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PATIENT SATISFACTION AMONG ADULTS WITH COELIAC DISORDERS ON GLUTEN-FREE DIET IN NAJRAN, SAUDI ARABIA: A CROSS-SECTIONAL STUDY

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ABSTRACT

Understanding patient satisfaction among adults with coeliac disorders on gluten-free diets is critical for healthcare providers and food manufacturers. It plays a crucial role in the management strategies of its chronic conditions. It significantly enhances treatment adherence, product development, and ultimately leads to better health outcomes. The aim of this study was to explore factors influencing satisfaction, perceived ease of adherence, healthcare support impact, and quality of life outcomes within the Saudi Arabian context. A cross-sectional, quantitative survey was conducted for a total of 101 adults with a confirmed diagnosis of coeliac disease by convenience and snowball sampling methods. A new questionnaire was developed by the researcher consisting of 35 items. The study results showed that (40.6%) of participants were diagnosed in duration period from 1-5 years, (30.7%) were diagnosed with coeliac disorders in duration period from 6-10 years. While (46.5%) of participants consumed a gluten free diet for between 1-5 years, (23.8%) consumed a gluten free diet for between 6-10 years. The results showed that (85.1%) of participants had high level of overall patients' satisfaction with gluten free diet. The mean percent of overall satisfaction of studied participants were (81.4%), (81.5%) for healthcare provider support, (76.9%) for social challenges and (76.8%) for quality of life impact as predictors influencing the patient's satisfaction. There is a highly significant correlation between patient's satisfaction with the gluten-free diet and perceived ease of adherence and reported quality of life (p -value= 0.00 and 0.00). Taste predictor also has a highly significant effect on patients' satisfaction (p -value= 0.000). There is a significant impact of high healthcare provider support level on overall satisfaction as perceived by patients managing a gluten-free diet (p -value= 0.04). The study concluded that there was highly significant correlation between patients' satisfaction with the gluten-free diet and perceived ease of adherence and reported quality of life. There is significant impact of high healthcare provider support level on overall satisfaction as perceived by patients managing a gluten-free diet. The findings concluded also, that taste was a significant predictor affecting patient satisfaction. Further research is needed to identify effective management strategies for addressing factors affecting patients' satisfaction among coeliac disorders adults.

Key words: Patient Satisfaction, Coeliac Disorders, Gluten-Free Diet, adherence, quality of life, healthcare support

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INTRODUCTION

Coeliac disease, often referred to as celiac disorder, is a long-lasting autoimmune condition that impacts around 1% of the world's population [1]. This disorder is triggered by ingesting gluten, a protein present in wheat, barley, and rye [2]. In individuals with coeliac disease, the consumption of gluten prompts an immune response that damages the lining of the small intestine, resulting in nutrient malabsorption and a range of gastrointestinal symptoms [2]. Common symptoms associated with coeliac disease include diarrhea, stomach pain, bloating, and fatigue. However, the clinical symptoms can differ significantly, with some individuals experiencing additional signs like anemia, osteoporosis, or neurological problems. Diagnosis usually requires blood tests to detect specific antibodies, followed by a small intestine biopsy for confirmation [3]. There is no current permanent solution for celiac disease. The only recognized treatment is a lifelong gluten-free diet, which necessitates the complete removal of gluten-containing food products, whether naturally occurring or added, from one's diet. For individuals with celiac disorder, adhering to a strict gluten-free diet is essential for maintaining health, not merely a personal choice [4]. This dietary plan entails cutting out all gluten sources from daily meals. Although it may appear simple, following a gluten-free diet can be difficult due to the widespread presence of gluten in numerous processed foods and the potential for cross-contamination during food preparation [5].

Gluten-free diets have become increasingly popular in recent years, even among people who do not have coeliac disease. However, for those who have the condition, it is a medical requirement rather than a lifestyle preference. Following this diet necessitates careful planning to ensure sufficient nutrition, as many gluten-free substitutes may contain less fiber, vitamins, and minerals than their gluten-containing equivalents [6].

Compliance with a gluten-free diet has been proven to alleviate symptoms, lower the chances of complications, and improve the overall quality of life for those with coeliac disease. A study by Mahadev *et al.* [7], indicated that strict compliance with a gluten-free diet was linked to mucosal recovery and a reduced risk of lymph-proliferative cancers in patients with coeliac disease. Maintaining a gluten-free diet presents various challenges. Individuals often express concerns regarding the availability of gluten-free foods, the higher prices of these products, and limitations in social situations. These issues can greatly affect patient satisfaction and their ability to stick to the diet in the long term [8].



Innovations in food technology have resulted in a broader range of gluten-free products on the market. This progress has somewhat alleviated the difficulties faced by coeliac patients, providing them with more choices and possibly enhancing dietary compliance. However, the quality, flavor, and nutritional content of these products continue to be subjects of ongoing investigation and enhancement [9].

Understanding patient satisfaction regarding gluten-free diets is essential for both healthcare professionals and food producers. This aspect is vital in managing chronic conditions such as coeliac disease. It greatly improves adherence to treatment, aids in product innovation, and ultimately contributes to better health results for those affected by coeliac disease [10]. The link between patient satisfaction and adherence highlights the significance of considering patient needs and preferences in management strategies for the illness.

Research by Sainsbury *et al.* [11], indicated that coeliac patients who felt more confident and satisfied with their care and dietary management displayed improved psychological well-being and experienced fewer gastrointestinal issues. This implies that satisfaction extends beyond simple happiness and can have real impacts on physical health. Similarly, healthcare professionals support is crucial in boosting patient satisfaction.

Effective communication, empathy, and thorough education regarding the disease and its management have been proven to significantly elevate patient satisfaction rates. A study by Barrio and Cilleruelo [12], discovered that coeliac Patients who obtained extensive knowledge about their condition and dietary management expressed higher satisfaction and an improved quality of life.

Several important gaps persist in comprehension of patient satisfaction in this area. One crucial aspect that needs further exploration is the long-term sustainability of patient satisfaction with gluten-free diets. There is a lack of longitudinal studies investigating how patient satisfaction changes over time. Moreover, most current research has been carried out in Western nations, especially in North America and Europe. This geographical bias restricts our understanding of patient satisfaction across various cultural settings. As noted in the global review of coeliac disease prevalence by Laurikka *et al.* [13], this condition impacts populations around the globe, but the management approaches and patient experiences can differ greatly across various cultures and healthcare systems.



Another significant gap is the insufficient research on how recent improvements in gluten-free food technology influence patient satisfaction. Although a study by Xhakollari *et al.* [14], investigated market trends for gluten-free products, there is a scarcity of thorough research that connects these advancements to changes in patient satisfaction and overall quality of life. The role of digital health providers' interventions in enhancing patient satisfaction among individuals with coeliac disease is another area that warrants further exploration. Additionally, there is a notable lack of research examining the intersection of patient satisfaction, adherence to a gluten-free diet, and mental health outcomes in coeliac disease. While a study by Zingone *et al.* [15], touched upon psychological aspects, a comprehensive exploration of how these factors interrelate and influence overall patient well-being is missing from the current literature.

Lee *et al.* [16], highlighted the significant cost difference between gluten-free and conventional products, but the long-term economic burden and its effects on patient satisfaction and adherence remain understudied, particularly in diverse socioeconomic contexts. Lastly, there is a gap in understanding how healthcare systems and provider-patient relationships influence satisfaction levels among coeliac patients. While studies by Barrio and Cilleruelo [12]; and Ferreira *et al.* [17], have explored aspects of patient education, a comprehensive examination of how different healthcare models and communication strategies affect patient satisfaction is lacking.

This research aimed to fill these gaps by offering a thorough and culturally varied examination of patient satisfaction among those with coeliac disease who follow a gluten-free diet. Additionally, the study's emphasis on the relationship among satisfaction, adherence to diet, mental well-being, and financial aspects will create a more comprehensive insight into the difficulties encountered by coeliac patients. This holistic approach will not only enhance existing academic understanding but also guide practical methods to improve patient care and support in managing coeliac disease.

The main objective of the study was to explore factors influencing satisfaction, perceived ease of adherence, healthcare support impact, and quality of life outcomes within the Saudi Arabian context. The specific objectives of the study were to: assess overall satisfaction levels among adults with coeliac disease following a gluten-free diet in Saudi Arabia, identify key factors influencing satisfaction with gluten-free diets, such as food availability, cost, taste, and social challenges. As well



as, to examine the correlation between perceived ease of adherence to a gluten-free diet and patient satisfaction, investigate how healthcare provider support impacts patient satisfaction in managing a gluten-free diet and explore the relationship between reported quality of life and satisfaction with following a gluten-free diet among adults with coeliac disease in Saudi Arabia. Considering the research gap, the current study intended to answer the following questions: How do patients with coeliac disease rate their overall satisfaction with their gluten-free diet? What are the key factors (example: food availability, cost, taste, social challenges) that influence satisfaction levels with gluten-free diets among coeliac patients? What extent does perceived ease of adherence to a gluten-free diet correlate with patient satisfaction? How do patients perceive the impact of healthcare provider support on their satisfaction with managing a gluten-free diet? And what is the relationship between patients' reported quality of life and their satisfaction with following a gluten-free diet?

MATERIALS AND METHODS

This cross-sectional, quantitative study design was conducted to assess patient satisfaction with gluten-free diets among individuals with coeliac disease in the Kingdom of Saudi Arabia (KSA). The study design was chosen to address the research questions effectively and provide comprehensive insights into patients' experiences and satisfaction levels.

Sampling and Sample Size

Convenience and snowball sampling methods were employed to reach the target population. A total of 101 adults (≥ 18 years) with a confirmed diagnosis of coeliac disease, who had been following a gluten-free diet for at least six months, were recruited from gastroenterology clinics, coeliac disease support groups, and online forums in KSA. Exclusion criteria included individuals following a gluten-free diet for reasons other than coeliac disease, those with other severe gastrointestinal disorders, or cognitive impairments that could interfere with completing the questionnaire.

Instrument Development

A new questionnaire was developed specifically for this study, based on a comprehensive literature review and expert consultation. Key references that informed the questionnaire development included studies by Casellas *et al.* [18]; Sainsbury *et al.* [11]; and Zingone *et al.* [15]. The questionnaire consisted of 35 items divided into six sections: Demographic data of the studied group, Overall satisfaction with gluten-free diet (addressing Research Question 1), Factors



influencing satisfaction (food availability, cost, taste, social challenges) (addressing research question 2), Perceived ease of adherence (addressing research question 3), Healthcare provider support (addressing research question 4) and Quality of life impact (addressing research question 5). Responses were recorded on a 5-point Likert scale, ranging from "Strongly Disagree" to "Strongly Agree" for most items.

Validity and Reliability

The questionnaire underwent a rigorous validation process, including expert review by gastroenterologists and nutritionists specializing in coeliac disease. Cognitive interviews were conducted with 10 coeliac patients to ensure clarity and relevance of the items. A pilot study with 50 participants was carried out to assess the internal consistency (Cronbach's alpha) and test-retest reliability of the instrument which was found ($\alpha = 0.94$). Necessary adjustments were made based on the pilot study results before full-scale implementation.

Data Collection

After obtaining approval from the Institutional Review Board of King Khalid Hospital, with number: **H-11-N-136**- the potential participants were contacted through partnering clinics, support groups, and online platforms. Those who expressed interest received detailed information about the study and an informed consent form. Upon providing consent, participants accessed the questionnaire through a secure online platform. The data collection period spanned 2 months.

Ethical Considerations

Strict ethical guidelines were followed, including obtaining informed consent from the institutional review board (IRB) of King Khalid hospital (H-11-N-136), ensuring confidentiality, and protecting participant data of patients. Participation was voluntary, and participants could withdraw at any time without consequence.

Data Analysis

Data analysis was conducted using statistical package for social science (SPSS) version 27.0. The following statistical methods were employed to address the research questions: the descriptive statistics for measuring means, standard deviations, and frequencies for demographic variables and overall satisfaction scores; Multiple regression analysis to identify key factors influencing satisfaction levels, Pearson's correlation coefficient to examine the relationship between perceived ease of adherence and satisfaction levels, Independent t-tests to compare satisfaction levels between groups reporting high and low healthcare provider support, Spearman's rank correlation to assess the relationship between reported



quality of life and satisfaction with the gluten-free diet, Cronbach's alpha was used to assess the internal consistency of the questionnaire and exploratory factor analysis was undertaken to confirm the underlying structure of the questionnaire and ensure its validity. The significance level for all statistical tests was set at $p < 0.05$. Results were presented using tables, graphs, and narrative descriptions as appropriate.

RESULTS AND DISCUSSION

The demographic characteristics of the study participants

Regarding the demographic characteristics of the study participants, the results showed that 25.7% of the study participants were aged 21-30 years, 21.8% were 31-40 years. The majority of participants (82.2%) were unemployed (Table 2). The majority of participants (77.2%) were female. While 31.7% had secondary educational level, 29.7% had higher level of education (Table 1). In this study, it was found that the characteristics of the participants to be comparable to those reported in the literature for Celiac Disorders and other chronic illnesses. As such, similar to the demographics of other Celiac Disorders studies, the majority of respondents in this study were educated middle aged women.

This aligns with the research conducted by King *et al.* [19]; and Lebwohl and Rubio-Tapia [20], which noted that the occurrence of celiac disease is more prevalent in women than in men. However, this may be due to a greater likelihood of men remaining undiagnosed, and the condition can emerge at any age, though it is more common to be diagnosed in the middle-aged demographic. This result is also possibly an artefact of the inclusion criteria for the study. It is possible that older people living with celiac disease have been less able to change their diets. Additionally, a systematic review and meta-analysis by Jansson-Knodell *et al.* [21], found a slight increase in Seropositivity among female participants in celiac disease screening studies, although some studies involving adults revealed similar Seroprevalences between men and women [22, 23].

In a similar study Alencar *et al.* [24], focusing on consumer perceptions of gluten-free products, the majority of participants were women (91.2%), primarily aged between 41 and 50 and possessing a university degree (45.4%). Education level serves as a significant predictive factor when examining compliance with a gluten-free diet. Earlier studies indicate that individuals with a higher educational attainment demonstrate greater adherence to a gluten-free diet [25].



In the same line of study, Faye [29] studied the Determinants of Patient Satisfaction in Celiac Disease Care and reported that the mean age of included respondents was 49 years, with the majority being women (81.7%) who identified as Non-Hispanic White (93.8%). Most respondents reported having a college or graduate level degree (93.4%), and 45% were followed in a specialized Celiac Disorders center.

Frequency distribution of the overall satisfaction with gluten-free diet and factors influencing satisfaction.

The results of the current study regarding the overall satisfaction level shows that 85.1% of participants had high level of overall satisfaction (Figure 1). Table 4 shows that the mean percent of overall satisfaction was 81.4%, 81.5% for healthcare provider support, 76.9% for social challenges and 76.8% for quality of life impact as they were presented in the Figure 2.

The current results are consistent with results of Muhammad *et al.* [8] who reported that maintaining a gluten-free diet presents various challenges. Individuals often express concerns regarding the availability of gluten-free foods, the higher prices of these products, and limitations in social situations. These issues can greatly affect patient satisfaction and their ability to stick to the diet in the long term. Barrio and Cilleruelo [12] discovered that coeliac patients who obtained extensive knowledge about their condition and dietary management expressed higher satisfaction and an improved quality of life.

In the same line of study, Faye *et al.* [29] who studied the Determinants of Patient Satisfaction in Celiac Disease Care reported that patient satisfaction with Celiac Disorders care was high overall, as 34.5% reported being “very satisfied,” and 35.8% reported being “satisfied.” For further comparison, these two groups were classified as being *satisfied* with their Celiac Disorders care whereas those who reported feeling “neutral” (20.1%), “dissatisfied” (6.1%), or “very dissatisfied” (3.5%) with their Celiac Disorders care were classified as being not satisfied, similar to those reported in other patient satisfaction studies on chronic illnesses.

There is a consensus with a systematic review conducted by Burden *et al.* [26], which analyzed 21 studies and pinpointed several common obstacles to adhering to a gluten-free diet that can enhance patient satisfaction and compliance. These challenges included the elevated price of gluten-free items, limited choices when dining out, and complications during social gatherings. Additionally, a study referenced in Gutierrez *et al.* [27], examined coeliac patients and their interactions with healthcare, revealing that those who received thorough education regarding



their condition and continuous support from healthcare professionals expressed greater satisfaction with managing their gluten-free diet.

In a similar study by Lee *et al.* [16], a market basket analysis was executed that compared the prices of gluten-free products to those containing gluten, discovering that gluten-free options were, on average, 183% more expensive each year. This significant price disparity and associated costs were identified as a key factor impacting patient satisfaction and adherence to the diet.

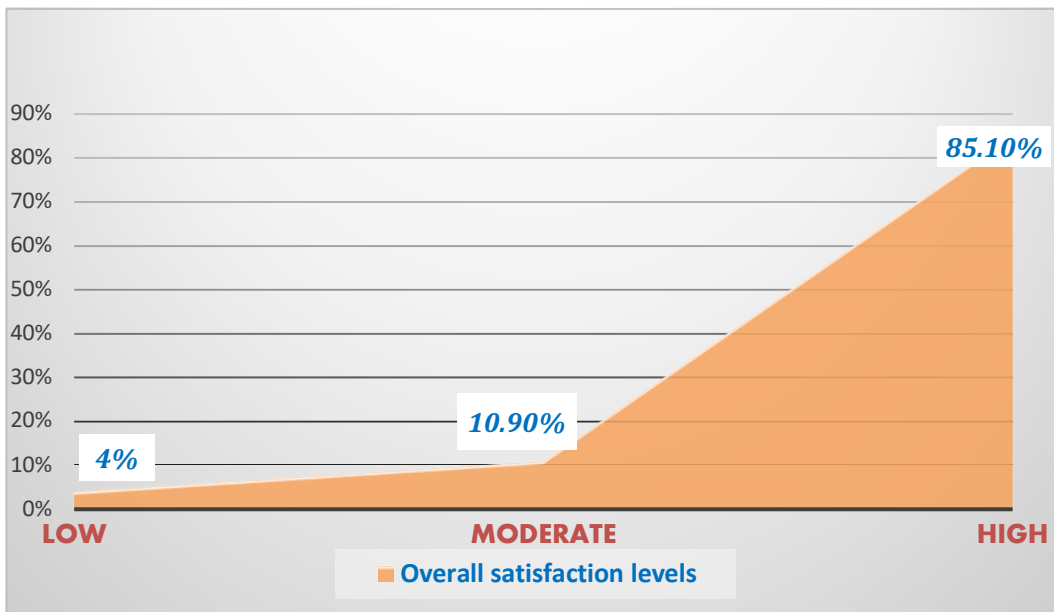


Figure1: Frequency distribution of the overall satisfaction levels of studied adults

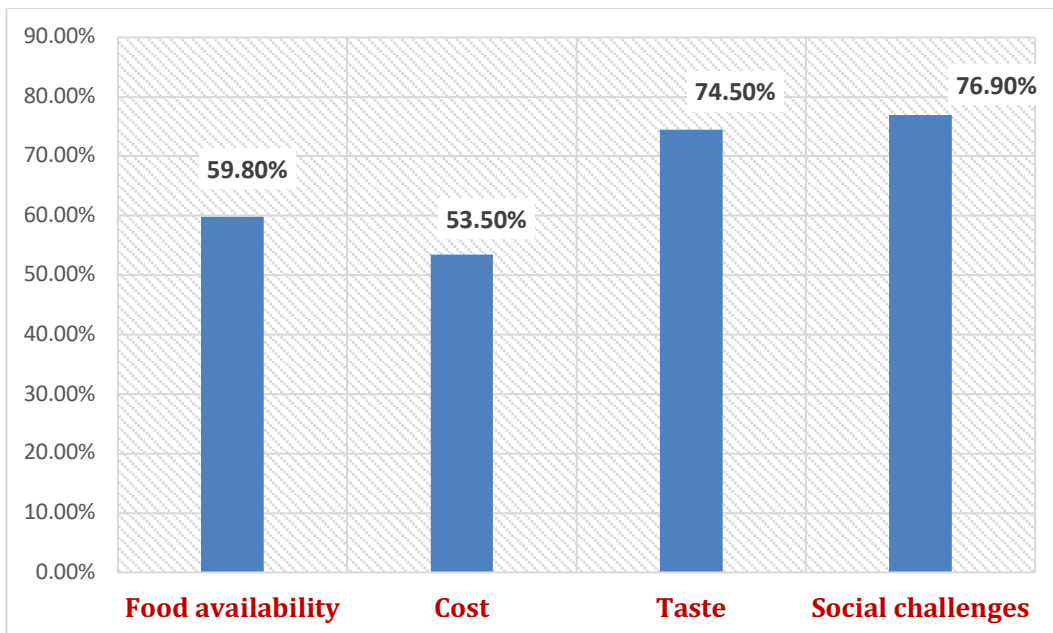


Figure 2: Mean percent of the factors influencing patients with the gluten-free diet satisfaction

The correlation between the studied variables

Table 5 shows that there is a highly significant correlation between adults satisfaction with the gluten-free diet and perceived ease of adherence and reported quality of life (p -value= 0.00 and 0.00). The present results are in line with study of Casellas *et al.* [30], who reported that the score obtained by the 251 celiac patients who reported perfect adherence to the Gluten Free Diet was significantly higher than that obtained by 83 celiac patients who reported unintended noncompliance and the 17 celiac patients who reported intentional noncompliance. This reflects that correct adherence to the Gluten Free Diet is associated with better quality of life assessed by the specific questionnaire.

Moreover, the rate of correct adherence to the Gluten Free Diet in patients included in this study was 73%. This value is consistent with the expected rate, because other series have published a rate of good adherence of up to 75% in adolescents [31] or from 70-81% in adults [32, 33]. Most publications have analyzed adherence to the Gluten Free Diet and their results have shown that correct adherence to treatment achieves a good symptomatic response.

However, there is much less information on how the degree of adherence is related to changes in health perception of celiac patients. The present findings are



inconsistent with the research conducted by Kneževi *et al.* [28], who indicated that the demand for innovation and variety in gluten-free products reflects a shift in consumer preferences towards more diverse options. Consumers are no longer satisfied with the limited choice of simple, familiar gluten-free products. Instead, they want new experiences and flavors that meet their nutritional needs while satisfying their culinary desires. As a result, consumers are looking for gluten-free alternatives with unique ingredients, innovative recipes and flavors. Only 65.78% of patients declared strict adherence to a gluten-free diet, 31.6% declared occasional deviations from the diet, whereas 5.26% did not follow the diet at all, mainly due to doubts regarding the diagnosis as well as the inconvenience of having to avoid certain foods.

On the other hand, a study by Faye *et al.* [29], which investigated factors influencing patient satisfaction among individuals with celiac disease, reported that there was no significant correlation with factors such as symptom severity ($P=0.268$), quality of life ($P=0.13$), and ongoing care from a celiac disease specialist ($P=0.139$) and healthcare providers. Furthermore, they discovered that neither membership in a celiac disease support group nor patients' self-reported adherence to a gluten-free diet, as measured by the Celiac Disease Adherence Test (CDAT), were predictors of satisfaction with celiac disease care.

Table 6 shows that taste predictor has highly significant impact on adults' satisfaction (p -value= 0.000). Table 7 shows that there is significant impact of high healthcare provider support level on overall satisfaction as perceived by adults managing a gluten-free diet (p -value= 0.04). In order to determine if patient satisfaction with Celiac Disorder care correlated with the type of provider, it was surveyed patients about follow-up care for their Celiac Disorder disease. Although the specific provider of Celiac Disorder care may not be the only significant predictor of patient satisfaction, it was found that many contributing factors stem from the patients' perspectives about their providers and their relationships. Similar to results obtained in prior studies, if patients consider their provider to be available when needed, knowledgeable, and addresses their emotional/psychiatric needs, reported overall higher levels of satisfaction [34]. The study did find, however, that if patients did not have Celiac Disorder care or follow with a naturopath, they reported lower satisfaction levels on univariable analysis. In contrast, if an individual reported being cared for by a celiac specialist, it was found that this was correlated with a higher overall satisfaction with Celiac Disorder care on univariable analysis, but not on multivariable analysis.



The results of this study are in contrast with those of Faye *et al.* [29] who found that there was no statistically significant difference in patient satisfaction between patients seeing a generalist or specialist for care, receiving celiac care from a primary care physician, dietitian, or gastroenterologist, as these were not associated with higher levels of patient satisfaction on univariable analysis.

CONCLUSION AND RECOMMENDATIONS FOR DEVELOPMENT

The present study found that individuals with celiac disease reported a high level of overall satisfaction. The findings also indicated elevated mean percentages of overall satisfaction, healthcare provider support, social challenges, and quality of life impact as predictors and factors influencing patient satisfaction (mean percentages: [(81.4%), (81.5%), (76.9%), and (76.8%)], respectively). There was a highly significant correlation identified between patient satisfaction with the gluten-free diet, perceived ease of adherence, and reported quality of life (p -values= 0.00 and 0.00). Additionally, the findings showed that taste was a significant predictor affecting patient satisfaction (p -value= 0.000). Patients' overall satisfaction, as related to managing a gluten-free diet, was significantly impacted by high levels of healthcare provider support as perceived by them (p -value= 0.04).

More research is necessary to discover effective management strategies that address factors influencing patient satisfaction among individuals with celiac disorders following a gluten-free diet, as well as reported quality of life. Programs based on a bio-psychosocial approach targeting socioeconomic challenges affecting patient satisfaction, along with mixed design studies to evaluate patient satisfaction among individuals with celiac disorders on a gluten-free diet, should be conducted to better understand their perceptions of these factors.

Limitations of the study

The constraints of this study involve its cross-sectional quantitative design, a limited sample size, and its execution at a single center, all of which diminish its external validity and inhibit the generalization of the findings. Another key point is that patients were aware of when they needed to provide stool samples, potentially leading to a deliberate avoidance of undesirable behaviors. Additionally, a limitation of the present study is the assessment of factors influencing patient satisfaction through quantitative data, analyzed numerically, which may inadequately reflect their opinions and experiences, and can also be subjective in nature.



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Availability of data and materials

The data supporting the conclusion of this article are included within the article.

Authors' contributions

Abdualsalam Madkhali and Abdulaziz Masmal (master) conceived, designed the research proposal defended the proposal successfully to grant the funds needed from the university. Data collection, data analysis was done by Ibrahim alsayed, Abdullah mahnashi; Shatha Hassan Ali Dahish, Tariq Nasser Haqawi, Murad Yahya Mathkur, Ahmed Hussain Ahmed. Writing up the manuscript was done by Hussain Mohammed Alwadani

Consent for publication

A consent letter was also sent by co –authors for approval of the final version of the manuscript to AJFAND editorial assistance board.

Competing interests

The authors declare that there are no competing interests.



Table1: Demographic data of studied adults according to the gender and educational levels (n=101)

Demographic data	No.	%
Gender		
Male	23	22.8
female	78	77.2
Educational level		
Primary	26	25.7
Elementary	12	11.9
Secondary	32	31.7
Bachelor	30	29.7
Post graduate	1	1.0

Table 2: Frequency distribution of demographic data of studied adults according to the age groups and work status (n=101)

Demographics	No.	%
Age groups		
1-5 years	5	5.0
6-10 years	7	6.9
11-20 years	20	19.8
21-30 years	26	25.7
31-40 years	22	21.8
41-50 years	14	13.9
>50 years	7	6.9
Work status		
Working	15	14.9
Retired	3	3.0
Not working	83	82.2



Table 3: Frequency distribution of medical data of studied adults (n=101)

Medical data	No.	%
Duration of coeliac disease diagnosis		
<1	4	4.0
1-5	41	40.6
6-10	31	30.7
11-15	14	13.9
16-20	5	5.0
21-25	2	2.0
26-30	1	1.0
>30	0	0.0
Duration of gluten free diet in years		
<1	10	9.9
1-5	47	46.5
6-10	24	23.8
11-15	13	12.9
16-20	4	4.0
21-25	1	1.0
26-30	1	1.0
>30	1	1.0

Table 4: Total scores of all factors influencing patients' satisfaction of studied adults

Scores	Minimum	Maximum	Mean	SD	Mean percent
Overall satisfaction	4	20	16.29	3.02	81.4
Food availability	3	15	8.97	3.66	59.8
Cost	1	5	2.67	1.47	53.5
Taste	1	5	3.72	1.02	74.5
Social challenges	2	10	7.69	1.52	76.9
Perceived ease of adherence	8	25	18.26	3.76	73.0
Healthcare provider support	10	25	20.38	2.99	81.5
Quality of life impact	15	40	30.72	5.29	76.8



Table 5: Correlation between patients' satisfaction with the gluten-free diet with perceived ease of adherence and reported quality of life

Items	Perceived ease of adherence		Reported quality of life	
	R	p-value	R	p-value
Patients satisfaction with the gluten-free diet	0.39	0.00*	0.48	0.00*

*significant at p-value<0.05

Table 6: Multiple Linear Regression analysis for key factors influencing patients' satisfaction with the gluten-free diet

Predictors	Regression coefficient	S. E	T	p-value
Food availability	.198	.159	1.245	.216
Cost	-.239	.342	-.699	.486
Taste	1.119	.304	3.686	.000*
Social challenges	.168	.211	.797	.428

*significant at p-value<0.05

Table 7: Difference in overall satisfaction according to the level of healthcare provider support

Healthcare provider support	Overall satisfaction		T	p
	Mean	SD		
Low	14.6	4.1	2.1	0.04*
high	16.5	2.7		

*significant at p-value<0.05



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