study group (IPANS) consists of thirty-two major centers from all over India. The IPANS has a website www.ipans.org and an online pancreatitis registry. IPANS has published a book "Chronic Pancreatitis and Pancreatic Diabetes in India". The book is freely accessible through a link on the IPANS website. The mission of IPANS is to identify the risk factors for pancreatitis in India and try prevent the occurrence of this disease.

IPANS

The Indian Pancreatitis Study

Coordinating Center: Amrita Institute of Medical Sciences

Cochin- 682026

Website: www.ipans.org