

Ketogenic Diet and Natural or Herbal Medicines are Effective in Preventing Epilepsy

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Abstract: Epilepsy is a long - term neurological disorder characterised by recurrent seizures. Drug - resistant epilepsy (DRE) affects around 30% of epileptic sufferers. The ketogenic diet (KD) is regarded as a promising alternative therapy for epilepsy sufferers. The goal of this research was to discuss nutrition and natural or herbal therapies for epilepsy. Ketone bodies alter chemical messengers and brain metabolic activity, regulating neuroprotective mechanisms against oxidative damage and lowering seizure frequency. In this section, we examine epilepsy, KD, and its supporting nutrients, as well as the critical function of KD in the therapy of epileptic illnesses.

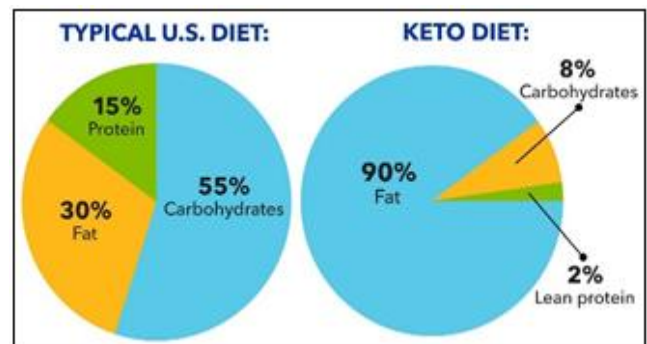
Keywords: Epilepsy, Ketogenic diet, MAD, LIGT, MCTD

1. Introduction

EPILEPSY - Epilepsy is a non - communicable chronic brain ailment that is the second most onerous in terms of morbidity and a constant barrier to patients' quality of life (Sisodiya et al., 2022). The illness may afflict individuals of any age, gender, color, or socioeconomic status, and the agony is experienced by both the patients and their caregivers (Spiciarich, 2019). Aside from the pain that people who have epileptic seizures feel, their dependents face societal stigma (Minwuyelet, 2019). The cause of epileptogenesis is uncertain; however, oxidative stress, neuroinflammation, and neurotransmitter system dysfunction may all play a part in epilepsy pathogenesis (Wu, Y., et al., 2020). The most prevalent kind of epilepsy, temporal lobe epileptic seizures, are considered to be caused by neuronal damage and are linked with frequent seizures, which contribute to cognitive deficits such as decreased motor learning and coordination (Hu, Y., et al., 2012).

With a global frequency of 0.5 - 1% and a lifetime incidence of 1 - 3% epilepsy is one of the most frequent neurological illnesses (Michael - Titus A. T., 2010). This chronic condition is frequently managed with medication; however, 30% of patients develop drug - resistant epilepsy (DRE), which is defined as the "failure of adequate trials of two tolerated and appropriately chosen and used antiepileptic drug schedules (whether as monotherapies or in combination) to achieve sustained seizure freedom" (Kwan P., 2009).

Ketogenic Diet: The conventional ketogenic diet (KD) has long been employed in the treatment of refractory epilepsy in children and adults, as well as in patients who are not surgical candidates, with evidence of success, particularly in the pediatric population (Martin - McGill K. J., 2018). In the past 20 years, several variations of KD for the treatment of epilepsy and other neurological illnesses have been established, including the modified Atkins diet (MAD), the low - glycemic index therapy (LGIT), and the medium - chain triglyceride diet (MCTD) (Schoeler N. E., 2016).



The keto diet is often advertised as a weight - loss approach, although it is really a medical diet that has been used to treat epilepsy since the 1920s. "The keto diet is a strict diet that mimics the effects of fasting," G. Qutubuddin Khan (2023), MD, a pediatric neurologist at the UK Epilepsy Clinic, said. "Keto requires you to cut out most carbohydrates and sugars while eating more fats and limited proteins." The term is derived from the ketosis process, which happens when a person fasts and the body begins to burn fat instead of glucose. Adults with difficult - to - treat epilepsy benefit from keto as well.

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2. Objective

- 1) To study the risk factors and mortality from epilepsy with evidence.
- 2) To Studying Nutrients with Natural and Herbal Herbs in the Treatment of Epilepsy.
- 3) To briefly study the ketogenic diet and its different types.

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A) Epilepsy Risk Factors:

Age, genetics, a family history of epilepsy, a history of febrile seizures, alcohol intake, CNS and other infections, brain trauma, head injury, perinatal stroke, preterm delivery, and geographical location are all risk factors (Berg, 1995). Epilepsy may occur at any age as a result of a head injury, central nervous system disorder, or tumour. Cerebrovascular disease is the most common risk factor in persons over the age of 65 (Grager, 2002). External non-genetic risk factors such as vascular disease, such as stroke, are becoming more frequent in adulthood. Certain kinds of epilepsy, whether in children or adults, may be associated with modifiable risk factors such as alcohol use, traumatic brain traumas, or CNS infections (Walsh, 2017). Knowing these risk factors may allow for more frequent outpatient clinic exams, alerting families about seizures, recommending to capture video in case of seizure suspicion, and getting an early electroencephalogram (EEG) if required (Kwan, 2006).

B) Types of KD are:

Ketogenic Diets	Macronutrients (% Total Daily Calories)			Ketogenic Ratio
	Fat	Protein	Carbohydrate	
Classic	90%	8%	2%	04: 01
MAD	65%	25%	10%	01: 01
LGIT	60%	30%	10%	01: 00.6
MCTD	65%	10%	25%	1: 1/ 2: 1

Classic Ketogenic Diet (KD): Wilder initially established the conventional KD in 1921 for the treatment of epilepsy in order to prevent the malnutrition that happens with extended fasting (Wilder, 1921). KD has a high fat content (80 - 90%) and a low protein (6 - 8%) and carbohydrate (2 - 4%) level in order to induce ketosis. KD simulates a fast, allowing for a restricted intake of fluids and calories. The cellular metabolism employs fatty acids as the principal source of energy in this situation, whereas hepatic catabolism dictates the synthesis of ketone bodies, resulting in urine ketosis. The fat - to - protein - to - carbs ratio is 4: 1, which means that the diet must include four parts of fatty acids and one of proteins and carbohydrates (Rho, 2017).

Modified Atkins Diet (MAD): Since 2003, the MAD has been employed at Johns Hopkins Hospital in Maryland (USA) to treat children and adults with refractory epilepsy (Kossoff, 2008). It is heavy in fat (65%), with a low protein (25%) and carbohydrate (10%) composition. The fat to protein and carbohydrate ratio is 1: 1, resulting in a more palatable and less restrictive variation of KD that is appropriate for youngsters or individuals with behavioural issues (Payne, 2011). There are no restrictions on liquids, calories, or proteins, but there are on carbs, with a maximum consumption of 10 - 20 g/day in children and 15 - 20 g/day in adults (Kossoff, 2004). Urinary ketosis may be caused by lowering your carbohydrate intake (Carrette E., 2008). It is advisable to take multivitamin complexes and calcium carbonate supplements on a daily basis. Fasting and meal weighing are not necessary for the diet to be started in an outpatient environment (Zupec - Kania B. A., 2009).

Low - Glycemic Index Treatment (LGIT): The LGIT was initially employed to treat refractory epilepsy at

Massachusetts General Hospital in Boston (USA) in 2005 (Pfeifer, 2005). It is a less restricted diet with a high fat content (60%), more protein than other diets (20 - 30%), and a low carbohydrate content (10%), as well as a low glycemic index (GI). Meals with a glycemic index of less than 50, such as meat, dairy products, certain fruits, whole grains, and bread, are permitted on this diet (Barzegar M., 2019). The fat - to - protein and carbohydrate - to - fat ratio is 1: 0.6. There are no restrictions on the addition of liquids and calories (Coppola G., 2011). LGIT generates less ketone bodies than KD, but it seems to be more tolerable (Pfeifer H. H., 2008).

Medium - Chain Triglyceride Diet (MCTD): Huttenlocher et al., (1971) were the first to describe the MCTD. It was revised in 2008 by Neal et al. (2008). It is a highly adaptable diet with a high fat content (30 - 60%), a low protein (10%), and a high carbohydrate (15 - 19%) composition. Long - chain triglyceride (LCT) fat generates more ketones per gramme than medium - chain triglyceride (MCT) fat (Miranda M. J., 2012). When compared to KD, the high ketogenic potential allows for a lower intake of fatty acids in favour of a higher intake of proteins and carbs, making the diet more appealing and useable for youngsters. Furthermore, as compared to the standard KD, children on MCTD develop faster, consume fewer micronutrients, and have considerably lower total cholesterol/high density lipoprotein ratios (Liu Y. M., 2008).

C) Mortality in Epilepsy:

Epilepsy patients are more likely to die young. Epilepsy with symptoms may shorten life by up to 19 years (Kalilani L., 2019). Epilepsy sufferers have a higher rate of premature mortality, trauma, murder, infections, and epileptic episodes than the general population (Gaitatzis, 2004). Although little is known about deaths in resource - poor countries, research indicates that they are greater than in other countries, which may assist in explaining why poorer countries have a higher prevalence and lower incidence of active epilepsy cases (Sander, 2003). Although the pharmacological reasons for early unexplained death in epileptic seizures are unknown, circulatory arrhythmias, particularly asystole associated with convulsions, have been found and are assumed to occur only in rare cases (Ducan, 2006).

D) Diagnosis of Epilepsy:

Clinically, epilepsy is diagnosed in a patient using neurophysiological testing that confirm the diagnosis. Brain imaging can identify several structural causes of epilepsy, such as brain tumours, hematomas, and stroke (Kutlubaev, 2018). Epilepsy is linked to more accurate diagnosis (EEG, radiographic imaging) and treatment of mental diseases such as depression, stress, and homicidal ideation (Dunn, 2018). The correct treatment of epileptic patients requires an understanding of the psychosocial correlates of epilepsy. Anticipating common mistakes in epilepsy diagnosis and treatment is crucial. Non - epileptic psychosomatic convulsions, dizziness with muscular twitching, wandering, limb dysfunction, and rapid eye movement (REM) behavioural abnormalities, the latter of which is more prevalent in senior men, are examples of early diagnostic mistakes (Lin, 2020).

E) Natural herbal medicines in epilepsy treatment:

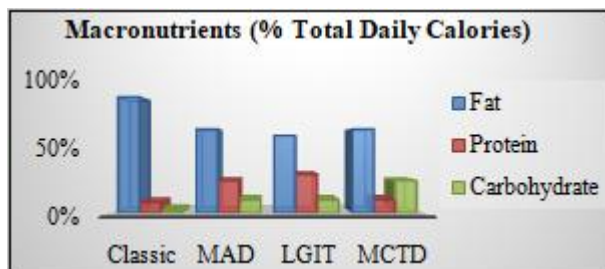
Natural therapies are required for the treatment of epilepsy. Herbal therapy is a medicinal method that has been used for ages to treat epilepsy in many different cultures (Sucher, 2015). Herbal remedies are presently the preferred complementary and alternative medicine therapy for epileptic seizures, as well as the side effects of antiepileptic medicines, and to maintain general health (Rhodes, 2008). Herbal remedies are used to treat seizures and reduce the side effects of antiepileptic pharmaceuticals, making them the most often used complementary and alternative medicine category in industrialised countries (Pearl, 2011).

Epilepsy is known as apasmara in Ayurveda, which means "loss of body consciousness." The Vedas, ancient Indian writings, mention four forms of epilepsy and nine illnesses that cause convulsions in children. Yoga, as a physical discipline, tries to re-establish a balance (union) between those parts of a person's health that generate seizures in the treatment of epilepsy. Yoga is one of the oldest formal disciplines known, with the goal of restoring this equilibrium. Asanas, pranayama, diaphragmatic breathing, and dhyana/meditation are examples (Sahaja, 1996).

F) NUTRIENTS IN EPILEPSY AND KETO DIET - Nathan (2009), Barzegar M. (2019)

Switzerland (Four-to-one ratio)	India (Two-to-one ratio)	Brazil (Four-to-one ratio)	Singapore (Four-to-one ratio)
6 g 35% Fat cream	34 g Chicken	25 g Skinless chicken breast	8 g Bacon
20 g Carrots	40 g Onion	20 g Okra	17 g Boiled lean pork
11 g Potato	93 g Tomato	5 g Green olives	20 g Cabbage
20 g Vegetable oil	1 g Ginger	14 ml Oil	green, boiled
13 g Ricotta (cheese)	1 g Garlic	1 Teaspoon of	33 g Sesame oil
	34 g Ghee/Oil	Chopped	
	1 or 2 Cloves	coriander	
	Bay leaf	Garlic salt	
	Green chili		
	Salt to taste		
	Red chili powder		
	(Dr Nathan's chart)		

[Courtesy of Maria Joaquina Marques-Dias (Brazil), Dr Gabriela Wohlrab (Switzerland), Dr Janak Nathan (India), and Dr Ong Hian Tat (Singapore)]



It is suggested to take nutritional supplements containing enough levels of vitamin and mineral components (multivitamins and minerals), such as omega - 3 PUFA, vitamin D3, vitamin E, vitamin B6, vitamin A, vitamin D, vitamin B complex, vitamin C, and pyruvate, Ca, Cell, and Zn. Three dietary alternatives are being examined for the treatment of seizures in epileptic patients. KD, MAD, and LGIT diets are examples (Kim JE, 2019; Soltani D, 2016).

3. Conclusions

For adults and children with refractory epilepsy, the KD is an effective, reasonably safe, and palatable dietary therapy. Less restrictive and more liberal KD variations have been created in recent decades to make the diet more practicable and pleasant while lowering adverse effects and making it accessible to a wider range of patients. KD offers a significant advantage over normal anticonvulsant therapy with AEDs, which has long-term negative effects. The most suitable dietary regimen must be chosen on an individual basis, taking into account the patient's age and circumstances, family environment, epilepsy type, epileptic patient nutrition status, and the response of epilepsy to various treatment methods. So that the sick person can recover quickly. For this, the patient should include some special food items in his diet according to his disease and

should also keep doing asanas, exercises, meditation and pranayam.

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