LOW BLOOD SUGAR

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All You Wanted to Know

BY DR. JULIUS OGENG'O

Excitement was high as I was completing my rotation that evening and very eager to return home after two months stay away. It was raining heavily and so I decided to cover myself with the doctor's white coat and walk through the rain to my apartment, in time to pack my few belongings. Before I opened the office door, Mrs Marabi, the matron, stopped me and asked me to see a patient who had come in unconscious, sweating excessively. Blood slide had shown no malaria parasites and test for typhoid was negative. The casualty doctor had admitted him to the medical ward as a possible case of head injury, as even the test for meningitis was negative. The only things that would suggest head injury were the unconsciousness and a couple of bruises on the forehead.

"The patient is a 43 year old Mr Maili and he is from Kenya. He was brought in from the roadside by policemen, and his identity has been obtained from documents found in his pocket," said Sister Marabi. Although I was reluctant to go to the ward, the mention of Mr Maili from Kenya gave me reason to engage the reverse gear.

When I got to the ward, I confirmed all the information given to me by the matron. In addition, he did not smell of alcohol, the bruises were fresh and there were no signs of struggle. His blood pressure and temperature were normal. "In all comatose patients, always think about diabetes, and when you are not sure of the level of sugar, give dextrose." This was a favourable statement from the Zairean physician who to trained us at the King George Hospital. This memory is what the patient needed. Dextrose is liquid sugar.

Dr. Ogeng'o: "Low blood sugar presents a high-risk abnormality which in the short run is more dangerous than high blood sugar especially because glucose is the only source of energy for the brain".

I took a sample of his blood and urine for sugar levels and immediately gave him concentrated dextrose. Before I withdrew the needle from the vein, the man woke up but I still put up a drip of less concentrated dextrose. He then narrated what had happened to him. This was his first episode. He had not eaten anything for the last 24 hours, not even a cup of tea, because he was feeling nauseated the day after he had drank more alcohol than usual. He woke up more as the dextrose ran in.

The laboratory results showed low sugar levels, a condition called hypoglycaemia. The type of sugar simple enough to be absorbed, and the one used by body cells is called glucose.

Because glucose is all essential for normal functioning of all body cells; normal blood glucose is essential for normal body function. Glucose is the body fuel that provides the driving energy. It is derived from the food we eat commonly - bread, *ugali*, potatoes, soda, tea with sugar etc, and kept within normal ranges by several body hormones. These hormones acting normally will make excess sugar to be stored as complex molecules (glycogen) which can in turn be broken down when blood glucose levels drop. One of the commonest diseases caused by abnormal handling of glucose is **Diabetes melitus** which is talked about a lot. Its commonest cause is some deficiency in a hormone called insulin, with the net result that blood glucose levels rise way above normal (Hyperglycaemia). In this article I shall discuss almost the opposite of diabetes - Hypoglycaemia (abnormally low glucose levels).

Hypoglycaemia represents a high-risk abnormality which in the short run is more dangerous than hyperglycaemia especially because glucose is the only source of energy for the brain. Absence of glucose or very low levels of the same, like that of oxygen produces deranged function, tissue damage, or even death if the deficit is prolonged.

The causes of hypoglycaemia can be divided into two categories:

- Hypoglycaemia that occurs following intake of a meal (post prandial)
- Hypoglycaemia hat follows missed meal/meals (fasting)
- Sugar levels can fall below normal after food intake in individuals who have undergone alimentary canal surgery. In these people, the stomach may empty rapidly and sugar is absorbed briskly leading to excessive production of insulin. The latter hormone then causes sugar levels to fall more rapidly than insulin. The consequent insulin-sugar imbalance leads to hypoglycaemia.
- Some children are intolerant to milk sugar (galactose) fruit sugar (fructose) and will develop hypoglycaemia after ingesting these things. In other people there may have been no surgery and they are not intolerant to anything, but will still develop hypoglycaemia after a meal. The cause may remain unknown.
- The second category is called fasting hypoglycaemia. In all cases there is an imbalance between the production of sugar (by the liver) and its utilization (by the peripheral tissues) i.e. an imbalance between supply and demand.
- Conditions that cause underproduction of glucose from the liver into the blood include:
- Deficiencies of hormones (chemical body messengers) that stimulate the production of glucose.
- Defects of enzymes (biological catalysts) that break down glycogen to release glucose
- Deficiency of the "raw materials" from which glucose is obtained for example in malnutrition, or late pregnancy starvation etc.
- Acquired liver disease such as hepatitis, cirrhosis or liver congestion (e.g. due to heart failure)
- Drugs such as alcohol, some antihypertensives, aspirin based drugs, those used to treat diabetes etc.

Conditions that cause over utilization of glucose include:

- Severe wasting with fat depletion
- Large cancers
- Excessive production of insulin from a tumour of insulin producing cells
- Abnormal sources of insulin

Accordingly then, it is obvious that hypoglycaemia may be a warning sign for a disease hidden in the least expected part of your body. Indeed fasting hypoglycaemia usually means that identifiable disease process is associated with the low blood glucose. Except perhaps for alcohol and prolonged voluntary fasting, most of the causes of hypoglycaemia may be beyond your control as a patient.

The presentation/symptoms of hypoglycaemia can be divided into two:

(a) Those due to excessive production of hormones that are designed to counter the hypoglycaemia. The hormone that gives the most obvious symptoms is the "FRIGHT, FIGHT, FLIGHT hormone" called epinephrine. Release of this regulatory hormone then causes a "state of emergency" characterized by sweating, shaking (tremors), rapid heartbeat, anxiety and hunger.

(b) Those due to dysfunction of the brain following diminished glucose levels include dizziness, headache, clouding of vision, blunted mental functions, confusion, abnormal behaviour, convulsions and loss of consciousness.

When the hypoglycaemia comes gradually, symptoms of brain dysfunction predominate.

The diagnosis of hypoglycaemia is not difficult because the symptoms are associated with low blood (and urine) sugar. What is difficult is establishing the cause of the hypoglycaemia. Various tests ranging from urine and blood tests for hormone levels; enzyme assays to complex examinations such as CT scans, ultrasound blood vessels, studies may be needed to decipher the actual cause of the hypoglycaemia. In a few cases, the cause may not be found.

Other conditions that may present similarly with hypoglycaemia include diseases that affect the brain such as malaria, typhoid, meningitis, head injury brain tumours etc. Other diseases that affect hormone producing organs (endocrine glands) may also present like/or with hypoglycaemia.

Whatever the presentation or the cause, the initial treatment of serious hypoglycaemia is intravenous administration of bolus concentrated glucose followed by constant infusion of glucose till the patient is able to eat a meal. Then they can have a carbohydrate rich meal.

Subsequently, if the cause of the hypoglycaemia is known, it can be treated. For example, hormone replacement or surgical removal of the tumour that might be. In some cases, avoidance of fasting and/or the culprit drug is all that is required. Abstain from alcohol, for example.

In conclusion, hypoglycaemia is a common problem causing symptoms that mimick several other illnesses. It signifies some underlying disorder which must be sought and corrected. Diabetics on treatment, for example, may develop hypoglycaemia from a missed meal or from inappropriate intake of medicine. Therefore, give the doctor a chance to conclude whether you have hypoglycaemia. Otherwise either the hypoglycaemia or its cause can easily cause avoidable death. Share this knowledge with your friend. ❑