https://doi.org/10.35845/kmuj.2024.23529

ORIGINAL ARTICLE

Role of resilience and social support in dietary adherence and alleviating celiac disease symptoms

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Date Submitted: November 11, 2023
Date Revised: September 07, 2024
Date Accepted: September 20, 2024

ABSTRACT

OBJECTIVES: To evaluate the association between resilience and social support with dietary adherence and symptom alleviation in celiac disease patients, while also exploring the effects of gender and disease severity.

METHODS: This cross-sectional study involved 73 patients, consisting of 20 men (27.4%) and 53 women (72.6%), recruited from three tertiary care hospitals (Mayo Hospital, Services Hospital, and Sir Ganga Ram Hospital) in Lahore, Pakistan between January 2022 and August 2023. Following ethical guidelines, participants completed a demographic form and four validated psychometric instruments; Resilience Scale-25, Multidimensional Scale of Perceived Social Support, Celiac Dietary Adherence Test and The Celiac Symptom Index. Patients with comorbidities such as diabetes, arthritis, renal issues, or cancer were excluded. Data were analyzed using SPSS V24.0.

RESULTS: Mean age of participants was 30.15±1.13 years. Among the 73 participants, 16 (21.91%) were in stage 1, 20 (27.39%) in stage 2, 20 (27.39%) in stage 3, and 17 (23.28%) in stage 4 of CD. Resilience was significantly associated with adherence to a gluten-free diet ($r = .73$, $p < .01$), and other resilience factors also positively influenced dietary compliance. Additionally, participants receiving social support showed a greater tendency to adhere to the dietary regimen ($r = .78$, $p < .01$). However, dietary adherence and symptom alleviation varied by disease stage, with no significant gender differences observed.

CONCLUSION: Resilience and social support enhance the likelihood of adhering to a gluten-free diet and managing symptoms, regardless of gender. However, the severity of illness can hinder symptom alleviation in celiac disease patients.

KEYWORDS: Celiac Disease (MeSH); Gluten Free Diet (MeSH); Resilience (MeSH); Resilience, Psychological (MeSH); Social Support (MeSH).

THIS ARTICLE MAY BE CITED AS: Sultan H, Zawar S, Irfan A. Role of resilience and social support in dietary adherence and alleviating celiac disease symptoms. Khyber Med Univ J 2024;16(3):237-43. https://doi.org/10.35845/kmuj.2024.23529

INTRODUCTION

Celiac Disease (CD) is an immune-mediated systemic disorder that primarily causes inflammation in the gastrointestinal tract but has widespread effects on the integumentary, reproductive, musculoskeletal, and nervous systems. CD occurs in genetically predisposed individuals following exposure to gluten, and is diagnosed by the presence of disease-specific antibodies in the serum and through small intestinal mucosal biopsies.[1]

A recent meta-analysis estimated the global prevalence of CD autoimmunity to be 1.4%, based on positive tests for IgA anti-TG2 and/or anti-endomysial antibodies.[2] In Asia, the overall prevalence of CD is reported to be 0.5%.[3] However, these numbers likely underestimate the true burden of the disease. Studies show that nearly 50% of newly diagnosed CD patients are asymptomatic, suggesting that countries without systematic screening programs may have a significantly higher disease burden than currently reported. Additionally, recent research has indicated an upward trend in the prevalence of CD over time.[4]

The present study is based on the Resilience Illness Model, where hope-derived meaning is directly influenced by illness-related distress, spiritual perspective, social integration, and family environment. Social integration, measured by perceived social support from family and friends, plays a crucial role in alleviating symptoms and reducing pain.[5]

Resilience encompasses a complex array of protective and salutogenic factors and processes that are essential for understanding health, illness, treatment, and healing, especially in the context of comorbidities and multimorbidity. It is defined as a positive adaptation, reflecting an individual's capacity to successfully navigate change, resist the negative impacts of stressors, and avoid significant dysfunction or the development of physical and mental health conditions.[6]

This study also draws on the Psychosocial Model of Health. In Melbourne, Australia, researchers found that patients with negative perceptions, pain catastrophizing, and heightened psychological distress related to their chronic illness were more likely to experience a lower quality of life and more pronounced symptom manifestations. [7] Conversely, a study conducted in Germany by Shani M, et al., demonstrated that social support and a positive perception of illness were linked to greater acceptance of the condition, reduced anxiety, and increased adherence to a gluten-free diet.[8]

The current study offers a detailed exploration of how psychosocial factors

impact dietary adherence and symptom management in celiac disease. In Pakistan, while a few bibliographic studies have addressed CD, research on dietary patterns and the psychosocial aspects of celiac disease has been limited. This study was designed to raise awareness about CD and offer insights into coping strategies. The primary aim was to explore the role of resilience and social support in promoting dietary adherence and alleviating symptoms in individuals with CD. Additionally, the study sought to assess how factors such as gender and disease severity affect these outcomes.

METHODS

The present study was conducted from January 2022 to August 2023, after obtaining ethical approval from the Ethical Committee of Lahore Leads University, reference # ERC:1/1/2022-289. Utilizing a correlational research design, we recruited 73 patients from the outpatient departments of three public hospitals (Mayo Hospital, Services Hospital, and Sir Ganga Ram Hospital) in Lahore, Pakistan through purposive sampling. Based on Kline's criteria (10 cases per parameter), the estimated sample size was set at 70.

All participants provided informed consent after receiving both written and verbal explanations of the study's purpose. The sample consisted of individuals aged 18 to 40 years, who had been diagnosed with CD by clinicians, confirmed through duodenal biopsies and serological tests. Only patients with a diagnosis of at least one year and experiencing mild to severe levels of CD were included.

Exclusion criteria included patients with comorbidities such as diabetes, arthritis, renal issues, or cancer. Additionally, participants with a history of CD since childhood were excluded to avoid bias, as those with a childhood onset may present a more complex clinical profile. No other exclusion criteria were applied.

During observations in the outpatient department, it was evident that many patients appeared fatigued while waiting for their appointments, with some undergoing medical procedures. Acknowledging the potential discomfort and inconvenience in this setting, the researchers deemed it inappropriate to conduct data collection on-site. To prioritize patient well-being and convenience, questionnaires were distributed for completion at home, allowing patients to respond in a more comfortable environment. Of the 73 patients approached, 41 responded via WhatsApp, while the remainder completed the questionnaire during their hospital visits as they waited for their appointments. Patients viewed the activity as a productive way to utilize their waiting time, offering a healthy distraction.

The questionnaire included demographic questions covering gender, age, marital status, socioeconomic status, and place of residence, along with specific measures aligned with the study's objectives. Patients were asked to complete the following questionnaires:

Resilience Scale-25: This scale was developed by Wagnild and Young in 1993, consisting of 25 items across five subscales. Responses were measured on a Likert scale ranging from "strongly agree" (7) to "strongly disagree" (1). Initially created for youth aged 18-22 in the USA, the scale demonstrated excellent internal consistency with an alpha reliability of 0.91. Over time, it has been validated for use in various clinical populations, including individuals with inflammatory bowel diseases, showing significant test-retest reliability and validity.[9,10] For this study, the scale was translated into Urdu to accommodate the Pakistani sample, with an alpha reliability of 0.89.

Multidimensional Scale of Perceived Social Support (2000): This scale consists of 12 items, divided into three subscales: family, friends, and significant others. Responses are scored on a scale from 1 to 7, with higher scores indicating greater perceived social support. In the Pakistani population, the scale has demonstrated high internal consistency, with an alpha of 0.92.[11,12] For the current study, the scale was also translated into Urdu to reduce culture bias, with a resulting reliability of 0.86.

Celiac Dietary Adherence Test (CDAT): This self-reported 7-item scale is designed to measure gluten intake over the past month. Responses range from 1 ("never") to 5 ("not at all important"), and item ratings are summed to produce a total score. Scores below 13 indicate good adherence, scores between 13 and 17 suggest moderate adherence, while scores above 17 reflect poor adherence.[13] This scale was initially validated in the U.S. on 120 adult celiac disease patients, demonstrating significant reliability and validity.[14] For this study, the scale was translated into Urdu to minimize cultural bias, and its reliability was confirmed with an alpha of 0.90.

The Celiac Symptom Index (CSI): The scale assesses the extent of physical symptoms over the last month and consists of 16 items across two subscales. The first subscale, comprising 11 items, measures specific symptoms such as fatigue, headache, and gastrointestinal discomfort, with responses ranging from 1 ("none of the time") to 5 ("all of the time"). The second subscale includes five items that evaluate general physical health, with variable scoring depending on the item. For example, pain is rated from 1 ("none") to 5 ("very much"), while items assessing relief and relative health are scored from 1 ("strongly agree") to 5 ("strongly disagree"). Higher scores indicate worse symptoms and poorer health status. The CSI showed good internal consistency reliability in both the development sample ($\alpha = 0.88$)15 and the current sample ($\alpha = 0.85$).

Statistical analysis: Data were analyzed using descriptive statistics, Pearson's correlation, t-tests, and ANOVA to assess the relationships and differences among variables. The results have been detailed in the corresponding section.

RESULTS

The study population comprised 20 men (27.39%) and 53 women (72.60%) with a mean age of 30.15±1.13 years. The duration of diagnosis varied from one year to over five years. Seventeen patients (23.28%) had undergone bowel surgery due to

mucosal conditions, while 56 had not. A genetic predisposition to the illness was reported by 67 patients (91.78%), whereas 6 (8.21%) reported no family history of the disease. Most participants were non-smokers, non-alcoholic, and unmarried. Further demographic and clinical characteristics are detailed in Table I.

The present study consisted of 20 (27.39%) men and 53 (72.60%) women with time span of diagnoses ranged from less than a year to more than five years. There were 17 (23.28%) patients with bowel surgery while 56 did not undergo for surgery (based on the mucosal condition). Around 67 (91.78%) patients were having genetic predispositions of illness while 6 (8.21%) did not report any genetic history. Most of the patients were non-alcoholic, non-smokers, and unmarried. The rest of the characteristics have been presented in Table I.

Results manifested that resilient approach was significantly positively associated with participants' tendency to take gluten free diet, $r = .73$, $p < .01$. Other factors of resilience like positive acceptance, $r = .45$, $p < .01$; trust in one's instincts, $r = .91$, $p<.01$; personal competence, $r = .78$, $p < .01$; control, $r = .54$, $p < .01$; and spiritual influences, $r = .93$, $p<.01$ were also enhancing participants 'inclination to take dietary food. Results further showed participants getting social support were more likely to take dietary diet, $r= .78$ $p<.01$. However, significant others support found to have non-significant relationship with resilience, dietary adherence, specific symptoms, and general health. Participants taking dietary food reported fewer specific symptoms in the past 4 weeks and an improvement in general health. Also, resilience and social support had an inverse association with specific symptoms and positively related with general health. Overall, an increase in resilience, $r = -.45$, $p < .01$; social support, $r = -.87$, $p < .01$; and dietary adherence, $r = -.56$, $p<.01$ was associated with decrease in symptom manifestation. In other words, resilience, social support and dietary adherence was reducing the symptoms of participants.

Results of t- test showed no significant differences in dietary adherence between men and women, $t = 1\text{-}1.01$, $p >.05$ with minimum effect size .02, so the difference is negligible. Similarly, the difference in manifesting specific symptoms, reporting general health and

Table I: Clinical characteristics of participants (n=73)

Characteristics		Frequency	Percentage	Characteristics		Frequency	Percentage
Time span of diagnosis (years)	<2	9	12.32	Vitamin A deficiency	Yes	42	57.53
	2-3	19	26.02		No	31	42.46
	4-5	18	24.65	Vitamin D deficiency	Yes	46	63.01
	≥5	17	23.28		No	27	36.99
Bowel surgery	Yes	17	23.28	Vitamin K deficiency	Yes	46	63.01
	No	56	76.72		No	27	36.98
Illness knowledge	Unaware	16	21.91	Genetic Predisposition	Yes	67	91.78
	General	26	35.61		No	6	8.22
	Good	22	30.13	Doctor patient relation	Bad	7	9.58
	Excellent	9	12.32		Fair	34	46.57
Smoking status	Yes	13	17.81		Good	25	34.25
	No	60	82.19		Excellent	7	9.58
Alcohol status	Yes	1	1.36	Socioeconomic Status	Lower class	19	26.03
	No	72	98.63		Middle class	44	60.28
Gender	Male	20	27.40		Upper class	10	13.69
	Female	53	72.60	Stages of CD	Stage 1	16	21.91
Marital Status	Single	65	89.04		Stage 2	20	27.39
	Married	8	10.95		Stage 3	20	27.39
					Stage 4	17	23.28

Table II: Pearson product moment correlation for resilience, social support, gluten free diet and symptoms manifestation

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14
R	----	.43**	.56**	.78**	.36**	.89**	.93**	.25**	.77**	.01	.73**	-.84**	.88**	-.45**
PA		----	.79**	.65**	.62**	.78**	.57**	.66**	.76**	.10	.45**	-.55**	.76**	-.65**
TI			----	.45**	.77**	.85**	.55**	.41**	.43**	.09**	.91**	-.83**	.70**	-.35**
PC				----	.60**	.80**	.68**	.71**	.69**	.00	.78**	-.72**	.84**	-.56**
C					----	.88**	.91**	.85**	.86**	.04	.54**	-.86**	.88**	-.67**
SI						----	.65**	.72**	.44**	.00	.93**	-.71**	.67**	-.32**
SS							----	.85**	.45**	.00	.78**	-.84**	.86**	-.87**
FS								----	.90**	.09	.52**	-.70**	.77**	-.54**
SOS									----	.06	.66**	-.78**	.81**	-.67**
GFD										----	.00	-.04	.07	.00
SS											----	-.20**	.86**	-.56**
GH												----	.81**	.34**
SMT													----	-.67**

Means	115.0	23.13	20.99	16.21	19.04	25.11	56.71	18.12	19.05	11.06	11.33	16.15	13.12	20.35
SD	1.23	11.0	.90	2.09	2.00	1.01	1.90	.80	1.12	3.07	.68	1.39	.79	1.16

R= Resilience; PA= Positive Acceptance; TI=Trust in one's instincts; PC= Personal Competence; C= Control; SI=Spiritual Influences; SS=Social Support; FS= Family Support; FS= Friends Support; SOS=Significant others support; GFD= Gluten Free Diet; SS= Specific Symptoms; GH= General Health; SMT= Symptom Manifestation Total Note. **p<.01, *p< .05

Table III: T-test representing differences in gluten free diet, specific symptoms, general health, and symptoms manifestation across gender

Variables	Men	Women	t	p	95% Confidence Interval		d
	Mean (SD)	Mean (SD)			LL	UL	
GFD	11.12(.03)	12.00(.02)	-1.01*	.13	-.31	19.06	.02
SS	17.14(.84)	16.01(.40)	-.71*	.56	-.20	30.12	.00
GH	11.34(.00)	12.00(.00)	-.67*	.68	.05	1.16	.01
SM	20.01(.04)	21.00(.02)	-.89*	.76	-.00	10.09	.00

Note: GFD= Gluten Free Diet; SS = Specific Symptoms; GH = General Health; SM= Symptoms Manifestation; LL= Lower limit; UL = Upper Limit; Cohens d= effect size; *p>.05

overall symptoms index was tiny as effect size is zero. However, the mean values showed that both men and women had greater dietary adherence (for details see measures section) and also averages of symptoms were in normal range.

ANOVA presented interesting findings by displaying participants in stage 3 (M=9.71, SD=.31) and 4 (M = 8.00, SD = .18) showed good dietary adherence than those in stage 1 (M= 14.56, SD= .04) and 2 (M= 13.00, SD = .02), F (4, 69) = 330.26, p<.05. However, participants suffering from stage 3 (M = 25.09, SD = .97) and 4 (M= 27.08, SD = .98) reported more specific symptoms than participants in stage 1(M= 14.01, SD = .70) and 2 (M = 15.00, SD = .01), F (4, 69) = 124.41, p < .05. The rest of the results have also been presented in Table IV.

DISCUSSION

The current study follows the Resilience in Illness Model and the Psychosocial Model of Health, indicating that understanding and adopting psychosocial factors for good health and symptom management opens the door for diverse types of treatments and body fitness. It not only enables patients to mature cognitively but also considers how social contexts influence their health patterns.[16] In our study, it was observed that resilient tendencies and related factors increased the participants' inclination to adopt a

Table IV: ANOVA representing differences in gluten free diet, specific symptoms, general health, symptoms manifestation across severity of illness

Variables	Stage 1	Stage 2	Stage 3	Stage 4	F	p-value
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)		
GFD	14.56(.04)	13.00(.02)	9.71(.31)	8.00 (.18)	330.26	.00*
SS	14.01 (.70)	15.00 (.01)	25.09 (.97)	27.08 (0.98)	124.41	.00*
GH	9.13(.05)	10.03(.07)	16.09(.01)	17.00(.02)	996.04	.00*
SM	18.01(.60)	20.00(.40)	30.01(1.00)	34.08(1.01)	1150.45	.00*

Note. GFD= Gluten Free Diet; SS = Specific Symptoms; GH = General Health; SM= Symptoms Manifestation; F=ANONA; p= significance value;*p<.05

gluten-free diet, which was also effective in reducing specific symptoms and improving general health. These findings align with a notable study conducted in New York, involving 394 patients with inflammatory bowel disease who participated in a resilience-based program. Patients suffering from mild to moderate ulcerative colitis and Crohn's disease showed a dramatic decrease in hospital service utilization and a 49% reduction in steroid use after undergoing resilience training, while control patients continued to experience similar issues (i.e., flare-ups). [17]

Social support is another pertinent factor of the study which was increasing the resilience abilities, dietary adherence of patients as well as associated with a reduction in specific symptoms and to improve general health. Specially, family and friends support were particularly vital. In Ghana, Australia and Pakistan, researchers found that social support plays an important role in diabetes, hypertension, and cancer management among patients.[18-20] However, in our study significant other's support was not related with dietary adherence and alleviating symptom index, we speculate that significant others usually include dating partners or friends so, in case of patients, such type of support is rare to receive as the mean score of significant other support was just M = 1.12 and in our sample, 61 patients were unmarried so they might be reluctant to make such friends due to their bad health. Recent qualitative research conducted in Germany supported our speculations. Researchers elaborated the difficulties of chronically ill spouses to maintain their marital relations smooth and stable. Participants stated that their relationships eventually became worst due to the loss of sexual intimacy and other health related complications.[21] So, it meant that chronically ill patients usually get deprived of such fruitful relationships. However, further evidences and researches are required to support these outcomes.

Another important objective was to study the gender differences in dietary adherence, general health, specific symptoms, and overall symptom manifestation. Results showed no significant gender differences in dietary adherence or symptom reduction. A study conducted in Italy found that females exhibited more gastrointestinal symptoms (such as vomiting, diarrhea, constipation, heartburn), and osteoporosis at the time of diagnosis. However, after 12 to 30 months of follow-up, both males and females reported no gastrointestinal symptoms, indicating that the treatment was effective.[22]

Other studies have shown that women are more inclined to present symptoms at the time of diagnosis; however, frequent treatment and dietary adherence diminish these gender differences.[23] Additionally, there are various explanations for the lack of gender differences, such as delays in Crohn's disease (CD) diagnosis and advanced age. [24] Similarly, in our study, there might be other explanations, as we found that dietary adherence and symptom reduction varied across the severity of CD. In stages 3 and 4, good dietary adherence was seen (based on mean scores), but participants still reported more symptoms and poorer general health due to the severity of illness. Interestingly, participants in stages 1 and 2 had moderate dietary adherence but reported fewer symptoms than those in stages 3 and 4. Thus, symptom manifestation varies across the stages of CD. A variety of studies show that the use of a strict gluten-free diet resolves a number of complications.[25-27] However, multiple studies have documented ongoing architectural disturbances and inflammatory changes, and with these continued inflammatory changes, a persistent risk for long-term complications remains. [28,29]

CONCLUSION

This study highlights the crucial roles of resilience and social support in managing celiac disease and adhering to a gluten-free diet. Our findings indicate that higher resilience is linked to better dietary adherence, which correlates with improved health outcomes and symptom reduction. The lack of significant gender differences suggests that the effects of resilience and social support apply broadly across patients. Additionally, the severity of illness influences dietary practices and health perceptions, emphasizing the need for targeted interventions. While a strict gluten-free diet is beneficial, ongoing health challenges call for further research into long-term management strategies.

Overall, integrating resilience training and social support into treatment plans can enhance patient outcomes, advocating for a holistic approach to chronic illness management. Future research should continue exploring these relationships to better support individuals with CD.

Limitations of the study

This study has several limitations, primarily due to its correlational nature, which prevents establishing cause-and-effect relationships. A longitudinal study could offer clearer insights into the roles

of resilience and social support in dietary adherence and symptom reduction. Additionally, various clinical factors, such as illness knowledge and duration, were not evaluated in relation to gluten-free diet adherence and symptom manifestation. Therefore, future research should focus on longitudinal or experimental designs for celiac disease patients to yield more robust scientific findings.

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AUTHORS' CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under :

HS: Concept, study design, acquisition of data, drafting the manuscript, approval of the final version to be published

SZ: Acquisition of data, drafting the manuscript, approval of the final version to be published

AI: Analysis and interpretation of data, critical review, approval of the final version to be published

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

CONFLICT OF INTEREST

Authors declared no conflict of interest, whether financial or otherwise, that could influence the integrity, objectivity, or validity of their research work.

GRANT SUPPORT AND FINANCIAL DISCLOSURE

Authors declared no specific grant for this research from any funding agency in the public, commercial or non-profit sectors

DATA SHARING STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request

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