SANAMED
2025; 20(2): 169–174
ISSN-1452-662X

DOI: 10.5937/sanamed0-59707
UDK: 616.89-008.454-08; 616.831-005.1-06
ID: 174832649
Original article

DEPRESSION IN PATIENTS WITH AND WITHOUT POST-STROKE EPILEPSY

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Primljen/Received: 23. 06. 2025. Prihvaćen/Accepted: 09. 08. 2025. Published online first 19. 08. 2025.

Abstract: **Introduction:** Depression is the most common neuropsychological complication of stroke. It affects quality of life, prolongs hospitalization, and leads to more frequent doctor visits. The incidence of depression after stroke ranges from 18% to 33%. About 6–15% of patients develop epilepsy following stroke. Patients with post-stroke epilepsy tend to experience depression more frequently.

Objective: The aim of this study was to compare the incidence of depression during the first year after stroke in patients who developed epilepsy versus those who did not.

Patients and Method: We tested patients during the first year after stroke, treated at the Department of Neurology, General Hospital Nikšić, Montenegro. Two groups of 60 patients each were assessed: one group with post-stroke epilepsy and the other without epilepsy. Depression was measured using the Hamilton Depression Scale. Statistical analysis included mean values, t-test, and Chi-square test (χ^2). A significance level of $p < 0.05$ was used for all tests.

Results: The incidence of depression after stroke was high among our patients. Depression prevalence in the post-stroke epilepsy group was 55%, while it was 26.7% in the group without epilepsy.

Conclusion: Patients with epilepsy have almost twice the incidence of depression compared to those without epilepsy after stroke ($p < 0.05$). These patients require special monitoring and more frequent follow-ups. Early detection of epilepsy and timely initiation of treatment with appropriate antiepileptic drugs, along with early management of depression, are important to prevent suicide and mortality and to improve quality of life.

Keywords: post-stroke depression, post-stroke epilepsy.

INTRODUCTION

Depression is the most common neuropsychological complication of stroke (STS). Post-stroke depression (PSD) often remains undiagnosed and untreated, despite its significant impact on rehabilitation outcomes and quality of life (1). Patients with PSD have an increased risk of mortality compared to those who do not develop depression after STS. The incidence of PSD is estimated to range from 18% to 33%, with some authors reporting that it occurs in one in three people after STS (2, 3). Most stroke patients experience their first depressive episode within the first few years following the stroke (4). One of the most commonly used scales for assessing depression is the Hamilton Depression Rating Scale (HAM-D) (5).

The association between stroke location and the occurrence of PSD has not been consistently confirmed, but PSD is more frequently observed with lesions in the frontal regions, left hemisphere, and basal ganglia. Independent predictors of PSD development within the first year after stroke include a history of mental disorders, degree of physical disability, and level of social support (6).

Post-stroke epilepsy (PSE) occurs in 6% to 15% of patients. Risk factors for PSE include cortical lesion location, stroke severity, early symptomatic seizures, involvement of the anterior cerebral circulation, and hemorrhagic stroke (7). The highest risk for developing PSE is during the first year, with over 80% of patients developing epilepsy within two years after stroke. The choice of antiepileptic drugs in patients with depression presents a particular challenge, as does the selection of antidepressants in patients receiving antiepileptic treatment (8).

Although PSD and PSE are relatively well-studied individually, few studies have analyzed their as-

sociation, especially in the early post-acute period. The combination of these complications may worsen neurological outcomes, prolong recovery, and require a more complex therapeutic approach (9,10). This study aims to compare the incidence of depression in patients with and without post-stroke epilepsy during the first year after stroke.

PATIENTS AND METHODS

A total of 120 patients diagnosed with stroke and treated at the General Hospital Nikšić in Montenegro were included in the study. The research was conducted during the first year after stroke. The first group consisted of 60 patients who developed epilepsy following the stroke, while the control group consisted of 60 patients with MU who did not experience epileptic seizures.

The inclusion criterion was that at least 14 days had passed since the stroke. Patients with previously diagnosed and treated depression were excluded. In patients with post-stroke epilepsy (PSE), seizures first appeared at least 7 days after the stroke, thereby fulfilling the criteria for late post-stroke epilepsy.

Basic demographic data (age and gender), type of stroke—ischemic or hemorrhagic (intracerebral hemorrhage)—and lesion location (cortical or subcortical) were collected. Stroke severity was assessed using the National Institutes of Health Stroke Scale (NIHSS) and classified as mild (≤ 6 points) or severe (7–21 points).

Depression was assessed using the Hamilton Depression Rating Scale (HAM-D). Based on the score, results were categorized as follows: no depression (0–7 points), mild (8–13 points), moderate (14–17 points), and severe depression (≥ 18 points).

Appropriate descriptive and inferential statistical tests, including mean, t-test, and chi-square test (χ^2-test), were used for data analysis. To compare differences between two independent groups, the nonparametric Mann-Whitney U test was applied. Statistical significance was determined at $p < 0.05$.

The study was conducted in accordance with the ethical principles of the Declaration of Helsinki and approved by the Ethics Committee of the General Hospital Nikšić. All participants provided informed consent before participation, following oral and written explanations of the study's purpose, procedures, and possible risks.

RESULTS

The average age of patients with depression after MU in the PSE group was M = 69.00 (SD ± 8.97), while patients without PSE were slightly younger on average, M = 66.59 (SD ± 10.52). A t-test for large independent samples showed that this difference was not statistically significant (p = 0.212) (Table 1).

Among stroke patients who developed PSE, depression was more common in men (63.3% vs. 36.7%), whereas in stroke patients without epilepsy, depression was more common in women (56.7% vs. 43.3%) ($p < 0.05$).

PSD was significantly more frequent in patients with PSE compared to those without PSE ($p < 0.005$).

Patients with PSE had significantly higher rates of moderate depression compared to those without PSE (20.0% vs. 8.3%). Severe depression was also significantly more common among post-stroke patients who developed epilepsy compared to those without epilepsy (21.7% vs. 3.3%).

No significant difference was observed in the frequency of PSD between patients with and without PSE in relation to stroke type and lesion location (Table 2).

When analyzing individual items within the HAM-D scale, our results indicate that depressed mood**,** feelings of guilt, and agitation are significantly more frequent in patients with stroke and epilepsy compared to those with stroke without epilepsy (Table 3).

DISCUSSION

In our group of stroke patients who did not develop epilepsy, depression was registered in 26.7% of the subjects (16/60), which is consistent with other studies reporting depression in 20–50% of patients during the first year after stroke (1, 2). Studies with longer follow-up periods have shown that the rate of depression significantly increases (3, 4). However, in our study, patients were followed only for one year after stroke.

In the group of patients who developed post-stroke epilepsy (PSE) during the first year after stroke, the prevalence of depression was almost twice as high – 55% (33/60). Nearly half of these patients had a significant level of depression: 20% had moderate, and 21.7% had severe depression. These findings align with previous studies (10, 11).

Analysis of individual HAM-D items showed that patients with PSE more frequently exhibited depressed

Table 1. *Average age of patients with depression after stroke*

	M	SD	t	df	p
Stroke with EPI	69.00	8.97	1.257	107	0.212
Stroke ohne EPI	66.59	10.52			

Table 2. *Comparative analysis of the frequency of PSD in patients with and without PSE*

		Stroke with epilepsia		Stroke without epilepsia		χ^2	df	p
		N	%	N	%			
Gender	Male	38	63.3%	26	43.3%	4.821	1	***0.028*** *
	Female	22	36.7%	34	56.7%			
	Total	60	100.0%	60	100.0%			
Ischemic stroke	Cortical	25	78.1%	29	63.0%	2.015	1	0.156
	Subcortical	7	21.9%	17	36,9%			
	Total	32	100.0%	46	100.0%			
Hemorrhagic stroke	Cortical	21	75.0%	10	71.4%	0.062	1	0.803
	Subcortical	7	25.0%	4	44.0%			
	Total	28	100.0%	14	100.0%			
Hemisphere	Right	19	31.7%	23	38.3%	0.586	1	0.444
	Left	41	68.3%	37	61.7%			
	Total	60	100.0%	60	100.0%			
Stroke severity (NIHHS)	Severe	38	59.6%	32	62.9%	0.234	1	0.267
	Mild	22	40.4%	28	37.1%			
	Total	60	100.0%	60	100.0%			
HAM-D	Not depressed	27	45.0%	44	73.4%	15.078	3	***0.002*** *
	8-13 (mild)	8	13.3%	9	15.0%			
	14-17 (moderate)	12	20.0%	5	8.3%			
	> 17 (severe)	13	21.7%	2	3.3%			
	Total	60	100.0%	60	100.0%			

Legends: *Statistically Significant Difference; HAM-D – Hamilton Depression Rating Scale; NIHSS – National Institutes of Health Stroke Scale; PSD – post-stroke depression; PSE – post-stroke epilepsy.*

Table 3. *Intergroup comparison based on the Mean score of the HAM-D scale*

HAM-D scale	Mean score		U-value	Z-score	p
	Stroke with epilepsia	Stroke without epilepsia			
Depressed mood	2.6	2.0	5.5	-2.3	***0.019*** *
Feelings of guilt	3.0	1.0	2.5	1.9	***0.023*** *
Suicide	2.1	3.0	9.0	1.3	0.097
Insomnia: early in the night	1.9	2.0	17.0	0.0	0.500
Insomnia: middle of the night	1.2	1.4	10.0	-0.42	0.34
Insomnia: early hours of the morning	2.0	1.0	12.5	0.10	0.46
Work and activities	2.5	3.0	35.0	0.55	0.29
Retardation	1.2	1.4	10.0	-0.42	0.34
Agitation	3.0	1.2	7.5	1.93	***0.031*** *
Anxiety psychic	3.0	1.5	43.0	1.18	0.12
Anxiety somatic	2.3	3.0	42.0	0.36	0.36
Somatic symptoms gastro-intestinal	1.4	1.2	17.0	0.0	0.50
General somatic symptoms	2.0	2.0	26.0	0.11	0.46
Genital symptoms	1.5	2.0	12.5	0.10	0.46
Hypochondriasis	2.5	1.5	12.5	0.10	0.46
Loss of weight	1.7	1.0	5.5	1.36	0.09
Insight	1.5	1.0	5.0	1.46	0.07

Legends: *Statistically Significant Difference, HAM-D - Hamilton Depression Rating Scale

mood, feelings of guilt, and agitation compared to patients without epilepsy. The literature describes an atypical presentation of depressive disorders in individuals with epilepsy, which, alongside depressed mood, includes a pleomorphic pattern of symptoms such as affective disturbances, pronounced agitation, and irritability (10). Therefore, treatment of these patients is complex and requires not only appropriate selection of antidepressants but also mandatory psychotherapy (12).

Recognition and timely treatment of post-stroke depression (PSD) are crucial, given its association with increased risk of suicide, poorer quality of life, and higher treatment costs. Additionally, PSD is linked to an increased risk of recurrent cerebrovascular events, which may further affect mortality after stroke (8, 12).

PSD most commonly develops within the first few months post-stroke, with peak prevalence between 6 and 24 months. However, in some patients, symptoms may persist up to five years after the event (4–12).

Risk factors for depression in patients with epilepsy include older age, lower education level, irregular use of antiepileptic drugs, and presence of anxiety (13, 14). Thus, patients with PSE require increased clinical supervision.

PSD typically lasts from 6 to 24 months, with 5–10% of patients experiencing symptoms beyond two years. Although about half of patients show significant symptom reduction within the first eight weeks, the treatment goal remains complete remission. By six months, approximately 50% achieve remission, and about two-thirds within two years. However, 15–20% of patients do not respond to antidepressant therapy (15).

Diagnosing epileptic seizures in elderly patients can be challenging, as they often cannot clearly describe seizure symptoms. Early recognition of epilepsy is essential for timely initiation of antiepileptic treatment. Special attention is warranted for patients with severe neurological deficits, permanent disability, extensive cortical damage, and hemorrhagic stroke, as they represent a high-risk group for developing PSE (3, 13–19).

Early-onset PSD responds better to treatment within the first year, while remission is significantly less common with late onset (12). Some studies report higher PSD prevalence in women, especially during the first months after stroke, though gender differences tend to diminish over time (16). In our study, depression was more common in women without epilepsy (56.7%), while among patients with PSE, depression was more frequent in men (63.3%). A higher frequency of PSE in males has been confirmed in other studies (17, 18), consistent with our findings.

A meta-analysis by Yang et al. showed a strong association between epilepsy and increased risk of depression. Depression in epilepsy patients can hinder therapy response, worsen the condition, reduce quality of life, and increase suicide risk (19). Patients with stroke and epilepsy exhibit significantly higher rates of depressive mood. Other authors confirm that depression impacts epilepsy control, with more severe depression linked to more severe epilepsy forms. A Turkish study reported that about 30% of epilepsy patients develop moderate to severe depression, indicating high prevalence (20).

A lack of personalized treatment approaches often leads to failure to achieve remission with the first antidepressant. Emerging evidence supports developing decision-making tools to tailor treatment choices to individuals, potentially improving depression outcomes. Identifying depression subtypes, considering symptoms underrepresented in current diagnostic frameworks, is important. While depression severity guides treatment decisions, it is insufficient alone (21).

Individualized care planning that identifies factors contributing to depression, incorporates patient habits and needs, and actively involves patients in goal-setting and treatment planning improves treatment outcomes. Techniques such as problem-solving, motivational interviewing, and behavioral activation have proven effective (22). Psychological support methods encourage active patient participation in care development (8, 10, 22).

CONCLUSION

This study highlights the importance of early detection of depression after stroke. It is equally important to identify depression in all patients with post-stroke epilepsy (PSE) to ensure timely and appropriate treatment, thereby reducing mortality in this population. Early identification of patients at risk for developing post-stroke depression (PSD) may enable targeted preventive measures or prompt initiation of effective antidepressant therapy.

Abbreviations

EPI – Epilepsy
HAM-D – Hamilton Depression Rating Scale
PSD – Post-stroke Depression
PSE – Post-stroke Epilepsy

Conflict of Interest Statement

The authors declare that there is no conflict of interest related to this study. There are no financial rela-

tionships, employment, consultancy, stock ownership, honoraria, patents, or paid expert testimony that could influence the outcome of the research presented. Furthermore, there are no close relationships, competitive academic agendas, or philosophical biases that might have affected the conduct of the study.

Funding: This study did not receive any external funding.

Ethical Approval and Informed Consent

All subjects included in the study gave informed consent to participate. Participant information was kept anonymous and in accordance with the International Committee of Medical Journal Editors (ICMJE) guidelines for the protection of research participants. The study was conducted in accordance with the Declaration of Helsinki. and approved by the Ethics Committee of the General Hospital Nikšić, Montenegro.

Author Contributions & Responsibilities

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Note: Artificial intelligence was not utilized as a tool in this study.

Sažetak

DEPRESIJA KOD PACIJENATA SA I BEZ EPILEPSIJE NAKON MOŽDANOG UDARA

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Uvod: Depresija je najčešća neuropsihološka komplikacija moždanog udara. Ona utiče na kvalitet života, produžava dužinu hospitalizacije i zahteva češće posete lekaru. Incidenca depresije nakon moždanog udara kreće se od 18 do 33%. Oko 6–15% pacijenata nakon moždanog udara ima epilepsiju. Pacijenti koji razviju epilepsiju kao posledicu moždanog udara češće imaju depresiju.

Cilj: Cilj naše studije bio je da uporedimo učestalost depresije kod pacijenata tokom prve godine nakon moždanog udara, koji su razvili epilepsiju, sa onima koji nisu imali epilepsiju.

Pacijenti i Metode: Ispitivali smo pacijente tokom prve godine nakon moždanog udara, koji su lečeni na Odeljenju za neurologiju Opšte bolnice Nikšić u Crnoj Gori. Prisustvo depresije testirano je u dve grupe od po 60 pacijenata: jedna grupa je imala epilepsiju nakon moždanog udara, dok druga nije. Testiranje je obavljeno pomoću Hamiltonove skale za depresiju. Za statističku analizu korišćeni su standardni testovi: aritmetička sredina, t-test i hi-kvadrat test (χ^2-test). Statistički značajnim smatran je nivo od 95% ($p < 0,05$).

Rezultati:Učestalost depresije nakon moždanog udara je visoka kod naših pacijenata. Prevalenca depresije kod pacijenata koji su imali epilepsiju nakon moždanog udara iznosi 55%, dok je kod pacijenata bez epilepsije 26,7%.

Zaključak: Pacijenti sa epilepsijom imaju skoro dvostruko veću učestalost depresije u poređenju sa onima koji nemaju epilepsiju nakon moždanog udara ($p < 0,05$). Ovi pacijenti moraju biti pod posebnim nadzorom i češćim kontrolama. Rana detekcija epilepsije i rano započinjanje terapije uz pravilan izbor antiepileptika, kao i rano lečenje depresije, od suštinskog su značaja za prevenciju suicida i smrtnosti kod ovih pacijenata, kao i za poboljšanje kvaliteta života.

Ključne reči: depresija nakon moždanog udara, epilepsija nakon moždanog udara.

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***How to cite this article**:* Perovic Z, Rosandic H. Depression in patients with and without post-stroke epilepsy. Sanamed. 2025; 20(2): 169-174. doi: 10.5937/sanamed0-59707.