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Case Report

Efficacy and Tolerability of Classical Ketogenic Diet in a Paediatric Patient with Refractory Status Epilepticus (RSE)

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Abstract

The case report describes one paediatric patient with refractory status epilepticus treated with the classical ketogenic diet. A patient diagnosed with refractory status epilepticus, visited our clinic and was placed on the classical ketogenic diet after assessing biochemical-electrochemical parameters. The treatment was followed for a minimum of six months. The patient had a 85% seizure reduction, improved cognition and sound behavioural aspect after the treatment of six months. There was no reported evidence of side effect, commonly related to KD. The patient has shown good tolerability to the diet. The quality of life of the patient and family improved significantly. The number of antiepileptic drugs was reduced. The ketogenic diet is an effective and well-tolerated alternative treatment option for patients with refractory status epilepticus and should be considered as an effective course of treatment worldwide for treating refractory epileptic cases.

Keywords: *Ketogenic Diet; Refractory Status Epilepticus; Seizure; Pharmacoresistant Epilepsy*

Abbreviations

RSE: Refractory Status Epilepticus; SE: Status Epilepticus; KD: Ketogenic Diet

Introduction

Epilepsy is the most prevalent of all serious neurological disorders. As per International League Against Epilepsy (ILAE) task force, created in 2014, epilepsy is considered to be a disease of the brain defined by any of the following conditions [1]:

- At least two unprovoked (or reflex) seizures occurring > 24 hour apart.
- One unprovoked (or reflex) seizure and a probability of further seizures similar to the general recurrence risk (at least 60%) after two unprovoked seizures occurring over the next 10 years.
- Diagnosis of an epileptic syndrome.

Epileptic Status epilepticus is prolonged seizure for more than 5 minutes. The type of seizure that lasts after administration of 3 consecutive anti-epileptic drugs (AEDs) is classified as refractory status epilepticus (RSE) or refractory epilepsy [2].

Over the decades of research it has been assured that the classical ketogenic diet is a safe and convenient mode of alternative therapy for refractory or pharmacoresistant epileptic patients [3]. The ketogenic diet is a high fat-normal protein-very less carbohydrate containing diet which is being used as a safe therapy for paediatric refractory epilepsy cases over the years [4]. According to previous studies the classical ketogenic diet has been used as a therapeutic diet to treat refractory epilepsy, where the regimen included 1 g protein/kg ideal body weight of the children/day, 10 - 15g of carbohydrate daily and rest of the energy from fat sources like butter, lard and full fat cream to bring the satiety [4].

In this study, we evaluated the efficacy and tolerability of classical ketogenic diet in a paediatric patient who has met the criteria for RSE.

Materials and Methods

The patient was a 26 months old girl, born out of full term pregnancy with no complication and normal body weight for gestational age. There was no history of seizure from both the parents. On her 12th day of life she has started recurrent epileptic jerks. She was put on several anti-epileptic drugs (AEDs) like, valproic acid, vigabatrin, levetiracetam with poor response or no response. Her seizure was marked as refractory or pharmacoresistant after failure of 3 consecutive AEDs. Her biochemical investigations, including blood, urine, and Cerebrospinal Fluid (CSF) analysis, as well as karyotyping, were normal. Brain MRI was also normal. EEG was abnormal with generalized spike and wave discharges during sleep. There was no evidence of SNC1A gene mutation.

At her age of 2 years and 2 months the patient's family have visited our clinic for diet consultation. There was no need of ICU admission though there was several episodes of seizures. The diet was administered in two phases:

Carbohydrate wash out phase: During the washout phase the patient was given > 5g of carbohydrate, normal protein as per ideal body weight and increased amount of fat per day. The phase has ensured desired ketosis (4+ Urine ketone) before starting the ketogenic diet. Unlike traditional way the child was not kept for fasting to get recommended ketosis.

Ketogenic diet phase: After the washout phase, ketogenic diet with 3.5:1 (Fat: Carbohydrate+protein) ratio was introduced to maintain ketosis. The fixation of ratio, daily calorie requirement and number of meals was based on the patient's intake during carbohydrate wash out period, ideal body weight, age of the child and number of seizures per day. The family has been given thorough training on ketogenic diet, process of diet administration, measurement of urine ketone, importance of maintaining 4+ urine ketone and significance of regular follow up. The urine ketone was measured with keto-diastix, four times a day. The patient maintained 3+ (+++) or 4+ (++++) throughout the treatment.

Blood parameters were also checked 3 monthly from the starting of the treatment. One week after the diet administration the child has shown improvement with 50% seizure reduction. She had become more alert and her cognition has improved with better eye-contact. After 3rd week she started responding to her parents and others around. On her 6 monthly follow up she has shown 85% seizure reduction and improved quality of life. Number of AEDs was decreased to 1 from 3. The patient was continued to receive the diet.

Results and Discussion

The study has demonstrated a satisfactory response of the ketogenic diet in terms of reduction of seizure frequency and tolerability in our refractory epilepsy patient. There was no reported evidence of side effects like vomiting, nausea, lose motion, steatorrhoea, dizziness, hyperlipidaemia, constipation etc. The diet started working within 7 days of administration. Growth parameters like height and weight were monitored thoroughly. The diet has been fine-tuned as and when required.

The ketogenic diet is highly scientific and calculated diet. The use of the ketogenic diet for the treatment of SE is rapidly increasing throughout the world; however, to implement the diet in the management of RSE patients a team of experts, including a trained neurologist, dietitian and sometimes a psychologist, if necessary [5]. The team will ensure healthy neuronal response, less drop-outs and personalization of the diet. Also the expert supervision will allow the diet to be continued and implement a longer term treatment when it is successful [3]. Team decision for each individual shall base on electroclinical-biochemical aspects considering the quality of life of both the patient and the family. More awareness needs to be generated to ensure the knowledge about the diet among general mass.

From our experience it is recommended that several prospective studies of patients, both children and adults, with different types of refractory SE, should be conducted and reported to further define the role of the diet in the management of these patients.

Conclusion

The ketogenic diet is a promising alternative therapy for RSE in both paediatric and adult population. The classic KD is introduced in 1920s to treat RSE. This high-fat, low-carbohydrate, adequate protein diet induces ketone body production through fat metabolism to replace the general glucose metabolism for energy production without compromising the body of necessary calories and nutrients to sustain growth and development. Thus, the study strongly recommend that classical ketogenic diet should be practiced worldwide irrespective of etiology. The diet has a novel approach in controlling seizure frequency, improving cognition and behavioural aspect of the patients, suffering from refractory epilepsy.

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