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The Effect of Neurology Rotation on Medical Students' Knowledge About Epilepsy and Attitudes Toward Disease

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Abstract

Objective: Negative attitudes toward epilepsy remain a common social or personal challenges for individuals with epilepsy. Limited knowledge levels and misconceptions are the main factors underlying stigmatization. This study aimed to evaluate the effects of neurology rotation on medical students' knowledge about epilepsy, approach to acute seizures, and attitudes toward epilepsy. The influence of epilepsy-related knowledge on attitudes toward the disease was also examined.

Methods: A total of 116 fifth-year medical students were included in the study and assessed twice: on the first day of the neurology rotation (pre-test) and on the final day of the 3-week rotation (post-test). All assessments were administered online using the "knowledge about epilepsy", "approach to epileptic seizure" and "attitudes toward epilepsy" questionnaires. Pre-post changes in total scores were analyzed, and regression analysis was used to identify factors associated with attitudes.

Results: Students' total knowledge scores increased significantly following the rotation (p=0.001). In contrast, no significant difference was observed in total attitudes score between pre-test and post-test (p=0.202). Regression analysis demonstrated that higher knowledge levels and male gender were independently associated with more positive attitudes toward epilepsy.

Conclusion: The neurology rotation resulted in a significant improvement in medical students' knowledge about epilepsy; however, it did not lead to measurable changes in attitudes. These findings indicate that additional or alternative educational strategies may be necessary to influence attitudes toward epilepsy.

Keywords: Epilepsy, knowledge, attitudes, neurology rotation, medical student

INTRODUCTION

Epilepsy is a prevalent neurological disorder that is often manageable with antiepileptic medications. However, negative attitudes and stigma toward the disease remain a major social and personal burden.[1] In particular, limited knowledge and persistent misconceptions are key contributors to stigmatization, which has been shown to negatively affect the quality of life of patients with epilepsy.[1-3] Stigma is associated with multifactorial factors, inadequate education and insufficient disease-specific knowledge.[4-9]

Studies from many low- and middle-income countries indicate that misconceptions—such as viewing epilepsy as a psychiatric, spiritual, or supernatural condition—remain widespread. Historically rooted misbeliefs have contributed to social isolation, reduced access to education and employment, marital difficulties, and even mortality.[10-14]

Healthcare professionals play a crucial role in providing appropriate acute and long-term care for patient with epilepsy. As future physicians, medical students will frequently encounter patients with epilepsy, and their knowledge and attitudes directly influence the quality of care they provide. However, medical students themselves may hold misconceptions or negative beliefs that affect clinical decision-making.[15-16] Structured educational interventions have been shown to reduce stigma and false beliefs.[15,17-21]

This study had two primary objectives: (1) to assess fifth-year medical students' knowledge of epilepsy and their attitudes toward the disease; (2) to evaluate the impact of the neurology rotation on these parameters.

METHODS

Study Design and Participants

This prospective observational study was conducted among 5th-year medical students at Selçuk University Faculty of Medicine between January 2025 and June 2025. A total of 148 students were eligible to participate in the study. Of these, 116 students completed both assessments (pre-test and post-test) and were included in the final analyses. Students who did not complete either assessment or who submitted incomplete questionnaires were excluded (n=32).

All students underwent a 3-week neurology rotation, and assessments were conducted on the first day (pre-test) and the last day (post-test) of the rotation.

Ethical Considerations

The study received approval from the Selçuk University Local Ethics Committee (approval no: 2025/27, date: 16.01.2025). Participants were voluntary, and electronic informed consent forms were obtained. Data were collected via Google Forms and stored securely.

Neurology Rotation Structure

The neurology rotation lasts 3 weeks and includes theoretical lectures, bedside clinical training, outpatient clinic participation, case discussions, neurophysiology laboratory exposure, and intensive care unit observations. Epilepsy was covered in both theoretical and practical components; however, no structured education was provided on its social aspects. Epilepsy-related theoretical instruction totalled approximately 4 hours and included epidemiology, seizure types, diagnostic strategies, treatment modalities (medical and surgical), and seizure first-aid. During the rotation, students also participate in diagnosis and treatment of epilepsy under the supervision of neurologists.

Data Collection Tools

Five tools were administered twice (pre-test and post-test):

1. Demographic Form

Participants were questioned about their demographic characteristics: age, gender, marital status, number of siblings, place of residence (with family-alone-student house-dormitory) and family financial status. Additionally, inquiries were made about possession of a driver's license and active driving status. Furthermore, participants were questioned in medical history about neurological disease, epilepsy, antiepileptic drug, syncope and/or seizure. Finally, medical history about epilepsy in relatives, epilepsy among close friends, and witnessing of epileptic seizures were questioned.

MAIN POINTS

- Neurology rotation contributes to knowledge about epilepsy in medical students.
- The most inadequate knowledges about seizure are position and trying to open mouth.
- The most negative attitudes are dating or marriage with an epileptic patient.
- The knowledge about driving in epilepsy increases after neurology rotation.
- Male gender and higher knowledge level are associated with positive attitudes.

2. Epilepsy Knowledge Questionnaire

The ''epilepsy knowledge questionnaire'' was employed to assess the participants' knowledge about epilepsy. The scale consists of a total of 16 items. This questionnaire includes items about social, medical, and seizure-related knowledge about epilepsy. All questions had closed-ended answers. Participants were asked to choose one of the following options: ''true,'' ''no idea,'' or ''false''. Correct answers were scored as 1 point, while incorrect or "no idea" responses were scored as 0 points. The total score ranges from 0 to 16. An increased score indicates a higher level of knowledge about epilepsy. The scale is valid and reliable (Kuder Richardson =0.72).[22,23]

3. Single-item Driving in Epilepsy Knowledge Question

An item was questioned to measure the participants' knowledge about driving in epilepsy. The legal driver's license regulation for epilepsy in Türkiye was updated on September 29, 2021.[24] Patients who have one of the following two items are evaluated by 3 neurologists. As a result, patients can obtain a driver's license.

3.a. A patient who has epileptic seizures—with or without loss of consciousness, provoked or unprovoked seizure—can obtain a driver's license under this condition. "If he/she does not have a seizure during the neurological follow-up at six-month intervals for three years (without antiepileptic medication or with maximum of two medications)."

3.b. Patients who have had one unprovoked epileptic seizure can get a driver's license under this condition. "Neurological follow-up at six-month intervals for two years, (no seizures and no antiepileptic medication for this period)."

4. Acute Seizure First-aid Knowledge Questionnaire

After literature review, the researchers developed a questionnaire to measure the students' knowledge and awareness about approach to acute epileptic seizures. The form consists of 7 items with answers as (yes, no or no idea). Frequencies and percentages of correct answers were calculated. For the items assessing approach to seizures with options "yes," "no," or "no idea," correct responses were assigned 1 point, and incorrect or "no idea" responses received 0 points.[25,26] This questionnaire is newly developed and not yet validity.

5. Attitudes Toward Epilepsy Scale

The "attitudes toward epilepsy" scale was used to assess the participants' attitudes toward epilepsy. This scale consists of 14 questions. The items are scored from 1 to 5 (five-point Likert scale; scores range from 1-completely disagree to 5-completely agree). The total score ranges from 0 to 70. Higher scores indicated more negative attitudes. The scale is valid and reliable (Cronbach's alpha =0.84).[22]

Statistical Analysis

Analyses were performed using SPSS 26.0. Descriptive statistics included frequency, percentage, mean±standard deviation. Normality was assessed using Kolmogorov-Smirnov tests, histograms, and Q-Q plots. Chi-square was used for categorical variables. This analysis was used not only to describe frequency distributions, but specifically to compare categorical variables between groups (e.g., pre- and post-rotation knowledge levels, gender differences). Other statistical tests were applied as: McNemar or marginal homogeneity tests were used for paired categorical data; paired t-tests for normally distributed paired numerical variables; Pearson or Spearman correlation analyses as appropriate; and linear regression to identify predictors of attitudes. P<0.05 was considered statistically significant.

RESULTS

Sociodemographic Characteristics

A total of 116 medical students completed both assessments before and after the neurology rotation. The mean age was 22.97±0.88 years, and gender distribution was balanced (52.6% female; 47.4% male). Most participants lived with family, and 85.3% had a driver's license, although only 44% were active drivers. Additional demographic characteristics are summarized in Table 1.

Knowledge About Epilepsy

Overall epilepsy knowledge improved significantly following the rotation. The mean total knowledge score increased from 13.43±1.92 to 15.00±1.17 (p=0.001). Seven of the sixteen items showed statistically significant improvement; these are detailed in Table 2A. Before the rotation, participants had sufficient knowledge about seizure triggers and misconceptions; however, knowledge about surgical treatment and seizure-related safety was limited. After the rotation, most items showed improvement, although some misconceptions persisted. The item-level results are shown in Table 2A.

Driving Regulations Related to Epilepsy

Knowledge about driving eligibility in patient with epilepsy improved significantly after the rotation (p=0.017). Driving knowledge level did not different between participants with and without a driver's license (p=0.092). Related findings are presented in Table 2B.

First-aid Knowledge for Epileptic Seizures

Four of seven first-aid items showed significant improvement after the rotation (p<0.05). Although students demonstrated strong understanding of removing harmful objects and avoiding inappropriate resuscitation attempts, several misconceptions remained prevalent particularly regarding positioning the patient on their back and attempting to restrain convulsive movements. Detailed item responses are provided in Table 2C.

Attitudes Toward Epilepsy

Attitudes toward epilepsy did not change significantly after the rotation (pre-rotation: 22.27±6.11, post-rotation: 21.62±6.11, p=0.202). Items about attitudes, there was no statistical difference between the pre- and post-rotation groups (p>0.05). However, attitudes about marriage remained less positive in post-rotation period (p=0.027). All attitude-related results are shown in Table 3.

Correlation Between Knowledge and Attitudes

In the pre-rotation assessment, knowledge about epilepsy and attitudes toward disease were not significantly correlated (r=-0.089; p=0.342). After the rotation, a statistically significant

Table 1. Sociodemographic characteristics of fifth year medical students

Variables	Overall (%), n=116*
Gender	
Female	61 (52.6)
Male	55 (47.4)
Financial situation in family**	
Under and national minimum wage	15 (12.9)
More than national minimum wage	101 (87.1)
Marital status	
Married	1 (0.9)
Single	115 (99.1)
Brothers/sisters	
Yes	112 (96.6)
No	4 (3.4)
Neurological diseases in history	
Yes	4 (3.4)
No	112 (96.6)
Syncope and/or seizure in history	
Yes	25 (21.6)
No	91 (78.4)
Epilepsy in history	
Yes	1 (0.9)
No	115 (99.1)
Antiepileptic treatment in history	
Yes	1 (0.9)
No	115 (99.1)
Epilepsy in a first-degree relative	
Yes	3 (2.6)
No	113 (97.4)
Epilepsy in a second-degree relative	
Yes	13 (11.2)
No	103 (88.8)
Epilepsy in a close friend	
Yes	14 (12.1)
No	102 (87.9)
Witnessing to an epileptic seizure	
Before rotation	30 (25.9)
During rotation	12 (10.3)
No	74 (63.8)

*: Descriptive statistical methods were used to express as number (n) and percentages (%). A total of 116 participants were evaluated twice, before and after the rotation.
**: The current minimum wage in Türkiye is 26,005.50 (Turkish lira) 12 per month in 2025. It became valid on January 1, 2025. On January 1, 2025, 1 euro =36.46 Turkish liras

negative correlation was detected (r=-0.214; p=0.021), indicating that higher knowledge scores were associated with more positive attitudes. As a result of, in the post-rotation period, the attitudes score decreases and attitudes become more positive.

Predictors of Attitudes Toward Epilepsy

A multiple linear regression model identified predictors of post-rotation attitude scores. Female gender predicted more negative attitude (β=0.327; p=0.001). Higher knowledge scores predicted more positive attitudes (β=-0.249; p=0.005). Regression details are presented in Table 4.

DISCUSSION

Over the past decade, many studies have examined the pathophysiology, etiology, and treatment of epilepsy. Despite these advances, inadequate and incorrect knowledge, negative attitudes, and persistent misconceptions remain widespread. Patients with epilepsy may experience social stigma and discrimination throughout their lives, and negative attitudes about epilepsy have also been documented among healthcare professionals and medical students.[3-7] In this study, we aimed to evaluate whether a 3-week clinical neurology rotation contributed to improving epilepsy-related knowledge and students' attitudes. The rotation led to increased epilepsy-related knowledge; however, attitudes toward epilepsy did not change significantly. Regression analysis suggested that higher knowledge levels were associated with positive attitudes, particularly among male participants. Although higher knowledge levels were generally associated with more positive attitudes, this relationship was not observed among female students. One possibility is that attitudes in this group may be influenced more by personal beliefs, social factors, or prior experiences rather than short-term knowledge gains. Because our study was observational and not designed to explore gender-specific mechanisms, these interpretations remain speculative and should be investigated in future research.

Educational program play an important role in improving epilepsy-related knowledge.[27] Most previous studies have been cross-sectional and non-interventional design.[28-30] Nevertheless, many have reported significant increases in knowledge following seminars, conferences, and structured training programs.[31-33] Some studies have also shown that knowledge and positive

Table 2. Knowledge about epilepsy and approach to acute epileptic seizure in medical students: pre-rotation and post-rotation period

			Pre-rotation group (n=116)[A]	Post-rotation group (n=116)[B]	p-value p[A-B]
A	**Items: Knowledge about epilepsy, n (%)**				
	Epilepsy is a neurological disease that has many types.	True	109 (94.0)	114 (98.3)	0.125*
	Most people with epilepsy can work in suitable jobs.	True	112 (96.6)	114 (98.3)	0.687*
	Most patients with epilepsy can be educated in public schools.	True	111 (95.7)	115 (99.1)	0.219*
	Epileptic patients can be dangerous for other people during seizure.	False	65 (56.0)	75 (64.7)	0.123*
	Some epileptic seizures may last for a few seconds.	True	98 (84.5)	115 (99.1)	**0.001***
	Epileptic seizures can be controlled with antiepileptic treatments in most patients.	True	99 (85.3)	110 (94.8)	**0.007***
	Brain surgical operation may be a curative treatment option for some patients with epilepsy.	True	47 (40.5)	97 (83.6)	**0.001***
	Most people with epilepsy have normal intelligence.	True	114 (98.3)	113 (97.4)	1.000*
	Patients with epilepsy can be successful in working life.	True	112 (96.6)	114 (98.3)	0.687*
	Abnormal neuronal activity in the brain is the main ethology for epileptic seizure.	True	103 (88.8)	114 (98.3)	**0.003***
	Epilepsy is an untreatable disease.	False	72 (62.1)	97 (83.6)	**0.001***
	Inadequate sleep, stress, and alcohol can induce seizures.	True	114 (98.3)	116 (100.0)	0.500*
	When you witness a seizure, you can stop the seizure by smelling alcohol/cologne.	False	86 (74.1)	110 (94.8)	**0.001***
	Patients with epilepsy can have normal life like other people.	True	109 (94.0)	111 (95.7)	0.727*
	Some types of seizures are difficult to recognize.	True	101 (87.1)	114 (98.3)	**0.002***
	When you witness a seizure, you should spill water on his/her face.	False	106 (91.4)	116 (100)	0.070*
B	**Items: Knowledge about driving in patients with epilepsy, n (%)**				
	Patients with epilepsy are not permitted to drive.	True	6 (5.2)	6 (5.2)	0.017**
	I have got no information about driving in epilepsy.	True	49 (42.2)	28 (24.1)	
	People with epilepsy can obtain a driving license, but there are some national legal regulations.	True	61 (52.6)	82 (70.7)	
C	**Items: Knowledge about approach to epileptic seizure, n (%)**				
	Restrain the patient. Try to hold the convulsive limbs.	False	73 (62.9)	93 (80.2)	**0.005***
	Remove sharp objects from the area.	True	116 (100)	116 (100)	1.000*
	Loosen any tight clothing: undo buttons around the neck, remove glasses.	True	111 (95.7)	113 (97.4)	0.687*
	Lay the patient on his/her back to make the person more comfortable.	False	26 (22.4)	54 (46.6)	**0.001***
	Try to open the patient's mouth with a stick, cloth, etc.	False	61 (52.6)	97 (83.6)	**0.001***
	Try to stop the seizure quickly with oral antiepileptic drugs.	False	87 (75.0)	110 (94.8)	**0.001***
	Start to cardiopulmonary resuscitation immediately.	False	110 (94.8)	116 (100)	1.000*

*: McNemar's test, **: Marginal homogeneity test. Bold font indicates statistical significance, p<0.001 was demonstrated as p=0.001

Table 3. Responses to attitudes toward epilepsy in medical students: pre-rotation and post-rotation period

			Pre-rotation group (n=116)[A]	Post-rotation group (n=116)[B]	p-value p[A-B]
A	**Items: Attitudes toward epilepsy, n (%)**				
	If I had epilepsy, I would hide my disease.	Completely disagree or disagree	92 (79.3)	97 (83.6)	0.472*
	If I knew that a friend had epilepsy, I would stay away from him/her.	Completely disagree or disagree	114 (98.3)	114 (98.3)	1.000*
	I would date someone who has epilepsy.	Completely agree or agree	65 (56.0)	67 (57.8)	0.892*
	I would object to working with someone who has epilepsy.	Completely disagree or disagree	108 (93.1)	107 (92.2)	1.000*
	I would be embarrassed if someone had epilepsy in my family.	Completely disagree or disagree	116 (100)	114 (98.3)	0.500*
	I would object to the marriage of my child with someone who has epilepsy.	Completely disagree or disagree	76 (65.5)	92 (79.3)	**0.027***
	I would marry someone who has epilepsy.	Completely agree or agree	65 (56.0)	67 (57.8)	0.892*
	If I knew that my doctor had epilepsy, I would not trust him/her.	Completely disagree or disagree	113 (97.4)	112 (96.6)	1.000*
	If I knew someone had epilepsy, I would prefer to stay away from him/her.	Completely disagree or disagree	116 (100)	115 (99.1)	1.000*
	Epilepsy is a shameful disease.	Completely disagree or disagree	114 (98.3)	113 (97.4)	1.000*
	I would be uncomfortable if I had to work with someone who had epilepsy.	Completely disagree or disagree	114 (98.3)	113 (97.4)	1.000*
	I would feel comfortable if I were to be in the same place with someone who has epilepsy.	Completely agree or agree	107 (92.2)	112 (96.6)	0.267*
	I think patients with epilepsy are frightening.	Completely disagree or disagree	114 (98.3)	111 (95.7)	0.453*
	I think patients with epilepsy are not physically attractive.	Completely disagree or disagree	114 (98.3)	112 (96.6)	0.687*
B	**Total attitude score toward epilepsy, mean±SD**		**22.27±6.11**	**21.62±6.11**	**0.202****

*: McNemar's test, **: Paired samples t-test. SD: Standard deviation

Table 4. Results of multivariate linear regression (backward) analysis

	B (95% CI)	Beta	t	p
Constant	44.814 (30.996-58.633)	1	6.426	0.001
Gender (reference: male)	3.985 (1.878-6.093)	0.327	3.747	**0.001**
Total knowledge score about epilepsy, post-rotation score	-1.301 [(-2.202)-(-0.399)]	-0.249	2.859	**0.005**

R^2: 0.168, p<0.001 was demonstrated as p=0.001. Bold font indicates statistical significance, CI: Confidence interval

attitudes may persist for up to one year after the intervention.[21] In another study, students who received a 6-week intensive training program demonstrated higher levels of knowledge and more positive attitudes.[31] Online epilepsy courses have additionally been associated with improvements in long-term knowledge and clinical practice.[34] Positive changes in attitudes have also been reported among university students following targeted educational activities.[35]

In our study, knowledge scores increased after the rotation; however, the lowest-performing items involved safety during seizures and surgical treatment options ("epileptic patients can be dangerous for other people during a seizure", false; "brain surgery may be a curative option for some patients", true; and "epilepsy is an untreatable disease", false). Attitude scores decreased slightly after the rotation, but this change was not statistically significant. The most negative attitudes were related to dating and marriage ("I would date someone who has epilepsy" and "I would marry someone who has epilepsy"). Similar findings have been reported previously, with the most persistent negative attitudes among university students concerning intimate relationships.[20,35] Although misconceptions often contribute to negative attitudes,[36,37] the regression analysis in our study identified male gender and higher knowledge as significant correlates with positive attitudes.

Misconceptions about first-aid in seizure remain a major global problem. Common false beliefs—such as the idea that smelling alcohol or cologne, or splashing water on the face, can stop a seizure—persist in many populations.[16] Some individuals incorrectly believe that cardiopulmonary resuscitation (CPR) should be initiated immediately during seizures, a misconception that may lead to inappropriate or harmful actions.[25] Another harmful misconception involves attempting to open the patient's mouth using objects such as sticks or cloths. Educational programs have been shown to reduce such unsafe practices; in one study, the proportion of participants who attempted to open the patient's mouth decreased from 64.4% to 13.7% after training.[38] Other studies among health students and professionals have reported high initial rates of this belief.[6,39] In our study, the most accurately answered items regarding seizure management were "remove sharp objects from the area" (true) and "start CPR immediately" (false). The least accurate items were "lay the patient on his/her back" and "try to open the patient's mouth with a stick/cloth", although knowledge of these improved after the rotation. While the rotation contributed to better seizure-management knowledge, these findings indicate that short clinical exposure may be insufficient. Structured first-aid education specific to epileptic seizures should be integrated into the medical curriculum.

Driving plays an important role in independence and social functioning for individuals with epilepsy.[40] However, neurological conditions such as epilepsy may increase accident risk due to impaired consciousness or adverse effects of antiepileptic medications.[41] Approximately one-third of patients continue to

experience seizures despite treatment,[42] and a notable proportion continue driving despite uncontrolled seizures.[43] Although precise figures vary internationally, it is known that some individuals conceal their diagnosis to obtain a driving license. Driving regulations for epilepsy differ across countries.[44,45] In Türkiye, updated driving regulations have been implemented since 2021. In previous studies with fifth-year medical students, correct responses regarding driving restrictions increased substantially after educational seminar.[20] In our study, correct responses regarding driving restrictions increased from 52.6% to 70.7% after the rotation, indicating improved awareness of medico-legal issues. Medical students will soon be responsible for issuing health reports and counselling patients, targeted training on the legal aspects of epilepsy is essential.

Strengths of the study: (1) The prospective design allowed evaluation of changes over time. (2) It is one of the few studies specifically assessing the impact of a neurology rotation. (3) The assessment covered general knowledge about epilepsy, its causes, seizure management, and students' personal experiences. Therefore, many parameters were evaluated. (4) The instruments used were valid, reliable, and previously applied to medical students. (5) The pre- and post-rotation assessments enabled examination of rotation-related changes in knowledge and attitudes.

Study Limitations

(1) The use of closed-ended items may have limited the depth of knowledge assessment. (2) This single-centre design restricts generalizability; multicentre studies are needed to better evaluate knowledge and attitudes. (3) Long-term retention of knowledge and attitudes could not be assessed, as evaluations were performed only pre- and post-rotation. (4) Potential response biases, including voluntary participation and social desirability effects, could not be ruled out. (5) The lack of blinding may have influenced participants' responses, as students were aware of the study's purpose.

CONCLUSION

This study demonstrated that higher epilepsy-related knowledge was associated with more positive attitudes among medical students. Although the neurology rotation significantly improved knowledge—particularly regarding seizure management and driving regulations—several misconceptions persisted. Despite these improvements, overall attitude scores did not change meaningfully after the rotation. These findings highlight the need for enhanced educational strategies within the medical curriculum to further strengthen students' understanding and attitudes toward epilepsy.

Ethics

Ethics Committee Approval: The study received approval from the Selçuk University Local Ethics Committee (approval no: 2025/27, date: 16.01.2025).

Informed Consent: Participants were voluntary, and electronic informed consent forms were obtained.

Footnotes

Authorship Contributions

Surgical and Medical Practices: F.E., B.A.D., Ç.Ş., Ş.Ö., Concept: F.E., C.A., Design: F.E., B.A.D., Ş.Ö., Data Collection or Processing: F.E., C.A., G.E., B.A.D., Ç.Ş., Analysis or Interpretation: F.E., G.E., Ş.Ö., Literature Search: F.E., B.A.D., Writing: F.E., C.A., G.E., B.A.D., Ç.Ş., Ş.Ö.

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