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Psychosocial outcomes in healthy siblings of children with celiac disease: A controlled cross-sectional study

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ABSTRACT

Objective: The aim of this study was to compare health-related quality of life (QoL) and anxiety/depressive symptoms in healthy siblings of children with celiac disease (CD) with age- and gender-similar healthy siblings of children without chronic illness.

Materials and Methods: This controlled cross-sectional study, conducted in a pediatric gastroenterology and child psychiatry setting at a tertiary-care hospital, enrolled healthy siblings aged 8–17 years into a CD-sibling group (n=70) and a control group (n=70). Sociodemographic data were collected using a standardized form, QoL was assessed using the Pediatric Quality of Life Inventory (PedsQL) Generic Core Scales, and psychiatric symptoms were assessed using the Revised Child Anxiety and Depression Scale (RCADS). Between-group comparisons and Spearman rank correlations were used, and predictors of total anxiety and psychosocial QoL were examined using univariable and multivariable linear regression.

Results: Sociodemographic and familial characteristics were largely comparable between groups. Compared with controls, the CD-sibling group had higher total anxiety scores (p=0.007), whereas depressive symptoms were similar between groups (p=0.758). Psychosocial and total QoL were lower in the CD-sibling group (both p<0.001), while physical QoL did not differ between groups (p=0.201). In multivariable models within the CD-sibling group, longer time since diagnosis and maternal psychiatric disorder independently predicted higher anxiety and poorer psychosocial QoL, whereas a greater number of siblings predicted lower anxiety and better psychosocial QoL.

Conclusion: Healthy siblings of children with CD experience increased anxiety and reduced psychosocial/total QoL, underscoring the importance of family-centered monitoring that includes sibling well-being and maternal mental health.

Keywords: Anxiety, celiac disease, depression, quality of life, pediatric, siblings

Introduction

Childhood chronic illnesses impose a multidimensional burden that extends beyond the affected child and permeates the entire family system (1). Advances in medical care have markedly improved survival and long-term outcomes for many pediatric chronic conditions; consequently, the psychosocial sequelae experienced by family members have become an increasingly important focus of clinical attention (2,3). Within this context, healthy siblings represent a particularly vulnerable yet often overlooked group who may be required to navigate complex emotional and developmental challenges. As parental time, energy, and financial resources are disproportionately directed toward the ill child, parents' emotional and physical availability for other children may diminish. In parallel, greater household responsibilities and heightened exposure to family stress can adversely affect healthy siblings' emotional well-being and everyday functioning (4,5).

A growing body of research suggests that healthy siblings of children with chronic illness may report poorer health-related quality of life (QoL) and face elevated risks of internalizing symptoms such as anxiety and depressive features, as well as behavioral problems and adjustment difficulties (6–8). Nevertheless, findings across studies remain heterogeneous, indicating that the magnitude and form of sibling impact are not uniform. Reported variability appears to be influenced by

illness- and context-related factors, including disease severity and visibility, treatment burden, illness duration, family coping resources, and socioeconomic circumstances (9–12).

Celiac disease (CD) is an immune-mediated disorder with distinctive management challenges, primarily characterized by the need for lifelong, strict adherence to a gluten-free diet (13). Unlike many chronic conditions in which treatment is episodic or largely clinic-based, CD management is embedded in daily life and requires continuous vigilance. Ongoing demands may include careful food selection, prevention of cross-contamination, restructuring of household meal routines, and sustained accommodations in school and social environments, as well as planning for travel and social events (14,15). These persistent requirements can shape family routines and the broader family climate (16,17). Notably, children with CD have been reported to exhibit a higher burden of psychological symptoms (e.g., anxiety and depressive symptoms) and poorer health-related QoL than their healthy peers (18). In parallel, parents of children with CD have been reported to experience higher parenting stress and a greater burden of mental health problems than parents of healthy children (16,19). Through mechanisms such as dietary restrictions, shifts in intra-family interactions, elevated parental stress, and concerns about exclusion or social adaptation, CD may also affect the mental health and psychosocial functioning of healthy siblings (17,19,20).

Although there is substantial literature on healthy siblings in the context of various pediatric chronic diseases (e.g., cancer, neurological disorders, congenital heart disease, and diabetes), studies directly examining psychosocial outcomes among healthy siblings in families affected by pediatric CD remain limited (4,19,21–23). Therefore, in this study, we evaluated health-related QoL and levels of anxiety and depressive symptoms in healthy siblings of children with CD by comparing them with age- and gender-similar healthy siblings of children without chronic illness.

Materials and Methods

This controlled cross-sectional study was conducted between June and December 2025 at the Pediatric Gastroenterology, Hepatology, and Nutrition and the Child and Adolescent Psychiatry outpatient clinics of Gulhane Training and Research Hospital. Participants aged 8–17 years were recruited into two groups. A total of 140 participants were enrolled (70 in the CD-sibling group and 70 in the healthy-sibling group). The CD-sibling group comprised healthy siblings of children with CD who were under follow-up at the Pediatric Gastroenterology clinic; eligible siblings were invited when families attended the clinic during the study period. Healthy siblings were defined as siblings without any known chronic physical illness, including a previous diagnosis of CD. In the CD-sibling group, eligible siblings had also undergone serological screening for CD as part of routine first-degree relative screening; those with positive CD serology or diagnosed CD were not included. The diagnosis of CD in the index child was confirmed by upper gastrointestinal endoscopy and small intestinal biopsy, in accordance with the European Society for Paediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN) 2020 criteria (24). As standard of care, all patients were prescribed a strict gluten-free diet after diagnosis. The healthy-sibling group (controls) comprised healthy siblings of children who presented to the same outpatient clinic for routine pediatric assessment (e.g., well-child/routine check-up) and who had no history of chronic medical illness; participating siblings in the control group were also required to have no chronic medical illness. The control group was selected to be similar to the CD-sibling group in terms of age and sex distribution.

Participants were excluded if the index sibling had a chronic disease other than CD, if the participant had any chronic physical illness, or if there was a history of a severe psychiatric diagnosis or treatment (e.g., autism, intellectual disability, schizophrenia). Participants were also excluded if they had neurocognitive, language, visual, or hearing impairment that could compromise valid questionnaire completion. In addition, participants were excluded if they were currently receiving psychotropic medication or active psychiatric treatment, to minimize potential confounding of symptom ratings and questionnaire-based outcomes. Participants with an acute medical condition at the time of assessment, those who declined participation, or those who left the questionnaire set incomplete were also excluded. These exclusion criteria were assessed during recruitment through a brief child psychiatry interview with the participant and parent/legal guardian, parental report, and review of available hospital records where applicable.

Participants who met the inclusion criteria and voluntarily agreed to participate were referred to the child psychiatry outpatient clinic. All data collection instruments were administered individually to participants, and completed forms were reviewed on-site to minimize missing responses. A study-specific semi-structured sociodemographic form was used to record parent- and child-related characteristics, including parental age, educational level, employment status, and history of chronic medical illness or psychiatric disorders, as well as monthly household income, number of siblings, birth order, and the child's age and gender; in the CD-sibling group, time since diagnosis (months) was also recorded. Health-related QoL was assessed using the Pediatric Quality of Life Inventory (PedsQL) Generic Core Scales (self-report, used in this study for participants aged 8–17 years), which evaluates physical, emotional, social, and school functioning and yields physical, psychosocial, and total QoL scores. Higher scores indicate better QoL. The original scale was developed by Varni et al. (25), and the Turkish validity and reliability of the relevant age forms were established by Memik et al. (26,27). Anxiety and depressive symptoms were assessed using the Revised Child Anxiety and Depression Scale (RCADS). The RCADS yields six subscale scores (Separation anxiety, social anxiety, obsessive–compulsive disorder, panic disorder, generalized anxiety, and major depressive disorder) and the composite indices used in this study: total anxiety score and anxiety–depression total score. The instrument was originally developed by Chorpita et al., and the Turkish adaptation was validated by Görmez et al. (28,29)

Statistical analysis

An a priori sample size calculation was performed using G*Power 3.1. For comparisons between two independent

groups on continuous outcomes, assuming a moderate effect size (Cohen's d = 0.50), a two-sided α level of 0.05, and 80% power, at least 64 participants were required per group. To account for possible incomplete data, we planned to recruit at least 65 participants per group; the final sample included 70 participants in each group.

All analyses were performed using IBM SPSS Statistics for Windows, Version 22.0 (IBM Corp., Armonk, NY, USA). Normality was assessed with the Shapiro–Wilk test. Continuous variables are presented as or median with interquartile range (IQR), as appropriate, and categorical variables as n (%). Between-group comparisons used the Mann–Whitney U test for continuous variables and the chi-square or Fisher's exact test for categorical variables. Associations between continuous variables were evaluated using Spearman rank correlation analysis (ρ). Univariable linear regression analyses were performed to examine the association of each candidate predictor (demographic and clinical variables) with psychosocial QoL and total anxiety scores. Variables with p<0.100 in univariable analyses were considered for multivariable modeling, and age and sex were included a priori. Multivariable linear regression models were then fitted using the enter method. Model assumptions were checked, including linearity, homoscedasticity, multicollinearity, and normality of residuals. Unstandardized coefficients (B) with 95% confidence intervals (CI), standardized coefficients (β), p values, and coefficients of determination (R^2) were reported. Two-sided p values <0.050 were considered statistically significant.

Results

A total of 140 participants were enrolled, with 70 individuals in the CD-sibling group and 70 in the healthy-sibling group. Sociodemographic and familial characteristics were largely comparable between groups (Table I). Child age, duration of breastfeeding, maternal age, and paternal age were similar across groups (Table II). Maternal psychiatric disorder was more frequent in the CD-sibling group than in the healthy-sibling group (20.0% vs 8.6%); however, this difference did not reach statistical significance (p=0.053) (Table I).

RCADS anxiety-related symptom scores were higher in the CD-sibling group than in the healthy-sibling group (Table II). The CD-sibling group had significantly higher scores for separation anxiety (p=0.005), generalized anxiety (p=0.014), panic disorder (p=0.006), and social anxiety (p=0.009). Obsessive–compulsive symptoms did not differ significantly between the groups (p=0.064). Depressive symptom scores did not differ between the groups (p=0.758). Total anxiety (p=0.007) and the total anxiety–depression score (p=0.018) were higher in the CD-sibling group.

PedsQL-assessed QoL outcomes differed between groups (Table II). Psychosocial QoL scores were significantly lower in the CD-sibling group (p<0.001), and total QoL scores were also lower in this group (p<0.001). Physical QoL scores did not differ between the groups (p=0.201).

In the CD-sibling group (n=70), time since diagnosis (months) had a median of 7.0 (IQR: 2.0–18.0; range: 0–36). Spearman rank correlation analyses indicated that time since diagnosis

Table I: Comparison of categorical sociodemographic and familial characteristics between the CD-sibling and healthy-sibling groups

	CD-sibling	Healthy-sibling	p
Total number of patient	70	70	-
Child gender (Male/Female)*	38 (54.3) / 32 (45.7)	35 (50.0) / 35 (50.0)	0.612
Number of siblings*			
1	28 (40.0)	23 (32.9)	0.668
2	32 (45.7)	35 (50.0)	
3	10 (14.3)	12 (17.1)	
Birth order*			
First	26 (37.1)	28 (40.0)	
Second	34 (48.6)	34 (48.6)	0.659
Third	10 (14.3)	7 (10.0)	
Fourth	0 (0)	1 (1.4)	
Pregnancy complications, yes*	4 (5.7)	3 (4.3)	1.000
Maternal education level*			
Primary	20 (28.6)	25 (35.7)	0.623
High school	35 (50.0)	33 (47.1)	
University	15 (21.4)	12 (17.1)	
Maternal employment status* (Not working)	46 (65.7)	48 (68.6)	0.719
Maternal chronic physical illness, yes*	14 (20.0)	8 (11.4)	0.164
Maternal psychiatric disorder, yes*	14 (20.0)	6 (8.6)	0.053
Paternal education level*			
Primary	14 (20.0)	16 (22.9)	0.744
High school	34 (48.6)	36 (51.4)	
University	22 (31.4)	18 (25.7)	
Paternal employment status* (Not working)	4 (5.7)	3 (4.3)	1.000
Paternal chronic physical illness, yes*	6 (8.6)	5 (7.1)	0.753
Paternal psychiatric disorder, yes*	10 (14.3)	5 (7.1)	0.172
Monthly household income*			
Minimum wage	6 (8.6)	9 (12.9)	0.714
1–2 × minimum wage	38 (54.3)	36 (51.4)	
>2 × minimum wage	26 (37.1)	25 (35.7)	

***:** *n (%) (Pearson chi-square test/ Fisher's exact test),* ***CD:** *celiac disease*

was negatively correlated with total QoL (ρ=–0.383, p=0.001) and psychosocial QoL (ρ=–0.374, p=0.001), and positively correlated with total anxiety (ρ=0.309, p=0.009) and total anxiety–depression scores (ρ=0.311, p=0.009). Psychosocial and total QoL were negatively correlated with both total anxiety and total anxiety–depression scores (all p<0.001) (Figure 1). Additionally, the number of siblings was negatively correlated with total anxiety (ρ=–0.645) and total anxiety–depression scores (ρ=–0.632), and positively correlated with psychosocial QoL (ρ=0.667) and total QoL (ρ=0.685) (all p<0.001). Other examined variables (child age, maternal age, paternal age, and breastfeeding duration) were not significantly correlated with these outcomes.

In multivariable linear regression models predicting total anxiety (adjusted R^2=0.477) and psychosocial QoL (adjusted R^2=0.620), number of siblings, time since diagnosis, and maternal psychiatric disorder remained independently associated with both outcomes (Table III). In the total anxiety model, a greater number of siblings was associated with lower anxiety scores

Table II: Comparison of continuous sociodemographic and clinical variables between the CD-sibling and healthy-sibling groups

	CD-sibling*	Healthy-sibling*	p
Total number of patients	70	70	-
Child age (years)	12.00 (9.00–14.00)	11.00 (9.25–13.00)	0.387
Duration of breastfeeding (months)	12.00 (6.25–18.00)	12.00 (9.00–18.00)	0.935
Maternal age (years)	40.00 (36.00–42.75)	39.50 (36.25–41.00)	0.378
Paternal age (years)	41.00 (38.25–44.00)	42.00 (39.25–44.00)	0.465
Separation anxiety disorder score	3.00 (1.00–7.00)	2.00 (1.00–2.75)	0.005
Generalized anxiety disorder score	6.50 (2.00–12.00)	4.00 (2.00–7.00)	0.014
Panic disorder score	4.00 (1.25–11.00)	2.00 (1.00–4.75)	0.006
Social anxiety score	6.00 (2.00–11.75)	3.00 (2.00–5.75)	0.009
Obsessive–compulsive disorder score	3.50 (1.00–9.00)	2.00 (1.00–5.75)	0.064
Depression score	5.00 (2.00–8.75)	5.00 (2.00–7.75)	0.758
Total anxiety score	26.00 (8.00–53.00)	13.00 (8.00–24.75)	0.007
Anxiety–depression total score	32.50 (11.00–62.00)	18.00 (12.00–31.00)	0.018
Psychosocial QoL score	67.50 (46.67–89.58)	85.83 (73.33–91.67)	<0.001
Physical QoL score	85.94 (75.00–93.75)	87.50 (81.25–93.75)	0.201
Total QoL score	70.65 (58.70–86.68)	85.87 (76.36–93.48)	<0.001

***:** *median (IQR) (Mann–Whitney U test),* ***CD:** *celiac disease,* ***QoL:** *quality of life*

Table III: Multivariable linear regression analyses of predictors of psychosocial QoL and total anxiety scores in the CD-sibling group

Variable	B	95% CI	β	p
Psychosocial QoL score				
Time since diagnosis	-0.68	[-1.07, -0.29]	-0.29	0.001
Number of siblings	15.85	[10.26, 21.43]	0.51	<0.001
Birth order	0.98	[-5.22, 7.18]	0.03	0.754
Maternal chronic physical illness*	-7.25	[-16.33, 1.83]	-0.13	0.115
Maternal psychiatric disorder*	-17.74	[-27.40, -8.08]	-0.33	<0.001
Paternal psychiatric disorder*	2.55	[-8.74, 13.84]	0.04	0.653
Child age	-0.13	[-1.73, 1.47]	-0.02	0.870
Child gender (female)	1.10	[-6.24, 8.44]	0.03	0.765
Total anxiety score				
Time since diagnosis	0.53	[0.06, 1.01]	0.21	0.027
Number of siblings	-17.97	[-24.63, -11.30]	-0.55	<0.001
Maternal psychiatric disorder*	13.84	[2.40, 25.27]	0.24	0.019
Paternal psychiatric disorder*	-3.70	[-16.88, 9.48]	-0.06	0.577
Child age	-0.58	[-2.28, 1.12]	-0.07	0.497
Child gender (female)	2.05	[-6.55, 10.66]	0.05	0.635

***:** *Yes*

(p<0.001), whereas longer time since diagnosis (p=0.027) and maternal psychiatric disorder (p=0.019) were associated with higher anxiety scores. In the psychosocial QoL model, a greater number of siblings was associated with higher psychosocial QoL (p<0.001), while longer time since diagnosis (p=0.001) and maternal psychiatric disorder (p<0.001) were associated with lower psychosocial QoL. Child age, gender, paternal psychiatric disorder, maternal chronic physical illness, and birth order were not significantly associated with either outcome (Table III).

Discussion

In this study, healthy siblings of children with CD exhibited a marked psychosocial burden compared with an age- and gender-similar control group. The CD-sibling group reported higher anxiety symptoms; in parallel, psychosocial and total health-related QoL scores were significantly lower. In contrast, depressive symptom levels did not differ between groups. Within the CD-sibling group, longer time since diagnosis was associated with higher anxiety and lower psychosocial/total QoL. Moreover, the strong inverse correlations between QoL scores and both total anxiety and the anxiety–depression composite further support a close link between emotional symptom burden and children's perceived well-being. These findings are consistent with the broader literature indicating that healthy siblings of children with chronic illness may experience poorer QoL and an elevated risk of internalizing symptoms (4,6,7). Notably, our study adds to this evidence base by characterizing psychosocial symptom burden in healthy siblings specifically within the context of pediatric CD.

Celiac disease represents a distinctive model among chronic pediatric conditions because its management relies less on a pharmacologic regimen than on a sustained lifestyle intervention that necessitates reorganization at the household level (13). Maintaining a lifelong gluten-free diet creates a continuous need for risk management that permeates everyday domains, including food purchasing, meal preparation, prevention of cross-contamination, coordination with schools/other institutions, and eating outside the home (14,15,30). This process is often experienced as a multidimensional burden, in which responsibility for diet management concentrates on

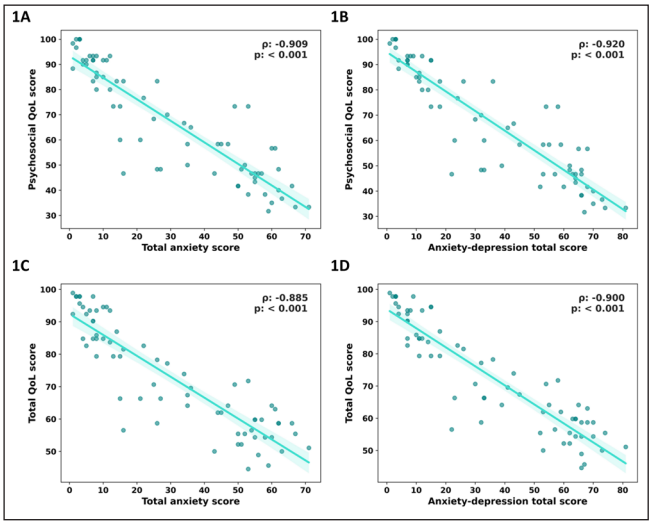

Figure 1: Associations between psychiatric symptom scores and QoL scores in the CD sibling group. Scatterplots illustrate the relationships between total anxiety score (1A) and anxiety–depression total score (1B) with psychosocial QoL score, as well as their associations with total QoL score (1C and 1D).

caregivers and co-occurs with restrictions in social activities, increased food-related costs, and heightened worries about the child's future (16,17,19,31). Re-defining household routines (e.g., mealtime practices, kitchen rules, and food sharing) may reduce healthy siblings' day-to-day autonomy and social spontaneity, while caregiver anxiety and sustained hypervigilance can become embedded in the family climate, strengthening perceptions of uncertainty or threat and, in turn, amplifying anxiety symptoms in healthy siblings (17–19,30,31). In family interviews conducted by Russo and colleagues, mothers reported carrying the primary responsibility for gluten-free diet management, whereas healthy siblings described dissatisfaction with limited food options at home and in restaurants and identified receiving less attention due to the family's focus on the affected child as salient areas of negative impact (19). Taken together, this framework suggests that the higher anxiety symptom levels across multiple domains and the lower psychosocial QoL observed in our CD-sibling group may be interpreted in the context of an enduring, vigilance-intensive management burden that becomes woven into daily family life.

In the regression analyses, a maternal history of psychiatric disorder emerged as one of the strongest and most consistent independent predictors of both total anxiety levels and psychosocial QoL. This finding aligns with theoretical frameworks suggesting that parental mental health can shape children's psychosocial adjustment through pathways such as caregivers' emotional availability, the broader family emotional climate, communication patterns, and coping processes (30,32–35). Although paternal psychiatric history was associated with children's anxiety symptoms and QoL scores in univariable analyses, the maternal variable remained more prominent in multivariable models, which may relate to mothers' often more central role in the day-to-day management of the gluten-free diet and in coordinating school and social planning in pediatric CD (16,18,19,30,36).

Within the CD-sibling group, longer time since diagnosis was associated with higher total anxiety levels and lower QoL. Given the enduring nature of CD management, it is plausible that the family-level management burden accumulates over time and that dietary and social adaptation demands become increasingly salient, potentially exerting a cumulative influence on the family climate and siblings' anxiety (16,19,20). Nevertheless, because of the cross-sectional design, this finding should not be interpreted as evidence of causality or within-person change over time (trajectory), but rather as an association between variables.

The finding that a lower number of siblings was associated with higher anxiety and poorer psychosocial QoL may reflect several family-level mechanisms, including reduced emotional buffering within the household, fewer opportunities for shared coping, and a greater concentration of responsibilities and parental attention across a smaller number of children (37–39). Notably, in a case–control study of healthy siblings of children with chronic illness, the number of family members was identified as an independent determinant of QoL, with higher family size (and, in most cases, a greater number of siblings) associated with higher sibling QoL scores (38). This pattern is also consistent with prior work emphasizing that within-family support networks and coping resources may play a protective role in siblings' adjustment (10,12).

Our findings highlight the need for a family-centered approach in pediatric CD care that explicitly includes healthy siblings. In routine follow-up, brief screening for anxiety symptoms and early identification of families with maternal mental health vulnerabilities may be clinically useful. Integrated, collaborative care between pediatric gastroenterology and child and adolescent mental health services may facilitate sibling-focused psychoeducation, supportive counseling, and interventions that strengthen coping skills (e.g., emotion regulation, stress management, and family communication) (8,37,40). In addition, support programs may target practical challenges such as managing eating-related situations in school and social settings, balancing household routines, and addressing siblings' concerns about exclusion and social adjustment (17,19,20).

Limitations

Despite these clinical implications, several limitations warrant consideration. The cross-sectional design limits causal inference, and the sample from a single tertiary-care center may reduce generalizability. Psychiatric symptoms were assessed using self-report measures; therefore, the findings reflect symptom levels rather than clinical diagnoses. The exclusion of participants receiving psychotropic medication or ongoing psychiatric care was intended to minimize potential confounding effects on questionnaire-based symptom scores; however, this criterion may have excluded the most severely affected siblings, potentially leading to selection bias and an underestimation of the true psychosocial burden in this population. In addition, unmeasured factors (e.g., family functioning, disease severity, challenges with gluten-free diet adherence, and stigma) may have influenced between-group differences. Accordingly, longitudinal and interventional studies examining underlying psychosocial mechanisms are warranted.

Conclusion

In conclusion, this study demonstrates that healthy siblings of children with CD experience a clinically meaningful psychosocial burden, characterized by higher anxiety symptoms and lower psychosocial and total health-related QoL compared with controls. Our findings further suggest that a lower number of siblings and a maternal history of psychiatric disorder may be associated with this burden, underscoring the need for family-centered psychosocial screening and supportive care that extends beyond the affected child to include healthy siblings and caregivers. Given the limited number of studies directly examining psychosocial outcomes in healthy siblings in the context of pediatric CD, our work adds novel evidence to the field and provides a clinically relevant foundation for future multicenter, longitudinal, and interventional research.

Ethics committee approval

This study was conducted in accordance with the Helsinki Declaration Principles. The study was approved by Gülhane Training and Research Hospital (12.06.2025, reference number: 2025/114).

Contribution of the authors

Study conception and design: HT, HTM, ST, YME, BIA, MAC, NB; data collection: HT, HTM, ST, YME, BIA; analysis and interpretation of results: HT, ST; draft manuscript preparation: HT. All authors reviewed the results and approved the final version of the article.

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Conflict of interest

The authors declare that there is no conflict of interest.

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