



KETOGENIC DIET IN DENTISTRY

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Abstract : Many people go on lifestyle diets typically to lose weight or to improve their systemic health, but often neglect the effect of these diets on oral health. One of such diet is Ketogenic diets. Ketogenic diets (KDs) are a very low-carbohydrate intake diet, which induces a state of physiological ketosis with increased use of ketone bodies as an energy source. Ketogenic diets (KDs) may be a helpful complement in the prevention of and therapy for several diseases. KD is a popular approach for achieving weight loss and its anti-cariogenic properties, but there is a lack of data with regard to clinical oral parameters. This seems surprising since caries are a process that is fundamentally dependent on digested fermentable carbohydrates. This review is meant to elaborate the effect of keto diet in dentistry and oral health of an individual.

KEYWORDS: Carbohydrates, Dentistry, Ketogenic diet, Oral health

IndexTerms - Component,formatting,style,styling,insert.

INTRODUCTION

Academic interest in the potential of Ketogenic Diets (KD) has grown dramatically in the last few years, with increasing evidence regarding the therapeutical role of KD in a broad range of diseases. Keto diet is short for ketogenic, involves eating a high amount of fat, a moderate amount of protein and very few carbs. While its safety and efficiency were investigated with respect to various anthropomorphic outcomes like body weight, body mass index (BMI), waist circumference; serological outcomes (cholesterol, markers of blood sugar and insulin resistance, etc.) , body functions (blood pressure, peak oxygen uptake (VO₂peak) and peak power, handgrip strength, etc.) [1,2,3], there is a lack of data with regard to clinical oral parameters. Many people go on lifestyle diets typically to lose weight or to improve their systemic health. However, very few consider the effect of the keto diet on their oral health. Consuming foods that contain high sugar or starch content put teeth at risk for the development of tooth decay. When left untreated, dental caries can cause pain and infection, and ultimately lead to tooth loss. Keto diets are known for its anti-cariogenic properties due to decrease in carbohydrate consumption. On the other side, there are aspects of KDs which may have a negative impact on periodontal parameters, such as a possible higher intake of saturated fatty acids or an increase in LDL values [4,5]. Keto diet has proven to be an effective alternative and a dietary boon to patients with epilepsy significantly reducing the occurrence of epileptic incidence in patients. Thus the aim of the present article is to discuss the effects of the ketogenic diet on the oral health and its significance in dentistry.

EFFECT CARBOHYDRATE ON ORAL HEALTH

There are two basic mechanisms suggested as to how processed carbohydrates can lead to an alteration of gingival inflammation by a local and a systemic pro-inflammatory effect. Kashket et al. were able to demonstrate that the supragingival plaque can metabolize processed carbohydrates to short-chain fatty acids, which, in turn, promotes an inflammatory reaction of the gingiva [6]. The systemic effect is thought to be mediated by high blood sugar peaks with an associated oxidative stress increase and the formation of advanced glycation end products [7,8]. However, there is also evidence that carbohydrate consumption significantly alters the plaque formation on both teeth and dental implants [9,10], which also has an impact

on gingival inflammation [11]. Since caries and periodontitis are the most common diseases in mankind [12], there is a fundamental need for research in therapeutics.

KETO DIET MECHANISM

In the keto diets, the intake of carbohydrates is reduced so that the body is forced to switch to fatty acid oxidation. This results in ketogenesis thus leading to the formation of keto bodies which are best energy fuel alternates for the body. The ketogenic-diet based on a ketogenic cycle also includes low starch, milk and protein. Ketosis is a biochemical cycle wherein proteins are depleted of carbohydrate intake which is the body's primary supply of sugar. As a consequence, deposits of accumulated fat are decomposed to compounds named ketones [13]. When there is a limit on carbs throughout the system, the fat is decomposed. The liver utilizes 2 pathways to feed the bodies, namely ketogenesis as well as gluconeogenesis. For ketogenic degradation the human diet consists about 70 percent carbohydrate, 25 percent protein and 5 percent carbohydrate [14]. After a human achieves ketosis the cells then use the ketone systems to create energy before the person continues to consume carbohydrates.

BENEFITS OF KETO DIET ON ORAL HEALTH

• PLAQUE REDUCTION

Dental plaque is a complex biofilm that accumulates on the hard tissues (teeth) in the oral cavity. It is generally considered that the foodstuff containing higher degree of fermentable carbohydrates is considered highly cariogenic in nature and therefore can lead to increased plaque build up. In the study performed by Woelber et.al (15) The results showed a trend towards lower plaque values, but with no significant changes from baseline to the end of the study with regard to the clinical periodontal parameters.

• CARIES REDUCTION

Dental caries, widely known as tooth decay, is the most common non-communicable disease worldwide [16, 17]. Dental caries results from carbohydrate fermentation by acid-producing bacteria within the dental biofilm. Bacteria present in the plaque ferment dietary carbohydrates, particularly sucrose, into acids that then cause a decrease in plaque pH adjacent to the tooth surface leading to demineralization of the tooth hard substances, e.g., enamel, dentine and cementum [18]. The elimination of sugar and carbohydrate, may also ameliorate carbohydrate-related problems such as dental caries and periodontal disease.

• EPILEPSY

Epilepsy is one of the most common neurological disorders diagnosed in children (19). It is in the catastrophic epilepsies where the response to AEDs is inconsistent that the ketogenic diet has proven to be an effective treatment strategy. There is accumulating evidence to suggest that this diet has antiepileptogenic properties that extend beyond its disease-modifying activity. (20). The ketogenic diet mimics biochemical effects of fasting, and thus, it is deficient in most vitamins, minerals, and probably trace elements. (21) A review of the pertinent literature on the complications associated with this dietary intervention that has largely been reported in the form of case reports indicates that most oral and systemic complications are related to a certain deficiency state. (22) Once the condition was investigated and corrective measures instituted, the condition in most of the cases was successfully reversed.

ILL EFFECTS OF KETO DIETS

• DRY MOUTH

Mouth maintains a balanced pH depending on the dietary consumption of a person. When carbohydrates are eliminated from a daily diet, the pH balance in the mouth is naturally thrown off with a steep decrease in pH of the mouth. As a result, increased acids in the mouth could cause the mouth to dry out more. A dry mouth can cause a lot of discomfort and eventual increases in dental caries as the dryness prevents bacteria from being washed away with saliva and eventual enamel break down.

• BAD BREATH

Keto breath may include a metallic taste in the mouth that remains for several days. It may also have a taste or smell similar to nail polish remover. The process occurs when ketones break down in stomach and rise up to your mouth. Keto breath does not necessarily cause harm to the teeth but may have an impact on day to day activities especially in social gatherings.

• EFFECT ON ORTHODONTIC TOOTH MOVEMENT

A study showed (23) that after 14 days of orthodontic tooth movement, the amount of tooth movement in the ketogenic group was lesser by approximately half the distance compared to that of the control group. Moreover, the expression of IL-1 β and TNF- α was also lower. Consuming ketogenic diet reduces the expected amount of tooth movement which was evidently shown by a significant lower cytokine expression of IL-1 β and TNF- α than the group under regular diet. This may suggest that ketogenic diet is a contributing factor in delaying the tooth movement during orthodontic treatment.

• OTHER COMPLICATIONS

Complications that might occur are wide ranging, including scurvy leading to persistent bleeding from the gums, (24) changes in platelet function with excessive bruising (25) to more serious conditions such as severe hypoproteinemia, lipemia, renal tubular acidosis, and marked elevation of all liver function tests.(26) It has also been reported that patients on a ketogenic diet exhibit a decrease in bone mass due to disordered mineral metabolism with features of vitamin D deficiency osteomalacia (27) and a definite susceptibility to fractures. (28) The ketogenic diet also causes cardiac complications by different mechanisms that include selenium deficiency (29) and low serum bicarbonate and high beta hydroxybutyrate. These can lead to changes ranging from electrocardiographic abnormalities including QT prolongation to gross pathologically significant anatomical changes such as severe dilatation cardiomyopathy. (30)

RECOMMENDATIONS

- Reduction of carbs and sugars reduce incidence of caries, keto diet can be advised to patients to reduce the risk of caries.
- Keto diet can be recommended to patients with gingivitis to help reduce inflammation and bleeding of the gingiva.
- Erythritol should be recommended as a sugar substitute to patients on keto diet due to its ability to reduce acid and plaque levels in the oral cavity.
- Keto breath can be masked by chewing gum to stimulate salivation.

CONCLUSION

The ketogenic diet is a unique therapeutic modality which has decidedly salutary effects in refractory forms of epilepsy, especially in children. This intervention has profound multiple effects at the biochemical level that are not completely understood and may affect different body systems. This may not only pose a risk in imparting dental care but may inherently affect the manifestation of dental caries and periodontal disease.

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