

# Ketogenic Diet: A Lifestyle Modification for Type 2 Diabetic Patients

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**Abstract:** Type 2 diabetes mellitus is characterized by four major metabolic abnormalities viz obesity, insulin secretory dysfunction, impaired insulin action and increased endogenous glucose output. As most of our daily diet comprises of carbohydrates, patients suffering from type 2 diabetes find it difficult to cope with the diet. The paper reviews ketogenic diet as a lifestyle change for a patient suffering from such a condition and provides an outline for improvement.

**Keywords:** Ketogenic, Diet, Diabetes, Low-Carbohydrate, Obesity

## 1. Introduction to Keto Diet

The word “KETO” in a ketogenic diet comes from the fact that it allows the body to produce small fuel molecules called ketones. This is an alternative fuel source for the body, used when blood sugar (glucose) is in short supply. Ketones are produced if one eats less carbohydrate rich food (these are broken down into glucose which is the body’s primary source of energy) and only moderate amount of protein (excess protein can also be converted to glucose through a biochemical process called gluconeogenesis). The liver metabolizes fat to produce ketones. These ketones then serve as a source of for the body, especially for the brain. On this diet the body switches its fuel supply to run mostly on fat, burning fat continuously.

### 1.1 What to Eat?

The key point for this diet to be effective is to keep the amount of carbohydrates that you consume less than 20g of net carbs per day [(Net carbs = Total carbs – Fibers (as fiber rich food passes through the gut undigested)]. Comparatively, fat intake should be on a higher side since fat will provide the energy required to sustain daily activities and a moderate amount of protein to avoid breakdown of muscle tissue, which protects one’s daily metabolic rate. Examples of food products are as follows:

#### **Polyunsaturated and Saturated fat sources:**

Nuts (Almonds, Walnuts, Peanuts), Avocado, Whole Eggs, Butter, Oil, Ghee, Cheese (unprocessed), Heavy Cream

#### **Protein rich foods**

Fish and Shellfish, Chicken (Brest/Leg Pieces), Red Meat, Beef, Pork

#### **Green Leafy vegetables**

Spinach, Cabbage, Cauliflower, Zucchini, Fenugreek, Coriander Leaves, Lettuce, Cucumber

#### **Other Vegetables**

Olives, Jalapenos, Mushrooms

#### **Beverages**

Water, Black Tea/ Coffee, Red Wine

### 1.2 What to avoid consuming?

Food products rich in carbohydrates are to be strictly avoided, these include Oats, Rice, Pulses and Lentils, Bread, Indian Bread like Roti, Chapati etc., Refined Flour, Wheat, Carrots, maize etc. Tomatoes and Onions can be consumed but must be minimized to fit the macronutrients required to maintain ketosis.

### 1.3 Benefits of the diet

#### **a) Weight Loss**

A person suffering from Type 2 Diabetes is generally obese. In a ketogenic diet one uses fat as a source of energy instead of carbohydrates. Maintaining a caloric deficit but a good protein intake according to the patient’s body weight and daily activity could help the patient burn fat while preventing lean muscle breakdown. This in turn reduces the BMI of the patient which in turn reverses obesity.

#### **b) Appetite control**

Since the patient’s body only relies on fat as a source of energy, it has abundant stored fat for providing energy which enables the person to sustain for weeks and months. This also helps in suppression of one’s appetite and the person would feel less hungry. Not having to combat hunger could potentially help in preventing addiction to sugar or such kind of food and possibly prevent many eating disorders like Bulimia nervosa.

#### **c) Controlling blood sugar**

A ketogenic diet may help people with type 2 diabetes because it allows the body to maintain glucose levels at a low but physiologically acceptable level. The lower intake of carbohydrates in the diet can help to eliminate large spikes in blood sugar, reducing the need for insulin. Studies on ketogenic diet have found that they can be helpful in controlling levels of HbA1C. This refers to the amount of glucose travelling with hemoglobin in the blood over about six months

#### **d) Impact on medication**

Ketogenic diet controls blood sugar levels. As such, some patients with type 2 diabetes who also follow a ketogenic diet may be able to reduce their need for medication.

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However, Scientists have warned that those following a ketogenic diet alongside an insulin regimen might have a higher risk of developing hypoglycemia (Blood sugar < 70mg/dl). It is best to discuss any diet changes with your physician while on medication.

#### e) Effect on cholesterol

Ketogenic diet proves to decrease the levels of triglycerides, LDL cholesterol, and increase the level of HDL cholesterol. Administering a ketogenic diet for a relatively longer period does not produce any significant side effects in patients. Therefore, it is safe to use a ketogenic diet for a longer period of time for clinically obese as well as patients having type 2 diabetes.

### 1.4 Mental performance

Some people follow this diet specifically for increased mental performance. Also, it is common for people to experience an increase in energy while in ketosis. By following this diet, the brain doesn't require dietary carbohydrates, its fueled by ketones which is an effective alternative brain fuel. Therefore, ketosis results in a steady flow of fuel (ketones) to the brain, thus avoiding problems experienced with blood sugar swings. This may sometimes result in improved focus and concentration and resolution of brain fog, with an improved mental clarity.

### 1.5 Other possible benefits

A calmer stomach, increased physical endurance, improvement in epileptic condition, normalized blood pressure, reversal of PCOS, less acne, fewer migraine attacks, less heart burn and less sugar cravings.

### 1.6 Diagnosis of the ketosis

It takes about 3-7 days depending upon the amount of exercise and other physical activities of the patient in order to enter the state of ketosis. The following symptoms are suggestive of the state of ketosis such as increased urination, dry mouth, increased thirst, possibly increased energy, reduced hunger and a fruity breath. In order to measure the level of ketones produced the following methods can be used

#### a) Urine ketone strips

Urine strips are the simplest and cheapest way to measure level of ketosis. It is the first option for most beginners opting to follow this diet. These strips are not reusable but efficient enough to provide accurate results.

#### b) Breath-ketone analyzers

Breath-ketone analyzers are also a simple way to measure ketosis but are more expensive compared to urine strips. They are reusable and cheaper than blood ketone meters in the long run.

#### c) Blood-ketone meters

Blood-ketone meters show an exact and current level of ketones in the patient's blood. They are the gold standard and most accurate method to measure ketosis level on this

diet. The major disadvantage is that this method is expensive and less feasible.

#### d) Potential side effects

When the patient suddenly switches his body's metabolism from burning carbohydrates to fat and ketones some side effects may be experienced as the body gets used to the new fuel especially during the early days. Symptoms may include headache, fatigue, muscle cramping, dizziness, light nausea, difficulty in focusing and irritability these side effects are short term for most people, and there are ways to minimize or cure them. These symptoms are termed as the keto flu which usually disappears within a week as the body adapts to increased metabolization of fat. The main cause of the keto flu is that carbohydrate rich food can result in water retention in the body, when the patient starts a low carb or ketogenic diet much of this excess fluid is lost. This can result in dehydration being main reason responsible for the symptoms of keto flu. These symptoms can be reduced or eliminated by making sure to consume enough water and salt.

## 2. Conclusion

The ketogenic diet proves to be beneficial for patients suffering from type-2 diabetes by treating the symptoms related to diabetes mellitus such as obesity. By controlling the blood glucose level, it reduces the need for medications and also improves mental clarity by preventing brain fog in the long run. Therefore, it is safe to use a ketogenic diet for a longer period of time for clinically obese as well as patients having type 2 diabetes.

## References

- [1] Sondike SB, Copperman N, Jacobson MS. Effects of a low-carbohydrate diet on weight loss and cardiovascular risk factors in overweight adolescents. *J Pediatr.* 2003;142:253–8. [PubMed] [Google Scholar]
- [2] Yancy WS, Jr, Guyton JR, Bakst RP, Westman EC. A randomized, controlled trial of a low-carbohydrate ketogenic diet versus a low-fat diet for obesity and hyperlipidemia. *Am J Clin Nutr.* 2002; 72: 343S. [Google Scholar]
- [3] Dashti HM, Bo-Abbas YY, Asfar SK, et al. Ketogenic diet modifies the risk factors of heart disease in obese patients. *Nutrition.* 2003;19:901–2. [PubMed] [Google Scholar]
- [4] Kreitzman SN. Factors influencing body composition during very-low-caloric diets. *Am J Clin Nutr.* 1992; 56(1 Suppl):217S–23S. [PubMed] [Google Scholar]
- [5] Mitchell GA, Kassovska-Bratinova S, Boukaftane Y, et al. Medical aspects of ketone body metabolism. *Clin Invest Med.* 1995;18:193–216. [PubMed] [Google Scholar]
- [6] Yehuda S, Rabinovitz S, Mostofsky DI. Essential fatty acids are mediators of brain biochemistry and cognitive functions. *J Neurosci Res.* 1999;56:565–70. [PubMed] [Google Scholar]
- [7] El-Mallakh RS, Paskitti ME. The ketogenic diet may have mood-stabilizing properties. *Med Hypotheses.* 2001;57:724–6. [PubMed] [Google Scholar]

- [8] Foster GD, Wyatt HR, Hill JO, et al. A randomized trial of a low-carbohydrate diet for obesity. *N Engl J Med.* 2003;348:2082–90. [PubMed] [Google Scholar]
- [9] Westman EC, Mavropoulos J, Yancy WS, Volek JS. A review of low-carbohydrate ketogenic diets. *Curr Atheroscler Rep.* 2003;5:476–83. [PubMed] [Google Scholar]
- [10] Foster-Powell K, Holt SH, Brand-Miller JC. International table of glycemic index and glycemic load values: 2002. *Am J Clin Nutr.* 2002;76:5–56. [PubMed] [Google Scholar]
- [11] DeFronzo RA, Simonson D, Ferrannini E. Hepatic and peripheral insulin resistance: A common feature of type 2 (non-insulin-dependent) and type 1 (insulin-dependent) diabetes mellitus. *Diabetologia* 1982; 23: 313–9. [PubMed] [Google Scholar]
- [12] Hollenbeck B, Y-Di Chen, Reaven GM. A comparison of the relative effects of obesity and non-insulin dependent diabetes mellitus on in vivo insulin-stimulated glucose utilization. *Diabetes.* 1984;33:622–6. [PubMed] [Google Scholar]
- [13] Sharman MJ, Kraemer WJ, Love DM, et al. A ketogenic diet favorably affects serum biomarkers for cardiovascular disease in normal-weight men. *J Nutr.* 2002;132:1879–85. [PubMed] [Google Scholar]
- [14] Iacovides, S. & Meiring, R. M. (2018). The effect of a ketogenic diet versus a high-carbohydrate, low-fat diet on sleep, cognition, thyroid function, and cardiovascular health independent of weight loss: study protocol for a randomized controlled trial. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5782363/>
- [15] Kosinski, C. & Jornayvaz, F. R. (2017). Effects of ketogenic diets on cardiovascular risk factors: Evidence from animal and human studies. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5452247/>
- [16] Masood, W. & Uppaluri, K. R. (2018). Ketogenic diet [Abstract]. <https://www.ncbi.nlm.nih.gov/books/NBK499830/>
- [17] Paoli, A., et al. (2013). Beyond weight loss: a review of the therapeutic uses of very-low-carbohydrate (ketogenic) diets. <http://www.nature.com/ejcn/journal/v67/n8/full/ejcn2013116a.html>

## Author Profile



**Yash Kripalani** received M.B.B.S degree from Dr. D.Y. Patil School of Medicine in 2019. From 2013-2018, he studied as a medical student and completed rotatory internship on February 2019. Also, is certified by International sports science association (ISSA), USA in specialist in sports nutrition since

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