DiabetesWatch

A publication of the PHILIPPINE DIABETES ASSOCIATION for the Filipino diabetic patient

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Which Type of Diabetes Mellitus are You?

Diabetes mellitus is not a single disease. It is a group of similar diseases whose common denominator is high blood sugar. Thus, there are several types of diabetes. Here, are some of them.

Type I, or Insulin-Dependent, Diabetes appears suddenly, most often in the young. Most cases are discovered when the patients are very ill, in what is known as acidosis. The manifestations are severe because this type of diabetes occurs when the beta cells of the pancreas are damaged to the extent that little or no insulin is produced. Thus, type 1 diabetic patients need daily insulin injections to survive.

Type II Diabetes, also called Non-Insulin Dependent, is the more common form and probably accounts for 90% of all diabetes. Its onset is gradual, the destruction of the beta cells of the pancreas is not total, and some insulin continues to be produced. This is the type of diabetes where pills work, although insulin may be prescribed in certain instances. This form of diabetes is usually subdivided into Type IIa and Type IIb, clinically recognized as the non-obese and the obese.

Gestational Diabetes is seen in pregnant women who did not have the disease prior to pregnancy. The diabetes often disappears after delivery, although permanent diabetes often follows within 10 years.

Impared Glucose Tolerance was formerly called 'latent' or 'chemical' diabetes. The blood sugar levels of this group of patients lie between the normal and diabetic values. Patients who belong to this group are at greater risk to develop cardiovascular problems than the normal population, although their eyes and kidneys do not suffer from the same fates as those of the diabetic group. However, some people with this condition eventually become diabetic.

Secondary Diabetes can be induced by drugs or chemicals. As such, the disorder will go away with appropriate therapy. However, some diseases can affect the pancreas to the extent that the beta cells may be damaged extensively to result in permanent diabetes. (ADL)

SUGAR SUBSTITUTES OR ARTIFICIAL SWEETENERS

Sweeteners have been part of the story of diabetes mellitus ever since, justifiably or otherwise. The earlier ones came in the form of SACCHARIN and CYCLAMATES. They were non-nutritive (had no food value) and therefore had no effect on blood sugar levels. Saccharin has been in use since 1879 while cyclamate was discovered in 1944.

In 1969, with what many toxicologists and food manufacturers regarded as ill-considered haste, the use of cyclamates was suddenly banned in the United States. This came about following the observation that oral cyclamates given at a daily dose of 400 mg/kg *over the lifetime of experimental rats* produced cancer of the urinary bladder in 60% of the cases. The safe dose established for rats was 240 mg/kg while that for man was 2.4 mg/kg. The rats therefore received quantities 50 times the dose considered safe for humans.

Sucaryl tablets used to contain 50 mg cyclamate and 5 mg saccharin. Cyclamated foods in the USA used to contain 50-400 mg cyclamate per serving while soft drinks contained 200-700 mg per bottle. A 150 lb man therefore must drink 500 eight-ounce bottles per day over his lifetime to get the same dose as caused cancer in rats. There has been no documented proof so far of cyclamate carcinogenicity in man since its discovery in 1944.

The International Diabetes Federation in 1971 recommended that cyclamates continue to be available on medical advise, that the upper limit of dosage be fixed at 50 mg/kg/day, and that no adult use more than 20 tablets per day and no child more than 10. Cyclamates are not recommended in pregnant women.

Saccharin was not spared the fate of the cyclamates. Studies showed that long term administration of saccharin to rats resulted in no adverse effects with the use of *1% solutions*, but with *5% solutions* cancer of abdominal organs was found to be unduly common. Implantation of saccharin pellets in the urinary bladder of the rats led to the development of cancer.

In 1970, the United States Food and Drug Administration stated that on the basis of available information, the use of saccharin did not pose a hazard to human beings. The proposal to recommend limitation on the amount of saccharin in the diet appeared in the Federal Register of the USA in June 1971 in accord with a recommendation to the US Food and Drug Administration by the National Academy of Sciences/National Research Council and became effective in February 1972. Earlier, the British Diabetic Association recommended a maximum of 11-14 tablets a day for adults.

In the USA, the Delaney Clause makes it illegal to incorporate in food any substance that has been found to induce cancer in animals.

Subsequently, as a result of a 1977 Canadian experiment in which an increased incidence of bladder cancer was found in the second generation of rats *fed with massive (5%) doses of saccharin*, the FDA proposed a ban on the substance. The equivalent dose in humans would be about 700 cans of diet soda daily. Because of public outcry against the ban, a moratorium was placed on its potential banning extended to June 1981. On August 14, 1981 Pres. Reagan signed S.1278, a bill to extend the availability of saccharin to the public for 24 months (to June 30, 1983). Subsequent studies have not clarified the situation and there is no evidence yet suggesting clear-cut danger due to moderate use, although the American Diabetes Association recommends caution in its use among pregnant women and suggests the imprudence of large amounts for young children.

(Continued on page 4)

HIGH BLOOD SUGAR IS POISON !

What happens if hyperglycemia (high blood sugar) is allowed to go uncontrolled for a long period of time in an organism? It leads to sugar toxicity and this can be manifested in the following conditions:

Cardiovascular diseases:

High blood sugar levels in the diabetic favor the formation of atherosclerosis and large and small vessel disease (macro and microangiopathy) because (1) the ability of platelets to clump or aggregate and to stick to damaged walls of blood vessels is enhanced. (2) the fibrinogen level (precursor for the formation of a factor for blood clotting) is elevated in the circulation (3) there is an increase in the viscosity or "thickness" of the blood, all brought about by the high blood sugar. These effects in association with other risk factors such as hypercholesterolemia, high blood pressure, excess weight and smoking account for the high incidence of heart attacks and strokes in the diabetic as compared to the normal person.

The white blood cells (known as soldiers of the body against infection) lose their protective function (decreased phagocytosis) because of high blood sugar and together with the deposition of cholesterol plaques in the walls of blood vessels, gangrene of the lower extremities (Fig 1) with or without superimposed infection is about five times more common in the diabetic than in the normal individual.

Retinopathy:

The presence of high blood sugar favors the formation of hemoglobin a_1c in quantities above normal. The oxygen from this molecule is released inadequately leading to oxygen debt in tissues like the retina. This has been implicated as a triggering factor in the formation of new vessels (neovascularization) in the retina. These blood vessels cause hemorrhage and retinal detachment that can lead to blindness.

The membrane of the red blood cell may also be affected by a high blood sugar environment such that it loses its ability to change its shape as when passing through a very small blood vessel. This contributes to the microcirculatory block and poor tissue oxygenation.

The development of diabetic retinopathy is directly related to the duration of diabetes. It rarely occurs in the first few years of diabetes but by ten years, approximately 50% of the patients have some degree of retinopathy. By 20-25 years, approximately 90-100% of the patients have some degree of retinopathy visible with the ophthalmoscope. The progression of diabetic retinopathy can be divided into:

1. Non-proliferating or background retinopathy: This consists of microaneurysms, exudates and venous dilatations confined to the retina.

2. Proliferative retinopathy: This is characterized by new vessel formation extending into vitreous, vitreous and pre-retinal hemorrhages, fibrous proliferation, vitreous retraction and retinal detachment.

There is a high incidence of cataract formation in the diabetic. Again high blood sugar favors the formation of sorbitol (sugar alcohol), in the presence of an enzyme aldose reductase, present in the lens of the eye. This sugar alcohol attracts water, thereby causing the lens to swell with subsequent formation of fibrous tissue.

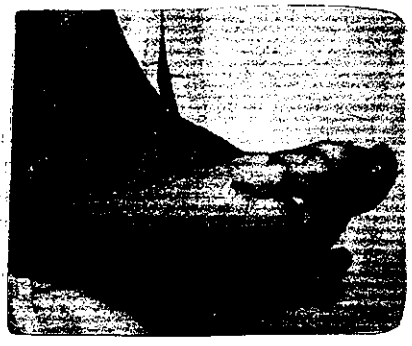

Figure 1 — Diabetic Gangrene

Figure 2 — Third nerve paralysis

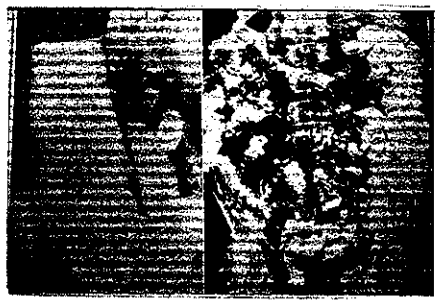

Figure 3 — X-ray of a dilated stomach, left; X-ray of small intestines, right

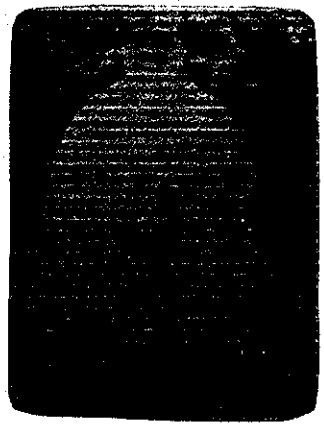

Figure 4 — X-ray of a dilated urinary bladder

Neuropathy:

1) Occlusion of the small blood vessels supplying the nerves and

2) The sorbitol pathway described above have been implicated as causes for the neuropathy seen in uncontrolled diabetes. The earliest signs are numbness, tingling sensations, and "needles and pin-prick" sensations of the lower extremities, pain and loss of vibratory sensations. Nerves supplying the muscles of the eye (Fig 2), stomach (Fig 3), small and large intestines, and the urinary bladder (Fig 4), may also be affected (paralysis of the III cranial nerve, nocturnal diarrhea, impotence and urinary bladder retention.)

Nephropathy:

The thickening of the basement membrane of capillaries supplying the glomerulus of the kidney, and proliferation of the mesangium are all direct effects of high blood sugar as well as its duration (Fig 5 & 6). While there may

be no obvious symptoms of kidney failure during the early years following the onset of diabetes, one has to be on guard for the development of swelling of the ankles, presence of protein and/or red blood cells in the urine signaling the destruction of more nephrons (the functioning unit of the kidney)

The clinical stages of diabetic nephropathy can be divided into 3 stages:

Early Stage

First 10-15 years of diabetes

A. Asymptomatic
B. Intermittent albuminuria
C. Microscopic hematuria – 5-10 RBC/HPF
D. Waxy or granular casts

Middle Stage

2-10 years duration

A. Nephrotic Syndrome
   1. Persistent albuminuria
   2. Hypoalbuminemia
   3. Edema
   4. Lipiduria
   5. Hyperlipidemia
   6. Hypertension
   7. Mild azotemia

Late Stage

1-2 years duration

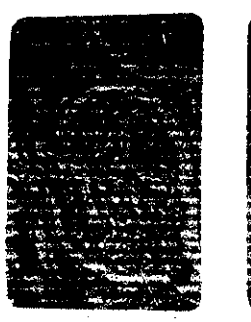

Figure 5 – Arteriosclerosis in diabetes

Figure 6 – Nodular glomerulosclerosis in diabetes

A. Chronic renal failure
   1. Uremia
   2. Anemia
   3. Neuropathy
   4. Congestive heart failure
   5. Pleural and pericardial effusion
   6. Acidosis
   7. Death

Pregnancy:

Uncontrolled diabetes during pregnancy is disastrous to both conceptus and mother because of the increased incidence of miscarriages, still births, big babies, babies with congenital defects and dystocias. It may aggravate retinopathy and nephropathy and may also induce weight gain and toxemia.

While we may not be able to solve completely all the complications of diabetes mellitus, it is worthwhile to attempt to keep the blood sugar as near normal as possible. More and more clinical studies now support the concept that good control of blood sugar lessens or slows down the development of the above diabetic complications. We try to aim for a normal blood sugar throughout the 24 hour period. During pregnancy, very strict control is necessary to prevent perinatal and maternal complications. (LCL)

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Artificial sweeteners . . .

(Continued from page 1)

The use of FRUCTOSE – a carbohydrate – has a very long history. As a sweetener it has to be taken in approximately the same amounts as sucrose or table sugar. It is eventually converted to glucose. Its use as a sweetener for diabetics may not be advantageous and is considered unwise.

Other nutritive sweeteners have lately come into the picture: SORBITOL, XYLITOL, and the most recent ASPARTAME. Sorbitol again is metabolised to fructose and therefore poses the same problems as fructose. Besides it significantly causes diarrhea. Xylitol also causes diarrhea and little information is available on its effects after long term administration in man. In animals, long term feeding has been associated with induction of tumors.

In 1981 the US Food and Drug Administration approved ASPARTAME as a low calorie sweetener. It is a product made up of two amino acids one of which is phenylalanine, a substance contraindicated in a rare hereditary disease called phenylketonuria.

None of these sweeteners can be recommended without reservations and the most serious gap in our knowledge is the lack of information as to the long term effects of their use by diabetic subjects.

It is important to weigh the possible hazards against the benefits to be derived from the use of artificial sweeteners. We must accept that they could be useful adjuncts in diabetic management since some patients could pose big problems in so far as feeding is concerned. It is difficult enough to induce fat diabetics to follow reducing diets. Artificial sweeteners may help make these diets appealing. But certainly they should be used only on advice of the physician, and the daily intake should be kept at a level where in the opinion of the physician it is necessary to keep nutrition optimal.

Artificial sweeteners certainly are not an essential part of dietary treatment. But when patients are notorious for their inability to adhere to given dietary prescriptions, small amounts would seem justified as an inducement to better dietary adherence. It would seem prudent to be cautious in their use, however, pending further studies by responsible agencies and institutions. (REF)