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Is Ketogenic Diet Good for People?

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Abstract. The ketogenic diet became quite popular as a treatment option for epilepsy in the 1920s to 1930s. The development of ketogenic diet also provides an alternative to non-mainstream fasting. However, new anticonvulsant therapies have substituted it as therapy for epilepsy. Although many cases of epilepsy could be effectively controlled using medications, unsuccessful epileptic control happened in around 20% to 30% of epileptics. For these individuals, especially children with epilepsy, the diet was re-introduced as a technique for managing the condition. Since the ketogenic diet was famous due to its efficient performance in treating epilepsy, people nowadays start to use this diet to lose weight. Hence, is ketogenic diet good or bad for people? Concerning to public health issue, we review ketogenic diet from perspectives of advantages and potential risk, which can serve as a reference for people who are on attempting a ketogenic diet. Given the obvious positive effects of this diet on effective medical treatment and weight loss, we believe it could have wider application in future. However, it's suggested for people to make choice with awareness of potential risks of the ketogenic diet.

1. Introduction

In modern society, people put heavy considerations into health and beauty. Using diet to maintain ideal body condition and shape is rather common. Among widely used diet, the ketogenic diet is gaining more and more attention. This diet is a low-carbohydrate, fat-rich eating plan and traditionally be used to treat specific medical conditions. The recent popularity of this diet is its special capability of helping people lose weight due to its considerable high-fat content. Glucose, the major source of energy for all body cells, supplies by carbohydrate foods. When the body depletes glucose, stored fat will produce ketones for energy.. Because body cannot store glucose, it needs large amount of glucose, especially for brain which demands the most glucose, about 120 grams per day. In this scenario, body first pulls stored glucose from the liver and breaks down muscle to release glucose during the diet. Three to four days later, when stored glucose is exhausted and the insulin level in blood decreases, fat will be used as the main energy source. Under the absence of glucose, the liver can produce ketone bodies from fat. Ketosis will be caused when ketone bodies accumulate in the blood. Normally, fasting will lead to a minor ketosis. When the brain employs ketones for fuel, people will experience ketoacidosis, the harmful level of ketosis. the ketogenic diet, state that if the rule of this diet is carefully followed, Blood levels of ketones will not lead to ketoacidosis if individuals carefully followed the ketogenic diet and produce enough insulin to prevent excessive ketones in blood. However, individual factors like body fat percentage and resting metabolic rate have different influences on the ketosis and the amount of ketone bodies in blood. Whether it is good for people, especially when used for losing weight is thus urgent to know. Here we present a review that summarizes the effectiveness and risks of using ketogenic diet to better understand this diet and help people make wider decision from a more comprehensive perspective.



2. Effectiveness of ketogenic diet

2.1. Ketogenic diet and childhood epilepsy

There is a study funded by more than one organization including HAS Charitable Trust aiming to investigate whether there are clear benefits in terms of seizure control in children with epilepsy treated with the ketogenic diet. In the study, a group of children who had seizure accepted ketogenic diet while the control group of children with seizure did not. After three months, the mean percentage of baseline seizures was significantly lower in the diet group than in the control group. Hence, the results from this trial of the ketogenic diet support its effectiveness in treatment of intractable epilepsy in children[1].

2.2. Ketogenic diet and Alzheimer's disease

Amyloid beta ($A\beta$ or Abeta) denotes peptides of 36-43 amino acids that are the main component of the amyloid plaques found in the brains of people with Alzheimer's disease.

Another study defining relationship of ketogenic diet with Alzheimer shows that diets rich in cholesterol and saturated fats increased the deposition of $A\beta$ and reduced level of $A\beta$ would decrease the risk of causing Alzheimer's disease. Therefore, dietary strategies aimed at reducing $A\beta$ levels should be take into consideration, in particular, levels of carbohydrates, total calories, and presence of ketone bodies[2].

2.3. Ketogenic diet and cancer

Tumor patients demand increased level of fatty acids and protein. On the contrary, glucose is the main energy source of tumors. Therefore, it might be helpful for cancer patients to provide them a diet sufficient of fat and protein and restrict the development of the carbohydrates (CHO) tumors. A previous study has identified the influence of the use of ketogenic diet for a brain tumor mice. The result indicated restricted amounts of ketogenic diet exert anti-tumor and anti-angiogenic influences. The reduction of total caloric content in ketogenic diet decreases circulating glucose and then caused therapy of brain cancer. This preclinical study provided an implication of restricted ketogenic diet on therapy of malignant brain cancer [3].

In another study, patients with advanced metastatic tumors and no conventional therapeutic options were selected as subjects. They were provided with a ketogenic diet (less than 70 g CHO/day) with normal groceries and a protein/fat shake mixed with food additives. Results indicated improvement of life quality and no severe adverse side effects. Therefore, for advanced metastatic tumors patients, ketogenic diet is also useful for their improvement of life quality and blood parameters [4].

2.4. Ketogenic diet and weight loss

Previous studies have identified the influencing factors of ketogenic diet on weight-loss. Higher satiety effect of proteins influences appetite control hormones and suppress the ketone bodies might cause the reduction of appetite. Besides, reduction of lipogenesis and the resting respiratory quotient, increase of lipolysis and metabolic costs of gluconeogenesis and the thermic effect of proteins, and greater metabolic efficiency in consuming fats are also critical factors [5].

Another study compares the hunger, appetite, and weight-loss responses to a high-protein, low-carbohydrate (LC ketogenic) and those to a high-protein, medium-carbohydrate (MC nonketogenic) diet in obese men feeding ad libitum.

It can be concluded that in the short term, high-protein, low-carbohydrate ketogenic diets reduce hunger and lower food intake significantly to a more extend than high-protein, medium-carbohydrate nonketogenic diets do [6].

3. Risks of ketogenic diet

3.1. Danger and risk with epilepsy

There is a study assessed 129 patients with intractable childhood epilepsy who were treated with the ketogenic diet. In the study, the children experienced dehydration and gastrointestinal (GI) disturbances, such as nausea, diarrhea, and constipation. The results indicated that temporary early and late onset complications could be successfully treated. However, serious complications of the ketogenic diet also lead to cease of its use, death of some patients, and incidence of the other diseases like sepsis, cardiomyopathy, and lipoid pneumonia. Therefore, although the ketogenic diet is a potent antiepileptic treatment for intractable childhood epilepsy, due to its poor tolerability and related complications, it is used only in limited patients. Most complications of the ketogenic diet are transient and can be treated. However, life-threatening complications should be monitored closely during follow-up [7].

3.2. Disadvantage with Alzheimer's disease

Clinical dementia rating (CDR) is a rating used to test the level of Alzheimer's disease. There is a study in 2017 assessed group of patients with CDR values being 0.5, 1 and 2. Among the completers, the researchers concluded that the medium-chain triglyceride-supplemented ketogenic diet is feasible in very mild (CDR 0.5) and mild (CDR 1) Alzheimer's disease participants, as 10 of 11 participants adhered to the dietary protocol. The medium chain triglyceride-supplemented ketogenic diet was not feasible in moderate (CDR 2) Alzheimer's disease participants as all four of these participants withdrew from the study [8].

3.3. Potential dangers of ketogenic diet

Changing the body's primary energy source from carbohydrates to fat causes an increase in ketones in the blood. This "dietary ketosis" is different from ketoacidosis, which is an extremely dangerous condition.

When one has too many ketones, people may be at risk. Using ketogenic diet as a treatment is most prevalent in type I diabetes when blood glucose is too high and can arise from a lack of insulin. Although rare, ketogenic diet can be recommended for people type II diabetes. However, being ill while on a low-carb diet may also increase one's risk from being on a ketogenic diet. The warning signs of ketogenic diet include consistently high blood sugar, dry mouth, frequent urination, nausea, breath that has a fruit-like odor and breathing difficulties [9].

If we equate de facto ketogenic diets with high-protein diets (which is not always correct), then the risks proposed by critics are possible kidney damage due to high levels of nitrogen excretion during protein metabolism, which can cause increase of glomerular pressure and hyperfiltration. There is no consensus view on that between studies; however, some infer the possibility of renal damage from animal studies. The well-documented correlation between obesity and reduced nephron quantity on raised blood pressure puts subjects with type II diabetes or metabolic syndrome at risk [5].

4. Conclusion

In this review, we focused on the effectiveness and risks of ketogenic diet. According to the above evidence, ketogenic diet is a quite effective and useful method for medical community and individuals. However, since the potential risk exists whether in the medical application or the daily supply, it should be argued that people make wiser decision according to their health condition and metabolic efficiency. The seemingly promising future of ketogenic diet is also challenged by the long duration validation for adverse effects.

References

- [1] Neal, E.G., Chaffe, H., Schwartz, R.H., Lawson, M.S., Edwards, N., Fitzsimmons, G., Whitney, A., Cross, J.H. (2008) The ketogenic diet for the treatment of childhood epilepsy: a randomised controlled trial. *The Lancet. Neurology*, 7(6): 500-506.
- [2] Van der Auwera, I., Wera, S., Van Leuven, F., Henderson, S.T. (2005) A ketogenic diet reduces amyloid beta 40 and 42 in a mouse model of Alzheimer's disease. *Nutrition & metabolism*, 2: 28.

- [3] Zhou, W., Mukherjee, P., Kiebish, M.A., Markis, W.T., Mantis, J.G., Seyfried, T.N. (2007) The calorically restricted ketogenic diet, an effective alternative therapy for malignant brain cancer. *Nutrition & metabolism*, 4: 5.
- [4] Schmidt, M., Pfetzer, N., Schwab, M., Strauss, I., Kämmerer, U. (2011) Effects of a ketogenic diet on the quality of life in 16 patients with advanced cancer: A pilot trial. *Nutrition & metabolism*, 8(1): 54.
- [5] Paoli, A., Rubini, A., Volek, J.S., Grimaldi, K.A. (2013) Beyond weight loss: a review of the therapeutic uses of very-low-carbohydrate (ketogenic) diets. *European journal of clinical nutrition*, 67(8): 789-796.
- [6] Johnstone, A.M., Horgan, G.W., Murison, S.D., Bremner, D.M., Lobley, G.E. (2008) Effects of a high-protein ketogenic diet on hunger, appetite, and weight loss in obese men feeding ad libitum. *The American journal of clinical nutrition*, 87(1): 44-55.
- [7] Kang, H.C., Chung, D.E., Kim, D.W., Kim, H.D. (2004) Early- and late-onset complications of the ketogenic diet for intractable epilepsy. *Epilepsia*, 45(9): 1116-1123.
- [8] Taylor, M.K., Sullivan, D.K., Mahnken, J.D., Burns, J.M., Swerdlow, R.H. (2017) Feasibility and efficacy data from a ketogenic diet intervention in Alzheimer's disease. *Alzheimer's & dementia* (New York, N. Y.), 4: 28-36.
- [9] Cherney, K. (2020). How the Ketogenic Diet Works for Type 2 Diabetes. <https://www.healthline.com/health/type-2-diabetes-ketogenic-diet>