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The Effect of Diet Training on Quality of Life and Subjective Happiness in Celiac Patients: A Randomised Controlled Trial

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Abstract

Aims

This study aimed to examine the effect of nurse-led diet training on quality of life and subjective happiness in adults with celiac disease in remission.

Design:

This study is a discussion article based on findings from an experimental intervention.

Data Sources:

Data were collected between 1 March and 1 August 2023 through face-to-face interviews using validated assessment tools.

Implications for Nursing:

The findings emphasize the essential role of nurses in celiac disease management through structured, evidence-based diet training. Nurse-led dietary education supports lifelong adherence to a gluten-free diet by enhancing patients' knowledge, addressing psychosocial challenges, and promoting effective coping strategies. Integrating regular diet training into routine nursing care may improve patient outcomes, reduce disease-related complications, and support holistic, biopsychosocial care.

Conclusion

Nurse-led diet training resulted in meaningful improvements in both quality of life and subjective happiness among adults with celiac disease. Given the lifelong dietary restrictions and behavioral demands of celiac disease, strengthening patient education strategies and identifying factors influencing dietary adherence are critical to optimizing long-term clinical and psychosocial outcomes.

Impact:

This study demonstrates that nurse-led diet training yields clinically relevant benefits, supported by moderate to large effect sizes. The findings highlight dietary education as a practical and cost-effective nursing intervention that can enhance patient well-being, improve treatment adherence, and potentially reduce long-term healthcare utilization.

Patient or Public Contribution:

Patients with celiac disease participated by completing validated questionnaires and engaging in face-to-face interviews. Although patients were not involved in the design phase of the study, their responses and shared experiences contributed to determining patient-centered outcomes for nursing practice.

INTRODUCTION

Celiac disease (CD) is an autoimmune and chronic disease that primarily affects the small intestine and is triggered by the consumption of gluten-containing grains (wheat, barley, rye) in genetically predisposed individuals.[1,2] It was reported that the prevalence of this disease, which is common all over the world,[1] varies between 0.3% and 1% in Turkey and that there are 154,027 celiac patients registered in the Ministry of Health data system as of the end of 2022.[3]

CD can present with many systemic findings such as osteoporosis, infertility, and autoimmune diseases, along with gastrointestinal symptoms such as abdominal pain, bloating, diarrhoea, weight loss, and iron deficiency, and can also lead to serious systemic complications such as an increased risk of malignancy in the long term.[1,4,5] These conditions seriously reduce the quality of life (QoL) of patients both physically and psychosocially, increasing the risk of mortality.[1,6] Effective disease management can positively affect not only the QoL but also the general life satisfaction and subjective happiness levels of individuals.

The only known effective treatment for CD is a strict lifelong gluten-free diet (GFD).[7–9] A high level of compliance with a GFD ensures control of disease symptoms, healing of the intestinal mucosa, and therefore an increase in QoL.[5,7,9–11] However, factors such as high cost of a GFD, difficulty in its implementation, restaurant/supermarket shopping, socio-demographic characteristics (older age, male gender, low level of education, age at diagnosis, and ethnicity), mental health conditions (low intention/motivation, low self-efficacy, and depression) and lack of knowledge) make it difficult for patients to adhere to the diet. In this case, many patients adhere to a GFD inadequately.[2,8,12] A recent systematic review reported that adherence rates were well below optimal in adults with CD, ranging between 42% and 91%.[2] Although remission is observed in patients following the use of GFD, CD patients have a lower level of QoL compared to same age-matched non-celiac patients.[13] Difficulty in adherence to a GFD and to go on with the diet may not only cause physiological symptoms to persist but also deepen psychological problems, leading to social isolation, decreased motivation, and a decrease in subjective happiness[2,6,8,12]

At this point, the concepts of QoL and subjective happiness come to the fore. QoL is a multidimensional concept that encompasses the physical, mental, and social well-being of individuals.[14] Subjective happiness, on the other hand, is a cognitive, emotional and social indicator of QoL that expresses the individual's satisfaction with his/her life and his/her positive emotional state.[15–19] It was presented in

the literature that subjective happiness is directly related to QoL and that physical and psychological well-being strengthens this link.[16,18–20] Therefore, it is of great importance to adopt approaches that not only reduce physiological symptoms but also support the general well-being of the individual in the management of CD.

Diet training stands out as a critical area of intervention at this point. They must be informed about changes in their lifestyle Lack of knowledge about a GFD and gluten-free foods in celiac disease is a major cause of inadvertent non-adherence. Fourteen studies comprising a recent systematic review reported that lack of knowledge was a barrier to GFD adherence.[2] Reliable, up-to-date, and comprehensive education could play an important role in improving knowledge and GFD adherence.[8,21,22] In this context, planned nutrition education provided specifically for the patient to increase celiac patients' adherence with a GFD increases the patients' knowledge level about a GFD, improves their label reading habits, and creates awareness about healthy alternatives. Therefore, close monitoring of the education provided not only affects clinical improvement in patients but also leads to significant improvements in their QoL and subjective happiness levels. It was reported in the literature that regular and planned education provided by an expert healthcare professional increases patients' nutritional awareness, facilitates their dietary adherence, changes their unhealthy eating habits, and accordingly improves their QoL and happiness levels.[4,8,19,22–26]

The literature incorporates studies that examine the effect of diet training provided to celiac patients on their QoL,[7,10,24,25] but no studies were found to examine their subjective happiness. In this respect, the study was conducted to examine the effects of diet training given to celiac patients in remission on the QoL and subjective happiness by approaching celiac disease from a holistic perspective.

Hypotheses of the Study

H_{a1}: Diet training provided to celiac patients has an effect on their QoL related to health.

H_{b1}: Diet training provided to celiac patients has an effect on their subjective happiness levels.

METHODS

Design of the Study

This study is a randomised controlled trial with a pretest-posttest, control group.

Population and Sample of the Study

The population of the study consisted of celiac patients (total = 150) registered with the Celiac Association in Adıyaman province. The sample size was calculated using G-Power software and

minimum sample size was determined as 66 (33 patients in the experimental group and 33 patients in the control group) at α = 0.01, 1-β = 0.99 and an effect size of 0.24 (112.90 ± 33.91).[27] The patients were randomly assigned to the experimental and control groups using a simple randomization method. Eligible patients were listed, and group allocation was performed using a random number table. To account for potential patient dropouts during the study, the initial sample size was set at 40 patients in the experimental group and 40 patients in the control group. Group allocation was performed prior to the intervention by a researcher not involved in data collection. The researchers assigned the participants to the groups by using a table of numbers (Fig. 1).

Inclusion Criteria

- -Being diagnosed with CD for at least 1 year or more
- - Maintaining a GFD for 1 year or more
- - Being ≥ 18 years, with confirmed CD,
- - Being diagnosed with CD by biopsy
- - Having no communication problem,
- - Having no cognitive problem,
- - Being at least literate and speaking Turkish.

Data Collection Tools

Data were collected using “a Personal Information Form, the Subjective Happiness Scale (SHS) and the Celiac Disease Questionnaire- Health-Related QoL (CDQ-HRQOL)”.

Personal Information Form: The form consists of a total of 10 questions about age, gender, educational level, marital status, profession, income level, duration of diagnosis, presence of comorbid diseases, regular check-ups, and body mass index (BMI).[27,28] Celiac Disease Questionnaire- Health-Related QoL (CDQ-HRQOL): It was developed by Häuser et al., (2007),[29] Aksan et al., (2015) assessed its Turkish validity and reliability study.[30] The scale consists of 28 questions, and the responses to the questions are evaluated under four subscales: emotional (7 items), social (7 items), gastrointestinal symptoms (7 items), and worries (7 items). Each item is scored on a 7-point Likert scale. The scores for the subscales range from 0–49, and total score of the overall scale ranges from 0-196. High values indicate a high health-related QoL, and low values indicate a poor health-related QoL. The scale was used in this study to assess the QoL of CD patients. The Cronbach-α coefficients for the subscales of the scale range between 0.73 and 0.93.[30] The Cronbach’s Alpha internal consistency coefficient of the overall scale was found to be 0.80 for the pretest and 0.86 for the posttest in this study.

Subjective Happiness Scale (SHS): It was developed by Lyubomirsky & Lepper (1999) and adapted by Akın & Satıcı (2011) into Turkish.[31,32] The scale is a 7-point Likert-type (1 = not appropriate at all, 7 = completely appropriate) assessment tool with four items. The fourth item of the scale is scored

reversely. The minimum and maximum scores of the scale are 4 and 28 points, respectively. A high score indicates a high level of subjective happiness and a low score indicates a low level of subjective happiness. The Cronbach's Alpha internal consistency coefficient of the scale was found to be 0.86.[32] The scale was applied in this study to assess the subjective happiness of CD patients. The Cronbach's Alpha internal consistency coefficient of the Subjective Happiness Scale was found to be 0.70 for the pretest and 0.74 for the post-test in this study.

Data Collection

Data were collected between 1 March and 1 August 2023. The researcher collected the data from the participants face-to-face. Patients were given written information about the purpose and procedure of the study. All patients were invited to an information meeting at the celiac association in the city centre a few weeks before the patient education programme began. Those who agreed to participate signed an informed consent form. It took approximately 20–25 minutes to fill out the data collection tools. The credentials of the participants were not recorded in the form, and all of them were assigned a number. The time elapsed between the collection of pretest and posttest data was 90 days (3 months).

Anthropometric Measures: The researcher who collected the data measured the individuals' body weight (kg) and height (cm) before and after the celiac association training. A simple digital scale was used for weight measurement, and a tape measure for height measurement. Their body mass index (BMI) was calculated. These values were also recorded on the personal information form. BMI is used for estimating body weight according to height but provides no data on the distribution of body fat. BMI is the body weight (kg) divided by the square of the height (in m) (BMI = kg/m^2).

Nursing Intervention

The trainings were held in a pre-designated empty room in the Celiac Association, a quiet and calm setting where patients could feel comfortable. Pretest data were collected from individuals who agreed to participate in the study. The training programme to inform the patients was based on the training manual designed in advance and was given through face-to-face interviews. PowerPoint presentations were used to describe the topics in the trainings. The information to be provided in the training was described in a way that individuals of all educational levels could understand. The training was completed in a total of 4 sessions lasting 45 minutes once every 2 weeks for 8 weeks with an individualised teaching method and question-answer technique. A researcher provided the trainings.

Control Group

None of the participants in the control group were subjected to any intervention. None of the participants were provided with any other individual or group training of similar content during the study.

Diet Training

The training manual was prepared by the researchers by reviewing the relevant literature[1,4,8,33] and taking expert opinions. The content of the training manual includes explanatory notes on the definition of the disease, its prevalence, its progression, diagnostic methods, symptoms and complications of CD, list of gluten-free foods that should be safely consumed, benefits of a gluten-free diet, risky and forbidden foods containing gluten that celiac patients should not consume, ways to break down barriers that affect adherence to a gluten-free diet, non-food sources of gluten, things to consider when purchasing labelled products, definition of cross-contamination, measures to be taken to prevent cross-contamination, what to consider when eating out, the importance of regular collaboration with the dietitian and nurse to maintain the GFD plan and programme, the importance of regular doctor check-ups, and how to prevent the disease in the future.

Table 1
Comparison of the control variables for the control and experimental groups (n = 67)

Descriptive Characteristics	Experimental Group (n = 33)		Control Group (n = 34)		* Significance
	n	%	n	%	
Gender					
Female	26	78.8	22	64.7	x^2=1.635
Male	7	21.2	12	35.3	p = 0.201
Educational Level					x^2=2.395
Primary School	7	21.2	10	29.4	p = 0.495
High School	9	27.3	10	29.4	
University	17	51.5	14	41.2	
Marital Status					x^2=1.624
Married	17	51.5	12	35.3	p = 0.203
Single	16	48.5	22	64.7	
Employment					x^2=0.391
Yes	23	69.7	26	76.5	p = 0.532
No	10	30.3	8	23.5	
Income Level					x^2=0.639
Income more than their expenses	5	15.2	3	8.8	p = 0.726
Income equal to their expenses	20	60.6	22	64.7	
Income less than their expenses	8	24.2	9	26.5	
Duration of Illness					x^2=3.366
1–5 years	19	57.6	12	35.3	p = 0.186
6–10 years	6	18.2	10	29.4	
≥ 11 years	8	24.2	12	35.3	
Additional Chronic Disease Condition					x^2=0.361
Yes	13	39.4	11	32.4	p = 0.548
No	20	60.6	23	67.6	

Descriptive Characteristics	Experimental Group (n = 33)		Control Group (n = 34)		* Significance
	n	%	n	%	
Gender					
Regular Check-ups Before Training					x^2=0.762
Yes	21	63.6	25	73.5	p = 0.383
No	12	36.4	9	26.5	
Regular Check-ups After Training					**x^2 = 9.360
Yes	25	75.8	34	100	**p = 0.002**
No	8	24.2			
	Experimental Group		**Control Group**		**Significance**
	± SD		**± SD**		
Mean age (years)	31.36 ± 10.75		34.91 ± 11.40		***F = 1.676 p = 0.145
BMI before training	21.81 ± 4.40		22.88 ± 3.73		F = 1.139 p = 0.290
BMI after training	21.76 ± 4.38		23.11 ± 3.79		F = 1.830 p = 0.181

*** Chi-square test, ** Fisher's exact test, ***ANOVA test, BMI= Body Mass Index.**

No statistically significant difference was found between the mean age, BMI before and after the training, gender, educational level, marital status, employment and income level, duration of diagnosis, presence of comorbidities, and regular check-ups before and after the training in the experimental and control groups (p 0.05) (Table 1).

Data Analysis

The data were analyzed using SPSS version 24.0 statistical software. Descriptive statistics were used to summarize the data. The chi-square test was applied to compare categorical control variables between the experimental and control groups. The Kolmogorov–Smirnov test was used to assess the normality of data distribution. For normally distributed data, the dependent samples t-test was used to compare pretest and posttest mean scores within groups, while the independent samples t-test was employed to

compare mean scores between the experimental and control groups. Levene's test was performed to assess the homogeneity of variances prior to conducting independent samples t-tests.

In addition, change scores (Δ = posttest − pretest) were calculated for each outcome variable, and independent samples t-tests were used to compare the magnitude of change between groups. Effect sizes were calculated using Cohen's d to evaluate the magnitude of differences, with values of 0.20, 0.50, and 0.80 interpreted as small, moderate, and large effects, respectively. One-way analysis of variance (ANOVA) was used to compare mean age and body mass index (BMI) between groups. The internal consistency of the scales was assessed using Cronbach's alpha coefficients. Statistical significance was set at $p < 0.05$.

Ethical Considerations

The Adıyaman University's Ethics Committee Ethical Committee (dated 24/01/2023 No. 1/8) approval and institutional authorisation were obtained to conduct the study. Patients who participated in the study were informed about the purpose of the study, and their questions about the study were answered. The patients were informed that their personal data would be kept confidential and would not be used except for the study, and they had the right to withdraw from the study at any time. All the participants signed an Informed Consent Form and the study was conducted in accordance with the ethical principles of Volunteerism and Protection of Individual Rights and Confidentiality. The study was conducted in accordance with the ethical rules set out in the Declaration of Helsinki Principles. None of the participants in the control group were subjected to any intervention. The patients in the control group were enrolled in the training programme and provided with a training manual after the posttest.

Permission was obtained from the authors of the scales to use them in the study.

RESULTS

A comparison of **pretest and posttest** mean scores of the celiac patients in the control group on CDQ-HRQOL subscales and SHS determined that the difference between the two means was not statistically significant ($p > 0.05$). In the control group, no statistically significant changes were observed between pretest and posttest scores across CDQ-HRQOL subscales ($p > 0.05$), and effect sizes were negligible to small (Cohen's d range: 0.01–0.35) (Table 2).

Table 2
Comparison of pretest and posttest mean scores of the control group on CDQ-HRQOL subscales and SHS (n = 34)

Scales	Control Group				
	Pretest	Posttest	Significance		
	$\bar{X}$ ± SD	$\bar{X}$ ± SD	t	p	Cohen's d
SHS	16.20 ± 3.46	17.64 ± 2.94	-2.011	0.053	0.35
Total CDQ-HRQOL	119.76 ± 14.32	120.76 ± 16.51	-0.271	0.788	0.05
Emotional	28.61 ± 6.85	27.05 ± 6.21	1.225	0.229	0.21
Social	32.00 ± 5.73	31.44 ± 6.75	0.314	0.756	0.05
Worries	29.82 ± 7.90	29.73 ± 6.17	0.058	0.954	0.01
Gastrointestinal	29.32 ± 7.70	32.52 ± 5.81	-1.903	0.066	0.33

SHS = Subjective Happiness Scale, CDQ-HRQOL = Celiac Disease Questionnaire- Health-Related Quality of Life, t = Dependent Samples t Test, $p < 0.05$.

A comparison of **pretest and posttest** mean scores of the celiac patients in the experimental group on CDQ-HRQOL subscales and SHS showed that the posttest mean score of the patients increased and the difference between the two means was statistically significant ($p < 0.05$). In the experimental group, statistically significant improvements were observed in SHS and all CDQ-HRQOL subscales ($p < 0.05$). Effect size analyses indicated moderate to large effects, particularly for total CDQ-HRQOL (Cohen's d = 0.88) and SHS (Cohen's d = 0.61) (Table 3).

Table 3
Comparison of pretest and posttest mean scores of the experimental group on CDQ-HRQOL subscales and SHS (n = 33)

Scales	Experimental Group				
	Pretest	Posttest	Significance		Cohen's d
	X̄ ±SD	X̄ ± SD	t	p	
SHS	16.63 ± 4.27	19.78 ± 3.29	-3.492	**0.001**	0.61
Total CDQ-HRQOL	117.00 ± 19.22	136.96 ± 16.00	-5.029	**< 0.001**	0.88
Emotional	28.15 ± 6.75	31.48 ± 6.57	-2.147	**0.039**	0.37
Social	31.24 ± 6.73	35.06 ± 5.53	-2.453	**0.020**	0.37
Worries	27.87 ± 8.26	32.24 ± 7.67	-2.481	**0.019**	0.43
Gastrointestinal	29.72 ± 9.02	38.18 ± 10.47	-3.427	**0.002**	0.60

SHS = Subjective Happiness Scale, CDQ-HRQOL = Celiac Disease Questionnaire- Health-Related Quality of Life, t = Dependent Samples t Test, p < 0.05.

A comparison of **pretest** mean scores of the celiac patients in the experimental and control groups on the CDQ-HRQOL subscales and SHS showed that the difference between the groups was not statistically significant (p 0.05). Pretest comparisons between the experimental and control groups yielded negligible effect sizes across all outcomes (Cohen's d = 0.05–0.20), indicating baseline equivalence between groups. The **posttest** mean scores were compared, the difference between the two means was statistically significant (p < 0.05). Effect size analyses demonstrated moderate to large effects, with the strongest effect observed for total CDQ-HRQOL (Cohen's d = 0.99) (Table 4).

Table 5 presents the comparison of change scores (Δ = posttest − pretest) between the experimental and control groups. The results showed that the increase in total CDQ-HRQOL scores was significantly greater in the experimental group than in the control group (t = 3.503, p = 0.001), with a large effect size (Cohen's d = 0.86), indicating a clinically meaningful improvement in health-related quality of life. Significant between-group differences were also observed for the emotional subscale (t = 2.444, p = .017), accompanied by a moderate effect size (d = 0.60). Although the differences in change scores for the social, worries, and gastrointestinal subscales did not reach statistical significance (p > 0.05), effect size estimates suggested small to moderate effects (d = 0.43–0.47), favoring the experimental group. These findings imply that the diet training intervention may have contributed to meaningful improvements in several domains of quality of life beyond what could be explained by statistical significance alone. Regarding subjective happiness, the change in SHS scores was not statistically significant between groups (t = 1.489, p = .141); however, the observed small-to-moderate effect size (d

= 0.36) suggests a positive trend toward increased subjective happiness in the experimental group (Tablo 5).

Table 5
Comparison of change scores (Δ = posttest − pretest) between groups Scale

Scale	t	p	Cohen's d
Δ SHS	1.489	.141	0.36
Δ Total CDQ-HRQOL	3.503	.001	**0.86**
Δ Emotional	2.444	.017	0.60
Δ Social	1.845	.070	0.45
Δ Worries	1.926	.059	0.47
Δ Gastrointestinal	1.766	.082	0.43

Δ = posttest − pretest; d = Cohen's effect size (pooled SD).

Positive Δ values indicate improvement in health-related quality of life (Fig. 2). Positive Δ values indicate improvement in emotional well-being (Fig. 3).

DISCUSSION

Regardless of the type of disease, diet training is important in alleviating disease complications and severity, maintaining health, and improving the effectiveness of medical treatment for diseases.[14,8,26] In CD, long delays between the onset of symptoms and diagnosis or inadequate diet training, the nutritional composition of the GFD is not sufficient and balanced to prevent nutrient deficiencies and non-adherence to the diet impair the patient's QoL and lead to the development of complications of the disease.[2,9,33] The findings of this study, which was conducted to examine the effect of diet training provided to celiac patients on QoL and subjective happiness levels, were discussed in the light of the relevant literature. The similarity between the experimental and control groups in terms of sociodemographic characteristics strengthens the internal validity of the study and indicates that the observed differences in outcomes are likely attributable to the diet training intervention rather than baseline group differences.

The Effect of Diet Training Provided to Celiac Patients on Quality of Life

In the control group, no statistically significant changes were observed between pretest and posttest scores for CDQ-HRQOL and subjective happiness, and the effect sizes were negligible. This finding

suggests that quality of life and subjective well-being did not improve in the absence of nursing-led diet training.

The QoL related to health is an important indicator for assessing the effectiveness of GFD therapy in celiac patients.[6] However, since many variables negatively affect dietary adherence,[2,8] it has been determined that CD patients have difficulty in strictly adhering to and maintaining a GFD for life,[7,8–10] thus their QoL is impaired.[6,7] However, some study results showed that participants had moderate QoL.[34] Hence, many studies in the literature have reported that although the rate of adherence to a GFD among celiac patients varies considerably, the rates of dietary adherence vary between 23% and 98%.[2,8,12] Therefore, undesirable symptoms can be prevented and QoL can be enhanced by giving training support to patients who have difficulty in adhering to their diets in CD. Studies also corroborate this idea[2,8,9,33] It has been found that anxiety, depression, and fatigue are prevalent in celiac patients who are not treated and these symptoms lead to impair their QoL.[6,8,35] A study conducted in Turkiye reported that celiac patients had a poor health-related QoL and participants reported impairment in their social, emotional, and physical health.[28]

Similarly, in the present study, no significant differences were observed between the experimental and control groups in pretest total and subscale CDQ-HRQOL scores, and effect size analyses confirmed baseline equivalence with negligible Cohen's d values (d = 0.05–0.20). In contrast, posttest comparisons revealed statistically significant and clinically meaningful improvements favoring the experimental group. Notably, the between-group posttest effect size for total CDQ-HRQOL was large (Cohen's d = 0.99), while moderate to large effects were observed across most subscales (d = 0.58–0.69). Furthermore, within-group analyses showed that the experimental group experienced significant improvements in overall CDQ-HRQOL and most subscales following the diet training, with effect sizes indicating clinically meaningful change. Together, these findings suggest that the observed improvements are attributable to the diet training intervention rather than to time or natural variation. High values obtained from the CDQ-HRQOL indicate a high level of QoL related to health. Sufficient adherence to a GFD is critical in alleviating disease symptoms and enhancing the expected QoL related to health.[5,11,12] Studies in the literature have reported that patients who adhere to a GFD have an improved their QoL.[2,11,12,33] While no significant differences were observed between the experimental and control groups at baseline, posttest comparisons revealed significant advantages in favor of the experimental group for most quality-of-life outcomes. The moderate to large between-group effect sizes further support the effectiveness of the diet training intervention. In line with these findings, the large effect size observed in the experimental group after diet training (Cohen's d = 0.88) suggests not only statistical significance but also strong clinical relevance of the intervention.

Previous research has demonstrated that sufficient knowledge about gluten-free foods promotes dietary adherence, reduces symptoms, and enhances QoL, whereas insufficient information may lead to excessive dietary restriction and poorer QoL.[12] An experimental study reported that patients diagnosed with irritable bowel syndrome had a poor QoL before the training, but the QoL mean scores of the

patients six months after being trained by the nurse in the intervention group showed a significant difference compared to the scores of the control group, so the QoL of the patients enhanced, the complaints of the disease subsided, and the frequency of hospitalisation declined.[25] Likewise, in the present study, within-group analyses of the experimental group revealed moderate to large effect sizes for pretest–posttest changes in overall CDQ-HRQOL and most subscales (Cohen's d = 0.37–0.88), whereas no meaningful changes were observed in the control group (d ≤ 0.35).

Consequently, the posttest mean scores of the overall CDQ-HRQOL and its subscales in the experimental group were higher than those in the control group, and the diet training positively affected the QoL of the patients in the experimental group due to its positive contribution to their adherence to the treatment. Nursing care for celiac patients aims to ensure their adherence to the lifelong diet, control the existing symptoms of the disease, enhance their quality of life, and avoid the possible complications.[36] Since no nursing care was provided to the control group during the study, no significant difference was found between the pretest and posttest CDQ-HRQOL mean scores.

Overall, the increase in CDQ-HRQOL scores following diet training confirms the hypothesis *"H_{a1}: Diet training provided to celiac patients has an effect on their QoL related to health,"* with findings supported by moderate to large effect sizes, underscoring the clinical importance of nurse-led dietary education. Change score analyses provided additional support for the effectiveness of the intervention, as the experimental group exhibited significantly greater improvements in total CDQ-HRQOL scores compared to the control group, with a large effect size. Moreover, even in subdomains where statistical significance was not achieved, small to moderate effect sizes suggest clinically meaningful improvements favoring the experimental group.

The Effect of Diet Training Provided to Celiac Patients on Subjective Happiness

Although the between-group difference in subjective happiness change scores was not statistically significant, the observed effect size indicates a positive trend toward increased subjective happiness in the experimental group, highlighting the psychosocial benefits of diet training.

An individual's happiness level and QoL can be assessed objectively outside and subjectively inside.[37] Happiness is assessed by the concepts of quality of life, subjective well-being, and life satisfaction.[38,39] The trainings provided by nurses can improve the QoL and subjective well-being of patients and positively affect their perception of health. In the present study, no significant difference was found between the pretest SHS mean scores of the experimental and control groups, and baseline effect sizes were negligible (Cohen's d = 0.11). However, a statistically significant difference emerged at posttest, favoring the experimental group, with a moderate to large between-group effect size (Cohen's d = 0.69). Furthermore, within-group analysis of the experimental group revealed a moderate to large pretest–posttest effect (Cohen's d = 0.61), indicating a meaningful increase in subjective happiness following diet training. It is known that as the SHS scores increase, so does the level of subjective happiness. It was

determined that the SHS posttest mean scores of the experimental group, who received the diet training, were positively affected compared to the control group, and the subjective happiness levels of celiac patients elevated. It is known that there is a general linear correlation between health and happiness. This result showed that diet training positively affected the subjective happiness of celiac patients. A significant difference was found between the SHS pretest and posttest mean scores of the celiac patients in the experimental group. The SHS posttest mean scores on the of the celiac patients in the experimental group increased. Ciacci et al. (2003) found in their study that celiac patients often face emotional distress and frustration related to dietary restrictions, which can affect their overall sense of well-being. Happiness found to be associated with the overall sense of well-being, and people with high anxiety scores and who feeling different from healthy people increased levels of unhappiness.[40]

In a study conducted to evaluate the effects of an active patient education method on the psychological well-being of women with celiac disease in remission, it was determined that patient education increased the psychological well-being of women with celiac disease.[24] A study conducted to examine the determinants of happiness and QoL in patients with systemic sclerosis reported that perceived disease impact (body image, fatigue, general disability) had a significant negative direct correlation with QoL and with happiness. For this purpose, it has been emphasized that it may be important to adopt treatment strategies aiming for not only disease control but also the reduction of relevant domains of disease impact (body image, fatigue, general disability) in order to improve patients' experience of the disease, and that strengthening resilience factors, such as positive psychological traits, may also contribute to better patient outcomes[20] Kaya et al., (2022) found a negative correlation between health anxiety and subjective happiness.[41] Happiness has played an important role in human life from the past to the present. Therefore, happiness is acknowledged to be a fundamental life goal for people. The traditional model of care often evaluates health and disease based on clinical assessments that ignore the psychosocial dimensions of health.[42] However, biopsychosocial care to be provided by nurses in the process of recovering and maintaining people's health can improve the patient's life satisfaction and happiness by enhancing psychological health as well as behavioural change.

Since no nursing care was provided to the control group, neither statistically significant changes nor meaningful effect sizes were observed in SHS scores, further supporting the effectiveness of the intervention. In conclusion, the increase in SHS scores following diet training confirms the hypothesis *"H_{b1}: Diet training provided to celiac patients has an effect on their subjective happiness levels,"* with moderate to large effect sizes demonstrating both statistical and clinical significance.

Limitations

The strengths of this study include the use of reliable and valid assessment tools, face-to-face interviews with patients who applied to the Celiac Association, and therefore a high response rate and limited response bias. The limitations of the study are that posttest assessment was carried out only once and the long-term effects of the training were not assessed. Furthermore, the study results are valid only for the patients included in the study and cannot be generalised for all patients.

Conclusion

The present study demonstrated that nurse-led diet training significantly improved health-related quality of life and subjective happiness among patients with celiac disease in the experimental group, whereas no meaningful changes were observed in the control group. The findings were supported not only by statistically significant differences but also by moderate to large effect sizes and change score analyses, indicating clinically meaningful improvements attributable to the intervention.

Given that celiac disease requires lifelong dietary adherence and significant lifestyle changes, nursing care plays a key role in supporting disease adaptation, symptom control, and long-term well-being. Continuous and structured diet education delivered by nurses may enhance treatment adherence, reduce disease-related burden, and help prevent more costly healthcare utilization. Accordingly, nurses should identify patient-specific needs, develop individualized care plans, and implement patient-centered and innovative interventions that promote sustainable positive outcomes for patients and their families. As celiac disease management is largely behavioral, future research should focus on factors influencing dietary adherence and psychosocial outcomes to further strengthen evidence-based nursing interventions.

Declarations

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During the present study, no financial support was received from institutions or organizations.

Conflict Of Interest

There is no conflict of interest between the authors and/or family members regarding this study.

Data Availability Statement

The data that support the findings of this study are available on re-quest from the corresponding author.

Ethıcs Statement

The ethical approval was obtained from the Adıyaman University's Ethics Committee (dated 24/01/2023 No. 1/8). The participants were informed about the purpose and procedure of the study before starting the study. Additionally, they were informed that they could leave the research at any time without any negative repercussions. All participants were provided with verbal and written informed consent. This study was conducted according to the Declaration of Helsinki.

Statistical Analysis

The author(s) affirm that the methods used in the data analyses are suitably applied to their data within their study design and context, and the statistical findings have been implemented and interpreted correctly. The author(s) agrees to take responsibility for ensuring that the choice of statistical approach is appropriate and is conducted and interpreted correctly as a condition to submit to the Journal.

Authors Contributions

Concept: SG, FK.

Design: SG, FK.

Supervision: SG.

Data Collection and/or Processing: SG, FK.

Analysis and/or Interpretation: FK.

Literature Review: SG, FK.

Writing: SG, FK.

Critical Review: SG, FK.

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Table 4

Table 4 is available in the Supplementary Files section.

Figures

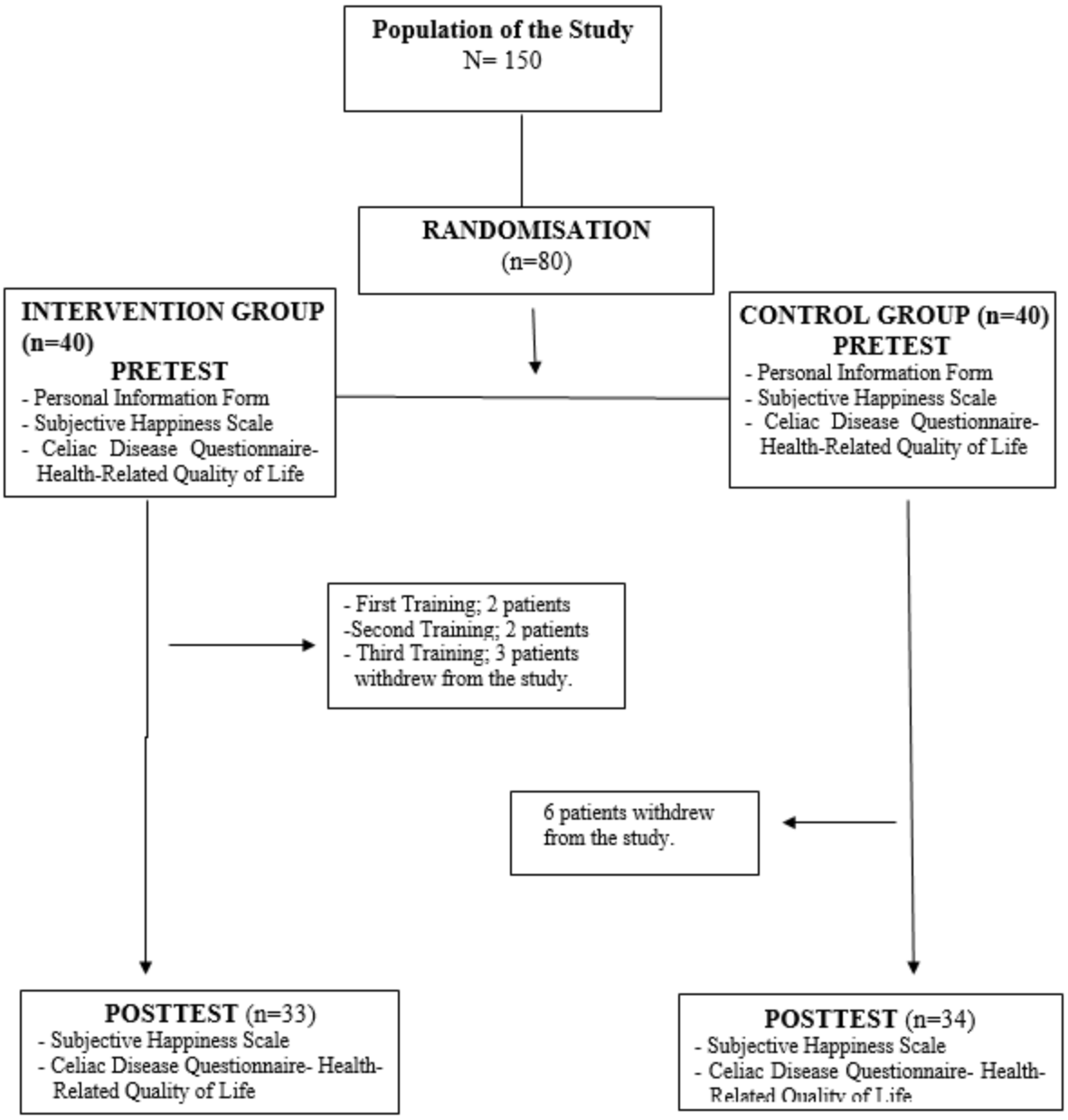


Figure 1

shows the Consort Flow Chart of the experimental study.

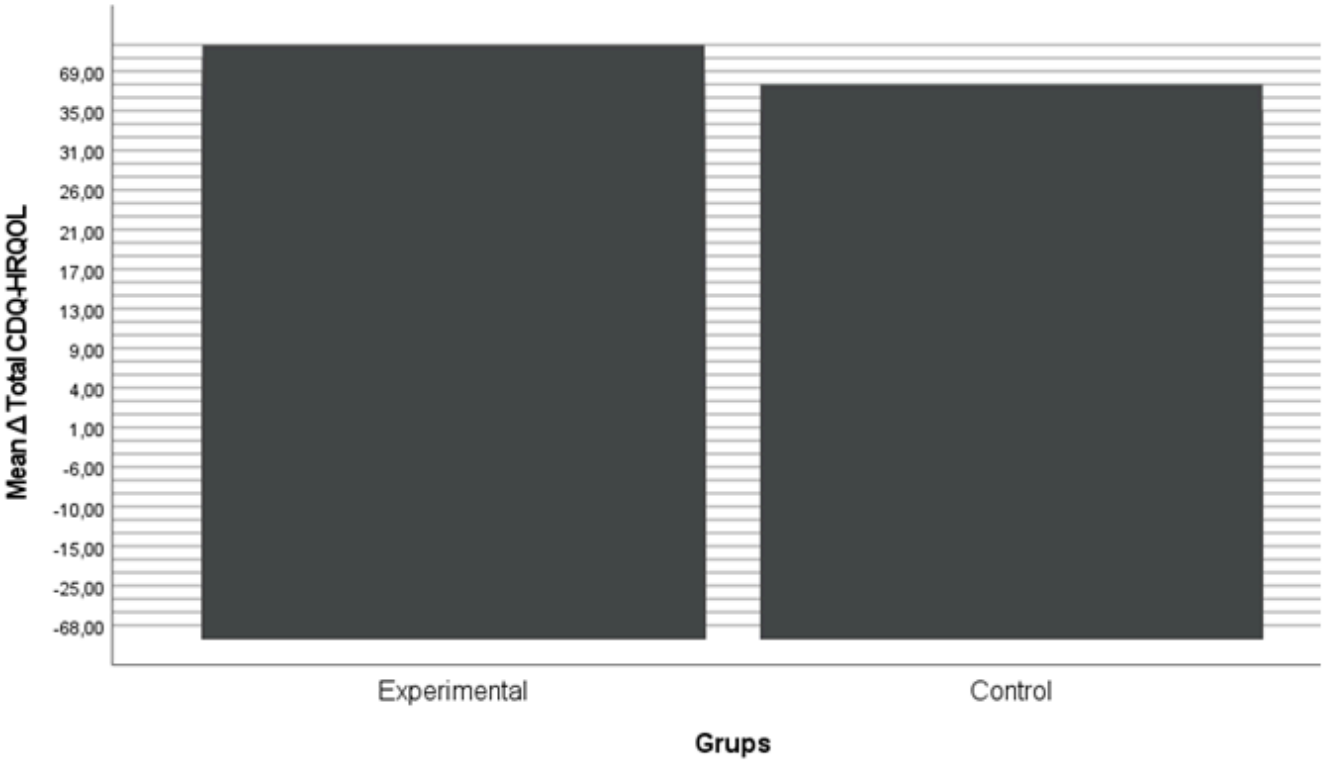


Figure 2

Comparison of mean change scores (Δ = posttest − pretest) in total CDQ-HRQOL between the experimental and control groups.

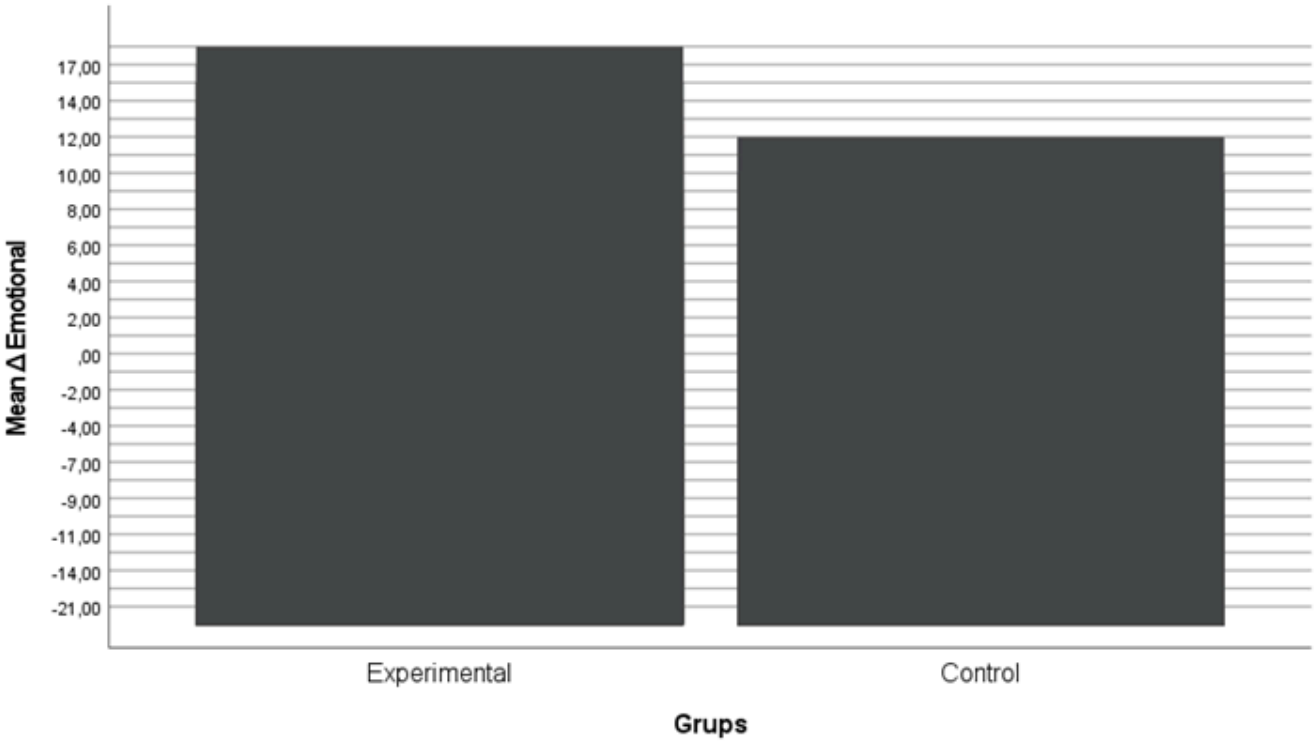


Figure 3

Comparison of mean change scores (Δ = posttest − pretest) in the emotional subscale of the CDQ-HRQOL between the experimental and control groups.

Supplementary Files

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- Table4.docx