



# Evaluation of the Effects of Fasting During the Holy Month of Ramadan on Patients with Epileptic Attacks Who Visited the Emergency Room

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## Abstract

**Background:** Epilepsy is one of the most common disorders of the central nervous system. Many factors affect the occurrence and severity of epileptic attacks (EAs). Food is one of the most challenging of the factors. Fasting during Ramadan is one of the important requirements in Islam, and it has always been challenging for epileptic patients. This study evaluated the number of EA cases admitted to the emergency room (ER) during Ramadan.

**Methods:** This prospective and cross-sectional study evaluated all ER visits by EA patients during the months of Shaaban, Ramadan, and Shawwal (all were convulsions). In this study, the mean average ER visit frequency was compared in the three months. The differences between the mean averages of EA visits were significant ( $P < 0.05$ ).

**Results:** Of the 156 cases, half were male and half were female. The frequency of EAs was 68, 35, and 53 for the months of Shaaban, Ramadan, and Shawwal, respectively. It was found that there was about 40% reduction in ER visits during the month of Ramadan, mainly due to the discontinuation of antiepileptic drugs.

**Conclusion:** During the Holy month of Ramadan, the number of visits to the ER due to EA (convulsions) decreased. Two mechanisms are involved in the reduced number of epileptic occurrences and their control: First, the consumption of a high-fat diet and bigger protein portions, and, second, reduced food consumption. Other possible factors are reduced travel during Ramadan, better administration of drugs, and the peaceful mind attributed to this month.

**Keywords:** Ramadan, Epilepsy, Epileptic attacks, Convulsion, Emergency

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## Introduction

Epilepsy is one of the most common disorders of the central nervous system. The prevalence of epilepsy in Kerman city (place of study) is 8 per 1000. The incidence of epilepsy depends on different factors (1), one of which is nutrition (2).

Eleven centuries ago, Razi delved into the subject of epilepsy and the role of nutrition in detail in his valuable book *Al-havi Fi al-Teb* (3). In Chapter 4 Section 3 of the book *Canoon of Medicine*, authored by Hossein son of Sina, he discusses the role of nutrition and even alcohol on epilepsy and convulsion, which is respectable (4).

One of the Islamic orders is fasting during the Holy month of Ramadan for all Muslims who have no medical restrictions. They abstain from all food, drink, and smoking for about 10–14 hours, which can cause changes affecting the frequency of epileptic attacks (EAs). Intermittent fasting is a safe diet therapy that can produce clinically significant weight loss (>5%) and improve

several markers of metabolic health in individuals with obesity (5,6).

On the other hand, there have been many studies focusing on the role of nutrition in epilepsy. Fasting may affect epilepsy in several ways. The mid-day use of the drug, if prescribed, is omitted which will reduce the serum level of the drug in the patient, and sleep patterns may also change. In a study, it was found that epileptic patients who had not had convulsions for a longer period before the start of Ramadan or had had good sleep had fewer problems during the month of Ramadan (7).

Another study found an increase in the frequency of convulsions during the month of Ramadan (8). Another study reported that the number of EAs in patients who were prescribed multiple drugs and did not observe their drug regimen increased during the month of Ramadan (9).

The ketogenic diet (KD) is a diet well-known for its anti-epileptic effects. Its antiepileptic effects were discussed by



Wilder in 1921, by Livingstone in 1972, by Huttenlocher in 1976, by Devivo in 1978, and by Withrou in 1980 (10). Ebrahimi et al discussed the role of charged amino acids in 2015 (2) and also the positive effects of the L-Arginine amino acid in patients resistant to treatment in 2020 (11). Amino acid supplements have generally been used (12). The use of prescription drugs and non-drug treatments for epilepsy has always been a serious challenge (13).

It is important to know that the first line of treatment for epilepsy is the prescription of anti-epileptic drugs. Unfortunately, only one or two anti-epileptic drugs are not enough for 30% of the patients (14,15). A major number of patients stop taking their medications due to side effects (16). These patients, especially those who do not have a condition that requires surgical operation, need help in other areas, and diet is an opportunity for effective intervention (17). The benefits of KD are well-known and it has been used for many years (18).

This study has evaluated the rate of EA admissions to the emergency room (ER) during the Holy month of Ramadan and the months directly before and after it.

## Methods

This prospective and cross-sectional study was conducted during the three months of Shaaban, Ramadan, and Shawwal on patients admitted to the ER due to EAs. For all of the patients, a questionnaire prepared by the researchers was used to collect relevant data, including demography, history, other illnesses, and medications. The data were analyzed using a computer software application (SPSS version 22).  $P < 0.05$  was taken as statistically significant.

## Results

The number of admissions to the ER at Shafa Medical Center in Kerman city, with a population of 500 000, was a total of 156 cases for the studied three months. Table 1 shows the admission distribution by sex for the three months of the study. A significant statistical reduction ( $P < 0.05$ ) was revealed in the number of patients admitted during the month of Ramadan. This is a more than 40% reduction.

Graph 1 shows the causes and underlying reasons for these EA cases. Considering the statistical distribution, there were no significant differences between the three months regarding the underlying reasons ( $P > 0.05$ ). The most common cause of EAs was antiepileptic drugs (AEDs) withdrawal. In the month of Ramadan, the EAs due to drug discontinuation showed a more pronounced reduction, but this reduction was not significant considering the overall reduction during the three months ( $P > 0.05$ ).

Blood sugar and serologic indices of all the cases were assessed upon arrival, but no significant statistical difference was found between the patients during the

three months.

## Discussion

In this study, we observed a 40% reduction (male and female) (in ER admissions due to EAs during the holy month of Ramadan compared to the months immediately before and after it (Table 1). The number of EAS cases increased in the month immediately after Ramadan but did not rise as high as the month before Ramadan. It can be said that the effect of the holy month of Ramadan continued for some time. This reduction may be because the patients stayed home and traveled less and, as a result, followed their drug regimen more strictly.

Another important consideration is the change in the subjects' diet during Ramadan. People tend to consume more fatty foods and increase their protein intake. A fat- and protein-rich diet tends to cause the physiologic pH of the body to become acidic. This is something that happens in KD too. In a study on rats, it was noticed that the convulsions caused by intraperitoneal injection of pentylentetrazol were reduced if accompanied by consumption of amino acids before injection (19).

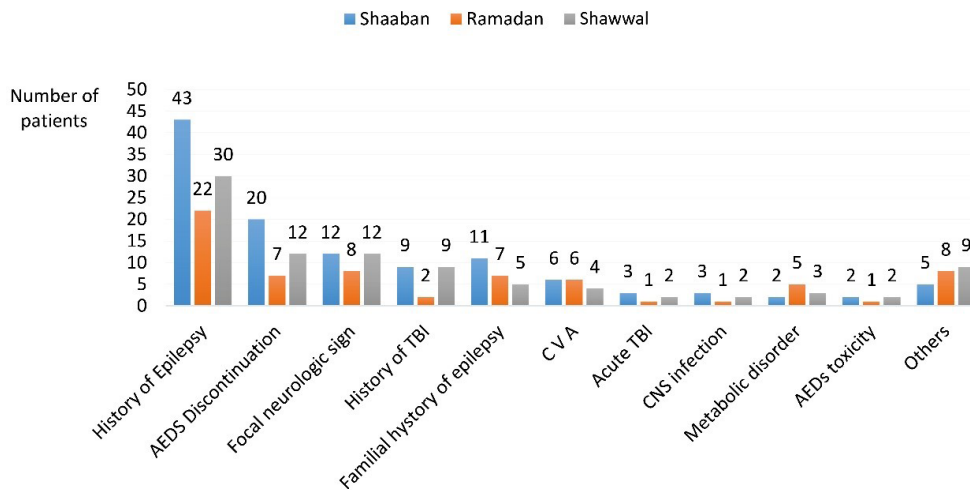
Magdy et al reported in 2020 that focal EAs and absence states decreased in the month of Ramadan and continued to stay low during the next month (20). In another study by Alqadi et al, it was shown that fasting had a positive effect on EA control, without a negative effect on quality of life (21).

It is important to note that the mechanism of the effect of food consumption limitation and KD are not the same. Each of these methods has its own special mechanism of effect (22). The use of alternating fasting can be useful in the treatment of epileptic patients who have not responded to antiepileptic drugs, with a mechanism of action different from that of the KD (both with or without KD) (23). In a study, that looked at the effect of hunger in rats, it was shown that short-duration hunger can improve the nervous system's electronic signals, make the metabolic activities (metabolic energy) regular, and create changes in electroencephalogram (24).

During the Holy month of Ramadan, two things happen: First, food abstinence for 10 to 14 hours; Second, consumption of a high-fat and a larger high-protein diet which is similar to KD (24). KD produces changes in the glucose metabolism of the brain, which causes an increase in the stimulation threshold (25). KD has been

**Table 1.** Distribution of emergency room admissions due to epileptic attacks (sex and month)

Month/Sex	Male	Female	Total
Shaaban	33	35	68
Ramadan	19	16	35
Shawwal	26	27	53
Total	78	78	156



**Figure 1.** Distribution of epileptic attack admissions in the emergency room in Shaaban, Ramadan, and Shawwal months. TBI: traumatic brain injury, CVA: cerebra vascular accidents

used in epileptic children for a long time (26). Both of the above consequences can be effective in reducing EAs. Food limitation causes an increase in the speed of neuron activity inhibition and produces its anticonvulsive effect, i.e., the speed of inhibitory activity increases, preventing the spread of epileptic discharges. KD may have an antiepileptogenic effect by reducing the production of epileptic discharges. These two activities have a synergic effect and cause an increase in antiepileptic effect (22). The mental peace during the month of Ramadan has a significant effect in decreasing EA too.

In this study, underlying disorders were evaluated as well. Figure 1 shows a significantly wide distribution of these factors. In this study, the biggest reason for needing to visit the ER was the discontinuation of AEDs by the patients. In addition, reduced traveling and proper administration of AEDs caused a reduction in ER visits. The patients who are diagnosed with epilepsy and know about their illness have a lower number of EAs due to better care (Figure 1). Discontinuation of AEDs is a common phenomenon and is due to intolerance of drugs by the patients due to the side effects. In some studies, side effects have been reported in up to 88% of the cases, which has an adverse effect on the quality of life of the patients (27). The rate of recurrence of EAs due to discontinuation of AED has been reported to be from 23 to 63%. The rate of EAs is dependent on the population studied and other factors like early discontinuation of AEDs, the number of EAs before the start of drug treatment, age, and, most important of all, the type of epilepsy (28,29).

## Conclusion

During the holy month of Ramadan, admission to the ER due to EAs decreases. Two mechanisms are involved; diets rich in fat accompanied by larger protein portions; and limiting food consumption. These cause a reduction in the production of epileptic discharges as well as an

increase in inhibition of abnormal discharges. Other factors include reduced travel, better administration of drugs in epileptic patients, and the mental peace associated with this month.

## Authors' Contribution

Data collection was done by Mohammad Karim Jahani Moghadam, and the rest of the work (design: including the initial idea, design methodology), data analysis, and writing the article is the responsibility of Hossein Ali Ebrahimi Maimand.

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## References

- Ebrahimi H, Shafa M, Hakimzadeh Asl S. Prevalence of active epilepsy in Kerman, Iran: a house based survey. *Acta Neurol Taiwan*. 2012;21(3):115-24.
- Ebrahimi HA, Ebrahimi S. Evaluation of the effects of charged amino acids on uncontrolled seizures. *Neurol Res Int*. 2015;2015:124507. doi: [10.1155/2015/124507](https://doi.org/10.1155/2015/124507).
- Zaker Mohammad Ebrahim. *The Content: Razice Book 1*. 1st ed. Shahid Beheshti University of Medical Sciences Publication; 2014. p. 129-45.
- Abdul-Rahman Sharaf-Kandi (Hezhar). *Avicenna: The Canon of Medicine Book 3, Part 1*. 4th ed. Soroush Publication; 1990. p. 177-193.
- Varady KA, Cienfuegos S, Ezpeleta M, Gabel K. Cardiometabolic benefits of intermittent fasting. *Annu Rev Nutr*. 2021;41:333-61. doi: [10.1146/annurev-nutr-052020-041327](https://doi.org/10.1146/annurev-nutr-052020-041327).
- Mandal S, Simmons N, Awan S, Chamari K, Ahmed I. Intermittent fasting: eating by the clock for health and exercise performance. *BMJ Open Sport Exerc Med*. 2022;8(1):e001206. doi: [10.1136/bmjsem-2021-001206](https://doi.org/10.1136/bmjsem-2021-001206).
- Magdy R, Kishk NA, Abokrysha NT, Ramzy GM, Rizk HI, Hussein M. Predictors of successful Ramadan fasting in Muslim patients with epilepsy: a prospective study. *Seizure*. 2020;80:67-70. doi: [10.1016/j.seizure.2020.04.012](https://doi.org/10.1016/j.seizure.2020.04.012).
- Gomceli YB, Kutlu G, Cavdar L, Inan LE. Does the seizure frequency increase in Ramadan? *Seizure*. 2008;17(8):671-6. doi: [10.1016/j.seizure.2008.03.008](https://doi.org/10.1016/j.seizure.2008.03.008).
- Abdou A, El Fatatry A, Allah HS, Abd Elhakeem N. Effect of

- Ramadan fasting on seizure control in epileptic patients (P6. 296). *Neurology*. 2015;84(14 Suppl):P6.296.
10. Niedermayer E. *The Epilepsies: Diagnosis and Management*. Urban & Schwarzenberg; 1990. p. 323-5, 376.
  11. Ebrahimi Meimand HA, Iranmanesh F, Ansari M, Molla Mohammadi H, Ebrahimi S. Evaluation of L-arginine effects on refractory seizures in epileptic patients. *J Kerman Univ Med Sci*. 2020;27(3):213-21. doi: [10.22062/jkmu.2020.90640](https://doi.org/10.22062/jkmu.2020.90640). [Persian].
  12. Evangelidou A, Vlachonikolis I, Mihailidou H, Spilioti M, Skarpalezou A, Makaronas N, et al. Application of a ketogenic diet in children with autistic behavior: pilot study. *J Child Neurol*. 2003;18(2):113-8. doi: [10.1177/08830738030180020501](https://doi.org/10.1177/08830738030180020501).
  13. Ebrahimi HA. Challenges in the treatment of epilepsy. *J Kerman Univ Med Sci*. 2012;19(6):212-24. [Persian].
  14. Ułamek-Kozioł M, Pluta R, Bogucka-Kocka A, Czuczwar SJ. To treat or not to treat drug-refractory epilepsy by the ketogenic diet? That is the question. *Ann Agric Environ Med*. 2016;23(4):533-6. doi: [10.5604/12321966.1226841](https://doi.org/10.5604/12321966.1226841).
  15. Kwan P, Brodie MJ. Early identification of refractory epilepsy. *N Engl J Med*. 2000;342(5):314-9. doi: [10.1056/nejm200002033420503](https://doi.org/10.1056/nejm200002033420503).
  16. Lamberink HJ, Otte WM, Geerts AT, Pavlovic M, Ramos-Lizana J, Marson AG, et al. Individualised prediction model of seizure recurrence and long-term outcomes after withdrawal of antiepileptic drugs in seizure-free patients: a systematic review and individual participant data meta-analysis. *Lancet Neurol*. 2017;16(7):523-31. doi: [10.1016/s1474-4422\(17\)30114-x](https://doi.org/10.1016/s1474-4422(17)30114-x).
  17. Kossoff EH, Hartman AL. Ketogenic diets: new advances for metabolism-based therapies. *Curr Opin Neurol*. 2012;25(2):173-8. doi: [10.1097/WCO.0b013e3283515e4a](https://doi.org/10.1097/WCO.0b013e3283515e4a).
  18. Ludwig DS. The ketogenic diet: evidence for optimism but high-quality research needed. *J Nutr*. 2020;150(6):1354-9. doi: [10.1093/jn/nxz308](https://doi.org/10.1093/jn/nxz308).
  19. Ebrahimi HA, Asadi M. Effect of charged amino acids on convulsion due to pentylenetetrazol in male adult rat. *Iran J Neurol*. 2005;4(12):13-7.
  20. Magdy R, Kishk NA, Abokrysha NT, Ramzy GM, Rizk HI, Hussein M. Fasting and post fasting effect of Ramadan on different seizure types in patients with active epilepsy. *Nutr Neurosci*. 2022;25(5):1100-4. doi: [10.1080/1028415x.2020.1840048](https://doi.org/10.1080/1028415x.2020.1840048).
  21. Alqadi K, Alghamdi O, Babtain F, Ba'arma H, Bajammal S, Albalawi M, et al. Effects of fasting during Ramadan on seizure control and quality of life in patients with epilepsy. *Epilepsy Behav*. 2020;112:107440. doi: [10.1016/j.yebeh.2020.107440](https://doi.org/10.1016/j.yebeh.2020.107440).
  22. Bough KJ, Schwartzkroin PA, Rho JM. Calorie restriction and ketogenic diet diminish neuronal excitability in rat dentate gyrus in vivo. *Epilepsia*. 2003;44(6):752-60. doi: [10.1046/j.1528-1157.2003.55502.x](https://doi.org/10.1046/j.1528-1157.2003.55502.x).
  23. Hartman AL, Rubenstein JE, Kossoff EH. Intermittent fasting: a "new" historical strategy for controlling seizures? *Epilepsy Res*. 2013;104(3):275-9. doi: [10.1016/j.epilepsyres.2012.10.011](https://doi.org/10.1016/j.epilepsyres.2012.10.011).
  24. Landgrave-Gómez J, Mercado-Gómez OF, Vázquez-García M, Rodríguez-Molina V, Córdova-Dávalos L, Arriaga-Ávila V, et al. Anticonvulsant effect of time-restricted feeding in a pilocarpine-induced seizure model: metabolic and epigenetic implications. *Front Cell Neurosci*. 2016;10:7. doi: [10.3389/fncel.2016.00007](https://doi.org/10.3389/fncel.2016.00007).
  25. Appleton DB, DeVivo DC. An animal model for the ketogenic diet. *Epilepsia*. 1974;15(2):211-27. doi: [10.1111/j.1528-1157.1974.tb04943.x](https://doi.org/10.1111/j.1528-1157.1974.tb04943.x).
  26. Freeman JM, Kossoff EH, Hartman AL. The ketogenic diet: one decade later. *Pediatrics*. 2007;119(3):535-43. doi: [10.1542/peds.2006-2447](https://doi.org/10.1542/peds.2006-2447).
  27. Baker GA, Jacoby A, Buck D, Stalgis C, Monnet D. Quality of life of people with epilepsy: a European study. *Epilepsia*. 1997;38(3):353-62. doi: [10.1111/j.1528-1157.1997.tb01128.x](https://doi.org/10.1111/j.1528-1157.1997.tb01128.x).
  28. Berg AT, Shinnar S. Relapse following discontinuation of antiepileptic drugs: a meta-analysis. *Neurology*. 1994;44(4):601-8. doi: [10.1212/wnl.44.4.601](https://doi.org/10.1212/wnl.44.4.601).
  29. Laue-Gizzi H. Discontinuation of antiepileptic drugs in adults with epilepsy. *Aust Prescr*. 2021;44(2):53-6. doi: [10.18773/austprescr.2021.005](https://doi.org/10.18773/austprescr.2021.005).

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