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COURSE TITLE: DIABETES, OBESITY AND CANCER.

QUESTIONS:

1. Define the following terms
2. Ketogenesis: Ketogenesis is a catabolic pathway of metabolism. In this process, fatty acids and certain ketogenic amino acids are broken down to derive energy by alternative means. Ketones bodies are produced in the ketogenesis process. Our body continuously produces ketone bodies in low amounts but in certain cases like starving, when carbohydrates are present in fewer amounts in the diet, ketogenesis is used to compensate for the energy requirements.

Fatty acids undergo oxidation in the mitochondria of the liver to generate high amount of energy and form three compounds, these are known as “ketone bodies”. These ketone bodies are water soluble and do not require lipoproteins for transport across the membrane. Ketone bodies are lipid molecules having a carbonyl group attached to two –R groups. These ketone bodies include: Acetoacetate, D-3-hydoxybutyrate, and Acetone.

KETOGENESIS PATHWAY: Our body normally derives energy from stored carbohydrate by the process of glycogenolysis or from non-carbohydrate sources such as lactate by the process of gluconeogenesis. Ketogenesis occurs continuously in a healthy individual, but under certain conditions such as increased concentration of fatty acids or carbohydrate reserves are decreased.

Ketogenesis happens under low blood glucose level, e.g. during fasting or starvation, on exhaustion of carbohydrate reserve, or When there isn’t sufficient insulin. All the main body parts such as the brain, skeletal muscles, heart, etc. Can utilise the energy formed by ketogenesis.

SIGNIFICANCE:

* Ketogenesis is used to get energy to the brain, heart and skeletal muscles under fasting condition.
1. KETONAEMIA: An excess of ketones in the blood, sometimes associated with lipolysis.
2. KETONURIA: is a medical condition in which ketone bodies are present in the urine. Higher levels of ketones in the urine indicate that the body is using fat as the major source of energy. Ketone bodies that commonly appear in the urine are acetoacetate and beta-hydroxybutyric acid. As with tests for glucose, acetoacetate can be tested by a dipstick or by a lab. The results are reported as small, moderate or large amounts of acetoacetate. A small amount of acetoacetate is a value under 20mg/dl; a moderate amount is a value of 30-4-mg/dl; and large amounts have the value of greater than 80mg/dl. In non-diabetic patients, ketonuria may occur during acute illness or severe stress.
3. What are the consequences of ketosis.

Ketosis is a metabolic process. When the body does not enough glucose for energy, it burns stored fats instead. These results in build-up of acids called ketones within the body. Ketosis can sometimes be referred to as a natural metabolic state. Ketosis is generally considered to be safe for most people but it may lead to some side effects especially in the beginning.

Ketosis is a natural part of metabolism. It happens either when carbohydrate intake is very low or when you have not eaten for a long time. Both of these lead to reduced insulin levels, which causes a lot of fat to be released from your fat cells. When this happens, the liver gets flooded with fat, which turns a large part of it into ketones. During ketosis, many parts of your body are burning ketones for energy instead of carbohydrate. However, this does not happen instantly, it takes the body including brain some time to adapt to burning fats and ketones instead of glucose. During this adaptation period, some temporary side effects may be experienced. These are generally referred to as “low-carb flu” or “keto flu”.

In the beginning of ketosis, you may experience a range of negative symptoms. They are often referred to as “low-carb flu” or “keto-flu” because they resemble symptoms of the flu.

 These include:

* Headache
* Fatigue
* Brain fog
* Increased hunger
* Poor sleep
* Nausea
* Decreased physical performance.

Note: the “low-carb flu” is usually over within a few days.

Bad breath is also a symptom: one of the more common side effects of ketosis is bad breath, often described as fruity and slightly sweet. It is caused by acetone. Blood acetone levels are elevated in ketosis and the body can get rid of it via the breath. Occasionally, sweat and urine can also start to smell like acetone. For most people, this unusual smell goes away within a few weeks.

Leg Muscles May Cramp: in ketosis, some people may experience leg cramps. Although they are minor problems. Leg cramps in ketosis are usually associated with dehydration and loss of minerals. This is because ketosis causes reduction in water weight. Glycogen, the storage form of glucose on muscles and liver, binds water. This gets flushed out when you reduce carb intake and it is one of the reason people rapidly lose weight in the first week of a low-carb diet.

Ketosis May Cause Digestive Problems: dietary changes can sometime lead to digestive issues. Constipation is a common side effect in the beginning. This is most commonly due to not eating enough fiber and not drinking enough fluids. Some people may also get diarrhoea but it is less common. Nevertheless, digestive issues are usually over within a few weeks.

ELEVATED HEART RATE: Some people experience increased heart rate as a side effect of ketosis. This is also called heart palpitations or a racing heart, and can happen during the first few weeks of a ketogenic diet. Being dehydrated is a common cause, as well as low salt intake. Also, drinking a lot of coffee might contribute to this.

1. Write concisely on the management of ketoacidosis.

Diabetic ketoacidosis (DKA) is a build up of acids in the blood. It can happen when your blood sugar is too high for too long. It could be life threatening, but it usually takes many hours to become serious. Then it happens because your body does not have enough insulin. The seals cannot use the sugar in your blood for energy, so they use the fat for fuel instead.

People with type 1 diabetes are at risk for ketoacidosis, since their bodies do not make any insulin. Your ketones can also go up when you miss a meal, you are sick or stressed or you have an insulin reaction.

DKA can happen to people with type 2 diabetes but it is rear. If you have type2 diabetes, especially when you are older, you are more like to have a condition with some similar symptoms Called HHNS (hyper osmolar, hyperglycemic nonketotic syndrome. It can lead to severe dehydration

The major treatment of this condition is initial rehydration using isotonic saline with subsequent potassium replacement and low-dose of insulin therapy. The use of bicarbonate is not recommended in most patients. Also cerebral edema occurs in children and adolescence than in adult which is one of the most dire complications of DKA.

Major component of the pathogenesis of diabetic ketoacidosis are reductions in effective concentrations of circulating insulin and concomitant elevation of counterregulatory hormones (catecholamines, glucagon, growth hormone and cortisol). These hormones bring about three major metabolic events: (1) hyperglycemia resulting from accelerated gluconeogenesis and decreased glucose utilization. (2) increased proteolysis and decreased protein synthesis and (3) increased lipolysis and ketone production. Hyperglycemia initially causes the movement of water out of the cells, with subsequent intracellular dehydration, extracellular expansion and hypernatremia. It can lead to a dieresis in which water losses exceed sodium chloride losses.

The therapeutic goals for diabetic ketoacidosis consists of improving circulatory volume and tissue perfusion, reducing blood glucose and serum osmolality towards normal levels, clearing ketones from serum and urine at a steady rate, correcting electrolyte imbalances and identifying precipitating factors. If ketoacidosis is not treated at an early stage, a patient could go into coma and possibly die.

The main aims in the treatment of diabetic ketoacidosis are replacing the lost fluids and electrolytes while suppressing the high blood sugars and ketone production with insulin.

FLUID REPLACEMENT: the amount of fluid replaced depends on the estimated degree of dehydration. If dehydration is so severe as to cause shock or a depressed level of consciousness, rapid infusion of saline for adults is recommended to restore circulating volume. Very mild ketoacidosis with no associated vomiting and mild dehydration may be treated with oral dehydration and subcutaneous rather than intravenous insulin under observation for signs of detoriation. Normal saline has generally been the fluid of choice.

INSULIN: Some guidelines recommends dose of insulin of 0.1 unit of insulin per kilogram of body weight. This can be administered immediately after the potassium level is known to be higher than 3.3 mmol/l, if the level is lower, administering insulin could lead to a dangerously low potassium level.

POTASSIUM: Potassium levels can fluctuate severely during the treatment of DKA, because insulin decreases potassium levels in the blood by redistributing it into cells via increased sodium-potassium pump activity. A large part of the shifted extracellular potassium would have been lost in urine because of osmotic diuresis. Hypokalemia often follows treatment. This increases the risk of dangerous irregularities in the heart rate. Therefore, continuous observation of the heart rate is recommended, as well as repeated measurement of the potassium levels.