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Verbal Mental Capacity and Medication Adherence in Psychiatric Outpatients: The Impact of Verbal Cognitive Reserve and Side Effects

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WHAT IS ALREADY KNOWN ON THIS TOPIC?

- *Medication adherence is a major determinant of treatment outcomes in psychiatric disorders, but nonadherence rates remain high (40%-74%).*
- *Previous studies have explored the influence of clinical symptoms and sociodemographic factors on adherence, with inconsistent findings.*
- *Cognitive impairment has been linked to poor adherence in chronic medical conditions, but evidence in psychiatric populations is limited and mostly focused on severe disorders such as schizophrenia and bipolar disorder.*

ABSTRACT

Objective: Medication adherence is a critical determinant of treatment outcomes in psychiatric disorders, yet the underlying factors remain unclear. This study aimed to examine the role of verbal mental capacity and clinical variables in predicting medication adherence among psychiatric outpatients.

Methods: A total of 67 patients (aged 18-60 years) were assessed using the Medication Adherence Rating Scale (MARS), Beck Anxiety Inventory, Beck Depression Inventory, Liverpool University Neuroleptic Side Effect Rating Scale (LUNSERS), and the Turkish version of the National Adult Reading Test (NART-TR). Participants were categorized into good adherence (n = 33) and poor adherence (n = 34) groups based on MARS scores. Comparative analyses between these groups, as well as correlation and multiple regression analyses, were conducted.

Results: Patients with poor adherence had significantly higher anxiety, depression, side effect scores, and NART-TR errors than patients with good adherence ($P < .05$). Correlation analysis revealed negative associations between MARS scores and anxiety, depression, side effects, and NART-TR errors. Regression analysis identified NART-TR errors ($\beta = -.342$, $P = .009$) and LUNSERS scores ($\beta = -.512$, $P = .022$) as independent predictors of medication adherence.

Conclusion: Verbal mental capacity and medication side effects emerged as critical determinants of adherence in psychiatric patients. Incorporating cognitive screening tools like NART-TR into routine practice may help identify individuals at risk of nonadherence and guide tailored interventions.

Keywords: Medication adherence, NART-TR, psychiatric disorders, side effects, verbal mental capacity

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INTRODUCTION

Medication adherence, defined as the extent to which a patient complies with a healthcare provider's recommendations, is one of the most important determinants of treatment success.[1] It is known that medication nonadherence ranges from 40% to 74% in psychiatric patient populations.[2-5] The medication nonadherence has been found to be directly associated with treatment failure and poor health outcomes in patients.[6,7] Therefore, identifying patient- and treatment-related predictive factors that influence medication adherence is of great importance for disease management and prognosis.

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WHAT THIS STUDY ADDS ON THIS TOPIC?

- *This study is the first to investigate the role of verbal mental capacity, assessed with the National Adult Reading Test-Türkiye (NART-TR), in predicting medication adherence among psychiatric outpatients.*
- *It demonstrates that verbal mental capacity and side effect burden are independent predictors of adherence, whereas depressive symptoms are not.*
- *The findings highlight the potential value of simple cognitive screening tools like NART-TR for early detection of patients at risk of nonadherence and for guiding personalized interventions in clinical practice.*

A comprehensive review of the extant literature has identified several factors that contribute to medication nonadherence in psychiatric patients. These factors include elevated anxiety levels, polypharmacy, young age, living alone, limited education, early onset of the disorder, lack of insight, and low social support.[5,8-10] However, conflicting results have also been reported regarding certain demographic factors such as gender.[8,11-13] In earlier studies conducted on psychiatric outpatient populations, stigma, high disease severity, and attributing the causes of the disease to spiritual factors were found to be associated with medication nonadherence.[14,15] All these studies suggest that clinical symptoms, certain sociodemographic data, and some psychosocial factors may have significant effects on medication adherence in psychiatric patients. However, given the presence of contradictory results in certain studies, it can be concluded that further research is necessary to clarify the existing ambiguities in this area.

The impetus to enhance medication adherence within the context of general medical practice has prompted researchers to delve into the investigation of other potential factors that may hinder adherence. Of particular interest is the relationship between medication adherence and cognitive functions, a subject that has recently garnered significant attention. Indeed, cognitive capacity can be considered a critical factor in understanding treatment instructions and managing medication therapy. To date, the effects of cognitive function on medication adherence have been studied in a wide range of patient groups. Among these, impaired cognitive function has been associated with poor medication adherence in patients with a variety of medical conditions, including diabetes mellitus, hypertension, hyperlipidemia, multiple sclerosis, heart failure, and cardiovascular diseases.[16-19] In elderly patients suffering from chronic diseases, the positive relationship between health literacy and medication adherence has been reported to disappear in the presence of cognitive impairment.[20] Preliminary research conducted on psychiatric patient populations has indicated a correlation between medication adherence and cognitive functions, including conceptualization and memory.[21] Subsequent studies have also reported that cognitive decline in psychiatric patients is associated with poor medication adherence.[22-25] The extant literature on the relationship between cognitive function and medication adherence in psychiatric patient groups has predominantly focused on bipolar disorder or schizophrenia patient groups. This emphasis on these psychiatric disorders is rational, given the increased destructive potential of medication nonadherence in such conditions. However, to date, no study has been conducted in this area on outpatient samples, which constitute a relatively larger portion of the psychiatric patient population.

A paucity of research has been conducted on the relationship between medication adherence and cognitive capacity in psychiatric patient groups. The findings from the limited number of studies conducted in this area suggest that cognitive functions should be given greater priority in order to better understand the factors that impair medication adherence in these patient groups. In addition to clinical practice, the absence of cognitive function assessment in drug research studies may impose substantial limitations. In their seminal study, Sanborn and colleagues[26] (2021) examined the effects of cognitive impairments on the study protocol in a randomized controlled trial. The findings of this study demonstrated that cognitive impairments have the potential to influence the outcomes of research studies by introducing variations in adherence to research protocols. On the other hand, comprehensive assessment of cognitive functions may not be possible in clinical practice or research. This is due to the fact that the evaluation of cognitive functions can be a time-consuming and costly process. In this context, the utilization of low-cost, reliable, practical, and easy-to-use tools is advantageous for the assessment of intellectual functions, including cognitive functions and intelligence levels, in clinical practice. The Turkish version of the National Adult Reading Test-Türkiye (NART-TR), which was recently developed, has been found to be valid and reliable in the assessment of these functions.[27] To the best of the authors' knowledge, there is an absence of research in the literature examining the relationship between NART-TR performance and medication adherence. The objective of this study is to examine the predictive roles of verbal mental capacity (assessed with the NART-TR), psychiatric symptoms (anxiety and depression), and medication side effects on medication adherence among psychiatric outpatients. It was hypothesized that patients with poor adherence would show higher anxiety and depression scores, greater severity of side effects, and lower verbal mental capacity compared to patients with good adherence.

MATERIAL AND METHODS

Participants and Procedure

The study included 81 patients who were followed up at the Psychiatry Outpatient Clinic of Necmettin Erbakan University Faculty of Medicine(Approval no: 2025/5492; Date: January 24, 2025). The inclusion criteria were as follows: subjects were required to be between 18 and 60 years of age and to voluntarily

agree to participate in the study. The exclusion criteria encompassed individuals with a duration of education less than 5 years, those with an uncontrolled medical condition, and those with a diagnosis of alcohol or substance use disorder. Informed consent was obtained from all patients included in the study. The participants were administered a series of assessments designed to measure anxiety, depression, verbal mental capacity, and side effects associated with medications. These assessments included the Beck Anxiety Inventory (BAI), the Beck Depression Inventory (BDI), the NART-TR, the Medical Adherence Rating Scale (MARS), and the Liverpool University Neuroleptic Side Effect Rating Scale (LUNSERS). Fourteen patients were excluded from the study due to missing data on the scales. The final sample size of the study comprised 67 patients. Participants were divided into 2 groups based on their MARS scores: those with good adherence to medication (GAM) (n = 33) and those with poor adherence to medication (PAM) (n = 34). A comparative analysis was conducted on sociodemographic data and psychometric scales between the 2 groups. The sample size of the study was calculated using the G*Power 3.1.9.6 software (α = 0.05, power = 0.90, effect size = 0.75). The analysis indicated that a minimum of 64 individuals should be included in the study.

Ethical Considerations

This study was conducted in accordance with the Helsinki Declaration for research involving human subjects and was approved by the Necmettin Erbakan University Ethics Committee for Non-Pharmaceutical Drug and Medical Device Research (Approval no:: 2025/5492; Date: January 24, 2025). Patients provided written informed consent both verbally and written to participate in this study.

Measures

Sociodemographic data form: The researchers developed a form to collect basic information from the participants, including their age, gender, marital status, employment status, and tobacco and alcohol use.

Medication Adherence Rating Scale: Medication Adherence Rating Scale was developed to assess patients' level of adherence to medication treatment.[28] The scale consists of 10 items that are answered using a "yes/no" response format. Scores on the scale range from 0 to 10. Higher scores on this scale indicate better medication adherence. In the Turkish adaptation study, scores ranging from 0 to 7 were classified as poor adherence, while scores between 8 and 10 were designated as good adherence. The Cronbach's alpha coefficient for the Turkish version of the scale was reported as 0.92.[29]

National Adult Reading Test-Türkiye: The NART-TR is a test designed to evaluate individuals' verbal intelligence and premorbid cognitive capacity.[27] The test comprises a list of 51 words that have been adapted into Turkish. Participants are instructed to recite these words aloud, and any words that are pronounced incorrectly are documented. An increase in the number of errors indicates lower cognitive capacity. The test has undergone validity and reliability studies in Turkish, and the results indicate that it possesses strong psychometric properties.[27]

Liverpool University Neuroleptic Side Effect Rating Scale: A self-report scale was developed to measure the severity of antipsychotic drug side effects.[30] The scale consists of 51 items, each scored on a scale from 0 (none) to 4 (very severe). The total score ranges from 0 to 204, with higher scores indicating more side effects. The Turkish adaptation was conducted by Yılmaz[31] (2004), and the Cronbach's alpha coefficient was reported as 0.89.

Beck Anxiety Inventory: A 21-item self-report scale was developed to measure anxiety levels in individuals.[32] Each item is scored on a scale ranging from 0 (none) to 3 (severe). The total score ranges from 0 to 63; higher scores indicate greater anxiety. The Turkish validity and reliability study was conducted by Ulusoy and colleagues[33] (1998), and the Cronbach's alpha coefficient was found to be 0.93.

Beck Depression Inventory: The BDI is a 21-item self-report scale that was developed to measure cognitive, emotional, and somatic symptoms of depression.[34] Items are scored on a scale of 0-3, and the total score ranges from 0 to 63. Higher scores indicate more severe depression. The study of Turkish adaptation and reliability was conducted, and the Cronbach's alpha coefficient was reported as 0.80.[35]

Data Analysis

Statistical analyses were carried out using SPSS software version 26.0 (IBM SPSS Corp.; Armonk, NY, USA). The Kolmogorov-Smirnov test was employed to assess the normal distribution of continuous variables. For non-normally distributed data, the Mann–Whitney *U* test was employed, and for normally distributed data, the independent sample *t*-test was utilized. The chi-square test was employed to compare categorical variables. The relationships between variables were examined using Spearman correlation analysis. To identify factors that predict medication adherence, multiple linear regression analysis was performed. Prior to conducting the analysis, the assumptions of linearity and homoscedasticity were examined using residual and scatter plots. Multicollinearity was tested with the collinearity diagnostics procedure; tolerance values were all >0.10 and variance inflation factor values were all <5, confirming that the assumption of absence of multicollinearity was met . The statistical significance was established with a *P*-value less than .05.

RESULTS

Sociodemographic Characteristics

A comparative analysis of the sociodemographic data revealed no significant differences between the groups. A comparison of sociodemographic data is presented in Table 1.

Psychometric Comparisons Between Groups

Psychometric comparisons between groups revealed that BAI scores were significantly higher in the PAM group compared to the GAM group ($P = .023$). Similarly, BDI scores were also significantly higher in the PAM group ($P = .034$). Furthermore, a statistically significant increase in the severity of side effects was observed in the PAM group ($P = .038$). The NART-TR test revealed a significantly higher number of errors in the PAM group ($P = .027$). The comparison of psychometric measurements is summarized in Table 2.

Correlations Between Sociodemographic and Psychometric Measures

According to Spearman correlation analysis, significant negative correlations were identified between MARS scores and LUNSERS ($r = -.33$, $P < .01$), BAI ($r = -.33$, $P < .01$), and BDI ($r = -.28$, $P < .05$) scores. These results indicate negative correlations between medication adherence and anxiety, depression, and severity of side effects. Additionally, a significant negative relationship was found between the number of NART-TR errors and medication adherence ($r = -.29$, $P < .05$). The statistical data pertaining to the correlation analysis results are presented in Table 3.

Table 1. Comparison of Sociodemographic Features of the Groups (mean ± SD)

		Group			
		GAM (n = 33) [n (%)]	PAM (n = 34) [n (%)]	*t* / *Z* / X^2	*P*
Age [a] (years) (median)		33.79 ± 13.13 (30)	33.18 ± 12.23 (32.5)	−0.094	.925
Gender	Female	20 (60.6)	22 (64.7)	0.120	.729
	Male	13 (39.4)	12 (35.3)		
BMI		26.25 ± 5.6	27.89 ± 6.95	1.057	.294
Marital status	Married	13 (39.4)	18 (52.9)	1.236	.266
	Single	20 (60.6)	16 (47.1)		
Number of daily medications [a] (median)		1.79 ± 1.05 (1)	1.76 ± 0.99 (1)	−0.028	.978
Occupational status	Unemployed	19 (57.6)	18 (52.9)	2.924	.404
	Retired	4 (12.1)	1 (2.9)		
	Officer	4 (12.1)	5 (14.7)		
	Worker	6 (18.2)	10 (29.4)		
Medical comorbidity	Yes	11 (33.3)	15 (44.1)	0.820	.365
Family history of psychiatric disorder	Yes	13 (39.4)	10 (29.4)	0.740	.390
Alcohol use	Yes	3 (9.1)	2 (5.9)	0.250	.617
Smoking status	Yes	12 (36.4)	16 (47.1)	0.787	.375

$P \leq .05$, chi-square and independent sample *t*-tests were carried out.
BMI, body mass index; GAM, good adherence to medication; PAM, poor adherence to medication.
[a]Mann–Whitney *U* test was applied due to non-normally distributed data.

Table 2. Comparison of Psychometric Tests of the Groups (mean ± SD).

	Group			
	GAM (n = 33)	PAM (n = 34)	*t* / *Z*	*P*
BAI(median)	12.3 ± 10.21 (10)	22.27 ± 17.46 (17)	−2.272	**.023**
BDI [a]	13.15 ± 10.76	19.76 ± 13.93	2.170	**.034**
NART-TR (median)	4.87 ± 5.78 (3)	8.82 ± 8.66 (5.5)	−2.207	**.027**
LUNSERS [a]	38.82 ± 27.38	55.47 ± 36.1	2.123	**.038**

$P \leq .05$, Mann–Whitney *U* test was carried out.
BAI, Beck Anxiety Inventory; BDI, Beck Depression Inventory; GAM, good adherence to medication; LUNSERS, Liverpool University Neuroleptic Side Effect Rating Scale; NART, National Adult Reading Test-Türkiye; PAM, poor adherence to medication.
[a]Independent sample *t*-test was applied due to normally distributed data.
Bold values = $P < .05$.

Regression Analysis of Factors Predicting Medication Adherence in Patients

In the multiple linear regression analysis, MARS scores were included as the dependent variable, and the number of NART-TR errors, BDI, LUNSERS, the number of daily medications, and gender were selected as independent variables in the model (R^2: 0.222, Adjusted R^2: 0.158, $P = .008$). The results of the analysis revealed that the variables significantly predicting medication adherence were the number of NART-TR errors ($\beta = -0.342$, $P = .009$) and the LUNSERS scores ($\beta = -0.512$, $P = .022$). This indicates that verbal mental capacity and side effect burden are the primary factors independently influencing medication adherence. Depression, the number of daily medications, and gender did not contribute significantly to the model ($P > .05$). Details of the regression analysis are presented in Table 4.

DISCUSSION

The present study revealed that there were no statistically significant differences in sociodemographic characteristics between the 2 groups classified according to medication adherence levels. However, the PAM group demonstrated significantly higher levels of anxiety, depression, and adverse effects. Additionally, they exhibited a higher incidence of errors, as measured by NART-TR. Correlation analyses revealed negative relationships between medication adherence and anxiety, depression, adverse effects, and verbal mental capacity. National Adult Reading Test-Türkiye and side effect scores were identified as independent predictors of medication adherence. These findings suggest that verbal mental capacity and the burden of side effects may be decisive factors in medication adherence in patients with psychiatric disorders.

In the present study, which was conducted on an outpatient sample, medication nonadherence was found to be 50.7%, a rate that is consistent with those reported in previous studies in this field.[3,8] A review of the extant literature reveals conflicting findings in terms of demographic data. For instance, while some researchers have reported an association between female gender and medication nonadherence.[8,11,13] others have reported an association between male gender and medication nonadherence.[5,12] A similar pattern of conflicting results is also observed in other demographic data. The findings of the present study are consistent with the literature, which reports an absence of a significant association between demographic and socioeconomic factors across groups.[9] However, when interpreting these results, it is important to consider that the sample size included in this study was relatively limited.

A review of the literature reveals that patients with poor medication adherence have higher scores on scales measuring anxiety, depression levels, or disease severity.[5,10,14,25] In the present study, significantly higher anxiety and depression scores were also found in individuals with poor medication adherence. This phenomenon may be attributed to an escalation in disease manifestations consequent to an irregular medication regimen. However, studies conducted on non-psychiatric patient samples have also reported higher levels of anxiety and depression associated with medication nonadherence.[16] These findings suggest that anxiety and depression levels may have a potential impact on medication adherence. Several mechanisms may underlie this association. For example, anxiety can increase

Table 3. Correlations Between Sociodemographic Features and Psychometric Test Scores in Entire Groups

	Age	BMI	LUNSERS	BAI	BDI	MARS	NART-TR
Age	1						
BMI	.55**	1					
LUNSERS	−.14	−.11	1				
BAI	−.05	−.11	.87**	1			
BDI	−.21	−.10	.86**	.81**	1		
MARS	.06	.04	−.33**	−.33**	−.28*	1	
NART-TR	.17	.12	−.10	−.06	.01	−.29*	1

Spearman's correlation test was performed.
BAI, Beck Anxiety Inventory; BDI, Beck Depression Inventory; BMI, body mass index; LUNSERS, Liverpool University Neuroleptic Side Effect Rating Scale; MARS, Medication Adherence Rating Scale; NART, National Adult Reading Test-Türkiye.
*$P < .05$.
**$P < .01$.

Table 4. Predictors of Medication Adherence in Patients

	MARS Score						
						Collinearity Statistics	
Independent Variables	**B**	**SE**	**βeta Coefficient**	**95.0% CI for β Coefficient**	***P***	**Tolerance**	**VIF**
Constant	8.153	0.476		7.201-9.105	**<.001**		
NART-TR	−0.069	0.026	−.342	−0.120 to −0.018	**.009**	.785	1.273
BDI	0.006	0.024	0.054	−0.042 to 0.055	.794	.306	3.272
Number of daily medications	0.237	0.182	0.156	−0.128 to 0.601	.199	.880	1.136
Gender (1 = female)	0.399	0.399	0.127	−0.400 to 1.198	.322	.790	1.266
LUNSERS	−0.024	0.010	−0.512	−0.044 to −0.004	**.022**	.268	3.728

Bold values = $P < .05$. Multiple linear regression analysis test was carried out. R^2: 0.222, Adjusted R^2: 0.158, $P = .008$.
BDI, Beck Depression Inventory; CI, confidence interval; LUNSERS, Liverpool University Neuroleptic Side Effect Rating Scale; MARS, Medication Adherence Rating Scale; NART, National Adult Rreading Test-Türkiye; VIF, variance inflation factor.

concerns about adverse effects, reinforce avoidance behaviors, and impair concentration needed to follow treatment routines. Depressive symptoms, on the other hand, may diminish motivation, increase hopelessness, and impair executive functioning, all of which can interfere with daily medication management. These psychological factors may therefore act as indirect barriers to optimal adherence.

A salient finding from this study was that medication side effect scores were found to be significantly higher in the PAM group. A substantial body of research has indicated a potential link between medication nonadherence and adverse effects. Bayraktar and colleagues[10] (2025) posited in their study, which was conducted on a population of 288 adolescents, that monotherapy and the experience of fewer side effects may play an important role in ensuring medication adherence. In another study, participants with poor medication adherence reported more sedation.[5] In a similar vein, another study found that patients with serious side effects were more likely to exhibit treatment nonadherence compared to those with moderate and low levels of side effects.[8] Settem and colleagues[25] (2019) reported significant negative correlations between MARS scores and positive attitudes toward psychotropic drug side effects in schizophrenia patients. These consistent results suggest that drug-related side effects may be an independent factor predicting medication nonadherence. The regression analyses of the current study demonstrated that experiencing a high degree of side effects significantly predicted medication nonadherence. This relationship may be explained by several underlying mechanisms. Side effects can decrease patient motivation to persist with treatment, foster negative beliefs about the safety or necessity of medications, and reduce overall quality of life. As a result, individuals may intentionally lower their dosage, omit doses, or discontinue treatment in an attempt to alleviate these burdens. Such processes highlight the complex psychological and behavioral pathways through which adverse effects impair adherence.

The present study determined that the NART-TR error count is an independent predictor of medication adherence. The extant literature suggests that individuals with low cognitive capacity encounter greater challenges in comprehending and adhering to treatment regimens, thereby elevating the probability of medication nonadherence.[36] Concurrent studies conducted in patients with cardiovascular disease, diabetes, and hypertension have identified a significant correlation between medication nonadherence and impaired cognitive performance.[17,19] A limited number of studies have been conducted on psychiatric patient groups, and the results of these studies suggest an association between medication adherence and executive functions, prospective memory, and general cognitive capacity.[22-25] The current literature contains only a limited number of studies that have examined the potential effects of cognitive functions, such as intelligence and mental capacity, on medication adherence. A substantial study comprising a sample of middle-aged and older adults reported a significant association between verbal intelligence levels and treatment adherence.[37] In a more recent study, although medication adherence

was not directly assessed, high mental capacity was found to be associated with voluntary treatment participation.[38] Individuals with low mental capacity may encounter challenges in comprehending intricate medication instructions and navigating daily routines. This can complicate medication administration, potentially leading to inaccurate dosing and untimely treatment. Additionally, it can hinder the management of adverse effects and the informed decision-making processes associated with treatment. These cognitive impairments become more pronounced in cases of polypharmacy or multi-step treatment plans, potentially increasing treatment failure and relapse risk. The findings from this study suggest a distinctive contribution to the limited research in this area. The present study demonstrated that practical and cost-effective intelligence measures, such as NART-TR,[27] can be used to predict medication adherence. In clinical practice, the implementation of such tools has the potential to facilitate the early identification of individuals who may encounter medication management challenges.

Strengths and Limitations

The present study addresses an important gap in the literature by examining verbal mental capacity, side effects, and psychiatric symptoms together in relation to adherence among psychiatric outpatients. Nonetheless, some limitations must be acknowledged. Firstly, the cross-sectional design of the study may constitute a potential limitation in establishing a cause-and-effect relationship. The relatively modest sample size and the single-center nature of the data collection may constrain the generalizability of the findings. The utilization of a self-report scale (MARS) in the evaluation of medication adherence might give rise to respondent bias. Moreover, the evaluation of verbal cognitive capacity employing the NART-TR disregards other components of cognitive function. Another limitation is that the educational level was not collected; thus, its potential impact on medication adherence could not be examined. Finally, there was a paucity of control over the types and doses of medications utilized by the patients. These variables have the potential to exert an influence on adherence levels.

This study examined factors that may influence medication adherence in a psychiatric outpatient clinic sample. The findings of this study underscore the pivotal roles that verbal mental capacity and the burden of side effects play in determining medication adherence. The implementation of practical and cost-effective assessments, such as the NART-TR, may facilitate the identification of individuals who are at high risk of nonadherence during the early stages of clinical practice. In the development of strategies to enhance medication adherence, it is imperative to assess verbal mental capacity and effectively manage adverse effects. Future research should aim to replicate these findings in larger and more diverse samples, using longitudinal designs and broader neurocognitive assessments.

Data Availability Statement: The data that support the findings of this study are available on request from the corresponding author.

Ethics Committee Approval: Ethical committee approval was received from the Ethics Committee of Necmettin Erbakan University (Approval No.: 2025/5492; Date: January 24, 2025)

Informed Consent: Written informed consent was obtained from patients who participated in this study.

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