ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

The Role Of Ketogenic Nutrition In Preventing And Managing Chronic Lifestyle Diseases: A Narrative Review.

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ABSTRACT

The ketogenic diet is characterized by low carbohydrate, high fat, and moderate protein intake (keto: ketones; genic: loving). Significant increases in diabetes and obesity rates have occurred over this time, which might have catastrophic consequences for both the general public's health and the economy. Ketogenic diets have recently sparked a lot of interest from both the general public and the scientific community studying nutrition. This essay will cover the benefits and drawbacks of the ketogenic diet concerning several lifestyle disorders, chiefly metabolic syndrome, which includes type 2 diabetes mellitus, hypertension, and dyslipidemia.

Keywords: Ketogenic diet, Lifestyle diseases, T2DM, Obesity, Cardiovascular Diseases, Kidney Diseases.

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ISSN: 0975-8585

INTRODUCTION

A high-fat, low-carb, adequate-protein diet is known as the ketogenic diet [keto: ketones; genic: loving. The aspirational goal of ketogenic diets, nutritional ketosis, is attained by limiting the amount of carbohydrates consumed, regulating the amount of protein consumed, and increasing the amount of calories from fat. This causes the body to use ketone bodies from fat metabolism, which is a metabolic state where the body prefers to use fat as its main fuel source [1].

In 1911, two doctors from Paris named Gulep and Marie documented the first-ever use of fasting as a therapy for epilepsy. In 1921, it was discovered that fasting for three days to three weeks could treat and cure almost any illness, including epilepsy. Improvement in seizures was usually observed within two to three days. Simultaneously, in 1921, Dr Wilder of the Mayo Clinic developed the hypothesis that an extremely high-fat, extremely low-carb diet would induce ketonemia, which is similar to fasting, and that a diet with both ketogenic and antiketogenic elements could help treat epilepsy [2].

The ketogenic diet has long been known to be an incredibly effective dietary strategy for treating intractable epilepsy, and in the last ten years, it has attracted a growing amount of research interest due to new data showing that it may also be used to treat a number of other illnesses, including obesity and cancer [3].

Among the several forms of ketogenic diets are the low glycemic index treatment (LGIT), the medium-chain triglyceride diet (MCTD), the modified Atkins diet (MAD), and the classic ketogenic diet (KD). The phrase "lifestyle diseases" describes a wide range of conditions that are mostly caused by a person's bad habits or everyday actions. Non-communicable diseases (NCDs) are caused by four changeable lifestyle behaviors: consuming alcohol, smoking, eating a poor diet, and not exercising. Lifestyle diseases are associated with certain behaviors. Lifestyle illnesses include conditions including diabetes, cancer, cardiovascular disease (CVD), and chronic respiratory diseases (CRD) [4].

Various diets are being used to improve metabolic pathways associated with different conditions like cancer, type 2 diabetes (T2D), cardiovascular diseases (CVDs), polycystic ovary syndrome (PCOS), and certain neurological disorders. These diets have shown broader therapeutic actions and beneficial health effects. However, some people are concerned about the possible negative consequences of these diets, such as micronutrient shortages, decreased appetite, nausea, constipation, exhaustion, hyperlipidemia, and unintentional weight loss [5]. A global epidemic has resulted from the sharp increase in the prevalence of type 2 diabetes (T2D) and obesity over the past few decades. This tendency has been exacerbated by factors such as globalization, economic expansion, a rise in sedentary behavior, drug use, and the shift in diet towards processed foods and high-calorie, low-fibre diet [6]. This review aims to understand how the ketogenic diet works on these lifestyle-related diseases.

Highlights Of Ketogenic Nutrition

Obesity

In one case study, obesity, type 2 diabetes, and hypertension were successfully treated with a paleolithic ketogenic diet. With weight loss, normalized blood pressure, improved glucose levels, and a better lipid profile over a 22-month period, the patient was able to stop taking medication without experiencing any negative side effects [7]. The ketogenic diet, with its high fat and low carb approach, promotes ketosis, aiding weight loss and improving metabolic health. It's beneficial for managing conditions like epilepsy and type 2 diabetes, while also potentially enhancing cholesterol levels and reducing inflammation for overall health benefits [8]. A low-carbohydrate ketogenic diet for type 2 diabetes improves glycemic control, reduces medication needs, and promotes weight loss, offering an effective alternative to conventional treatments by addressing insulin resistance and hyperinsulinemia [9]. Very-low-calorie ketogenic diets (VLCKDs) rapidly treat obesity and type 2 diabetes, preserving muscle mass while reducing hunger through ketosis induction. Recommended initially for motivated patients under strict medical supervision, VLCKDs offer reversible intervention within a comprehensive strategy [10].

Hypertension

According to the study, women with obesity and hypertension who have VLCKD may benefit from weight loss, better body composition, lower blood pressure, and less inflammation. But more widespread demographic validation is required [11]. The review shows how combining the ketogenic diet with physical activity effectively lowers blood pressure in hypertensive patients, suggesting a strong strategy for managing hypertension. Further research is urged to optimize these combined therapeutic approaches [12]. The review confirms VLCKD's effectiveness for weight loss and improving metabolic markers in overweight and obese individuals. It suggests VLCKD as a promising obesity management strategy, noting its generally well-tolerated safety profile. Yet, further long-term studies are needed for sustained validation [13].

Type 2 Diabetes

It discussed the possible advantages of a ketogenic diet (KD) as a preventative measure against diabetes mellitus and obesity. It highlights the link between obesity and diabetes as well as the role that dietary and lifestyle modifications have in managing these conditions. It suggests that the KD may lead to improved glucose management, weight loss, and a reduction in risk factors for metabolic disorders [14]. The potential mechanisms of action of KD, such as improved insulin sensitivity, improved fat metabolism, and appetite management, are also covered in the research. The study finds that while the KD can be a useful strategy for preventing obesity and diabetes, more research is necessary to completely comprehend its advantages and potential drawbacks [15]. The KD might be regarded as an effective diabetes treatment because it regulates insulin and glucose levels. Therefore, KD provides evidence for a bridging between diabetes and obesity treatment [16].

In their narrative review titled "The Potential Health Benefits of the Ketogenic Diet," Kathryn Dowis and Simran Banga explore the various health advantages associated with the ketogenic diet, particularly in the context of metabolic conditions like obesity and diabetes. Published in May 2021, the review synthesized current research to present a comprehensive overview of how the high-fat, low-carbohydrate ketogenic diet can lead to improvements in weight management, glycemic control, and insulin sensitivity. They discussed the ways in which the ketogenic diet works, like lowering insulin levels, modifying hunger, and causing ketosis. Although the authors acknowledge the encouraging results of multiple studies, they also advocate for longer-term, more comprehensive study to properly comprehend the possible advantages and disadvantages and to develop standardized implementation recommendations. Their research highlights the need to weigh scientific rigor against enthusiasm when assessing the potential health and disease-management benefits of the ketogenic diet [1].

Challenges Of Ketogenic Nutrition

Obesity

It is advised to speak with a nutritionist before reinstating carbohydrates after losing weight. Generally speaking, a well-balanced diet that includes meats, fruits, vegetables, berries, and fiber helps replenish micronutrients that are lost when grains are eliminated, which lessens symptoms like constipation, brain fog, and fatigue—often referred to as the "keto flu." Dietary effects are also influenced by gender, hormones, and body composition; pregnancy, lactation, and thyroid problems present particular difficulties for women. According to new research, body composition might be a more accurate measure of obesity than BMI [17].

Despite the early beneficial effects, it may be difficult to sustain the benefits of the ketogenic diet (KD) over time. A significant problem is the possibility of overcompensation with dietary fat; as fat has more than twice as many calories per gram as either protein or carbs, weight gain may result if caloric intake surpasses caloric expenditure. The restrictive nature of KD can make it challenging to follow since it can lead to psychological exhaustion from rigorous dietary guidelines, a lack of variety in food, and confrontation with social and cultural eating norms. Furthermore, reintroducing carbohydrates can occasionally cause increased uncontrolled calorie intake, rebound hyperphagia, or overeating, as well as rapid weight gain and glycogen reserve replenishment. Studies like the one by Crosby et al. demonstrate that consuming large amounts of

saturated fat can harm lipid profiles, increasing LDL cholesterol and the risk of hypercholesterolemia, which can increase cardiovascular risk in vulnerable people. This raises concerns regarding cardiovascular health as well. Therefore, true metabolic health cannot result from weight loss brought on by a macronutrient imbalance. In order to assess the efficacy of the ketogenic diet (KD), the publication "Recent Advances in the Application of a Ketogenic Diet for Obesity Management" examines clinical trials conducted during the previous five years. They summarised these investigations, which range in length from 25 days [18] to a year. However, because ketosis was only seen during the first two of the seven feeding phases and no information was provided regarding the other stages, it was difficult to determine the precise duration of severe ketosis in Cicero's study. KD is often taken for a brief period of time, usually no more than a few weeks, because its primary purpose is to help obese people lose weight quickly [19].

Kidney Disease

While obesity is a known risk factor for chronic kidney disease (CKD), it is not uncommon to find people who have both severe obesity and renal failure. In these cases, KD is not recommended because of the relative excess of protein that may be harmful to the kidneys. Furthermore, prior research demonstrated that in individuals with moderate chronic renal disease (GFR > 60), kidney function is not affected by VLCKD, and nearly one-third of them even achieved GFR normalization following the dietary intervention [20]. Consuming animal fat and saturated fat, which are common components of conventional ketogenic diets, has been linked in observational studies to an increase in albuminuria. Particular issues with ketogenic diet use include the potential for worsening metabolic acidosis due to an increased net acid load and the possibility of developing nephrolithiasis. These issues have all been documented in paediatric patients receiving ketogenic diet therapy for epilepsy [21].

Nephrolithiasis was a common problem that affected participants in studies of young kids treated for epilepsy with a ketogenic diet. The high dietary fat content of a ketogenic diet, which is essential for ketosis, reduced water consumption that results from the avoidance of fruits and vegetables. However, even though individuals on a ketogenic diet for epilepsy may have non dietary reasons for their nephrolithiasis and for non-epileptic purposes of ketogenic diet, like reduced urinary pH from obesity and insulin resistance [22].

Hypertension and Cardiovascular disease

Nephrolithiasis is another possible side effect of metabolic acidosis in ketogenic diet users. Renal fibrosis is a frequent consequence of hypertension that is considered to pose a major risk to human health. the synthesis of ketone bodies, which will serve as a substitute energy source to help people lose the weight they want. B-HB is the primary energy source and accounts for more than 70% of ketone bodies. Furthermore, a short KD may exacerbate insulin resistance and glucose intolerance, which when paired with hypertension can lead to inflammation and injury to vascular endothelial cells, ultimately impairing kidney function, according to multiple studies [23]. Because elevated levels of lipoproteins containing apoB are associated with an increased risk of cardiovascular disease, it is not advised for people without metabolic syndrome or diabetes to continue living this lifestyle. Plant-based diets that permit moderate daily intakes of non-saturated lipids and modest amounts of red meat and saturated fats, however, are safe and may even help prevent atherosclerotic cardiovascular disease and other chronic illnesses, according to the evidence that is currently available [24]. Participants on a very low carbohydrate diet had significantly higher levels of low density lipoprotein, which accelerates atherosclerosis and likely promotes atherosclerotic features associated with CVD. According to Batch et al. (2020), this process is explained by a lower intake of carbohydrates, which impacts the synthesis of ketone bodies by reducing the production of insulin, hampering the activation of 3-hydroxy-3-methyl-glutaryl-coenzyme A (HMG-CoA) reductase, and stimulating HMG-CoA lyase [25].

Diabetes Mellitus

For the sake of fair opportunity, it should be mentioned that although long-term research poses logistical difficulties, this is the case for all diabetes management dietary approaches. In addition to contributing to the lack of long-term studies on diabetes care, non-compliance and adherence are among the problems limiting the use of ketogenic diets [26]. According to a study's findings, people with Type 1 diabetes

who employ traditional glycaemic management methods and stick to a ketogenic diet may have almost normal HbA1c levels and minimal glycaemic fluctuation. But according to Leew et al. (2018), these individuals might also be more susceptible to hypoglycemia and dyslipidemia. Overall, the limited study to far indicates that its usage may be explored in very particular cases, such as the co-occurrence of obesity and T1D or prolonged fasting periods, provided it is administered by trained healthcare professionals and accompanied by continuous glucose monitoring. Keep in mind that not everyone will find the cost-benefit ratio useful, and more investigation is needed to properly pinpoint those who would be good candidates for its application [20].

CONCLUSION

A low-carb ketogenic diet has the potential to boost fat oxidative metabolism, reduce body weight, and assist regulate appetite. Overall, the KD deserves very careful management because it is as effective as pharmaceutical interventions and is equally likely to cause adverse events if improper care is not received. As such, its prescription should be handled by medical professionals with the necessary training, who will keep current recommendations in mind but also have the understanding to consider the unique circumstances of each patient they are treating [20]. Even a slight weight loss may benefit the patient's metabolism because many of the patients considering these diets are already overweight or obese. Ketogenesis, which is encouraged by the ketogenic diet, aids in the treatment of some neurological conditions. Despite being a high-fat dish, there are several circumstances in which it may be beneficial to our health. Additionally, it works well when the brain needs less glucose and starts using ketone bodies [27]. The ketogenic diet can be distinguished from other dietary approaches by their mechanisms, macronutrient composition, and possible benefits and risks.

When implementing the ketogenic diet, individuals should be screened for potential contraindications or conditions that may necessitate changes or strict monitoring. Assess and monitor patients' progress, including weight reduction, metabolic indicators, and potential ketogenic diet side effects [28]. After weight loss, it is necessary to maintain body weight, which is typically a serious issue. Therefore, more research is necessary to determine the ideal dietary macronutrient composition as well as to properly evaluate the effects of long-term KD consumption on metabolic disorders and cardiovascular risk factors [29].

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