Ketogenic Diet as a weight loss diet- an over-hyped diet

M Maisha[1], M Begum[2], B H N Yasmeen[3]

Introduction

Obesity is a prevalent chronic disease that has affected many developed countries.[1] This comes with the risk of conditions like hypertension, risk of cardiovascular disease, arthritis, etc.[2] Obesity is so high that it is in "epidemic proportions" in these countries.[2] With that, many weight-loss diets have risen as well. The Ketogenic Diet is a diet that has caused a huge uproar in recent times. Like many previous fad diets, it has been associated with its effects on weight loss and many other supposed health benefits that can come with that, however its distinction is that it is very high in fat. This diet was first used to treat epilepsies, but it has now gained attention as a weight loss diet, but this diet also comes with many negative health consequences.[3]

Pathophysiology of weight loss with Ketogenic diet

The Ketogenic Diet is a high fat, adequate protein, and low carbohydrate diet. This diet is supposed to help with weight loss and create the benefits of the weight loss related health benefits (ex. reduce risk of cardiovascular disease, etc.) by causing nutritional ketosis. This simply makes the body burn fat and use ketones to create energy instead of relying on glucose as the body's primary energy source.[4] During the first 3-4 days, the body starts taking glucose--in the form of glycogen--from the liver to fuel itself, however if the ketogenic diet is continued, insulin will decrease and the body will begin to use fat as its primary energy source.[5] The unfinished oxidation of fatty acids by the liver will result in an buildup of ketone bodies in the blood (ketosis), this is when a ketogenic diet maintains the body to stay in this condition.[6] Mild ketosis is normal for the body to be in when fasting, lactating, and post-exercise, however after that the body reverts to homeostasis quite quickly.[6] However the diet continues this process of ketosis.

Macronutrients in Ketogenic diet and its Consequences

Being a high fat, adequate protein, and low carbohydrate diet, its macronutrient distribution ranges would differ than that of the Acceptable Macronutrient Distribution Ranges (AMDR). The AMDR consists of 20-35% of total calories from fats, 10-35% of total calories from protein, and 45-65% of total calories from carbohydrates.[7] However the ranges of ketosis is about 75-80% of total calories from fat, 15-20% of total calories from protein, and less than 10% of daily carbohydrates, this is quite a significant difference from the ranges in the AMDR, because fat consists of most of the daily intake in the ketogenic diet.[8] But looking at the 2020 version of Canada's Food Guide, the ideal plate is very different from an ideal plate of a person on the ketogenic diet.[1] The only part of the ketogenic diet that falls adequately with the ideals of Canada's Food Guide is the protein section, since the ketogenic diet requires 15-20% of daily protein intake where the plate shows about a quarter of the plate full of protein foods. This is due to the amount of whole grain foods shown on the plate as these are too carbohydrate rich. Also, the

[1]Marjana Maisha
Life Sciences Program
University of Toronto
Ontario, Canada

[2]Dr. Monirun Begum
MSC, PhD (Nutrition)
Acadia University
Nova Scotia, Canada

[3]Prof. Dr. B H Nazma Yasmeen
MBBS, MCPS, MD, FRCP (Glasgow)
Professor and Head
Dept. of Paediatrics
Northern International Medical College, Dhaka, Bangladesh

Correspondence
Marjana Maisha
Life Sciences Program
University of Toronto
Ontario , Canada
E-mail: marjana.maisha1@gmail.com

DOI: https://doi.org/10.3329/nimcj.v16i1.86523
Northern International Medical College Journal Vol. 16 No. 1-2 July 2024-January 2025, Page 750-752

amount and type of fruits and vegetables shown differ with the ideals of the diet, as the fruits and vegetables would have to cater to the less than 10% daily carbohydrate limit and must fulfill the 75-80% daily fat intake. This can create negative havoc on the nutritional intake of the individual due to not having enough fruits and vegetables with the risk of having too many carbohydrates. Fruits and vegetables rich in carbohydrates can include bananas, sweet potatoes, beetroots etc. Thus, a person on the ketogenic diet would normally avoid these foods and limit their nutritional intake.

The ketogenic diet is very high in fat meaning that this macronutrient is being oversupplied. High fat diets can cause weight gain depending on how many calories of it is consumed, which can cause adiposity.[9] Also the associated risks with this can cause type 2 diabetes and fatty liver disease.[9] High fat diets are also associated with certain types of cancers, such as lung, breast, rectal, and colon cancers.[10] Foods high in fat can also be high in saturated fats and trans fats. With that comes the risks of cardiovascular disease, high blood pressure, high cholesterol level, kidney stones, gallstones, and osteoporosis.[11] Trans fats increase the low-density lipoproteins (LDL) which makes the cholesterol levels to go up leading to atherosclerosis, whereas saturated fats also lead to the increase of LDL levels, causing these negative consequences as well.[12] It is important for those on the ketogenic diet to get foods high in fat from whole, unprocessed foods to negate these negative consequences.

This diet is very low in carbohydrate intake to make the body stay on nutritional ketosis. Adults need 45-65% of their daily total calories from carbohydrates.[13] Glucose made by carbohydrates is the body's primary energy source for use, but since the body doesn't have enough of the glucose to use, it shifts to using ketones. Not having enough carbohydrates can lead to decreased growth in developing children and adolescents, and developing fetus also in pregnant women.[14] Also, low carbohydrate diets lead to hormonal imbalance leading to irregular menstrual cycles or amenorrhea.[14] Ketoacidosis can also occur from low carbohydrate intake because if the body cannot produce enough insulin, uncontrolled amounts of ketones are built up in the blood, eventually altering the blood pH, leading to disastrous consequences and possible death.[15] The brain is the main consumer of glucose being only two pounds and needing about 20% of energy from it.[16] Therefore, this diet can lead to brain fog, low blood sugar, headaches, dizziness, difficulty focusing, nausea, mental exhaustion, and irritability.[16] Being deprived of the body's main energy source can lead to fatigue and even more fatigue when exercising.

Micronutrients in Ketogenic diet and its Consequences

Ketosis can also cause undersupply of certain micronutrients. This can occur if people try to avoid fruits and vegetables high in carbohydrate to stay in ketosis. With avoiding these fruits and vegetables comes the undersupply of certain nutrients. Those on the ketogenic diet are found to have a low amount of magnesium. This can lead to magnesium deficiency over time, which is an electrotype disturbance, this can cause symptoms of poor coordination, tremor, loss of appetite, etc.[17] With magnesium deficiency, there is often also sodium and potassium deficiency.[18] This can lead to seizures, nausea, headache, loss of energy etc.[18] Also with deficiency of sodium and potassium, there is usually an increase of the blood volume, meaning that blood pressure can increase and the heart has to work harder, leading to heart disease.[18] People on the ketogenic diet also tend to have less intake of selenium leading to deficiency.[19] Selenium deficiency is associated with cardiomyopathy and heart attack.[19] Low fiber intake is also associated with this diet, causing symptoms such as constipation and diarrhea.[20] There are many deficiencies that can occur if the ketogenic diet is pursued long-term.

The ketogenic diet can have many negative consequences over time. This diet is dangerous to continue in the long term due to the overconsumption of fat and the deficiencies of carbohydrate, magnesium, sodium, potassium, selenium, and fiber. These nutrient imbalances can cause chronic malnutrition over time and lead to disastrous consequences. Also, it is important for those who are picking foods high in fats to pick those that are whole and unprocessed to limit the amount of saturated and trans-fat consumed. Overall, this diet is not healthy, and it is an over-hyped diet.

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