

Original article

Aphasia in post-stroke patients: clinical findings from selected cities of Republic of Srpska

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Summary

Introduction. Aphasia frequently occurs following a cerebrovascular insult, disrupting daily functioning and quality of life. This study aimed to examine aphasia in post-stroke patients from selected cities of Republic of Srpska.

Methods. A retrospective analysis of medical records was conducted on 100 consecutive stroke patients hospitalized at the General Hospital Trebinje and the University Hospital Foča between 2022 and 2024. Participants were stratified by sex and stroke type (ischemic vs. hemorrhagic). Aphasia was diagnosed based on clinical evaluation by speech-language pathologists and neurologists without standardized assessment tools. Aphasia types were classified according to medical records. Statistical analysis included chi-square or Fisher's exact test, univariate logistic regression, and Mann–Whitney U test, with significance set at $p < 0.05$.

Results. Aphasia was present in 69% of patients. No significant association with sex was observed ($p = 0.434$). A significant association was identified between stroke type and aphasia: 96.6% in hemorrhagic versus 57.7% in ischemic stroke ($p < 0.001$). Hemorrhagic stroke was associated with higher odds of aphasia (OR = 9.26; 95% CI: 1.09–76.92; $p = 0.041$). Age was also a significant predictor (OR = 1.19; 95% CI: 1.10–1.28; $p < 0.001$), corresponding to a 19% increase in odds per year. Sex was not a statistically significant factor (OR = 1.41; $p = 0.584$).

Conclusion. Stroke type was significantly associated with aphasia, whereas sex is not a statistically significant factor. When assessing post-stroke patients with aphasia, it is essential to consider demographic and clinical characteristics to plan timely speech-language therapy.

Key words: aphasia, stroke, prevalence, type of aphasia

Introduction

Aphasia is a complex neurological language disorder resulting from damage to the dominant hemisphere, most often the left. It manifests as impairments in spontaneous speech, comprehension, naming, repetition, reading, and writing. The most common causes of aphasia are cerebrovascular diseases, specifically ischemic or hemorrhagic stroke, often leading to permanent disabilities in psychosocial functioning [1]. Recent evidence suggests that approximately

one-third of stroke survivors develop aphasia, which substantially impairs communication, limits social participation, and negatively affects overall quality of life [2, 3, 16].

Poststroke aphasia presents in various forms and degrees of severity. Diagnosing aphasia in the acute and subacute phases enables timely planning and initiation of speechlanguage therapy. According to the literature, aphasia occurs in about 30–40% of stroke cases [4]. Recent studies confirm that poststroke aphasia is one of the most common neurological impairments, significantly affecting communication, social participation, and quality of life [2, 5]. Given the lack of epidemiological data on aphasia in Republic of Srpska, the present study aimed to examine the prevalence of aphasia in hospitalized stroke patients in whom this disorder had been diagnosed.

Method

Time and place of the study

The study included 100 consecutive patients who met the inclusion criteria during the defined recruitment period. All consecutive patients meeting inclusion criteria during the study period were included, with no additional exclusion criteria applied. This sample size reflected the available clinical population and provided a reliable basis for estimating the presence of aphasia and examining group differences. The sample consisted of 100 participants of both sexes (49 women, 51 men). The youngest participant was 50 years old and the oldest 95 years. Patients were treated at the General Hospital Trebinje (50%) and the University Hospital Foča (50%) between 2022 and 2024.

Inclusion criteria were: (1) age ≥ 18 years; (2) first-ever stroke (ischemic or hemorrhagic) confirmed by neuroimaging; (3) hospitalization at the participating centers between 2022 and 2024. No patients were excluded based on

age, sex, or stroke severity. Exclusion criteria: prior stroke, pre-existing aphasia or other neurological disorders affecting language, and incomplete medical records.

Data were collected from medical records with the approval of the Ethics Committees of the respective institutions: Foča (Approval No. 01-1468/24-3, August 20, 2024) and Trebinje (Approval No. 02-2560/24, June 21, 2024). Due to the retrospective design, the Ethics Committees waived the requirement for informed consent. The study was conducted in accordance with the Declaration of Helsinki. A retrospective analysis was performed. The diagnosis of aphasia was established based on clinical documentation involving both a neurologist and a speech-language pathologist. Aphasia types were classified based on clinical judgment documented in medical records by the speech-language pathologist.

The primary outcome was the presence of any type of aphasia. Secondary outcomes included the type of aphasia (Broca, Wernicke, global, conduction).

Foča and Trebinje were selected because both cities have general hospitals employing a speech-language pathologist.

Statistical analysis

Statistical data processing was performed using SPSS version 24.0 for Windows. Descriptive analysis employed percentages. The chi-square test was used to examine associations between categorical variables (sex, stroke type) and aphasia. For 2×2 tables with expected cell counts below 5, Fisher's exact test was used instead of chi-square. Univariate logistic regression analysis was performed to identify independent predictors of aphasia presence among stroke patients. The dependent variable was the presence of aphasia (yes/no), while sex, age, and type of stroke (ischemic vs. hemorrhagic) were included as independent variables. Regression coefficients (B), standard errors (SE), Wald chi-square values, p-values, odds ratios

(OR), and 95% confidence intervals (95% CI) were calculated. The Mann-Whitney U test was used to compare age between patients with and without aphasia. All tests were performed at a significance level of $p < 0.05$. This study was reported following the STROBE guidelines for cross-sectional studies.

Results

Aphasia was present in the majority of participants, indicating that the sample was predominantly clinical (Table 1). Ischemic stroke was more frequent than hemorrhagic stroke, reflecting the expected distribution of stroke etiologies within the sample (Table 2).

Table 1. Distribution of respondents in relation to the presence/absence of aphasia

Group	N	%
Have aphasia	69	69%
No aphasia	31	31%
Total	100	100%

Table 2. Distribution of participants in relation to the cause of stroke

Group	N	%
Ischemia	71	71%
Hemorrhage	29	29%
Total	100	100%

No statistically significant association was found between sex and the presence of aphasia ($\chi^2 = 0.613$, $p = 0.434$), indicating a comparable distribution of aphasia across male and female participants (Table 3).

Age-related differences were observed between groups. The median age of patients with aphasia was 82 years (IQR 11) compared to 65 years (IQR 16) in those without aphasia. The Mann-Whitney U test showed a statistically significant difference between the groups ($U = 313.00$; $Z = -5.643$, $p < 0.001$), indicating that participants with aphasia were significantly older than those without aphasia. The Mann-Whitney U test also showed the statistically significant difference in age between male and female respondents with aphasia ($U = 404.50$, $Z = -2.26$, $p = 0.024$). Female respondents had a higher median age (83.0 years, IQR = 6.5) compared to male respondents (79.0 years, IQR = 12.0), indicating that women were older on average than men (Table 4).

A statistically significant association was found between stroke type and aphasia. Given the expected cell counts (hemorrhagic without aphasia < 5), Fisher's exact test was used (Table 5). Aphasia was present in 96.6% of patients with hemorrhagic stroke compared to 57.7% of those with ischemic stroke ($p < 0.001$). Univariate logistic regression (Table 6) confirmed that hemorrhagic stroke was associated with

Table 3. Distribution of respondents based on the presence of aphasia in relation to sex

Sex	Have aphasia		No aphasia		χ^2	df	p	OR (95% CI)
	N	%	N	%				
Male	32	65.3%	17	34.7%	.613	1	.434	1.00 (ref)
Female	37	72.5%	14	27.5%				1.40 (0.60–3.28)

Table 4. Differences in age according to aphasia status and sex among respondents

Variable	Group	N	Mdn	IQR	Mann-Whitney U	Z	p
Aphasia status	Have aphasia	69	82.0	11.0	313.00	-5.64	0.001
	No aphasia	31	65.0	16.0			
Sex (within aphasia group)	Male	32	79.0	12.0	404.50	-2.26	0.024
	Female	37	83.0	6.5			

Table 5. Distribution of respondents according to type of stroke

Type of stroke	Aphasia		No aphasia		Test	p	OR (95% CI)
	N	%	N	%			
Ischemia	41	57.7%	30	42.3%	Fisher's exact test	<0.001	1.00 (ref)
Hemorrhage	28	96.6%	1	3.4%			20.49 (2.63–159.6)

Table 6. Univariate logistic regression analysis of factors associated with aphasia presence

	B	SE	Wald Chi Square	p	OR (95% CI)
Sex	.344	.630	.299	.584	1.41 (0.41–4.84)
Age	.172	.039	19.09	<0.001	1.19 (1.10–1.28)
Type of stroke	-2.229	1.092	4.17	.041	0.11 (0.01–0.92)

significantly higher odds of aphasia compared to ischemic stroke (OR = 9.26; 95% CI: 1.09–76.92; $p = 0.041$). The same analysis showed that increasing age was a significant predictor of aphasia (OR = 1.19; 95% CI: 1.10–1.28; $p < 0.001$), indicating that each additional year of age increased the odds of aphasia by approximately 19%, while sex was not a statistically significant predictor (OR = 1.41; $p = 0.584$).

Discussion

The results of our study suggest a high prevalence of aphasia within this clinical sample, particularly among patients with cerebral hemorrhage. Specifically, aphasia was diagnosed in 69% of the sample of 100 hospitalized patients. This figure is somewhat higher than earlier empirical findings; most studies report that aphasia occurs in 30–40% of patients after the first stroke [5, 7, 8, 9]. Some studies report even lower prevalence rates, ranging from approximately 20% [10] to 24.7% [11]. Meta-analyses and systematic reviews point to variable data on post-stroke aphasia prevalence, ranging from as low as 7% to as high as 70% [12]. As suggested by the authors of the cited studies, such variation is largely attributable to differences in the timing of as-

essment and the diagnostic methods used. Accordingly, the high percentage of aphasia cases in our study may be related to the fact that most clinical assessments were conducted in the acute stroke phase. The high prevalence observed in this study likely reflects early-phase clinical assessments and potential overdiagnosis due to non-standardized evaluation criteria. This finding also implies that the diagnosis of aphasia cannot rely solely on clinical judgment; rather, standardized assessment instruments such as the Serbian Aphasia Screening Test [1, 13] and the Serbian version of the Boston Diagnostic Aphasia Examination [5] should be employed.

Consistent with the literature, aphasia occurs more frequently in the elderly population and is predominantly associated with left-hemisphere lesions [1]. Our regression analysis further confirmed age and stroke type as significant predictors of aphasia.

Studies have shown that the incidence of aphasia is not significantly associated with sex. Although the prevalence of aphasia was higher among females (72.5%) than males (65.3%), this difference was not statistically significant ($p = 0.434$). These findings align with contemporary research, including the meta-analysis by Walentin et al., which suggests that sex differences diminish when age and stroke severity are con-

trolled for [14]. Furthermore, Vuković emphasizes that sex plays a secondary role compared to lesion localization and the etiology of brain injury [1]. More recent studies further highlight that sex is not an independent risk factor for aphasia; rather, its effect depends on interactions with other variables such as age and individual neurological capacities [15].

Regarding stroke type, our results show that aphasia was diagnosed in 96.6% of patients with cerebral hemorrhage, compared to 57.7% of those with ischemic stroke. These findings are consistent with literature indicating that hemorrhagic stroke may be associated with more extensive cortical involvement, particularly in regions responsible for language processing [16]. Supporting this, it has been reported that hemorrhagic strokes more often affect the dominant hemisphere and typically involve broader cortical areas, thereby increasing the risk of more severe forms of aphasia [4].

Analysis of aphasia types yielded the following distribution: Broca's aphasia was present in 40.6% of patients, followed by Wernicke's aphasia in 29%, global aphasia in 18.8%, and conduction aphasia in 11.6%. Broca's aphasia, the most prevalent form, is associated with damage to the frontal lobe of the left hemisphere, whereas Wernicke's aphasia is associated with lesions in the posterior temporal lobe [4]. This distribution supports previous studies confirming that Broca's and Wernicke's aphasia are the most common types following stroke [1, 4], while conduction and other classical aphasia types are less frequent [1, 17, 18]. Data from Senegal indicate that Broca's and global aphasia are the most commonly observed forms [19]. Although these studies originate from distinct sociocultural and medical contexts, our results suggest that similar clinical patterns of aphasic disturbances occur in Republic of Srpska. The high prevalence of global aphasia among our participants reflects the severity of brain damage, which is particularly common in hemorrhagic stroke [20].

Pedersen and colleagues also emphasize that different types of aphasia depend on the localization of the brain lesion [21]. Early identification and classification of aphasia types are considered particularly important for planning more effective treatment [4] and should be incorporated into the assessment of speech and language functions in stroke patients.

Recent literature highlights the importance of early speech-language intervention, as well as the use of digital technologies and neuromodulation as adjunctive treatments [16]. Timely speech-language therapy following stroke promotes neuroplasticity during the period when the brain is most receptive to the reorganization of language functions [22]. Early involvement of a speech-language pathologist is crucial, as the most significant recovery of language functions typically occurs within the first six months post-stroke [4]. Systematic speech-language therapy reduces the impact of aphasia and can improve the likelihood of full recovery of communicative abilities [22, 23].

Numerous studies indicate that aphasia has a significant impact on patients' recovery and quality of life [24–26]. It has also been reported that aphasia prolongs hospital stays, reduces functional independence, and hinders social reintegration and rehabilitation [7, 27]. Ellis and colleagues emphasize that, in addition to diminishing the quality of life of both patients and their families, aphasia substantially increases healthcare costs during the first year following a stroke [28].

Study limitations

Since this is a retrospective clinical study on aphasia in post-stroke patients conducted in selected cities of Republic of Srpska, the relatively small sample size limits the generalizability of the findings. The study sample included only hospitalized patients from two centers, which may limit the generalizability of the findings. Although clinical assessment was performed

by the neurologist and the speech-language pathologist, the study relied on existing medical records, which may have introduced variability in the available diagnostic information. The absence of standardized aphasia assessment instruments may have introduced diagnostic variability and potential classification bias, which should be considered when interpreting the findings. The analysis did not include multivariable modeling to control for potential confounders such as age, lesion localization, and stroke severity. Future studies should include larger and more representative samples and employ standardized aphasia assessment instruments commonly used in aphasiology.

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Ethical approval. The Ethics Committee of the General Hospital Trebinje, Republic of Srpska, Bosnia and Herzegovina (No. 02-2560/24, June 21, 2024), and University Hospital Foča (No. 01-1468/24-3, August 20, 2024), ap-

Conclusion

Aphasia is a common consequence of stroke, with a significantly higher prevalence in hemorrhagic than in ischemic stroke. Stroke type was significantly associated with the presence of aphasia. Although a slightly higher proportion of aphasia was observed in females, no significant association with sex was found. Broca's and Wernicke's aphasia were identified as the most frequent types. Given that patients with hemorrhagic stroke in our sample demonstrated an aphasia rate of 96.6%, early clinical speech-language assessment should be initiated upon admission in this group.

proved the protocol and informed voluntary consent was obtained from all individual respondents and non declinate to participate. The research was conducted according to the Declaration of Helsinki.

Conflicts of interest. The authors declare no conflict of interest.

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Afazija kod pacijenata nakon moždanog udara: klinički nalazi iz odabranih gradova Republike Srpske

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Uvod. Afazija se često javlja nakon cerebrovaskularnog insulta, narušavajući svakodnevno funkcionisanje i kvalitet života. Ova studija imala je za cilj da ispita prisustvo afazije kod pacijenata nakon moždanog udara iz odabranih gradova Republike Srpske.

Metode. Retrospektivna analiza medicinske dokumentacije sprovedena je na uzorku od 100 uzastopnih pacijenata sa moždanim udarom hospitalizovanih u Opštoj bolnici Trebinje i Univerzitetskoj bolnici Foča u periodu od 2022. do 2024. godine. Ispitanici su podijeljeni prema polu i tipu moždanog udara (ishemijski naspram hemoragijskog). Afazija je dijagnostikovana na osnovu kliničke procjene logopeda i neurologa, bez primjene standardizovanih dijagnostičkih instrumenata. Tipovi afazije klasifikovani su na osnovu medicinske dokumentacije. Statistička analiza uključivala je hi-kvadrat test ili Fisherov egzaktni test, univarijantnu logističku regresiju i Mann–Whitney U test, uz nivo značajnosti $p < 0,05$.

Rezultati. Afazija je bila prisutna kod 69% pacijenata. Nije utvrđena statistički značajna povezanost sa polom ($p = 0,434$). Utvrđena je značajna povezanost između tipa moždanog udara i afazije: 96,6% kod hemoragijskog u odnosu na 57,7% kod ishemijskog moždanog udara ($p < 0,001$). Hemoragijski moždani udar bio je povezan sa većim izgledima za afaziju ($OR = 9,26$; 95% CI: 1,09–76,92; $p = 0,041$). Starost je takođe bila značajan prediktor ($OR = 1,19$; 95% CI: 1,10–1,28; $p < 0,001$), što ukazuje da svaka dodatna godina života povećava vjerovatnoću prisustva afazije za približno 19%. Pol nije bio značajan ($OR = 1,41$; $p = 0,584$).

Zaključak. Tip moždanog udara bio je značajno povezan sa afazijom, dok pol nije statistički značajan faktor. Prilikom procjene pacijenata sa afazijom nakon moždanog udara, neophodno je uzeti u obzir demografske i kliničke karakteristike kako bi se planirala pravovremena govorno-jezička terapija.

Ključne riječi: afazija, moždani udar, rasprostranjenost, tip afazije