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Dose Dairy Products have any Effect on Epilepsy?

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Abstract:

- ***Background:***
  A person with epilepsy may be more susceptible to seizures due to dietary issues. Epilepsy is a chronic neurological illness. There is still debate and uncertainty regarding the connection between milk and dairy products and epilepsy.

- ***Methods:***
  Using PubMed and Google Scholar, a narrative review was carried out to find English-language publications assessing dairy consumption, milk's nutritional components, dietary treatments, and seizure outcomes in epilepsy.

- ***Results:***
  Dairy products are not consistently identified as seizure triggers in the majority of epidemiological and clinical research. Calcium and vitamin D from dairy products may be beneficial, especially for people taking long-term anti-seizure drugs. Ketogenic diets used for refractory epilepsy combine metabolic pathways with high-fat dairy components. Rarely, immune-mediated inflammation caused by a cow's milk protein allergy can make seizures worse.

- ***Conclusion:***
  There is currently no evidence to recommend routinely limiting dairy products in people with epilepsy. Nutritional sufficiency should be given top priority in dietary recommendations while taking individual sensitivities into account.

Keywords: *Epilepsy; Dairy Products; Milk; Seizures; Diet; Ketogenic Diet.*

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I. INTRODUCTION

The illness known as epilepsy is characterized by repeated spontaneous seizures that are not clearly linked to a particular triggering event, as well as abrupt and brief episodes of seizures accompanied by loss or disruption of consciousness. But occasionally, either internal or external triggers might cause seizures. Numerous triggering variables have been found, including lack of sleep, excessive alcohol consumption, early awakenings, menstruation, psychological stress, photic stimulation, reading, writing, thinking, calculating, and playing musical instruments. (2).

Over 70 million people are thought to have epilepsy globally, which has a significant negative social and economic impact. The relationship between alcohol consumption and the risk of epilepsy has been documented in earlier research. These findings are inconsistent, albeit. There hasn't been much research done on the impact of other lifestyle choices, such coffee and milk consumption, on epilepsy. (1)

Recent research suggests that a certain diet may be linked to the incidence of seizures. A crucial milk protein called casein frequently results in hypersensitivity. It appears that the release of inflammatory cytokines during the immune system response process modifies the integrity of the blood-brain barrier (BBB) and causes neuronal inflammation, which may be an epileptogenic focus. However, a number of studies show that full-fat milk or dairy products with a greater fat content are an effective anti-inflammatory element that raises the threshold for seizures. (3)

Dairy products and milk are staples in many diets around the world and offer vital nutrients including calcium, high-quality proteins, and vitamins that are critical for general health and development. (4)

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For example, a Mendelian randomization study revealed a potential protective impact of dairy intake at the population level (5) genetically predicted increased milk consumption may be linked to a slightly lower risk of having epilepsy. However, case reports and immunological research have connected childhood seizures to cow's milk protein allergies, which may be caused by disruption of the blood-brain barrier and systemic inflammation. (6,7)

Furthermore, specific dietary treatments for epilepsy, like the ketogenic diet, which was first developed from high-fat milk components, show significant seizure control in refractory cases, highlighting the significance of dietary lipids and metabolic modulation in seizure management. (3). All of these findings point to a complex link between milk and dairy products and epilepsy that includes metabolic, immunological, and nutritional aspects. However, there is currently little and frequently contradictory evidence, thus a thorough analysis of the literature is required to elucidate possible mechanisms and clinical consequences.

II. METHODS

The method used was a narrative review. Major medical databases, such as PubMed and Google Scholar, were searched using keywords like epilepsy, diet, milk, dairy products, and seizures to find pertinent literature. English-language original research articles, clinical trials, observational studies, and review papers were taken into consideration. Included were studies that reported food triggers and those that concentrated on dietary therapy for epilepsy.

- *Nutritional Composition of Milk and Dairy Products and Their Relevance to Epilepsy*

Macronutrients and micronutrients found in milk and dairy products are complex meals that may have an impact on brain function. Carbohydrates (mostly lactose), proteins (casein and whey), lipids, calcium, phosphorus, and fat-soluble vitamins (such vitamin D) are the main constituents. These nutrients are essential for bone metabolism, neural signaling, and brain function in general. (9)

- *Calcium and Vitamin D*

Neuronal excitability and synaptic transmission depend on calcium. Epileptogenesis and the spread of seizures have been linked to dysregulation of calcium homeostasis. [10] It has been demonstrated that vitamin D possesses neuroprotective and anti-inflammatory properties in addition to facilitating calcium absorption. Long-term use of enzyme-inducing anti-seizure drugs like phenytoin and carbamazepine has been linked to vitamin D deficiency in people with epilepsy, according to several studies. (11). Therefore, consuming enough dairy products may promote bone health and possibly reduce skeletal issues without negatively impacting seizure management.

- *Dairy Proteins and Neuroimmune Interactions*

In vulnerable people, milk proteins—especially casein—can function as antigens and trigger immunological reactions. Elevated levels of pro-inflammatory cytokines, including interleukin-6 and tumor necrosis factor-α, have been seen in children with cow's milk protein allergies. These cytokines may change the permeability of the blood–brain barrier and enhance neuronal excitability. (4,5), Even though these reactions are rare, they point to a possible way that dairy products can affect seizures in a tiny percentage of individuals.

- *Fat Content and Seizure Threshold*

The neurological effects of dairy products seem to be significantly influenced by their fat content. Ketogenic dietary therapy, which encourages the synthesis of ketone bodies and lowers the frequency of seizures in people with drug-resistant epilepsy, shares biochemical similarities with high-fat dairy products.(6, 12), Low-fat dairy products, on the other hand, might not have this beneficial metabolic effect and have been linked to a reduced seizure threshold in experimental mice.[4] When examining the association between dairy consumption and epilepsy, our results emphasize the significance of dairy composition rather than consumption.

- *Milk and Dairy Products as Potential Seizure Triggers*

There is little scientific evidence to support the frequent notion held by patients and caregivers that milk or dairy products cause seizures. Regular dairy consumption and seizure frequency do not consistently correlate, according to the majority of population-based and clinical studies. (4) Individual dietary triggers for epilepsy are well known, nevertheless, and clinical management should take patient-reported sensitivities into account.

Rarely, removing cow's milk has improved seizures in kids with milk protein allergies, suggesting a customized dietary management strategy (5). However, it is not advised to completely forgo dairy products because this could lead to nutritional deficits, especially in calcium and vitamin D, which are already common in people with epilepsy. (11)

III. CLINICAL EVIDENCE ON DAIRY CONSUMPTION IN EPILEPSY

- *Observational and Epidemiological Studies*

There are few yet insightful clinical and population-based research assessing the connection between dairy consumption and epilepsy. Regular use of milk or dairy products is not significantly linked to an increased frequency of seizures, according to the majority of observational research. Dairy consumption is unlikely to be detrimental at the population level and may potentially provide protective effects through nutritional pathways, according to a Mendelian randomization analysis that linked genetically predicted increased milk intake to a slightly lower risk of epilepsy. (4)

Dairy products have not been found to be frequent or reliable seizure triggers in dietary surveys of people with epilepsy. Rather than uniform dietary limits, reported dietary triggers tend to vary greatly across people, supporting the significance of individual susceptibility.[13]

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➢ *Experimental and Animal Studies*

Mechanistic insights into the potential effects of dairy products on seizure susceptibility have been obtained through animal models. Dairy products with different fat contents have varying impacts on seizure thresholds, according to studies employing chemically induced seizure models. While high-fat dairy products seem to have neutral or somewhat beneficial effects, low-fat dairy products have been linked to an increased vulnerability to seizures.(14) These results lend credence to the theory that neuronal excitability may be modulated by lipid content and metabolic consequences rather than dairy itself.

However, as food metabolism and immunological responses vary greatly between species, extrapolating animal studies to human epilepsy must be done with caution. (15).

➢ *Drug–Nutrient Interactions and Bone Health in Epilepsy*

Anti-seizure medicine (ASM) use for an extended period of time is linked to a number of nutritional and metabolic issues, especially those that impact bone health. Phenytoin, carbamazepine, phenobarbital, and primidone are examples of enzyme-inducing ASMs that enhance the hepatic metabolism of vitamin D, which results in decreased bone mineral density, secondary hyperparathyroidism, and decreased calcium absorption (.9, 17) Therefore, compared to the general population, those with epilepsy have a higher risk of osteopenia, osteoporosis, and fractures.

Since milk and dairy products are a significant dietary supply of calcium and vitamin D, they may help prevent bone loss brought on by ASM. In children and adolescents with epilepsy, whose peak bone mass growth may otherwise be hindered, adequate dairy diet has been demonstrated to enhance calcium balance and support skeletal integrity. Crucially, there is no compelling evidence that the pharmacokinetics or effectiveness of frequently given ASMs are negatively impacted by regular dairy product consumption. (20)

Clinically speaking, maintaining a sufficient intake of foods high in calcium, such as milk and dairy products, is consistent with the current guidelines for managing epilepsy, which place an emphasis on monitoring bone health and addressing nutritional deficits. (17) Therefore, rather than enforcing needless dietary limitations, dietary counseling should concentrate on preserving nutritional sufficiency.(18)

Ketogenic Diet, Dairy-Derived Fats, and Metabolic Mechanisms in Epilepsy.

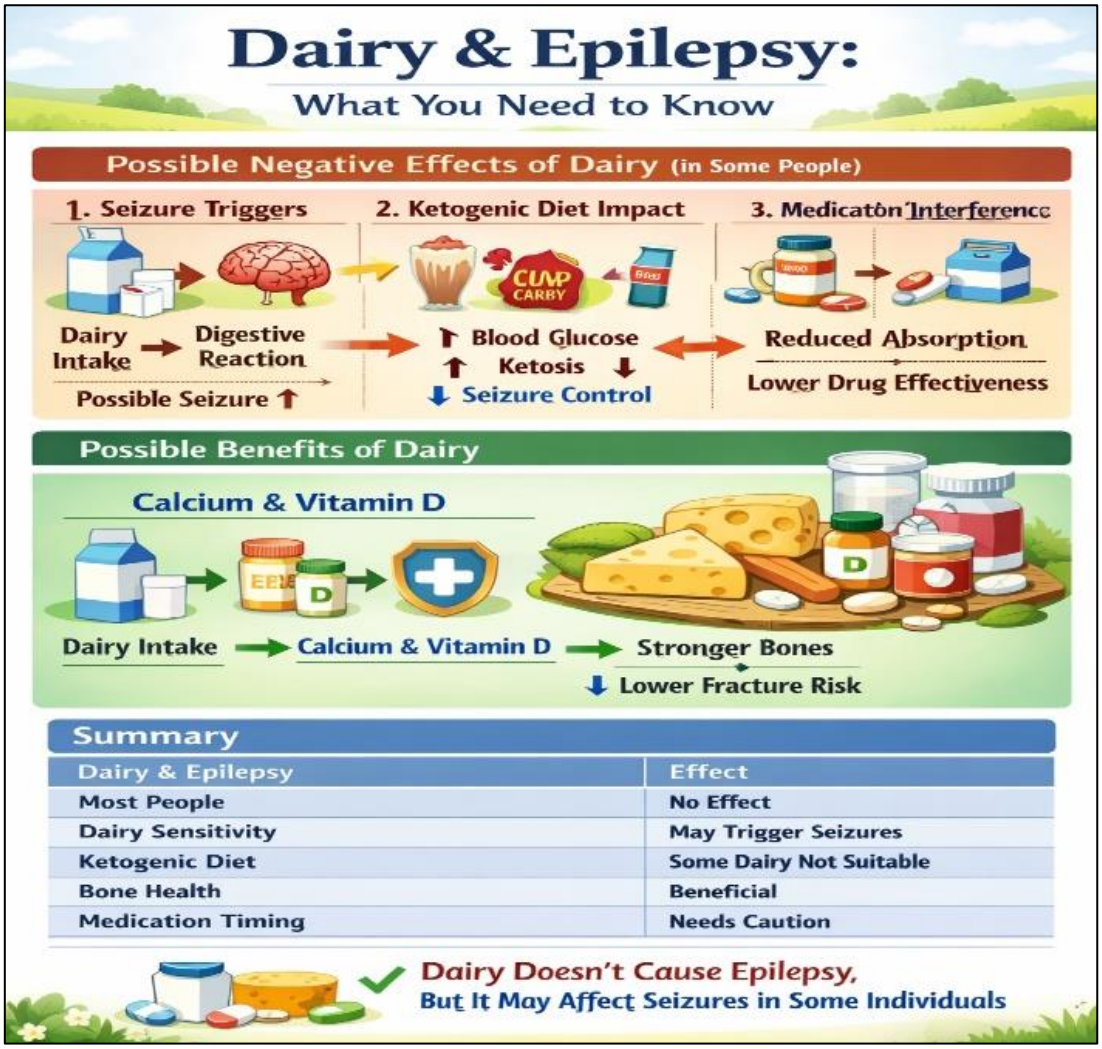

Fig 1 Dairy & Epilepsy

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IV. DISCUSSION

This review integrated epidemiological data, experimental findings, and clinical observations to analyze the available information about the association between consumption of dairy products and epilepsy. According to recent research, dairy products do not consistently affect seizure activity; instead, their impact seems to be regulated by individual susceptibility, immunological responses, metabolic processes, and nutritional makeup.

Although there is still little information on dairy consumption, epidemiological evidence suggests that lifestyle variables can affect the incidence of epilepsy. While the role of milk and dairy products has been less thoroughly investigated, large population-based studies have mostly concentrated on alcohol and caffeine intake (2,4). Significantly, a Mendelian randomization study showed that a slightly lower risk of epilepsy was linked to genetically predicted increased milk consumption, indicating a possible protective impact at the population level (4,5). By reducing confounding variables, this genetic method increases the observed association's dependability.

Dairy products may affect a person's susceptibility to seizures, according to experimental research. Dairy products with varying fat concentrations can have various impacts on seizure threshold, according to animal models. While high-fat dairy products showed neutral or slightly beneficial effects, low-fat dairy products were linked to increased seizure susceptibility (8). These results are in line with data from ketogenic dietary regimens, which significantly rely on high-fat ingredients, such as lipids produced from dairy, to control seizures in patients with drug-resistant epilepsy (3,13,21).

Another crucial factor to take into account is the immunological effects of dairy proteins. Cow's milk protein allergies have been linked to neurological symptoms, such as seizures, in vulnerable people, especially youngsters (6,15). Increased neuronal excitability and disruption of the blood–brain barrier may result from elevated pro-inflammatory cytokines seen in these situations, which may contribute to the development of seizures (7,12). However, in the general epilepsy community, such immune-mediated reactions are uncommon and do not support regular dairy avoidance.

From a nutritional standpoint, dairy products include vital micronutrients like calcium and vitamin D, which are necessary for bone health and neural transmission. Long-term use of enzyme-inducing anti-seizure drugs has been associated with decreased bone mineral density and vitamin D deficiency, which raises the risk of fracture in people with epilepsy (11,17,18). In children and adolescents, where appropriate bone mass accrual is crucial, adequate dairy intake may help attenuate these negative consequences (19).

Anecdotal evidence is the main source of concerns about dairy products as seizure triggers. Dairy products are not consistent or common seizure triggers, according to systematic reviews and dietary surveys, and reported dietary sensitivities vary greatly among people (14). This is in favor of individualized dietary guidance as opposed to broad dietary prohibitions.

Lastly, the relevance of lipid metabolism and energy regulation in seizure control is shown by the compelling clinical data for ketogenic and medium-chain triglyceride diets (13,21–25). These therapeutic diets show that dietary fat, not lactose or dairy proteins, is essential for regulating seizure thresholds and neuronal excitability.

This review is limited by its narrative design, which may introduce selection bias. With variations in study populations, dietary assessment techniques, and seizure outcomes, the information that is now available is limited and inconsistent. The use of self-reported dietary intake in many research raises the possibility of recall bias. Furthermore, the direct application of mechanistic insights to humans is limited because they are primarily obtained from animal or experimental investigations. Establishing causal links between dairy consumption and epilepsy is hampered by the absence of long-term randomized controlled research.

V. CONCLUSION

Dairy products and epilepsy have a complicated and individual-specific interaction. Dairy products can include vital minerals like calcium and vitamin D that maintain bone health, especially for those using long-term anti-seizure drugs, and they do not cause seizures in the majority of epileptics. Rarely, immunological reactions to dairy products can cause seizures in certain people, especially youngsters who have a protein allergy to cow's milk. Certain dietary treatments, including the ketogenic diet, which can help control seizures in drug-resistant patients, may benefit from high-fat dairy components. In general, regular dairy restriction is not necessary, and dietary recommendations should concentrate on preserving balanced nutrition while taking individual sensitivities and metabolic requirements into account.

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