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Article

Comparison of Quality of Life, Anxiety, and Depression Levels in Celiac Patients with Children Without Chronic Illnesses

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Abstract

Aim: Celiac disease is a chronic and multisystemic illness, and the lifelong treatment process negatively affects the quality of life of patients and their families. This study aims to compare the quality of life, depression, and anxiety levels of children and adolescents diagnosed with celiac disease to those of a healthy control group. **Methods:** The research involved a total of 129 individuals aged 8-18 years (64 with celiac disease and 65 healthy volunteers) and their parents. To assess children with celiac disease and healthy children, we used a sociodemographic form we created, along with the State-Trait Anxiety Inventory (STAI), Trait Anxiety Inventory (TAI), Children's Depression Inventory (CDI), Pediatric Quality of Life Inventory (PedsQL), and Parent Quality of Life Inventory tests. **Results:** Diet adherence, parental education level, and family income level were found to be directly associated with quality of life and depression/anxiety levels (**p<0.05**). Significant differences in height, weight, and BMI measurements were observed between individuals with celiac disease and the healthy group (**p<0.05**). Key factors negatively affecting the quality of life in individuals with celiac disease were difficulty adhering to the diet and low family income levels. **Conclusion:** Celiac disease should not be approached solely as a physical condition. The psychosocial impacts of this disease, including depression and anxiety, can be addressed more effectively through early diagnosis and management. A holistic treatment approach that considers the psychosocial well-being of children can significantly improve their quality of life.

Keywords: celiac disease; quality of life; mental health; pediatric

Introduction

The Celiac disease is characterized by gluten-related gastrointestinal and extra-gastrointestinal symptoms, the presence of celiac-specific antibodies, HLA-DQ2 or HLA-DQ8 haplotypes, and involvement of the proximal small intestine [1]. In celiac disease, in addition to gastrointestinal symptoms such as chronic or intermittent constipation, diarrhea, abdominal pain, and bloating, low quality of life, anxiety, and depression may also occur [1,2].

The ESPGHAN guidelines recommend evaluating children diagnosed with celiac disease using quality of life surveys. This is because a gluten-free diet, especially during the first 6 months, significantly reduces patients' quality of life [1]. Patients with symptoms such as diarrhea, mouth ulcers, widespread weakness had significantly lower physical health composite scores likely due to greater restrictions in daily activities, work-related activities, physical pain, and general health. Patients with dyspepsia, mood changes, and depression had lower mental health composite score compared to others, as they scored poorly in mental health, emotional role, and vitality domains [3].It

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has been reported that in families of children with chronic illnesses, the individuals most affected psychologically are the parents and siblings of the sick child [4].

Celiac Disease, a chronic and multisystemic illness, creates anxiety about the future for children and their families and can lead to depressive processes that may affect social life. In this study, we aim to compare the quality of life, anxiety, and depression levels of children and adolescents aged 8–18 who have been diagnosed with Celiac Disease with those of healthy children and adolescents from the general population who do not have any chronic illnesses.

Methods

Study Group

Our study included 64 children and adolescents aged 8-18 years, along with their parents, who were randomly selected from patients diagnosed with celiac disease and followed up between 2008 and 2017 at Necmettin Erbakan University according to ESPGHAN criteria. The control group consisted of 65 healthy volunteers without chronic illnesses and their parents. The necessary ethical approval for the study was obtained from the Medical Research Ethics Committee of Necmettin Erbakan University Meram Medical Faculty (2015/346).

Sociodemographic data forms, Children's Depression Inventory, State-Trait Anxiety Inventory, Trait Anxiety Inventory, Pediatric Quality of Life Inventory for ages 8-13, and Pediatric Quality of Life Inventory for ages 13-18 were administered to the children and adolescents in both the patient and control groups. The parents of the participants were also given the appropriate Pediatric Quality of Life Inventory for the children and adolescents' age groups.

Inclusion and Exclusion Criteria

The study included children and adolescents aged 8-18 years with celiac disease and healthy volunteers without any physical condition that would impair functionality or any chronic illness requiring continuous treatment and follow-up. Informed consent was obtained from all celiac patients and healthy volunteers, as well as from their parents.

Sociodemographic Information Form

This study consists of comparable sociodemographic data of the patients and healthy volunteers included. These data include name, age, gender, height, weight, body mass index (BMI), and their z scores according to WHO Anthro and Anthro plus software at the time of diagnosis, mother's age, father's age, mother's education level, father's education level, number of siblings, family income level, and a history of psychiatric illness in the family. In addition to these, children and adolescents in the celiac disease group were asked about their age at diagnosis, how many years they have been diagnosed with celiac disease, diet adherence, objective diet adherence, the difficulty of adhering to the diet, comorbid conditions, use of additional medications, and Marsh staging of the small intestine biopsy.

Depression, Anxiety, and Quality of Life Scales

The Children's Depression Inventory (CDI), designed by Kovacs in 1981[5], was used to assess the level of depression in children and adolescents in the study. This scale is one of the most used scales for children aged 6-17 years. The scale consists of 27 items and is completed by the child, selecting the most appropriate answer from three options. Each answer is scored between 0 and 2 points. Items B, E, G, I, J, K, L, N, O, P, Ş, Ü, and V are reverse-scored items. The maximum possible score is 54, and a cutoff score of 19 is considered indicative of depression.

"The State-Trait Anxiety Inventory (STAIC) was developed by Spielberger and colleagues[6] and adapted to Turkish by Öner and LeCompte [7]. The 40-item inventory consists of two scales: State Anxiety (STAI) (measuring the individual's immediate anxiety) and Trait Anxiety (TAI)

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(measuring general anxiety levels). Scores range from 1 to 3, with total scores between 20 and 60, where higher scores indicate higher anxiety levels.

The Pediatric Quality of Life Inventory (PedsQL), developed by Varni et al. in 1999[8], consists of 23 items assessing physical and psychosocial functioning in children. Both children and parents can evaluate the child's health. Scores range from 100 to 0, with higher scores indicating better quality of life. The options consist of "never" (100 points), "rarely" (75 points), "sometimes" (50 points), "often" (25 points), and "always" (0 points). The scores from the selected items are summed and divided by the number of marked items to obtain the scale score. Scoring is conducted in three areas: first, the Total Scale Score (TSS); second, the Physical Health Total Score (PHTS); and third, the Psychosocial Health Total Score (PsyHTS), which is calculated based on the scores of items assessing emotional, social, and school functioning. A higher total score indicates a higher quality of life. If more than 50% of the scale is left unanswered, it is considered invalid.

Statistic

SPSS version 27 was used for the analysis of the study. Continuous variables are presented with mean, median, standard deviation, maximum, and minimum values. For continuous variables showing normal distribution, comparisons between two groups were made using the independent samples t-test, which is a parametric test. For variables not showing normal distribution, the Mann–Whitney U test was used for group comparisons.

The relationship between continuous variables was assessed through correlation analysis, and the relationship was examined using Pearson and Spearman correlation coefficients. A significance level of 95% ($p<0.05$) was accepted in the study.

Results

In our study, 64 patients aged 8-18 years diagnosed with celiac disease, who were followed up at the Meram Faculty of Medicine Pediatric Gastroenterology Outpatient Clinic, were included, along with a control group of 65 children and adolescents without any chronic diseases. Celiac disease diagnosis in patients was confirmed by small intestine biopsy.

Among the patients included in the study, 45 were female (70.3%) and 19 were male (29.7%). In the control group, there were 37 female (56.9%) and 28 male (43.1%) participants. There was no significant difference between the patient and control groups in terms of gender ($p=0.11$). The mean age of the patient group was 12.39±3.38 years old, while the mean age of the control group was 12.75±3.02 years old, and there was no statistically significant difference between them ($p= 0.53$). When the patient and control groups were compared, a statistically significant difference was found in height SDS ($p:0.017$) and BMI SDS ($p<0.001$) values. Celiac patients had significantly lower values.

A statistically significant difference was found when comparing the maternal education levels between the patient and control groups ($p<0.001$). In the control group, the number of children whose mother was a college graduate was 22, whereas in the celiac patient group, this number was only 3. A statistically significant difference was found when comparing the paternal education levels between the patient and control groups ($p<0.001$). In the control group, the number of children whose father was a college graduate was 30, whereas in the celiac patient group, this number was only 7. The education level of parents in the control group was found to be higher. In the verbal assessment where the minimum wage was considered a middle-income level, the family income levels of celiac patients were found to be statistically significantly lower ($p<0.001$). Statistics related to demographic data are presented in Table 1.

Table 1. Demographic Data of The Study Group.

	Celiac	Control	Total	p-value
Age (mean±SD)	12.39±3.38	12.75±3.02	12.57±3.2	0.53
Female, N (%)	45 (70.4%)	37 (56.9%)	82 (63.6%)	0.11
	Female Male			0.53

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Diagnosis age (yo), mean±SD		8.12±3.87	8.77±3.39		
Follow-up (yo)		4.28±3.17	3.43±2.56		0.30
Dietary compliance⁺, N (%)		32 (71.1%)	11 (57.89%)		0.54
BMI SDS		-0.55±1.13	0.38±1.26	-0.08±1.28	**<0.001**
Height SDS		-0.49±1.28	0.07±1.37	-0.21±1.35	**0.017**
Siblings, N (mean±SD)		2.17±1.17	2.37±0.99	2.27±1.05	0.292
Maternal Education, N	Primary School	53	26	79	**<0.001**
	High school	8	17	25	
	College	3	22	25	
Paternal Education, N	Primary School	37	16	53	**<0.001**
	High school	20	19	39	
	College	7	30	37	
Family Income*	Low	27	9	36	**<0.001**
	Middle	30	20	50	
	High	7	36	43	

* the minimum wage was considered a middle-income level; ⁺ Full compliance.

The mean age at diagnosis for girls with celiac disease was 8±3.8 years, while for boys, it was 8.6±3.4 years. Considering the follow-up durations with a celiac disease diagnosis, 16.9% (n=11) of the patients had been followed for less than 1 year, 35.4% (n=23) for 1-3 years, 16.9% (n=11) for 3-5 years, and 30.8% (n=20) for more than 5 years. When the dietary compliance, laboratory remission status, and dietary adherence difficulties of celiac patients were compared by gender, no statistically significant differences were found in any of these aspects. When the histopathological results reported according to the Marsh classification were compared with age and dietary adherence difficulty, no statistically significant differences were found separately.

The average PHTS values calculated from the quality of life scales for parents were compared, and no significant difference was found (p=0.124). However, when the average PsyHTS and TSS values were compared, a significant difference was found (p=0.02, p=0.04). When the PedsQL (Pediatric Quality of Life Inventory) scores were compared between the patient and control groups, no statistically significant difference was found. The results are provided in Table 3. When the total scores of the Trait Anxiety Inventory (TAI) and State Anxiety Inventory (STAI) applied to the patient and control groups were compared, a statistically significant difference was found in the TAI scores (p=0.023). However, when the Children's Depression Inventory (CDI) scores were compared between the patient and control groups, no statistically significant difference was found (p=0.499)(Table 2).

Table 2. Comparison of Parent and Child/Adolescent PedsQL Scores, State Anxiety Inventory (STAI), Trait Anxiety Inventory (TAI) and Children's Depression Inventory (CDI) scores in Celiac and Control Groups.

	Group	n	Mean	p-value
Parent PHTS[1]	Celiac	64	75.44	0.124
	Control	65	82.64	
Parent PsyHTS[2]	Celiac	64	74.66	**0.02**
	Control	65	81.44	
Parent TSS[3]	Celiac	64	74.93	**0.04**
	Control	65	82.22	
Child/Adolescent PHTS[1]	Celiac	64	79.13	0.129
	Control	65	83.03	
Child/Adolescent PsyHTS[2]	Celiac	64	78.36	0.099
	Control	65	82.69	

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Child/Adolescent TSS[3]	Celiac	64	78.63	0.08
	Control	65	82.68	
STAI	Celiac	64	31.75	0.63
	Control	65	31.22	
TAI	Celiac	64	34.65	**0.023**
	Control	65	32.23	
CDI	Celiac	64	9,63	0.499
	Control	65	10,28	

[1] PHTS (Physical Health Total Score), [2] PsyHTS (Psychosocial Health Total Score), [3] TSS (Total Scale Score).

Table 3. Comparison of Quality of Life, Anxiety, and Depression Levels with Dietary Compliance.

Self-Reported Dietary Compliance	TAI	STAI	CDI	Child/Adolescent PHTS	Child/Adolescent PsyHTS	Child/Adolescent TSS
	mean	mean	mean	mean	mean	mean
Strict Compliance	33,84	31,14	8,40	80,23	80,85	80,64
Partial Compliance	35,58	32,58	10,58	75,33	70,79	72,37
Poor Compliance	45,00	36,00	26,50	85,94	90,83	89,13
p-value	0,108	0,390	**0,023**	0,213	**0,021**	**0,037**

No statistically significant difference was found in the PedsQL results of the patient group and their parents when evaluated by gender. In the patient group, no statistically significant differences were found in the comparisons of TAI (Trait Anxiety Inventory), STAI (State Anxiety Inventory), and CDI (Children's Depression Inventory) scores by gender.

In the patient group, quality of life scales were compared with self-reported dietary compliance, and the comparisons of Child/Adolescent PsyHTS and TSS scores were found to be statistically significant (p_1=0.021, p_2=0.037). In the patient group, the administered scales were statistically compared with dietary compliance, and only the CDI (Children's Depression Inventory) scores showed a statistically significant difference when compared with self-reported dietary compliance (p=0.023) (Table 3).

To better understand the psychosocial impact of parental education, an analysis was performed in the celiac patient group comparing fathers' educational levels with outcomes from adult and child quality of life questionnaires (PedsQL), the State-Trait Anxiety Inventories (STAI and TAI), and the Children's Depression Inventory (CDI). The results indicated a statistically significant difference in CDI scores, with children of fathers with lower educational attainment reporting higher levels of depressive symptoms (p = 0.02). In the patient group, the PedsQL scores of children and adolescents were compared based on paternal educational levels. Statistically significant differences were observed in both the Child/Adolescent Physical Health Summary Score (PHTS) and the Child/Adolescent Total Scale Score (TSS), with lower scores associated with lower paternal educational levels (p_1 = 0.044, p_2 = 0.035). In the patient group, parental PedsQL scores were compared according to fathers' educational levels. Statistically significant differences were found in both the Parental Physical Health Summary Score (PHTS) and the Parental Total Scale Score (TSS), with lower scores observed in families where the father had a lower educational level (p_1 = 0.021, p_2 = 0.047). An analysis was conducted within the patient group to examine the relationship between maternal educational levels and health-related quality of life outcomes in children and adolescents with celiac disease. The comparison revealed statistically significant differences in both the Child/Adolescent Physical Health Summary Score (PHTS) and the Child/Adolescent Total Scale Score (TTS), with lower scores observed among children whose mothers had lower levels of education (p_1 = 0.037, p_2 = 0.040). In the patient group, maternal educational levels were compared with the results of the State-STAI, TAI and CDI. A statistically significant difference was found in the Trait Anxiety Inventory scores,

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with higher anxiety levels observed in children whose mothers had lower educational levels (p = 0.020). These statistical data are presented in Table 4.

Table 4. Comparison of Parental Educational Levels and Family Income with Adult and Child Quality of Life Questionnaires, State-Trait Anxiety Inventories, and The Children's Depression Inventory in The Celiac Patient Group.

Parents' Educational Level		TAI	STAI	CDI	Child/Adolescent PHTS	Child/Adolescent PsyHTS	Child/Adolescent TSS	Parent PHTS	Parent PsyHTS	Parent TSS
		mean	mean	mean	mean	mean	mean	mean	mean	mean
None	Maternal	39	37	9	75,00	56,67	63,04	68,75	68,33	68,48
	Paternal	-	-	-	-	-	-	-	-	-
Primary School	Maternal	34.5	31.64	9.61	78,40	78,01	78,14	73,81	73,09	73,34
	Paternal	35.25	32.40	11	76.87	76.04	76.33	71,64	73,08	72,58
High School	Maternal	40.2	34.2	12.8	75,62	76,67	76,30	80,00	79,67	79,78
	Paternal	34.33	34.11	7.17	81.77	80,83	81,16	80,51	73,43	75,90
College	Maternal	26.67	28	5	100,00	95,00	96,74	100,00	97,22	98,19
	Paternal	32	27.14	8.14	85,27	85,24	85,25	84,82	86,67	86,02
p-value	Maternal	**0,02**	0,437	0,189	**0,037**	0,082	**0,040**	**0,035**	**0,034**	**0,029**
	Paternal	0,256	0,156	**0,02**	**0,044**	0,072	**0,035**	**0,021**	0,149	**0,047**
Family Income*		TAI	STAI	CDI	Child/Adolescent PHTS	Child/Adolescent PsyHTS	Child/Adolescent TSS	Parent PHTS	Parent PsyHTS	Parent TSS
		mean	mean	mean	mean	mean	mean	mean	mean	mean
Low		35,30	33,56	10,70	76,97	74,63	75,44	70,49	71,54	71,18
Middle		35,26	30,85	9,63	77,55	78,83	78,38	75,96	74,94	75,29
High		29,43	27,00	5,86	94,20	91,19	92,24	92,86	87,38	89,29
p-value		0,067	**0,021**	0,073	**0,008**	**0,018**	**0,004**	**0,008**	0,057	**0,012**

* the minimum wage was considered a middle-income level.

To investigate the potential relationship between family income and various psychosocial factors, the celiac patient group's family monthly income was compared with PedsQL scores, the State and Trait Anxiety Inventory (STAI, TAI), and the Children's Depression Inventory (CDI). In the patient group, family income levels were compared with the PedsQL scores of children and adolescents. Statistically significant differences were found in the Child/Adolescent PHTS, Child/Adolescent PsyHTS, and Child/Adolescent TTS scores (p1 = 0.008, p2 = 0.018, p3 = 0.004). In the patient group, family income levels were compared with the PedsQL scores of parents. Statistically significant differences were found in the Parent PHTS and Parent TTS scores (p1 = 0.008, p2 = 0.012). Family income levels were compared with the results of the TAI, STAI, and CDI scales. A statistically significant difference was found in the STAI results (p = 0.021). These findings are summarized in Table 4.

There was no significant difference in the evaluation of previously diagnosed or treated psychiatric disorders. In the patient group, one individual was receiving treatment for major depression and another for bipolar disorder.

Discussion

In this study, PedsQL, STAI, TAI, and CDI scores of children with celiac disease were compared with those of children without chronic illness and not undergoing treatment for any acute condition, along with demographic variables. When anthropometric measurements were evaluated, BMI SDS and height SDS values were found to be significantly lower in the celiac group ($p_1 < 0.001$, $p_2 = 0.017$). In the celiac group, maternal and paternal education levels, as well as the average monthly income level, were significantly lower ($p_1 < 0.001$, $p_2 < 0.001$, $p_3 < 0.001$). As indicated in many previous studies

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in the literature, short stature and low BMI values have been observed in celiac patients, and this has been attributed to malnutrition secondary to villous atrophy[1,9–12]. The necessity of investigating celiac disease as an etiological factor in cases of growth retardation and failure to gain weight has also been emphasized in the ESPGHAN guidelines[1].

According to the results of our study, although the quality of life scale scores were found to be lower in children diagnosed with celiac disease compared to the control group, this difference was not statistically significant. However, when the quality of life scales administered to parents were evaluated, significantly lower scores were observed in the Psychosocial Health Summary Score (PsyHTS) and the Total Scale Score (TTS) ($p_1 = 0.02$, $p_2 = 0.04$). These findings suggest that the disease may affect not only the children but also the parents' perception of quality of life. Previous studies have also demonstrated that quality of life scores in celiac patients are significantly lower, often associated with pre-existing psychopathologies[13,14]. In our study, despite the low prevalence of psychiatric disorders, the particularly low psychosocial scores suggest that this may be due to impaired social interaction stemming from the burden of the disease. This issue has also been addressed in other studies[15,16].

In our study, when comparing the celiac group with the control group, no statistically significant differences were found in the State Anxiety Inventory (STAI) and Children's Depression Inventory (CDI) scores. However, the Trait Anxiety Inventory (TAI) scores were significantly higher in the celiac group ($p = 0.023$). This suggests that while situational anxiety and depressive symptoms may not differ markedly between groups, children with celiac disease may have a higher predisposition to experience anxiety as a stable personality trait. The chronic nature of the disease, lifelong adherence to a strict gluten-free diet, and its impact on daily routines and social interactions may contribute to this elevated trait anxiety[10,16–19]. These findings underscore the importance of long-term psychological monitoring and support in children diagnosed with celiac disease.

In our study, when dietary compliance was taken into consideration, an increase in psychosocial health summary scores (PsyHTS) and total scale scores (TSS) on the PedsQL was found to be statistically significant among children and adolescents in the celiac group ($p_1 = 0.021$, $p_2 = 0.037$). This finding suggests that better adherence to a gluten-free diet is associated with improved quality of life, particularly in psychosocial domains. High levels of dietary compliance may contribute to reduced symptom burden, enhanced social functioning, and overall better daily functioning. As noted in previous studies, these results emphasize the importance of supporting dietary adherence in pediatric celiac patients not only for physical health but also for the improvement of psychological and social well-being[13,15,16,20].

In our study, both maternal and paternal educational levels were positively associated with higher PedsQL scores in both parent-reported and child/adolescent self-reported assessments. As the educational level of the parents increased, statistically significant improvements were observed in quality-of-life scores. This suggests that higher parental education may contribute to better disease management, increased health literacy, and greater support for the child's physical and psychosocial well-being. Educated parents may also be more aware of the importance of dietary adherence, psychological support, and medical follow-up, all of which can positively impact the overall quality of life of children with celiac disease. These findings were also demonstrated in the study by Toluna Oflu et al [20]., where only maternal education level was examined; however, such variables have not been included in the design of many other studies. In the study conducted by Sevinç et al [13]., no statistically significant difference was found. This highlights the role of educational factors in the management of chronic pediatric conditions.

Our study found that lower average monthly household income was significantly associated with decreased PedsQL scores in both parent-reported and child/adolescent-reported assessments. This indicates that lower socioeconomic status may negatively impact the perceived quality of life in children with celiac disease and their families. Statistical comparisons related to family economic status have been addressed in many studies; however, statistically significant results have not often been obtained[10,13,18,20]. In our study, we found that economic status positively correlated with

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quality-of-life scores and the State Anxiety Inventory (STAI) scores. Financial constraints may limit access to gluten-free food options, healthcare services, and psychological support, all of which are essential for effective disease management and maintaining well-being. Additionally, economic hardship may contribute to increased stress within the family, further affecting both the child's and the caregivers' quality of life. These findings highlight the need to consider socioeconomic factors when developing comprehensive care plans for pediatric celiac patients.

Conclusion

This study demonstrated that quality of life scores was lower and the frequency of anxiety and depressive symptoms was higher among patients with celiac disease. It also showed that major contributing factors to these outcomes included dietary adherence, parental education level, and the average monthly family income.

As a limitation of this study, we were unable to administer the PedsQL to patients under the age of 8, and therefore could not observe stress factors and their effects during this developmental period. Additionally, since the study was designed as a cross-sectional study, it was not possible to predict how these conditions might change over time. A multicenter study design that evaluates patients of all age groups during the follow-up process could yield more comprehensive and effective results.

Institutional Review Board Statement: The necessary ethical approval for the study was obtained from the Medical Research Ethics Committee of Necmettin Erbakan University Meram Medical Faculty (2015/346), approved on

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