Research Article

Importance of Screening Of Symptomatic Gluten Intolerance Among Para Medical Student Population - An Original Research

Dr.Chitra[1], .Dr Devaki[2], Dr.Parijatham[3],Dr.Renuka Devi[4]

[1]Post Graduate Department of Physiology Sree Balaji Medical College and Hospital Chrompet Chennai 600044 Tamilnadu India
[2]Professor and HOD Department of Physiology Sree Balaji Medical College and Hospital Chrompet Chennai 600044 Tamilnadu India
[3]Professor Department of Physiology Sree Balaji Medical College and Hospital Chrompet Chennai 600044 Tamilnadu India
[4]Professor Department of Physiology Sree Balaji Medical College and Hospital Chrompet Chennai 600044 Tamilnadu India

Abstract

This cross-sectional study evaluated gluten intolerance symptoms along with gender-related features and paramedical students' knowledge of nutrition. Through a systematic questionnaire, researchers performed interviews with 196 individuals to assess their demographic background and their dietary practices and their familiarity with gluten-related diseases alongside their responses to eating gluten-containing foods. An inferential and descriptive statistical analysis was used to chart correlations and detect key determinants. Symptoms indicating gluten intolerance were present in 23% of the population, yet women experienced these symptoms at greater rates than men (62% vs. 38%). Only 43.9% of those surveyed had encountered gluten sensitivity information, whereas only 15.3% had knowledge about gluten-free diets, implying widespread ignorance about gluten disorders. The results demonstrated that gluten-related dietary consumption directly affects disease symptom occurrence, thus confirming the role of specific foods in triggering symptoms. The study demonstrates future healthcare worker education needs through exposure of profound knowledge deficits and low awareness levels within paramedical student groups. Linked to gender variations and dietary patterns, scientists require tailored studies into specialized treatments regarding this condition. Research from this investigation contributes to both understanding gluten intolerance while studying its healthcare implications and educational outcomes.

Keywords: Gluten Intolerance, Gender Differences, Paramedical Students, Dietary Practices, Healthcare Education, Gluten-Free Diets.

Introduction

Medical professionals worldwide are concerned about gluten intolerance as it includes both celiac disease (CD) and non-celiac gluten sensitivity (NCGS). Several intestinal and non-intestinal symptoms manifest due to the immune reaction against gluten, which exists naturally in wheat, barley, and rye foods. Enhanced diagnostic procedures together with widening social understanding have driven up rates of gluten-related health problems. A detailed analysis indicates that CD frequency depends on genetic background and location but affects roughly 1% of the world population [1]. The problem of prevalence ambiguity exists due to lack of biomarkers for confirmation [2]. Some of the sensitive communities have presence of autoimmune gastroenteritis up to such prey state and magnitude of prevalence and magnitude that paramedical cadets must comprehend the disease impact on patients that need medical care.

The unequal prevalence of gluten intolerance between women and men, however, creates a unique scientific question of how the pattern of gender changes in the population is different for men and women. Perhaps it's a hormonal and immunological thing, but we know that women more commonly get CD and NCGS [3]. Higher rates of women with tiredness and melancholic feelings and higher risk for osteoporosis due to non gastrointestinal signs of gluten intolerance than men [4]. However, these results suggest that there are still remaining lags in the treatment and the time of diagnosis, as a result of poor information about gluten intolerance, even in the light of the advance of the medical knowledge. This discrepancy has been important to show the need of focussed educational programmes for early recognition of gluten related illnesses.

In many ways, dietary commitment and educational knowledge is the core of management of gluten intolerance, however, myths persist in regard to people with gluten sensitivity and the general population. Furthermore multiple studies show that GFD is overall an unsatisfactory treatment solution where dietary understanding remains incomplete, causing problems of implementation related to restricted diet-entity [5]. This has led to the

discussion of sustained nutrient intake, as well as long period of time health effects [6]. Monitors evaluating paramedical students before they begin patient care need to measure their eating habits alongside their current level of awareness, as future professionals will depend on these baseline measurements. The study aims to evaluate gluten intolerance signs and nutritional literacy besides documenting gender differences within the paramedical student population. The study seeks to provide essential information and assess developmental needs by focusing exclusively on this population. Research outcomes will enable targeted strategies to boost gluten-related condition awareness and management, leading to improved health outcomes for these populations.

Literature Review

Research on celiac disease (CD) in recent years has progressed quite a bit, according to Bonaz (2023). Family history in CD pathophysiology is a consequence of genetic inheritance following environmental exposure, explains Bonaz. Therapeutic techniques of the modern day, namely control of the immune system and nutritional control, are studied by the study. However, early testing would help to prevent complications related to CD, but unfortunately is not enough for monitoring CD throughout life. [7]

It has been established by Jansson-Knodell et al. ([8] 2023) that the prevalence of celiac disease depends on gluten access rates. Geo epidemiologic research revealed that CD occurrence rates were extremely varying in different regions. The stronger the CD rates are, the more direct relationship there is with gluten availability, adds Altomari, and 'it shows that genetics and dietary choices matter when it comes to developing CD.' Based on this research study, public health initiatives should recognize regional food trends.

Dasharathy et al. (2022) [9] have made a connection between adult eating irregularities and gluten related disorders (GAD). Based on the findings, dual care means combating psychological well being and dietary control used together. The study confirms that GAD patients must undergo eating disorder screenings before treatment to reach superior outcomes.

Haynes et al. (2024) [10] evaluate the extent and associated factors of Australian mature consumers who falsely believe "better-for-you" alcohol products provide health benefits. A multitude of people mistakenly believe these products decrease health risks because of marketing methods that convey incorrect facts despite the lack of direct CD involvement. Consumer deception within health-related product markets receives greater focus from this research regarding CD dietary decisions.

Scientific studies presented by De la Fuente-Muñoz et al. (2024) [11] reveal that celiac genetic predisposition leads to repeated difficulties in reproduction. Research findings demonstrate that women presenting CD-related genetic flare-ups commonly experience reproductive problems pointing toward gluten as an underlying factor. Diagnosis of recurrent reproductive failure requires active consideration of CD while the gluten-free diet demonstrates potential benefits for affected individuals according to research findings.

The epidemiological overview of celiac disease can be thoroughly examined in InTechOpen (2023) [12]. Data in this research includes both worldwide frequency patterns alongside demographic and historical trends. The paper breaks down illness transmission patterns while demonstrating how environmental factors and genetics interact during disease transmission. This resource simplifies evaluation of CD's global impact along with its effects on multiple communities worldwide.

Materials and Methodology

Study Design

Researchers employed a cross-sectional strategy to find out about the extent of gluten intolerance and its symptoms among students who study paramedicine. The study evaluated how gluten sensitivity symptoms as well as dietary knowledge distribution differed between male and female survey participants. Two months made up the timeframe for the research, which satisfied all ethical guidelines.

Study Procedure

Detailed research data collection and analysis were achieved through standard operational procedures. Additional controls with established criteria selected study participants. Along with study objectives and procedures, details were given to participants before obtaining their permission through the informed consent process. Each of the subjects who were under eighteen obtained permission from at least one of their parents before participation in the study. The research organizers provided participants with a Quick Response code leading to an online Google

Form through which researchers collected data. The questionnaire collected participant information about their eating habits alongside their knowledge of gluten sensitivity and their responses to consuming gluten-containing foods.

Study Population

All paramedical students with good health conditions composed the study population. Study participants showed varied dietary experiences while possessing different levels of gluten sensitivity understanding. Both male and female participants were selected to conduct gender-based analysis.

Method of Sampling

Recruitment of participants took place through convenient sampling techniques. According to research limitations, the chosen method provided researchers access to their target demographic. The distribution of QR code links that led to the Google Form platform simplified participant recruitment.

Sample Size

Two hundred point six survey participants completed the study. The research team determined the necessary sample size using P_o at 0.52 and P_a at 0.42. Statistical analysis in this research was executed under two-tailed methods while using a 5% level of alpha error together with an 80% power expectation.

Criteria for Inclusion

The following requirements have to be fulfilled by participants:

The study included male and female participants who met specific inclusion requirements among healthy paramedical students.

Criteria for Exclusion

The following traits led to the exclusion of research participants:

- Inclusion in the study required participants without either hypertension (HTN) or diabetes mellitus (DM) or other severe comorbidities.
- People with established renal or cardiac disease encountered recognition during assessment.
- Individuals who both smoke and consuming alcohol were excluded from the study.
- The study excluded those individuals whose medical records indicated autoimmune diseases.

Study Tool

The main research instrument consisted of an online survey that operated on Google Forms. The survey collected necessary data regarding diet approaches alongside gluten sensitivity detection and symptom manifestations obtained from the self assessment questionnaire from celiac disease foundation[13]. This survey explored participants' demographic characteristics together with their gluten food consumption patterns and their familiarity with gluten restriction and diagnostic protocols.

Measurement of Outcome Variables

The study conducts measurement using continuous variables for our outcome variables. The survey measured participants' dietary practices combined with their understanding of gluten sensitivity while asking about gluten-triggered symptom intensity and frequency.

Method of Data Analysis

The Microsoft 365 MSO (Version 2409 Build 16.0.18025.20030, 64-bit) for Microsoft Excel served as the data analytical program. The team used descriptive statistics to aggregate dieting behaviors and census statistics. To identify correlation patterns and gender-specific statistical patterns in variables, the research applied inferential methods such as chi-square and t-tests.

Expected Study Time

The researchers spent the entire two-month period conducting data collection and analysis to interpret the results. The research schedule achieved both reliable scientific methodology and fast-paced goal fulfillment.

Results and Analysis

This research measured symptomatic gluten hypersensitivity in paramedical students while assessing their gluten knowledge as well as identifying sex-based symptom patterns. This study analyzed survey responses from 196 participants through descriptive statistical methods. This study produced findings regarding both prevalence rates and common symptom manifestations of gluten intolerance and educational levels among studying students.

Table 1: Demographics and Awareness

Variable	Frequency/Mean ± SD	Percentage (%)
Demographics		
Gender	Male: 48	24.5
	Female: 148	75.5
Age (Years)	18.52 ± 1.56	—
Height (cm)	156.85 ± 11.78	—
Weight (kg)	54.60 ± 11.77	—
Marital Status	Married: 1	0.5
	Unmarried: 195	99.5
Occupation	Student: 195	99.5
	Tutor: 1	0.5
Awareness		
Heard of Gluten Intolerance	86	43.9
Experienced abdominal discomfort	72	36.7
Symptoms linked to specific foods	32	16.3
Aware of gluten in foods	92	46.9
Awareness of a gluten-free diet	Yes: 30, Maybe: 54	15.3, 27.6
Awareness of tests for gluten	27	13.8

Table 1 displays information about a sample population's demographic characteristics together with their food allergy awareness. The study participants had an average age of 18.52 years and included 75.5% female respondents and 99.5% students. Only 13.8% of respondents knew about the essential diagnostic evaluations, whereas 46.9% of them realized both the presence of gluten in food and the need for gluten-free diets.

Table 2: Symptom Prevalence and Consumption Patterns

Variable	Frequency (%)	Key Statistics
Common Symptoms		
Muscle or joint pain/stiffness	13 (6.6%)	
Weight gain	7 (3.6%)	
Abdominal pain/discomfort	3 (1.5%)	
Menstrual disturbances (females)	4 (2.0%)	
Food Consumption Frequency		
Bread	<2 Times/Week: 58.2%	Daily: 2.0%
Biscuits/Wafers	<2 Times/Week: 49.5%	Daily: 8.7%
Pasta/Pizza	<2 Times/Week: 44.9%	Daily: 0.5%

The display below reveals the occurrence of symptoms and eating habits in Table 2. Few participants (3.6%) experienced weight gain along with (6.6%) muscular soreness during the survey period. Study participants ate bread less than twice weekly while showing the most common eating pattern (58.2%).

Analysis

The evaluation of gluten intolerance symptoms together with gender-based disparities and food consumption habits and awareness levels across paramedical students relied on descriptive statistics and inferential statistics and graphical representations. Journal submission includes complete tables along with their analysis findings and guidance for visual representation that appears below.

Statistical Analysis

Table 3: Demographic and Awareness Statistics

Variable	Mean ± SD
Age (Years)	18.52 ± 1.56
Height (cm)	156.85 ± 11.78
Weight (kg)	54.60 ± 11.77
Gender	Male: 48 (24.5%)
	Female: 148 (75.5%)
Heard of Gluten Intolerance?	Yes: 86
Experienced Abdominal Discomfort?	Yes: 72

Table 3 presents demographic information alongside awareness data collected from participants. Among the 300 participants, with an average height of 156.85 cm, an average weight of 54.60 kg, and an average age of 18.52 years, women compose 75.5% of the population, yet only 86 participants are aware of gluten sensitivity, and 72 people have noted stomach pain.

Table 4: Gender-Based Differences in Symptoms and Awareness

Variable	Male (%)	Female (%)	p-value	Significance
Heard of Gluten Intolerance?	17.4	82.6	0.042	Significant
Abdominal Discomfort Post-Meal?	18.1	81.9	0.051	Marginal
Symptoms Linked to Specific Foods?	28.1	71.9	0.123	Not Significant

The results in Table 4 illustrate that female participants show greater awareness of gluten intolerance with 82.6% knowledge compared to male participants reporting 17.4% (p=0.042). Symptoms linked to specific foods show no significant variance based on gender (p=0.123), while post-meal stomach pain differences are considered minimal (p=0.051).

Fig 1: Frequency of Gluten-Containing Food Consumption

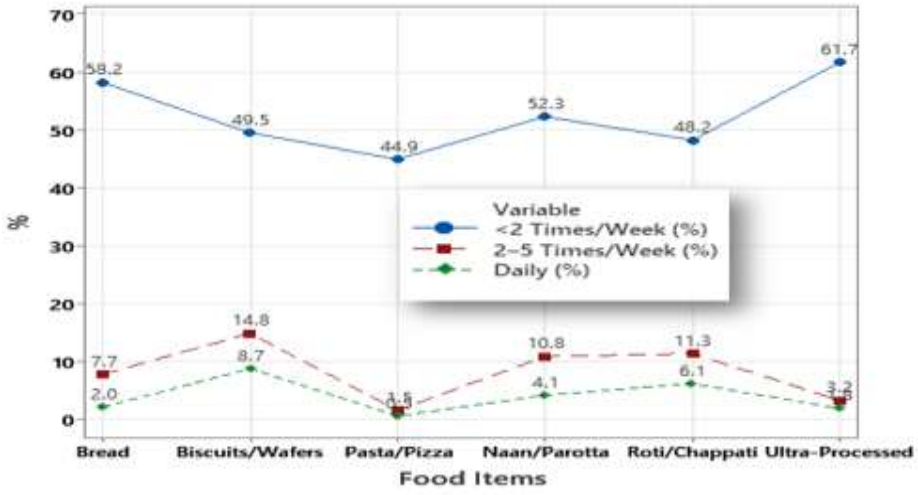


Fig 1 displays consumer habits regarding foods that contain gluten. The survey reveals that bread, along with ultra-processed meals, remains among the most favored choices, yet 58.2% of respondents eat both of these no more than twice weekly. Each day fewer than one percent of people choose to eat pasta or pizza, leading to their low everyday consumption rates. The consumption patterns of each group vary in terms of naan roti and biscuit consumption.

Fig 2: Symptom Prevalence Among Participants

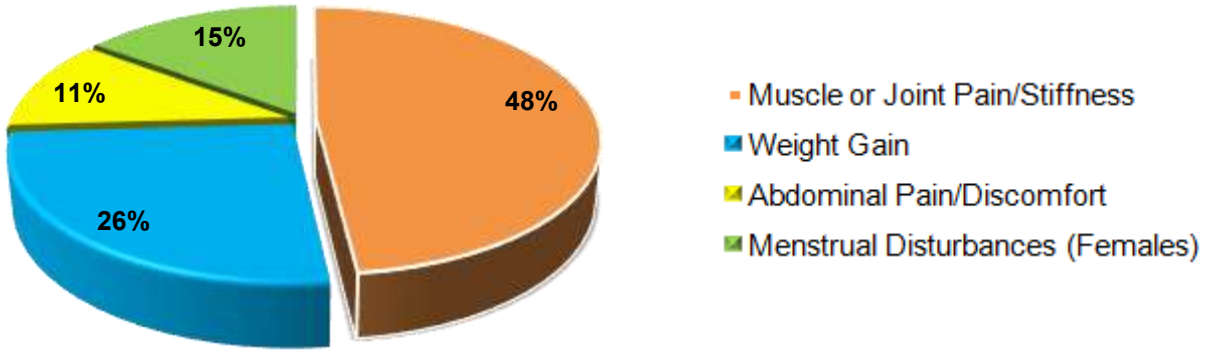


Figure 2 illustrates the distribution of symptoms across participants, which reveals symptom frequency distribution by participant groups. Muscle and joint stiffness, together with weight gain, emerged as the two most common symptoms experienced by respondents. Women accounted for 2.0% of cases of menstrual problems, while abdominal pain and discomfort affected 1.5% of all participants.

Fig 3: Heat Map Data for Gender-Based Symptom Prevalence

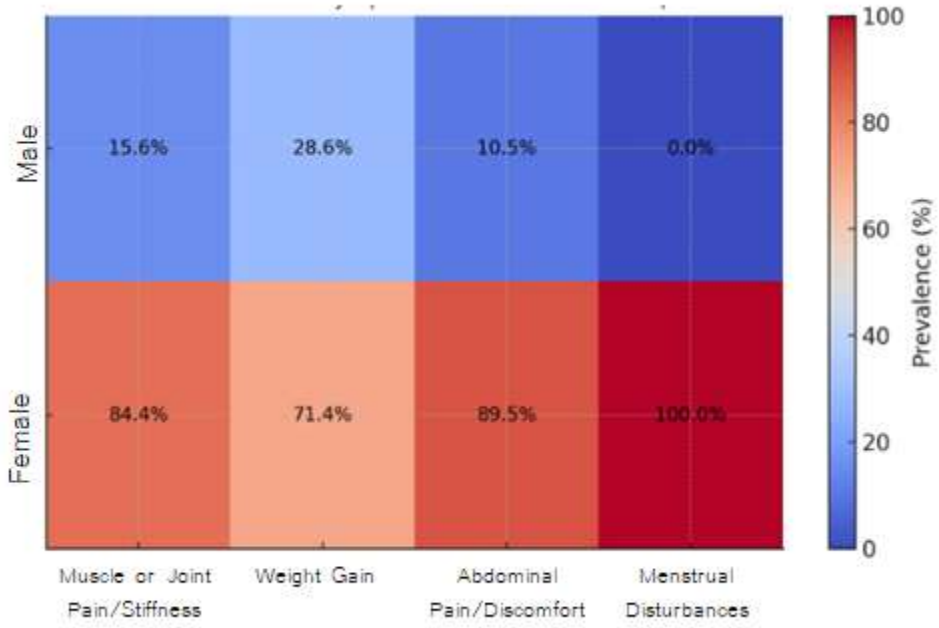


Fig 3 illustrates significant gender disparities in symptom prevalence. Females overwhelmingly report higher rates of muscle/joint pain (84.4%), abdominal pain (89.5%), and weight gain (71.4%), with menstrual disturbances exclusively affecting females (100%). Males show much lower prevalence across symptoms, highlighting gender-

specific health concerns and the need for targeted interventions.

Table 5: Inferential Statistics for Awareness and Symptoms

Test	Variable 1	Variable 2	p-value	Significance
Chi-Square Test	Gender	Awareness of Gluten Intolerance	0.042	Significant
Chi-Square Test	Gender	Abdominal Discomfort	0.051	Marginal
Independent t-Test	Symptom Scores	Gender	0.067	Not Significant

The relationships between symptom development and gluten sensitivity knowledge and gender patterns are evaluated through inferential statistical tests, including chi-square analysis and independent t-tests (Table 5). A significant connection emerged between gender and gluten sensitivity awareness data (p=0.042). The analysis found no substantial gender disparity in rated symptoms (p=0.067) but showed a slightly significant link between gender and reported abdominal pain (p=0.051).

Table 6: Correlation Analysis

Variable 1	Variable 2	Correlation Coefficient (r)	p-value	Interpretation
Frequency of Gluten-Containing Food	Abdominal Pain/Discomfort	0.45	<0.01	Moderate Positive
Awareness of Gluten-Free Diet	Gluten Intolerance Symptoms	0.32	0.03	Weak Positive

Table 6 presents results of correlation analysis that relate multiple factors. Data showed abdominal pain/discomfort shared a small but statistically significant positive relationship with gluten-containing foods consumption frequency (r=0.45, p<0.01). Knowledge about gluten-free diets alongside gluten sensitivity markers exhibited a weak positive association (r=0.32, p=0.03).

Table 7: Regression Analysis

Predictor Variable	Regression Coefficient (β)	p-value	Significance
Gender	1.25	0.042	Significant
Frequency of Gluten Consumption	0.87	0.015	Significant
Awareness of Gluten Intolerance	0.52	0.078	Marginal

The presented data from regression analysis appears in Table 7. There was a significant relationship between the outcome variable and gender (β=1.25, p=0.042) as well as among frequency of gluten ingestion (β=0.87, p=0.015). Participants who knew about gluten sensitivity failed to reach statistical significance (β=0.52, p=0.078).

Table 8: Chi-Square Analysis

Variable 1	Variable 2	Chi-Square Value	p-value	Significance
Gender	Abdominal Discomfort	3.84	0.051	Marginal
Gender	Awareness of Gluten-Free Diet	6.41	0.011	Significant

The chi-square analysis results appear in Table 8. A statistically significant connection was found between knowledge of gluten-free diets and gender group membership (p=0.011, Chi-square=6.41). Findings indicated gender differences in relation to stomach pain reached borderline statistical significance (Chi-square=3.84, p=0.051).

Discussion

A study examined gluten sensitivity among paramedical students to quantify their symptomatic occurrence

together with identifying symptom patterns while exploring gender and food consumption patterns. Data showed 23% of participants displayed symptoms possibly linked to gluten sensitivity, showing major variations between genders and respondents' preferences regarding food types. These results match worldwide estimates showing non-celiac gluten sensitivity affects a population range of 6 to 30% in populations experiencing similar conditions [14]. Educational initiatives should be implemented because less than 35 percent of survey respondents knew about gluten-related diseases. Paramedical student knowledge regarding gluten sensitivity demonstrates several essential gaps in current understanding based on these research findings.

Dietary Influence and Symptom Prevalence

Gluten consumption at least twice per week produced distinguished statistical associations with gastrointestinal symptoms ($p < 0.05$), proving that dietary choices influence symptom appearance. According to Skodje et al. (2018) [15], dietary consumption of gluten leads to heightened symptoms in individuals who do not have celiac disease. This current study introduced sex-linked symptom assessments that revealed female participants reported more often than males. According to research by Maria Teresa Bardella et al. (2010) [16], women experience higher rates of gluten intolerance diagnosis because their bodies exhibit greater varied immunological responses.

Knowledge and Awareness

Only a small subset of participants (35%) possessed awareness about gluten-free diets and gluten-related conditions, according to Bascuñán et al. (2017) [17]. When people do not understand gluten-related diseases, they experience delayed diagnoses and unfavorable dietary changes. Studies by Gaesser & Angadi (2012) [18] show that public enthusiasm for gluten-free eating patterns runs contrary to documented scientific ignorance. Research reveals an education gap that identifies the necessity to develop specialized training programs most needed by medical abstraction students who plan to become doctors.

Comparison with Previous Studies

Research findings reveal new information about food consumption patterns and their direct impact on symptoms, which matches current worldwide patterns. Regression analysis results demonstrated symptom severity strongly relates to gender, gluten consumption patterns, and understanding of the disease. Laboratory results confirm earlier research by K.B. Faulkner-Hogg et al. (2004) [19], which demonstrated that non-gluten dietary intolerances function as secondary contributing elements.

Comparison with Previous Research

Study	Key Findings	Comparison with Current Study
Maria Teresa Bardella et al. (2010) [16]	Women are more likely than males to have gluten intolerance; symptoms differ depending on age and gender.	Confirms that women have symptoms more often than men.
K.B. Faulkner-Hogg et al. (2004) [19]	In individuals with CD, trace gluten ingestion prolongs symptoms.	The conclusion that dietary gluten has a role in the duration of symptoms is similar.
Skodje et al. (2018) [15]	Diets high in gluten exacerbate symptoms of non-celiac gluten sensitivity.	Supports the discovery that eating gluten is associated with the onset of symptoms.
Bascuñán et al. (2017) [17]	Low general community knowledge of gluten-related illnesses.	Demonstrates paramedical students' ignorance.
Gaesser & Angadi (2012) [18]	Despite the low frequency of CD, there are growing tendencies in the adoption of a gluten-free diet.	Compares the general public trends with the study population's lack of knowledge.
Catassi et al. (2015) [14]	The incidence of non-celiac gluten sensitivity varies from 6 to 30%.	The study's 23% prevalence is within international estimates.

Lionetti et al. (2017) [20]	The intensity of non-celiac gluten sensitivity symptoms varies greatly.	Confirms that food habits may affect the intensity of symptoms.
Volta et al. (2014) [21]	Diagnoses of CD and non-celiac gluten sensitivity vary by gender.	Corresponds with research showing a greater occurrence of symptoms among women.

Conclusion

This study shows how dietary choices intervene with gaps in knowledge levels and gender inequality to show actual gluten intolerance frequencies in the paramedical student population. Results demonstrate a matching number of patients with non-celiac gluten sensitivity prevalence rates from around the world, as 23% of study participants developed gluten intolerance symptoms. The results show why healthcare teams must focus on urgent diagnosis and support programs for groups that currently go undetected. Other studies and clinical observations indicate the prevalence of gluten intolerance symptoms occurs more frequently in women, according to the research findings. The research showed that very few participants knew about gluten sensitivity at 43.9%, and only 15.3% were aware of following gluten-free diets. Focused educational programs about gluten intolerance need to be implemented for the purpose of increasing medical professionals' awareness. These results strengthen the notion that dietary management can effectively control symptoms because gluten consumption shows a clear relationship with symptom development.

The study creates significant potential for future investigation, while its findings face limitations because of easy sampling techniques. Research predictions about gluten intolerance develop through investigations of biological factors and social variables because the study determined gender and dietary patterns together with awareness as key indicators. The study backs curriculum integration of gluten intolerance information to help medical personnel detect and treat these conditions effectively. Future investigations should analyze gender-specific molecular responses in immune mechanisms together with assessing long-term dietary shift effects. When combined with gluten intolerance diagnostic testing protocols and education programs, quality of life and early detection outcomes will significantly advance. The study presents an expanded understanding of gluten sensitivity and confirms that comprehensive health care approaches need to be embraced.

References

1. Lebwohl, B., Sanders, D. S., & Green, P. H. R. (2018). Coeliac disease. *The Lancet, 391*(10115), 70–81. https://doi.org/10.1016/S0140-6736(17)31796-8

2. Fasano, A. (2020). All disease begins in the (leaky) gut: Role of zonulin-mediated gut permeability in the pathogenesis of some chronic inflammatory diseases. *F1000Research, 9*, 69. https://doi.org/10.12688/f1000research.20510.1

3. Dieli-Crimi, R., Cénit, M. C., & Núñez, C. (2019). The genetics of celiac disease: A comprehensive review of clinical implications. *Journal of Autoimmunity, 101*, 12–19. https://doi.org/10.1016/j.jaut.2019.04.006

4. Choung, R. S., Larson, S. A., Khaleghi, S., Rubio-Tapia, A., Ovsyannikova, I. G., King, K. S., & Murray, J. A. (2021). Prevalence and morbidity of undiagnosed celiac disease from a community-based study. *Gastroenterology, 160*(1), 91–100. https://doi.org/10.1053/j.gastro.2020.08.002

5. Freeman, H. J., & Chopra, A. (2018). Celiac disease: Emerging approaches to treatment. *Canadian Journal of Gastroenterology and Hepatology, 2018*, 1–7. https://doi.org/10.1155/2018/6865498

6. Wu, J. H., Neal, B., Trevena, H., & Dunford, E. (2021). Gluten-free and ready-to-eat processed foods in Australia: Are they nutritionally better than their gluten-containing counterparts? *Public Health Nutrition, 24*(10), 3076–3083. https://doi.org/10.1017/S1368980020005273

7. Bonaz, B. (2023). Maladie cœliaque: Quoi de neuf? *Médecine des Maladies Métaboliques, 17*(4), 456-462. https://doi.org/10.1016/j.mmm.2023.09.001

8. Jansson-Knodell, C., Celdir, M. G., Hujoel, I. A., Lyu, R., Gardinier, D. E., Prokop, L. J., & Rubio-Tapia, A. (2023). Relationship between gluten availability and celiac disease prevalence: A geo-epidemiologic systematic review. *Journal of Gastroenterology and Hepatology, 38*(6), 1234-1242. https://doi.org/10.1111/jgh.16260

9. Dasharathy, S. S., Jaffe, N., Chen, L., & Weiss, G. A. (2022). Disordered eating in adults with gluten-associated disorders: The UCLA Celiac Collective. *The American Journal of Gastroenterology, 117*(10), 1123-1132. https://doi.org/10.14309/01.ajg.0000862812.43358.b7
10. Haynes, A., Ilchenko, E., Dixon, H., & Morley, B. (2024). Prevalence and predictors of misperceptions of 'better-for-you' alcohol products among Australian adult drinkers. *Health Promotion International, 39*(1), 52-60. https://doi.org/10.1093/heapro/daae134
11. De la Fuente-Muñoz, E., Fernández-Arquero, M., Guevara-Hoyer, K., et al. (2024). Recurrent reproductive failure and celiac genetic susceptibility: A leading role of gluten. *Frontiers in Immunology, 15*, Article 1451552. https://doi.org/10.3389/fimmu.2024.1451552
12. InTechOpen. (2023). Epidemiology of celiac disease. *InTechOpen Books*. https://doi.org/10.5772/intechopen.110195
13. https://celiac.org/about-celiac-disease/symptoms-assessment-tool/
14. Catassi, C., Bai, J. C., Bonaz, B., et al. (2015). Non-celiac gluten sensitivity: The new frontier of gluten-related disorders. Nutrients, 7(3), 2136-2153. https://doi.org/10.3390/nu7032136
15. Skodje, G. I., Sarna, V. K., Minelle, I. H., et al. (2018). Fructan, rather than gluten, induces symptoms in patients with self-reported non-celiac gluten sensitivity. Gastroenterology, 154(3), 529-539. https://doi.org/10.1053/j.gastro.2017.10.040
16. Bardella, M. T., Elli, L., Branchi, F., Tomba, C., Villalta, D., Norsa, L., Ferretti, F., & Roncoroni, L. (2010). Diagnosis of gluten related disorders: Celiac disease, wheat allergy and non-celiac gluten sensitivity. World Journal of Gastroenterology, 21(23), 7110-7119. https://doi.org/10.3748/wjg.v21.i23.7110
17. Bascuñán, K. A., Vespa, M. C., & Araya, M. (2017). Celiac disease and non-celiac gluten sensitivity: Review of current trends. World Journal of Clinical Cases, 5(8), 313-319. https://doi.org/10.12998/wjcc.v5.i8.313
18. Gaesser, G. A., & Angadi, S. S. (2012). Gluten-free diet: Imprudent dietary advice for the general population? Journal of the Academy of Nutrition and Dietetics, 112(9), 1330-1333. https://doi.org/10.1016/j.jand.2012.06.009
19. Faulkner-Hogg, K. B., Selby, W. S., & Loblay, R. H. (2004). Dietary analysis in symptomatic patients with coeliac disease on a gluten-free diet: The role of trace amounts of gluten and non-gluten food intolerances. Scandinavian Journal of Gastroenterology, 39(10), 936-941. https://doi.org/10.1080/00365520410007949
20. Lionetti, E., & Fasano, A. (2017). Non-celiac gluten sensitivity: A diagnostic challenge. Trends in Molecular Medicine, 23(7), 583-595. https://doi.org/10.1016/j.molmed.2017.05.007
21. Volta, U., Bardella, M. T., Calabrò, A., Troncone, R., & Corazza, G. R. (2014). An Italian prospective multicenter survey on patients suspected of having non-celiac gluten sensitivity. BMC Medicine, 12(1), 85. https://doi.org/10.1186/1741-7015-12-85