

Research Article

Navigating Epilepsy Care: Assessing Therapeutic Approaches among Health Professionals in Eastern Mediterranean Countries

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Abstract

Background: Various therapeutic modalities, such as pharmacotherapy, the ketogenic diet, and surgical interventions, are indicated in the management of epilepsy. The awareness of health professionals regarding the utility of each modality varies from one country to another, influenced by knowledge and continuous education. This study aims to evaluate the familiarity of health professionals operating in the Eastern Mediterranean Region (EMR) countries with the therapeutic modalities employed in managing epilepsy.

Methods: Health professionals, including general practitioners, neurophysiologists, pediatricians, neurosurgeons, psychiatrists, and psychologists, working in the EMR, were invited to participate in an online questionnaire survey. The questionnaire, distributed via Google Forms, comprised categorized questions addressing therapeutic modalities relevant to their expertise.

Results: Approximately 78.9% of health professionals believed that epilepsy is a treatable condition, with 96.2% considering pharmacological intervention as a specific approach for its management. Additionally, 42.6% believed that dietary manipulation could be beneficial for patients. A notable finding was a low level of knowledge observed in over 90% of health professionals regarding certain Antiseizure Medications (ASMs) indicated for specific types of epilepsy. Additionally, neurophysiologists exhibited a high mean level of knowledge concerning the number of ASMs administered.

Conclusion: Health professionals exhibited a low level of knowledge regarding the treatment modalities for epilepsy. Consequently, there is a need for comprehensive programs to enhance the awareness of professionals who manage patients with epilepsy.

Keywords: EMR; Epilepsy; Health professionals; Ketogenic diet; Knowledge; Treatment.

Abbreviations: ASMs: Antiseizure Medications; EMR: Eastern Mediterranean Region; ILAE-EMR: International League Against Epilepsy-Eastern Mediterranean Region; KSA: Kingdom of Saudi Arabia; SD: Standard Deviation; UAE: United Arab Emirates.

Introduction

Epilepsy is a chronic disease that manifests as recurrent unprovoked seizures [1]. Most clinicians believe that the prognosis of epilepsy relates to seizure cessation upon treatment [2]. Therapeutic approaches include non-pharmacological, pharmacological, and surgical interventions [1,2]. The ketogenic diet is a non-pharmacological therapy for epilepsy [3], providing an efficacy index of 13% with patients showing >50% seizure reduction [4]. Additionally, the ketogenic diet in its two forms, the classical and modified Atkin diet, exhibits an anticonvulsant effect and is effective in myoclonic epilepsy, and generalized drug-resistant epilepsy [5].

Carbamazepine is the drug of first choice for focal epilepsy in many countries [6], followed by zonisamide [7] and lamotrigine [8]. Levetiracetam is preferred in elderly patients due to its tolerability [9]. Recently, new brands of antiepileptic agents or Antiseizure Medications (ASMs) have been authorized for the treatment of childhood-onset epilepsy syndromes, including genetic epilepsy [10]. These include stiripentol (a gamma-aminobutyric acid receptor-A modulator), cannabidiol (a cannabis derivative), and fenfluramine (an amphetamine derivative) [11]. Surgical treatment is beneficial in pediatric patients, particularly when performed early, as it improves cognitive outcomes and the quality of life [12]; however, it poses significant concerns in the management of refractory epilepsy [13].

The choice of treatment for epilepsy is influenced by various factors, including the frequency and severity of seizures, the patient's age, overall health, and medical history. Therefore, identifying the specific type of epilepsy and documenting the adverse effects of ASMs experienced by patients is crucial in its treatment. Conversely, studies indicate that health professionals either lack awareness of adverse reactions to ASMs or have poor knowledge about dispensing ASMs, considering vital aspects like drug interactions, prescription to pregnant women with epilepsy, and pharmacokinetic profiles of ASMs [14,15].

This study aims to assess the awareness of health professionals regarding the treatment modalities for managing epilepsy, focusing on pharmacotherapy, the ketogenic diet, and surgical intervention in the Eastern Mediterranean Region (EMR) countries.

Materials and Methods

Design

A cross-sectional survey was conducted using an online questionnaire, created with Google Forms, and was distributed to medical health professionals residing in the Asian and African countries of the EMR.

Participants

Medical professionals residing in the EMR countries were recruited from the community through an online survey. To facilitate statistical analysis, they were categorized based on their working locations into Asian and African EMR countries, considering the limited number of respondents in some countries. The inclusion criteria required all participants to have an academic degree in medical science. Additionally, they were grouped according to their affiliations such as general practitioners, neurophysiologists, neurosurgeons, pediatricians, psychiatrists, and psychologists.

Materials

The questions comprised information regarding their gender, residency, medical professional category, and location. The questionnaire helped to collate participants' opinions on managing epilepsy, covering aspects such as treatability, therapeutic approaches, commonly used ASMs, and types of diet that are beneficial in epilepsy.

Statistical Analysis

The sample size was determined using the G*Power software, version 3.1, a freely accessible online program. This software facilitates sample size and power calculations for various statistical methods. Statistical comparisons were conducted using the Chi-square test, Fisher's exact probability test, and the difference between proportions test. The analyses were performed using the Excel-10 software program (Microsoft Corporation, Redmond, Washington, USA). The significance level (p -value) assumed for all tests was ≤ 0.05 . The results are presented as number (percentage [%]), median (interquartile range [Q1-Q3]), and mean (Standard Deviation [SD]) as applicable.

Ethical Approval

The study is observational and non-interventional, conducted in multiple countries in the EMR. Most of these countries do not mandate 'ethical approval' for this type of research. The executive committee of the International League Against Epilepsy-Eastern Mediterranean Region (ILAE-EMR) has certified the project titled "Navigating Epilepsy Care: Assessing Therapeutic Approaches Among Health Professionals in Eastern Mediterranean Countries."

Results

Participant Demographics

A total of 418 participants from countries in the EMR responded to the survey. The distribution included Algeria (n=1), Bahrain (n=75), Egypt (n=53), Iraq (n=40), Jordan (n=3), the Kingdom of Saudi Arabia (KSA) (n=8), Kuwait (n=2), Libya (n=17), Morocco (n=28), Qatar (n=72), Sudan (n=69), Tunisia (n=27), the United Arab Emirates (UAE) (n=2), and Yemen (n=21) (Figure 1). Among the respondents, 62.4% were females, and 37.6% were males. Based on their countries of residency, 46.7% were from Africa, and 53.3% were from Asia.

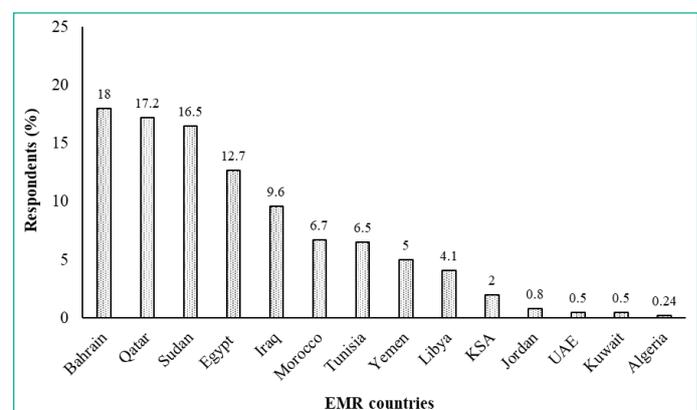


Figure 1: Distribution of survey respondents in the EMR countries. Health professionals from Algeria, Bahrain, Egypt, Iraq, Jordan, the Kingdom of Saudi Arabia (KSA), Kuwait, Libya, Morocco, Qatar, Sudan, Tunisia, the United Arab Emirates (UAE), and Yemen participated in the online survey. The data are arranged in descending order.

The majority were general practitioners (67.7%), followed by psychiatrists (8.6%), neurophysiologists, and pediatricians (8.1% each). In terms of healthcare levels, approximately 50.5% were from tertiary healthcare, 19.4% from primary healthcare, and 17.8% from secondary healthcare. Around 83.7% of the health professionals reported treating 1-50 patients per month (Table 1).

Survey Analysis

Approximately one-fourth of the health professionals believed epilepsy to be an untreatable disease (Table 1). This belief significantly correlates with the practices of these professionals. Some health professionals practicing in secondary healthcare levels (28.4%) and private clinics (19.5%) held the view that epilepsy is untreatable compared to their counterparts. Notably, a considerable proportion of health professionals (78.9%) dealing with a higher number of epileptic patients believed that epilepsy is a treatable disease. However, no significant differences were observed in terms of sex, health profession, and country of residence regarding the belief in the treatability of epilepsy (Table 1).

Among the respondents, 44.3% expressed a positive belief in the utility of the ketogenic diet for managing epilepsy. On the other hand, 42.7% were ignorant about specific diets and 36.8% had no idea how diet can help people with epilepsy. Approximately 96.2% believed in the efficacy of specific drugs for epilepsy management (Table 2).

In this regard, over half of the health professionals showed awareness of particular ASMs, including valproic acid, carbamazepine, phenytoin, lamotrigine, levetiracetam, and phenobarbitone (Table 3). Specifically, 33.3% were knowledgeable about 5-8 ASMs used in epilepsy management (Figure 2).

In contrast, less than 10% seemed familiar with zonisamide and rufinamide as ASMs. Surprisingly, among the list of 16 ASMs, neurophysiologists were acquainted with an average of 10.4 drugs, while psychologists and pediatricians exhibited the least knowledge regarding these drugs (Table 4).

Table 1: Characteristics of medical professionals believing in the treatability of epilepsy.

Determinants	Treatable n (%)	Non-treatable n (%)	Do not know	p-value
Sex				
Female (n=261)	203 (77.8)	43 (16.5)	15 (5.7)	0.710
Male (n=157)	124 (79.0)	29 (18.5)	4 (2.5)	
Countries of residency				
Africa (n=195)	145(74.4)	39 (20.0)	11(5.6)	0.130
Asia (n=223)	182 (81.6)	33 (14.8)	8 (3.6)	
Profession				
General practitioner (n=283)	215 (76.0)	57 (20.1)	11(3.9)	0.193
Neurophysiologist (n=34)	30 (88.2)	4 (11.8)	0 (0.0)	
Neurosurgeon (n=21)	18 (85.7)	2 (9.5)	1 (4.8)	
Pediatrician (n=34)	31 (91.2)	2 (6.5)	1 (2.9)	
Psychiatrist (n=36)	29 (80.6)	7 (19.4)	0 (0.0)	
Psychologist (n=10)	4 (40.0)	0 (0.0)	6 (60.0)	
Healthcare levels				
Primary (n=81)	67 (82.7)	11(13.6)	3 (3.7)	<0.001
Secondary (n=74)	51 (68.9)	21(28.4)	2 (2.7)	
Tertiary (n=211)	171(81.1)	33 (15.6)	7 (3.3)	
Military medical services (n=5)	5 (100.0)	0 (0.0)	0 (0.0)	
Non-government organization (n=11)	7 (63.6)	0 (0.0)	4 (36.4)	
Private clinics (n=36)	26 (72.2)	7 (19.5)	3 (8.3)	
Number of patients per month				
0 (n=41)	28 (68.3)	7 (17.1)	5 (12.2)	<0.001
1-50 (n=350)	276 (78.9)	62 (17.7)	12 (3.4)	<0.001
51-100 (n=20)	17 (85.0)	2 (10.0)	1(5.0)	<0.001
>10 (n=7)	6 (85.7)	1(14.3)	0 (0.0)	<0.001

p-value was calculated by using Chi-square and Fisher exact probability tests for categorized data.

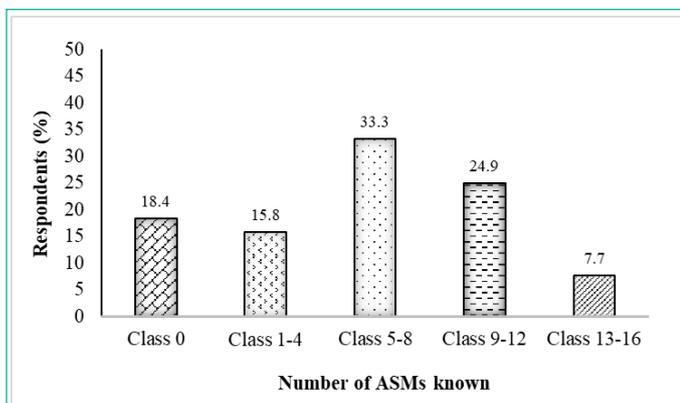


Figure 2: Awareness of the survey respondents assessed on the number of ASMs known to them. The health professionals were grouped into Class 0, Class 1-4, Class 5-8, Class 9-12, and Class 13-16 based on their knowledge of the 16 ASMs listed in Table 3.

Table 2: Response of medical professionals to drug and diet Specifications in the management of epilepsy.

Determinants	Respondents n (%)
Therapeutic approaches	
Specific drugs (Anti-epileptics)	402(96.2)
Vagal nerve stimulation	3(0.7)
Complementary medicine	2(0.5)
Surgery	2(0.5)
Not aware of the treatment	9(2.1)
Can diet help people with epilepsy?	
Yes	178(42.6)
No	86(20.6)
No idea	154(36.8)
Types of diet	
Ketogenic diet	79(44.3)
Low carbohydrate	6(3.4)
Glycine free diet	4(2.2)
Vegetable and fruits	3(1.7)
Gluten-free diet	1(0.6)
Others	9(5.1)
No idea about specific diet	76(42.7)

Table 3: Frequency of awareness among medical professionals regarding specific ASMs.

Sl. No.	Generic name	Respondents n (%)
1	Valproic acid	320(76.6)
2	Carbamazepine	295(70.6)
3	Phenytoin	269(64.4)
4	Lamotrigine	260(62.2)
5	Levetiracetam	236(56.5)
6	Phenobarbital	234(56.0)
7	Benzodiazepine	193(46.2)
8	Topiramate	177(42.3)
9	Gabapentin	167(40.0)
10	Oxcarbazepine	160(38.3)
11	Pregabalin	131(31.3)
12	Eslicarbazepine	48(11.5)
13	Tiagabine	45(10.8)
14	Lacosamide	43(10.3)
15	Zonisamide	41(9.8)
16	Rufinamide	4(0.96)

Table 4: Statistical evaluation of the awareness among medical professionals regarding 16 ASMs.

Professions	Mean (SD)	Median (Q1-Q3)
General practitioner	7.22(3.27)	7.0(5.0-10.0)
Neurophysiologist	10.41(3.91)	10.0(6.5-14.0)
Neurosurgeon	8.8(3.50)	7.5(6.25-11.75)
Pediatrician	7.19(3.32)	7.0(4.0-9.5)
Psychiatric	8.56(2.92)	9.0(6-10.0)
Psychologist	5.67(5.51)	3.0(2.0-12)

The results are expressed as mean (standard deviation) and median (interquartile range) as applicable.

Discussion

Several studies conducted on the general population highlight a pervasive lack of knowledge about epilepsy management policies [16-18]. One such study conducted in Moscow showed that only 38% of the participants believed epilepsy to be a curable disease [17]. Contrary to this, our study revealed that less than 20% of health professionals working in secondary health-care or private clinics perceived epilepsy to be an untreatable health condition. This could be due to our study population comprising medical practitioners with a better understanding of the condition. Although most respondents in our study believed that epilepsy is a treatable disease, no direct correlation was found between the positive responses and the number of epileptic patients managed. This observation may stem from the limited knowledge of health professionals in patient management or the patients' non-adherence to therapeutic regimens [18]. Moreover, they exhibited a lack of awareness regarding treatment modalities in epilepsy management.

In this study, approximately 46.2% believed that diet could aid epileptic patients, and 44.3% thought the ketogenic diet might be beneficial though reports regarding these effects are controversial [19]. A recent review highlighting the importance of using a ketogenic diet in its available four types, in the management of refractory epilepsy, showed it to be highly effective in seizure reduction [3]. Typically, a significant proportion (96.2%) believed that pharmacotherapy is the sole avenue for managing epilepsy, with less than 1% acknowledging vagal nerve stimulation, complementary medicines, and pediatric surgery as alternative management options. Vagal nerve stimulation is a neuromodulation through surgical intervention that is implicated in refractory epilepsy [20]. Surgical interventions are particularly important in the management of certain epilepsies, such as temporal lobe epilepsy [21], and there is no clinical-based evidence of using herbal medicines in the management of epilepsy [22]. Overall, the health professionals participating in this study seemed unaware of the surgical modalities in epilepsy management.

Additionally, the respondents demonstrated variable awareness towards specific antiepileptic medications (Table 3). Less than 10% were aware that tiagabine, lacosamide, zonisamide, and rufinamide are antiseizure drugs. This suggests a lack of familiarity with refractory epilepsy, status epilepticus, and epilepsy comorbidities, where these drugs are particularly important [23-26]. This gap clarifies the importance of scientific programs aimed at expanding knowledge and fostering positive attitudes toward pharmacotherapy and other allied approaches among general practitioners, pediatricians, and psychologists involved in the management of epilepsy. Notably, neurophysiologists exhibited greater familiarity with ASMs compared to other health professionals (Table 4). Therefore, this study highlights the lack of comprehensive programs aimed at enhancing the awareness

of health professionals. The results also underscore the significance of introducing educational initiatives to improve understanding and attitudes regarding pharmacotherapy and related strategies in epilepsy management.

The strength of this study lies in the questionnaire items, which encompassed various therapeutic modalities for managing different types of epilepsies and involved different categories of health professionals who manage patients with epilepsy.

Despite providing valuable insights, this study has a few limitations, including a small sample size within health professional categories and potential bias associated with online surveys. Self-reporting may introduce social desirability bias, and the cross-sectional nature limits dynamic understanding. The questionnaire, while comprehensive, may not capture nuanced aspects of epilepsy management. Future research should address these limitations with larger, diverse samples, mixed-methods approach, and longitudinal designs.

Conclusion

A notable lack of knowledge prevailed among health professionals regarding pharmacotherapy and other therapeutic modalities in epilepsy management as observed in this study. These findings necessitate the need for comprehensive training courses for health professionals who deal with patients with epilepsy across various healthcare levels.

Author Statements

Author Contributions

All the authors collaborated in formulating the questionnaire during online meetings. Subsequently, the questionnaire link was disseminated in various countries through the respective authors, each responsible for distribution in their country. The feedback responses were compiled with the assistance of NK and his assistant SB in Morocco and were then shared with all authors. The manuscript was written by GBA, and MA in Iraq. Before finalizing, the draft underwent revisions and edits involving input from all authors.

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Conflict of Interest

The authors declare no potential conflicts of interest concerning the research, authorship, and/or publication of this article.

References

1. Stafstrom CE, Carmant L. Seizures and Epilepsy: An Overview for Neuroscientists. *Cold Spring Harb Perspect Med.* 2015; 5: a022426.
2. Beghi E, Giussani G, Sander JW. The Natural History and Prognosis of Epilepsy. *Epileptic Disord.* 2015; 17: 243-253.
3. Sampaio LP. Ketogenic Diet for Epilepsy Treatment. *Arq Neuropsiquiatr.* 2016; 74: 842-848.
4. Liu H, Yang Y, Wang Y, Tang H, Zhang F, et al. Ketogenic Diet for Treatment of Intractable Epilepsy in Adults: A Meta-Analysis of Observational Studies. *Epilepsia Open.* 2018; 3: 9-17.
5. Elia M, Klepper J, Leiendecker B, Hartmann H. Ketogenic Diet in the Treatment of Epilepsy. *Current Pharmaceutical Design.* 2017; 23: 5691-5701.
6. Beydoun A, DuPont S, Zhou D, Matta M, Nagire V, et al. Current Role of Carbamazepine and Oxcarbazepine in the Management of Epilepsy. *Seizure.* 2020; 83: 251-263.
7. Baulac M, Brodie MJ, Patten A, Segieth J, Giorgi L. Efficacy and Tolerability of Zonisamide Versus Controlled-Release Carbamazepine for Newly Diagnosed Partial Epilepsy: A Phase 3, Randomised, Double-Blind, Non-Inferiority Trial. *Lancet Neurol.* 2012; 11: 579-588.
8. Marson AG, Al-Kharusi AM, Alwaidh M, Appleton R, Baker GA, et al. The SANAD Study of Effectiveness of Carbamazepine, Gabapentin, Lamotrigine, Oxcarbazepine, or Topiramate for Treatment of Partial Epilepsy: An Unblinded Randomised Controlled Trial. *Lancet.* 2007; 369: 1000-1015.
9. Pohlmann-Eden B, Marson AG, Noack-Rink M, Ramirez F, Tofighy A, et al. Comparative Effectiveness of Levetiracetam, Valproate and Carbamazepine among Elderly Patients with Newly Diagnosed Epilepsy: Subgroup Analysis of the Randomized, Unblinded KOMET Study. *BMC Neurol.* 2016; 16: 149.
10. Chu H, Zhang X, Shi J, Zhou Z, Yang X. Antiseizure Medications for Idiopathic Generalized Epilepsies: A Systematic Review and Network Meta-Analysis. *J Neurol.* 2023; 270: 4713-4728.
11. Gonzalez-Giraldo E, Sullivan JE. Advances in the Treatment of Drug-Resistant Pediatric Epilepsy. *Semin Neurol* 2020; 40: 257-262.
12. Kelly KM, Chung SS. Surgical Treatment for Refractory Epilepsy: Review of Patient Evaluation and Surgical Options. *Epilepsy Res Treat.* 2011; 2011: 303624.
13. Anyanwu C, Motamedi GK. Diagnosis and Surgical Treatment of Drug-Resistant Epilepsy. *Brain Sci.* 2018; 8: 49.
14. Almohammadi AM, Huzaim RM. Level of Physicians Awareness of Antiepileptic Drug Adverse Effects. *Epilepsy Behav.* 2018; 89: 59-62.
15. Ali MAO, Mahgoub EAA, Nimir M, Ali KM. Knowledge of Pharmacists About Anti-Epileptic Drugs in a Developing Country. *Curr Drug Saf.* 2020; 15: 32-37.
16. Elhassan MA, Alemairy AA, Amara ZM, Hamadelneel AA, Mohamed AH, et al. Epilepsy: Knowledge, Attitude, and Practice Among Secondary School Teachers in Khartoum State. *Neurol Ther.* 2017; 6: 225-235.
17. Guekht A, Gersamiya A, Kaimovskiy I, Mizinova M, Yakovlev A, et al. Attitudes Towards People with Epilepsy in Moscow. *Epilepsy Behav.* 2017; 70: 182-186.
18. Das AM, Ramamoorthy L, Narayan SK, Wadwekar V. Barriers of Drug Adherence Among Patients with Epilepsy: in Tertiary Care Hospital, South India. *J Caring Sci.* 2018; 7: 177-181.
19. Wells J, Swaminathan A, Paseka J, Hanson C. Efficacy and Safety of a Ketogenic Diet in Children and Adolescents with Refractory Epilepsy-A Review. *Nutrients.* 2020; 12: 1809.
20. Ohemeng KK, Parham K. Vagal nerve stimulation: Indications, Implantation, and Outcomes. *Otolaryngol Clin North Am.* 2020; 53: 127-143.

21. Jayalakshmi S, Vooturi S, Gupta S, Panigrahi M. Epilepsy Surgery in Children. *Neurology India*. 2017; 65: 485-492.
22. Liu W, Ge T, Pan Z, Leng Y, Lv J, et al. The Effects of Herbal Medicine on Epilepsy. *Oncotarget*. 2017; 8: 48385-48397.
23. Verrotti A, Moavero R, Panzarino G, Di Paolantonio C, Rizzo R, et al. The Challenge of Pharmacotherapy in Children and Adolescents with Epilepsy-ADHD Comorbidity. *Clin Drug Investig*. 2018; 38: 1-8.
24. Ortiz de la Rosa JS, Ladino LD, Rodriguez PJ, Rueda MC, Polania JP, et al. Efficacy of Lacosamide in Children and Adolescents with Drug-Resistant Epilepsy and Refractory Status Epilepticus: A Systematic Review. *Seizure*. 2018; 56: 34-40.
25. Hubert K, Knake S, Bauer S, Voss M, Rosenow F, et al. Treatment of Status Epilepticus with Zonisamide: A Multicenter Cohort Study of 34 Patients and Review of Literature. *Epilepsy Behav*. 2020; 109: 107139.
26. Asadi-Pooya AA. Lennox-Gastaut Syndrome: A Comprehensive Review. *Neurol Sci*. 2018; 39: 403-414.