DIABETES AND BLINDNESS IN KENYA: A chronic disease of nutrition in transition

By Dr George Omolo Rombo (BSc, MSc, Post Grad Dip Ed, PhD), Lecturer in Food Biochemistry, Processing and Safety, Department of Foods, Nutrition and Dietetics, Kenyatta University, P. O. Box 43844, Nairobi.

Mobile 0723 161 865, E-mail gomolor@yahoo.com

and

Margaret Muoki, (BEd, MSc) Research Assistant, Department of Foods, Nutrition and Dietetics, Kenyatta University, P. O. Box 43844, Nairobi.

ABSTRACT

Objective: To determine the extent of diabetes as a chronic disease in Kenya and relate it to incidences of blindness in the country.

Data source: Literature review from archives, hospital records, newspapers, peer reviewed journals and books.

Data selection: What do the experts say as reported in the journals and newspapers?

Data extraction: Journals, Archives, Ministry of Health, Hospitals, Newspaper reports.

Discussion: Healthy lifestyles and diet can help reduce diabetes. People with high risk of developing Type 2 diabetes can reduce their chances of getting the disease by up to 50 per cent if they loose as few as 4 kg through exercise, for example.

Conclusion: Diabetes is characterized by increased blood glucose concentrations. These are regulated by a loop comprising two components, the insulin-secreting β-cells of the
pancreas and the insulin sensitive tissues such as the liver, muscles and adipose tissue which respond to insulin.

WHAT IS DIABETES?

A person with diabetes has a condition in which quantities of glucose in the blood is too high (hyperglycaemia). This is because the body does not produce enough insulin, produces no insulin, or has cells that do not respond properly to the insulin produced by the pancreas (Ngetich, 2010). The long term effects of diabetes can be devastating—nerve damage, blindness, kidney failure and cardiovascular disease (Underwood, 2003).

Diabetes is a general term for diseases characterised by excessive thirst and urination. Why is it called a chronic disease? Diabetes is a chronic disease because it is non-communicable unlike diarrhoea, malaria, polio etc. Usually refers to diabetes mellitus. It is characterised by elevated sugar levels in the blood and in urine. A fasting glucose level of 7.0-µmol/L is considered normal while higher suggests diabetes. The normal sugar level in the blood is regulated by the hormone insulin which is produced in the islets of Langerhans in the pancreas (Atkinson and Maclaren, 1990: Arredondo, Jorquerra, Carrasco, Elbala and Hertrampf, 2007). Diabetes is the fifth largest killer disease in the world and with the modern lifestyles, it is likely to take more casualties with it (Lati, 2007; Ngirachu, 2008).
DIABETES IS A DISEASE OF AFFLUENCE

The prevalence of diabetes rises dramatically with industrialisation and concomitant rise in obesity and sedentary (lifestyle with minimal physical activity) lifestyles in developing countries (Wylie-Rosett and Vinicor, 2001). In Kenya, for example, the rapid rise in type 2 diabetes since independence has been attributed to change from high fibre
traditional foods such as cassava, sorghum, millet, vegetables and etc to more refined Western diets such as sifted maize meal, polished rice, white bread etc (Thorburn, Brand and Truswell, 1987; Maina, 2007). Over 90 per cent of diabetes patients suffer from type 2 diabetes which is more common in people 30 years of age or more (Ngetich, 2010). The consumption of foods with low glycemic index (GI), or high in soluble fibre like legumes, improves blood glucose and lipids in people with type 2 diabetes (Brand, Colagiuri, Crossman, Allen, Roberts, and Truswell, 1991; Frost, Wilding and Beecham, 1994).

The GI of commercially available breakfast cereals varies over a 2 fold range, from 120-130 for low fiber corn and rice cereals to almost 65 for psyllium-enriched, high fiber cereals (Foster-Powell, Brand-Miller, 1995; Wolever, Vuksan and Eshuis, 1991). Removal of fibre during modern processing of cereal foods could also be a major cause of diabetes type 2 in developing countries (Tsilias, Gibbs, McBurney and Wolever, 2000).

Rapid urbanisation of indigenous populations may also lead to rapid increase in incidences of diabetes. Between 10 and 35 per cent of urbanised Australian Aborigines and Pacific Island populations develop diabetes compared to only 3 per cent among native white populations (American Diabetes Association, 2000; Sboros, 2001). Similar effects were displayed by Falashas (or Black Jews) airlifted from Ethiopia to Israel during the great hunger of early 1980s. These migrants had a rapid diet change from high fibre injera and vegetables in Ethiopia to highly refined low fiber diet foods in Israel and over fifty per cent developed type 2 diabetes (NIDDM) within a year or so (Hales, 1994).

**Diabetes Mellitus.** A chronic disorder of carbohydrate metabolism, characterized by hyperglycemia (high sugar concentration in the blood) and glycosuria (high sugar concentration in urine) and resulting from inadequate production or utilisation of insulin (Taber’s Cyclopedic Medical Dictionary, 1993). Persons fulfilling these conditions are not a homogeneous group. Diabetes mellitus is classified according to two syndromes: Type I, or insulin-dependent diabetes mellitus (IDDM) and Type II, or non-insulin-dependent diabetes mellitus (NIDDM) see figure 1 above.
In Type I, the patients secrete little or no insulin. Delivery of an insulin encoding gene into diabetic rats and mice has helped them regulate their blood glucose levels (Olefsky, 2000; Lee, Kim, Kim, Shin and Yoon, 2000). In the past, this form of diabetes was called juvenile-onset, ketotic, or brittle diabetes (Pearce et al, 2008).

In Type II, insulin is produced, but exogenous insulin is needed to control hyperglycemia. Older terms for this form of diabetes were maturity-onset, non-ketotic, or stable diabetes. Type II diabetes occurs much more frequently than Type I.

**SYMPTOMS:**

Principal symptoms are elevated blood sugar (hyperglycemia), sugar in urine (glycosuria), excessive urine production (poyyuria), excessive thirst (polyphagia); itching, frequently about the genitals. Urine specific gravity 1.020 to 1.040; sugar excessive; urine contains diacetic acid, beta-hydroxybutyric acid, acetone when disease process is in advanced stage. More common in women and after the age of 40 (see figure 2 below). Fasting blood sugar raised above normal range of 5 to 8 µmol/L of blood; boils and carbuncles; vascular changes may be present. Loss of weight; emaciation; weakness; and debility (general weakness). When severe diabetes is allowed to progress without proper treatment, coma ensues with weakness and sweet (acetone) odour of breath; nausea, headache, vomiting, dyspnoea, sense of intoxication, delirium, and deep coma resulting in death.

**AETIOLOGY:**

Basic cause is still unknown but the pathological defect is failure of β-cells of the pancreas to secrete an adequate amount of insulin. In most instances diabetes mellitus is the result of genetic disorder, but it may also result from a deficiency of beta cells caused by inflammation, malignant invasion of the pancreas, or surgery. In the absence of
insulin, glycogenesis (production of glucose from proteins and/or fats) and glycolysis (conversion of glucose into energy) are adversely affected. After insulin is secreted by the beta cells of the pancreas, it is transported to the cells of the body where it binds to specific insulin receptors. The insulin then acts to promote glucose metabolism in the cell and to inhibit glucose production by the liver.

**COMPLICATIONS:**

Diabetic acidosis due to excessive production of ketone bodies; low resistance to infections, esp. those involving extremities; ulceration of lower extremities; increase in incidence of toxaemia in pregnancy; cardiovascular and renal disorders; disturbances in electrolyte balance.

Diabetic neuropathy is estimated to occur in 40 per cent of patients in whom diabetes has been present for about or over 25 years. A single peripheral nerve may be involved, the autonomic nervous system may be involved, or cranial nerves may be affected.

![Diabetes prevalence, by age](image)

**Figure 2. Number of diabetic patients in United States**
where age-distribution data exists for the years 1990 and 1998. Note that there were general increases in percentages over the eight years.

Source: Center for Disease Control cited in Adler and Kalb, 2000

However, in Kenya, despite rapid increase in diabetes type I among children, over 90 per cent of reported cases of diabetes are of the type II which is mainly caused by sedentary lifestyles copied from the West. *(The Star, 2001; AFP, 2010; Mwaniki, 2010)*.

Diabetics are prone to develop retinopathy, glaucoma, and various type of neuropathy. Eye involvement is common, and 0.2 per cent of diabetics become blind each year. This complication is much less frequent in the insulin-dependent type than the non-insulin-dependent type. The retinal changes may be of the non-proliferative type with retinal ischemia and areas of infarction. In the proliferative type, new vessels are formed in the retina and these may lead to retinal detachment. These new vessels are destroyed by use of photocoagulation; this helps to prevent further deterioration of vision.

Cardiovascular disease is the major cause of death in diabetics. In addition, peripheral vascular disease may lead to ischemia and gangrene of the lower limbs. Amputation(s) may be required. Press reports add that one in twenty people living in rural areas has diabetes and in urban areas the number could be as high as one in ten especially among the urban poor *(Kiage, 2010)*. One of the most serious complications complications from diabetes is blindness. The eye can be affected by diabetes in several ways, including:

**Diabetic retinopathy**
High sugar in the blood can cause walls of the vessels in the retina to weaken. Blood may then leak into the eye cavity. This could lead to blindness.

**Cataracts**

Clouding of the eye lenses can develop in early age and cause blindness. This may be corrected by simple cataract surgery or insertion of an intraocular lens will most ties lead to visual restoration.

**Transient refractive disorders**

When blood sugar is either too high or too low one can develop sudden long or short sightedness. Fortunately the situation comes back to normal one the sugar is controlled.

**CONTROL OF BLOOD SUGAR LEVELS**

Cardiovascular disease is the major cause of death in diabetics. In addition, peripheral vascular disease may lead to ischemia and gangrene of the lower limbs. Amputation(s) may be required if the levels of sugar in the blood is not controlled (Adler and Kalb, 2000).

**Glaucoma**

This is a condition resulting from progressive damage of the optic nerve often associated with high pressure inside the eye. This eventually leads to irreversible loss of vision. People with diabetes are nearly twice as likely to get glaucoma as other adults. There are no early symptoms until profound visual lose has occurred. Regular eye check-up can detect stages and treatment given to avert blindness.

The commonest and perhaps the most serious of these complications is diabetic retinopathy. It is the leading cause of blindness in the US and is on the rise in Kenya.
People with long duration of diabetes and whose blood sugar is not well controlled are at a higher risk of getting diabetic retinopathy. Other conditions like hypertension, pregnancy, obesity and smoking puts one at a higher risk of diabetic retinopathy.

There are usually no symptoms of diabetic retinopathy until there is sudden loss of vision. Sometimes there is blurring of vision and floaters, but these are non-specific. It is therefore necessary for diabetic patients to have a complete eye examination by a qualified eye specialist [ophthalmologist] at least once a year.

**LEASER SURGERY**

If diabetic retinopathy is detected the eye doctor can perform simple laser procedure in the eye to prevent progression of the problem. This procedure is usually done in the clinic and takes no more than 10 to 15 minutes.

When done properly and at the right time, it is effective in preventing one from getting blind. Follow up in the clinic after the laser is necessary and in some cases the doctor may repeat the procedure after certain interval.

When diabetic retinopathy is not detected early or proper laser treatment has not been done, bleeding may occur inside the eye. When this happens one will need a more complicated surgical procedure called vitriotectomy, which has lower chances of restoring of normal vision.

To prevent diabetic eye problems one needs to: Have proper yearly eye check-up in a reputable eye clinic or hospital, ensure that your doctor checks for signs of cataract and glaucoma as well during each check-up if you are pregnant see the eye doctor during the first three months and do not smoke (Kiage, 2010).
SYMPTOMS

- Blurred vision (due to the blood glucose build-up in the eye)
- Pain in the leg muscles and feet (due to the lower oxygen level in the blood)
- Heart problems (arising from the glucose and fatty acid build-up in the blood)
- Thirst at regular intervals
- Pain during urination
- Headaches and confusion
- Nausea and sweating
- Weakness and hunger
- Amputation
- Slurred speech and trembling
- Unconsciousness (possibly leading to coma)
- Severe complications can lead to death

TYPES OF DIABETES

There are two types of diabetes: type 1, the easily-recognisable type which is treated with insulin is usually genetic, and type 2, which has a slow onset and is often undiagnosed and is caused by obesity and/or sedentary lifestyles in developing countries (Wylie-Rosett and Vinicor, 2001; Knip and Akerblom, 2005). The trouble with type 1 diabetes is the immune system, which instead of attacking invasive bacteria and viruses, it attacks the insulin producing β cells of the islets of Langerhans in the pancreas. This leads to a decline in the production of insulin hence elevated glucose concentration in the blood (Underwood, 2003). Between 50 and 65 per cent of type 2 diabetes patients remain undiagnosed because of the lack of specific symptoms (Knip and Akerboom, 2005).

As a result, a number of diabetes patients are being admitted to public hospitals to have their feet or legs amputated, cataracts removed, or to be treated for kidney failure and stroke – due to late diagnoses of type 2 diabetes.
TREATMENT:

Consists of diet, insulin, exercise, and hygienic measures. At first the patient should be placed on a well-balanced diet adequate in all basic essential: carbohydrates, proteins, fats, vitamins, minerals, and fluids. In many patients this may be all that is required. Obese persons with this disease should be placed on a diet that will enable them to lose weight. Control of diabetes is much more difficult in an obese person. Blood sugar determinations should be made at frequent intervals. Glucose levels in the urine may be monitored by the patient or family as often as necessary. In addition, the availability of kits for use at home enables patients to monitor blood glucose level at home. Long-term blood glucose regulation may be objectively assessed by determining the glycosylated haemoglobin (haemoglobin A1c) in blood (Pearce, Noakes, Keogh and Klipton, 2008).

Dietary therapy was the only treatment available in the era before insulin therapy (Gerhard, Ahmann, Meeuws, McMurry, Duell and Connor, 2004). As discussed by Joslin, (1928) dietary carbohydrate had to be restricted in patients with type 1 diabetes because of impaired carbohydrate metabolism. Such diets were ketogenic and consisted of largely fats and proteins- the “good foods of life,” eg. meat, cream, butter, cheese, and eggs. These diets alone were major sources of death among diabetic patients (Joslin, 1928). The discovery of insulin in 1921 (Banting and Best, 1922), made it possible to introduce carbohydrate containing foods in to the diabetic diet. However, type 2 diabetes does not respond to insulin and may only be treated by exercise and diet therapy (Knip and Akerblom, 2005).

HOW MANY KENYANS ARE DIABETIC?

At least 1.2 million Kenyans have diabetes (Weru, 2008) or is it 2 million according to reports by Dr Acharya of Nairobi University? (Ngetich, 2010)? Out of these cases, more than 20,000 children suffer from the disease in Kenya. Diabetes is, actually also, the
leading cause of heart diseases such as hypertension, heart attack and cancer among young children in the country (Mwaniki, 2010).

Over 58 per cent of patients admitted at Kenyatta Hospital are diabetic. Unless safe lifestyles are adopted, 4.5 per cent of Kenyans could be diabetic in the next ten years according to Dr William Maina, Head of The Department of Non-Communicable Diseases and Sanitation in the Ministry of Public Health. He adds that, between 5-10 per cent of children in Kenya suffer from type I diabetes and insulin is needed to treat them. Type two diabetes affects mainly adults and is estimated to affect over 3.3 per cent of Kenyans (Weru, 2008). There are two types of glucometers used by diabetics to measure the levels of sugar in the blood at home (Likimani, 2002). It has been predicted that by the year 2010 one in six adults over the age of 40 will have Type 2 diabetes in Kenya (Daily Nation, 2008).

HEALTHY LIFESTYLES MAY HELP REDUCE DIABETES

People with high risk of developing Type 2 diabetes can reduce their chances of getting the disease by up to 50 per cent if they loose as few as 4 kg, exercise regularly and follow a healthy diet. Initially type 2 diabetes was very common in adults but recent trends show a sharp increase among obese children (The Star, 2001; Klein, Sheard, Pi-Sunyer, Daly, Wylie-Rosett, Kulkarni and Clark, 2004). Regular exercise and aerobic fitness also improve insulin sensitivity and glycemic control (National Institute of Health, National Heart, Lung, and Blood Institute, and National Institute of Diabetes, Digestive and Kidney Disorders, 1998; US Department of Health and Human Services, Centers for Disease Control, 1996; Hu, Sigal and Rich-Edwards, 1999.) and may reduce the risk of or development of diabetes (Wei, Gibbons, Mitchell, Kampert, Lee and Blair, 1999), and even reduce the mortality rate among patients with type 2 diabetes (Church, Cheng and Ernest, 2004).
CONCLUSIONS

Diabetes is characterized by increased blood glucose concentrations. These are regulated by a loop comprising two components, the insulin-secreting β-cells of the pancreas and the insulin sensitive tissues such as the liver, muscles and adipose tissues which respond to insulin. Loss of blood glucose control is due to a β-cell failure, resulting in insulin deficiency, insulin resistance of the target tissues (liver, muscles and adipose tissues).

Type 1 is perceived to be a chronic immune-mediated disease with sub clinical prodrome (a prodrome is a symptom indicative of an approaching disease) characterized by selective loss of insulin producing β-cells in the pancreatic islets in genetically susceptible people (Knip, 2002). The preclinical disease is asymptomatic and may last from a few months to more than 10 years. Acute clinical onset, ketoacidosis and dependency on exogenous insulin are characteristic features, and may lead to absolute dependency on insulin injections or death (Pearce et al., 2008). Type 1 diabetes is genetic and it afflicts mainly young children.

Type 2 diabetes is typically a metabolic disorder of obese middle aged or old people with slow clinical onset and a non-insulin dependence (Wilkin, 2001). Type 2 diabetes is a component of the metabolic syndrome characterized by obesity, insulin resistance, lipid abnormalities, hypertension, cardiovascular disease and the rapidly urbanizing populations of developing countries (Knip and Akerblom, 2005). Type 2 diabetes is environmental and largely an adult disease.

References


2. AFP, 2010. Western diseases spread to Third World: Explosion a result of importing lifestyles from developed nations of the West


37. US Department of Health and Human Services, Centers for Disease Control. 1996. 


