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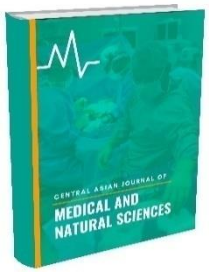

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What is the Ketogenic Diet and How Does it Affect on Testosterone and Cortisol Hormones?

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Abstract: High-protein, low-carb diets caused a significant drop in total testosterone, this suggests that individuals consuming such diets may need to be cautious about harmful effects on endocrine systems, what recommend is that if a low-carb diet is something you can stick to, control calories and lose weight, it's fine, can lose some body mass to become skinny, however, if your goal is to maintain or gain as much muscle as possible, a low-carb diet is not recommended.

1. What is Keto Diet?

The ketogenic diet (keto) is a low-carb, high-fat diet, it has been used for centuries to treat certain medical conditions in the nineteenth century the ketogenic diet was commonly used to help control diabetes, in 1920, it was introduced as an effective treatment for epilepsy in children for whom the drug was not effective, the ketogenic diet has also been tested and used in places under close monitoring for cancer, diabetes, polycystic ovary syndrome and Alzheimer's disease, however, diet is gaining attention as a potential weight loss strategy due to the craze of a low-carb diet, which began in the seventies with the Atkins diet (a low-carb, high-protein diet that was a commercial success) today's other low-carb diets including the Paleo, South Beach and Dukan diets are all high in protein, but moderate in fat, the ketogenic diet is exceptionally high in fat, usually 70% to 80%, despite eating only a moderate amount of protein(1).

2. How Keto Diet Works

The hypothesis of the ketogenic diet for weight loss is that if you deprive the body of glucose – the main source of energy for all cells in the body, which is obtained by eating carbohydrate foods – an alternative fuel called ketones will be produced from stored fat (hence the term genetic keto), the brain needs most of the glucose with a steady supply of about 120 grams per day, because it cannot store glucose during fasting or when eating a very small amount of carbohydrates, the body first withdraws the stored glucose from the liver, it breaks down the muscles temporarily to release glucose if this lasts for 3-4 days, the stored glucose is completely depleted, the levels of a hormone called insulin in the blood drop and the body begins to use fat as the main fuel, the liver produces ketone bodies from fat, which can be used in the absence of glucose (1).

When ketone bodies accumulate in the blood, this is called ketosis, healthy individuals naturally suffer from mild ketosis during fasting periods (for example, sleeping through the night), and very strenuous

exercise says proponents of the ketogenic diet, if dieted carefully, blood ketone levels will not reach a harmful level (known as ketoacidosis), because the brain will use ketones as fuel, healthy individuals will typically produce enough insulin to prevent excessive ketones from forming (2) when does ketosis occur, the number of ketone bodies that accumulate in the blood varies from person to person and depends on factors such as body fat percentage and resting metabolic rate (3).

3. What is Ketoacidosis

Excessive ketone bodies can produce a dangerous toxic level of acid in the blood called ketoacidosis, the kidneys begin to excrete ketone bodies with body water in the urine, which causes some fluid-related weight loss. Ketoacidosis often occurs in individuals with type I diabetes because they do not produce insulin, the hormone that prevents overproduction of ketones, however, in a few rare cases, ketoacidosis has been reported in non-diabetic individuals after following a prolonged low-carb diet (4,5).

4. Diet Food

There is no single standard ketogenic diet that contains a specific proportion of macronutrients (carbohydrates, protein and fats) the ketogenic diet usually reduces total carbohydrate intake to less than 50 grams per day – less than the amount found in medium regular bread, it can reach up to 20 grams per day In general, common ketone sources indicate an average of 70-80% fat from total daily calories, and 5-10% carbohydrates and 10-20% protein, for a 2,000-calorie diet, this translates to about 165 grams of fat and 40 grams of carbohydrates, 75 grams of protein the amount of protein in the ketogenic diet remains moderate compared to other low-carbohydrate diets rich in protein, because eating too much protein can prevent ketosis, the amino acids in protein can be converted into glucose, so the ketogenic diet determines enough protein to maintain lean body mass, including muscle, but this still causes ketosis, there are many versions of ketogenic diets, but all of them prohibit carbohydrate-rich foods, some of these foods may be obvious carbohydrates from refined and whole grains such as bread, cereals, pasta, rice, biscuits, potatoes, corn, other starchy vegetables, and fruit juices, some of what may not be clear are beans, legumes and most fruits, most keto plans allow eating foods high in saturated fat, such as fatty cuts of meat, processed meats, lard, and butter, in addition to sources of trans fats such as nuts, seeds, avocados, vegetable oils and oily fish, depending on your source of information, ketogenic food lists may vary and even conflict, programs suggest following the ketogenic diet until you lose the required amount of weight when this is achieved to prevent weight regain, one can follow the diet for a few days a week or a few weeks each month alternating with other days allowing for a higher intake of carbohydrates.

5. Health Benefits of the Keto Diet

Many studies have pointed to the health benefits of the keto diet, the most important of which are:

1) Weight Loss

The keto or ketodiet helps in weight loss, it is a diet that stimulates appetite by reducing levels of hunger-causing hormones, it helps increase metabolism that converts foods and drinks into energy, a study has proven the effect of keto on weight loss, after noticing that people who followed the keto diet lose about a kilogram compared to people who follow a low-fat diet.

2) Reduce the Risk of Certain Cancers

Keto Diet may reduce the incidence of cancer, as a result of the contribution of the keto diet to the elimination of cancer cells, the ketogenic diet also contributes to reducing the risk of complications of the glycemic hormone insulin, a study has shown that adopting this diet along with radiation and chemotherapy treatments may have anti-cancer effects.

3) May Improve Heart Health

Keto Diet Can Promote Heart Health and Prevent Associated Health Complications such as cardiovascular disease by reducing total cholesterol, bad cholesterol and triglycerides, versus increasing good cholesterol, but, only in the case of a person eating healthy fats instead of unhealthy fats, then a healthy and balanced diet.

4) Enhance Brain Function

Ketones released from the liver after a keto diet are useful in promoting the health of brain neurons that may die with age, protect the brain from the risk of neurological disorders such as Alzheimer's, and Parkinson's disease and some epilepsy syndromes in children

5) Reduce Possible Seizures

A keto diet changes metabolism and how the body uses energy from foods and drinks, the ketogenic stage of the body helps reduce the risk of seizures experienced by epilepsy patients and their symptoms, which are difficult to control with medication.

6) Improve PCOS Symptoms

A high-carbohydrate diet causes weight gain in women with PCOS, a study proved that following the keto diet, it can improve the symptoms of polycystic ovary syndrome, which include hormonal imbalance and weight gain. (6)

7) Improve Blood Sugar Levels

A recently published randomized trial revealed that patients who adhered to the keto diet experienced improved blood sugar control and a decrease in cumulative sugar levels (7).

6. Health Complications of the Keto Diet

Although the keto diet is a beneficial diet for people who want to lose weight, however, there are many health effects and complications that may threaten the health of pregnant women, women in lactation, diabetics, kidney patients and pancreatitis, and usually include:

1. Nutrient Deficiencies

People can be at risk of nutrient deficiencies such as vitamins and minerals, (iron, magnesium, zinc) as a result of not getting enough vegetables, fruits and grains.

2. Liver and Kidney Disorders

The ketogenic diet is high in saturated fat and then calories, this can lead to increased LDL cholesterol, kidney stones, osteoporosis and increased levels of uric acid in the blood (gout).

3. Constipation

What distinguishes the ketogenic diet is that it is low in foods that contain fiber, such as grains, legumes, vegetables and fruits, which promote bowel movements and prevent constipation.

4. Mood Swings

The brain needs enough sugars, by eating healthy carbohydrates, because keto is a low-carb diet, following it can cause confusion, loss of concentration and confused thinking in some people.

Although the keto diet is effective in weight loss, however, consulting a doctor before following it is necessary to prevent health complications that may affect some people.

7. The Effect of the Keto Diet on Testosterone

Testosterone is one of the most important male hormones in men, the pituitary and hypothalamus control the production of male hormones and sperm, testosterone is secreted from the testicles in men by 90% to 95% and 5% is secreted by the adrenal gland and testosterone is the main sex hormone for males and is important for the development of reproduction, low endogenous testosterone is associated with an increased risk of chronic diseases including type II diabetes (7) and cardiovascular diseases in many respects cortisol chemically contradicts testosterone, since taking exogenous cortisol lowers testosterone, the relationship between testosterone and cortisol is likely to stem from its anabolic properties.

A recent systematic review showed that moderate protein and low-carb diets had no effect on testosterone but high-protein, low-carb diets caused a significant 37% reduction in total testosterone (8) the mechanism behind this is that protein intake is more than 35% may outweigh the ability of the urea cycle to convert nitrogen derived from the catabolism of amino acids into urea, leading to hyperammonia and its toxic effects (9) Testosterone has been shown to inhibit the urea cycle (10) while glucocorticoids regulate the urea cycle, in addition, the most pronounced reduction in cortisol at rest was the longest study of a high-protein, low-carb diet, therefore, the decrease in testosterone and the increase in cortisol in protein-rich diets, may regulate the urea cycle and increase nitrogen excretion and thus reduce the harmful effects of excess protein consumption (11).

8. The Effect of Keto Diet on the Hormone Cortisol

The increase in cortisol during a low-carb diet in the short term is likely related to the roles of glucocorticoids in glucose balance, cortisol, glucacon, and sugar generation (glucose generation from certain non-carbohydrate carbon substrates) like amino acids all increase in low-carb diets (12) because glucocorticoids increase blood sugar formation, the initial rise in cortisol may be partly responsible for a transient increase in blood sugar formation on a short, low-carb diet, in addition, cortisol may rise to provide glucose for brain function, where the brain cannot use fatty acids significantly as fuel, in contrast, autologous ketogenic production increases sharply during the first three weeks of a low-carb diet (13).

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