

Dietary Habits, Lifestyle and Awareness of Gluten-Related Disorders Among High School Students in the Greater Poland voivodeship

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Abstract

Gluten-related disorders (GRDs) require appropriate diagnosis and, in some cases, strict dietary treatment. At the same time, gluten-free products are increasingly chosen by people without a diagnosed disorder. This cross-sectional survey assessed dietary habits, lifestyle behaviours, familiarity with GRDs, sources of nutrition information, and reasons for choosing gluten-free products among 169 high school students from the Greater Poland voivodeship, Poland. The data were collected in 2018. Half of the participants reported physical activity at least three times per week (50.3%), 47.9% read food labels, 56.8% consumed two or fewer main meals per day, and 66.3% reported frequent snacking. Familiarity with the term "gluten" (49.1%) was more common than familiarity with "celiac disease" (39.0%). The Internet or social media was the most frequently indicated source of nutrition information (52.6%), while curiosity was the most common

reason for choosing or trying gluten-free products (47.9%). The findings indicate gaps in knowledge of GRDs and support the need for age-appropriate nutrition education, including critical assessment of online information.

Introduction

In recent decades, the clinical and social recognition of gluten-related disorders (GRDs) has increased significantly worldwide, making them an important and growing public health concern. GRDs comprise a heterogeneous group of conditions triggered by the ingestion of gluten-containing cereals such as wheat, rye, and barley. This spectrum includes celiac disease (CD), wheat allergy and non-celiac gluten sensitivity (NCGS), each differing in pathophysiology, diagnostic criteria and clinical presentation (Sapone et al. 2012; Catassi et al. 2015; Lebowhl et al. 2018).

CD is a chronic, systemic, immune-mediated enteropathy triggered by gluten ingestion in genetically predisposed individuals and affects approximately 1% of the global population, although many cases remain undiagnosed (Lebowhl et al. 2018; Singh et al. 2018). Its only effective treatment is a strict lifelong gluten-free diet (GFD), supported by appropriate education and nutritional monitoring (Fasano 2003; Lebowhl et al. 2018). Wheat allergy is an IgE-mediated response to wheat proteins, whereas NCGS refers to intestinal or extraintestinal symptoms associated with gluten-containing foods after CD and wheat allergy have been excluded (Catassi et al. 2015; Sapone et al. 2012). In people without a medically diagnosed GRD, a GFD should not be regarded as inherently healthier or as a weight-loss strategy. Moreover, an inadequately planned GFD may be nutritionally unbalanced (El Khoury et al. 2018; Gaesser, Angadi 2012; Niland, Cash 2018).

Adolescence is a formative period for dietary habits and health literacy. Young people obtain nutrition information from the Internet and social media, peers, family, school and healthcare professionals. Digital platforms facilitate access to health information, but the quality and reliability of online content vary considerably (Holmberg et al. 2019). Adolescents also commonly report irregular meal patterns and frequent snacking, while restrictive diets adopted without professional guidance may contribute to nutritionally unbalanced choices (Moreno et al. 2010; Niland, Cash 2018). Familiarity with a dietary term does not necessarily reflect accurate clinical knowledge; even adolescents diagnosed with CD may have difficulty identifying gluten-containing and gluten-free foods (Pohoreski et al. 2023). Describing adolescents' dietary behaviours, familiarity with GRDs, information sources, and motivations may therefore help identify priorities for nutrition and health education.

Accordingly, the aim of this study was to assess self-reported meal patterns, physical activity and food-label reading, familiarity with gluten and CD, sources

of nutrition information, and reasons for choosing or trying gluten-free products among high school students in the Greater Poland voivodeship, Poland.

Materials and Methods

Study Design and Research Area

The study was conducted as a cross-sectional survey among high school students in the Greater Poland voivodeship, Poland. Data were collected in five urban and semi-urban locations, namely, Poznań, Koło, Rogoźno, Oborniki and Wągrowiec.

Participants and Sampling

The study group comprised 169 students, including 106 females (62.7%) and 63 males (37.3%). The inclusion criteria were high school student status, age 16–19 years and voluntary participation. The mean age was 17.71 ± 0.85 years. Information on place of residence and household size was collected to characterize the study group.

Research Tool (Questionnaire)

Data were collected using an original, anonymous, structured questionnaire comprising 22 items. The questionnaire was developed for the purposes of the study and covered lifestyle and physical activity, meal frequency, snacking, food-label reading, familiarity with gluten-containing products and GRDs, sources of nutrition information, and reasons for choosing or trying gluten-free products. Familiarity with the terms “gluten” and “celiac disease” was based on participants’ declarations. Meal frequency was categorized as four to five meals, three meals, or two or fewer main meals per day, snacking as often/very often or occasionally/never, and food-label reading as yes or no. The question concerning gluten-free products referred to reasons for choosing or trying such products and did not distinguish between trying them once, occasional consumption and regular adherence to a GFD.

Ethical Considerations

The study was conducted using an anonymous, non-interventional questionnaire, and no directly identifying personal data were collected. Formal approval from an ethics committee was not obtained. Before participation, students were informed about the purpose of the study, the voluntary nature of participation, the confidentiality of their responses and their right to discontinue the questionnaire at any time without consequence. Verbal informed consent was obtained from all participants prior to questionnaire completion.

Data Collection Procedure

Paper questionnaires were administered during regular school hours. Teachers and the researcher supervised the procedure and clarified procedural instructions when necessary. The same administration approach was used across the five locations.

Statistical Analysis

Data were analyzed using descriptive statistics. Age is presented as mean $\pm$ standard deviation (SD), while categorical variables are reported as absolute numbers (n) and percentages (%).

Results

Characteristics of the Study Group

The study involved 169 high school students from the Greater Poland voivodeship. Their mean age was 17.71 ± 0.85 years. Females comprised 62.7% of the sample ($n = 106$), and males 37.3% ($n = 63$) (table 1).

Table 1. Socio-demographic profile of the participants ($N = 169$)

Parameter	Category	n	%
Gender	female	106	62.7%
	male	63	37.3%
Place of residence	village	23	13.6%
	town <50k inhabitants	84	49.7%
	town 50–100k inhabitants	36	21.3%
	city >250k inhabitants	26	15.4%
Household size	1–3 persons	56	33.1%
	4 persons	79	46.8%
	5 or more persons	34	20.1%

Source: Author's own work based on research.

Lifestyle, Physical Activity, and Consumer Behaviour

Half of the participants (50.3%; $n = 85$) reported physical activity three or more times per week. Food-label reading was declared by 47.9% ($n = 81$) of respondents (table 2).

Table 2. Physical activity and consumer awareness

Parameter	Category	<i>n</i>	%
Physical activity	≥3 times/week	85	50.3%
	2 times/week	43	25.4%
	once a week / only Physical Education in school	41	24.3%
Label reading	yes, I check ingredients	81	47.9%
	no	88	52.1%

Source: Author's own work based on research.

Dietary Habits and Meal Frequency

More than half of the participants (56.8%; $n = 96$) reported consuming two or fewer main meals per day. Frequent snacking (often or very often) was reported by 66.3% ($n = 112$) (table 3).

Table 3. Meal frequency and dietary patterns

Parameter	Category	<i>n</i>	%
Meal frequency	4–5 meals/day	18	10.7%
	3 meals/day	55	32.5%
	≤2 meals/day	96	56.8%
Snacking frequency	often/very often	112	66.3%
	occasionally/never	57	33.7%

Source: Authors' own work based on research.

Awareness of Gluten and Information Sources

Self-reported familiarity with the term “gluten” was declared by 49.1% ($n = 83$), whereas 39.0% ($n = 66$) reported familiarity with the term “celiac disease.” The Internet or social media was selected as the primary source of nutrition information by 52.6% ($n = 89$) of participants (table 4).

Table 4. Self-reported familiarity with gluten-related terms and declared primary information sources

Parameter	Category	<i>n</i>	%
Familiarity with “gluten”	yes	83	49.1%
Familiarity with “celiac disease”	yes	66	39.0%
Familiarity with “celiac disease” or “gluten”	no	20	11.9%
Primary information source	Internet/social media	89	52.6%
	healthcare professionals/books	40	23.7%
	school/family/other	40	23.7%

Source: Authors' own work based on research.

Motivations for Choosing Gluten-Free Products

In the full study group ($N = 169$), curiosity or willingness to try was the most frequently reported reason for choosing or trying gluten-free products (47.9%; $n = 81$). A medical indication was reported by 1.2% of participants ($n = 2$) (table 5).

Table 5. Reported reasons related to choosing or trying gluten-free products ($N = 169$)

Reported reason	<i>n</i>	%
Curiosity/willingness to try	81	47.9%
Medical indication	2	1.2%
Influence of family or friends	21	12.4%
Other/no specific reason	65	38.5%

Source: Authors' own work based on research.

Discussion

The results show that health-oriented behaviours coexisted with less favourable eating patterns in the study group. Approximately half of the participants reported regular physical activity or food-label reading, while 56.8% consumed two or fewer main meals per day and 66.3% reported frequent snacking. Similar patterns of irregular meal frequency and selective engagement in health-related behaviours have been described among adolescents (Moreno et al. 2010; Velardo 2015). These findings suggest that individual pro-health behaviours do not necessarily form part of a consistently balanced lifestyle and should be considered together in nutrition education.

Familiarity with the term “gluten” was 10.1 percentage points higher than familiarity with “celiac disease.” Although these declarations do not provide a detailed assessment of knowledge, they suggest that a widely used dietary term may be better recognized than the medical condition for which a GFD is essential. Educational activities should therefore explain the differences among CD, wheat allergy, and NCGS, as well as the medical indications for a GFD. This need is supported by studies showing substantial gaps in knowledge of gluten-free food selection among adolescents with CD, patients, and healthcare professionals (Crespo-Escobar et al. 2024; Pohoreski et al. 2023).

The Internet or social media was the most frequently indicated source of nutrition information (52.6%). This is consistent with the important role of digital media in adolescents' access to information about food, weight, and health (Holmberg et al. 2019). The result highlights the need to include digital health literacy in school-based nutrition education. Students should be taught how

to assess the author, evidence base, commercial purpose and medical relevance of online dietary claims.

Curiosity or willingness to try was the most common reason for choosing gluten-free products, whereas only two participants reported a medical indication. This agrees with reports that gluten-free products are frequently selected for reasons unrelated to a diagnosed GRD (Gaesser, Angadi 2012; Niland, Cash 2018). The wording of the questionnaire did not distinguish occasional experimentation from regular consumption; therefore, the result should not be interpreted as the prevalence of GFD adherence. Nevertheless, it shows that gluten-free products had attracted the interest of many students in the surveyed group. In a blinded trial involving adolescents and young adults with gastrointestinal symptoms, gluten did not increase gastrointestinal or mental health symptoms compared with placebo (Crawley et al. 2022), which further emphasizes the importance of avoiding unnecessary dietary restrictions without appropriate diagnosis.

The findings support educational activities that combine basic knowledge of GRDs with practical nutrition literacy. School-based education could explain when a GFD is medically required, distinguish treatment from occasional consumption of gluten-free products, and emphasize regular, balanced meals. Because the Internet and social media were commonly indicated as information sources, education should also address the reliability of online content and the difference between clinical recommendations and lifestyle marketing.

Study Limitations

Several limitations should be considered. The study included a relatively small regional sample, which limits the generalizability of the results. The data were self-reported and may have been affected by recall and social-desirability bias. The original questionnaire was not a standardized, validated instrument, and familiarity with the terms “gluten” and “celiac disease” was assessed through declarations rather than a detailed knowledge test. The analysis was descriptive and did not include comparisons between subgroups. In addition, the question concerning gluten-free products did not distinguish between a single trial, occasional consumption and regular adherence to a GFD. The data were collected in 2018 and should therefore be interpreted in their historical context, particularly because sources of online nutrition information have changed rapidly. The absence of ethics committee review and written parental or legal-guardian consent should also be regarded as a limitation.

Conclusions

Among the students surveyed here, irregular meal patterns and frequent snacking coexisted with regular physical activity and food-label reading. Familiarity with

CD was lower than familiarity with the term “gluten,” and the Internet or social media was the most frequently indicated source of nutrition information. Curiosity was the main reason for choosing or trying gluten-free products, while medical indications were rare. Although the data were collected in 2018, the findings identify educational needs related to GRDs, balanced eating and critical evaluation of online nutrition information.

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Author Contributions

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Formal analysis: T.W., O.D., K.S.

Investigation: O.D.

Data curation: T.W., O.D., K.S.

Writing – original draft: T.W., O.D.

Writing – review & editing: K.S.

Supervision: K.S.

Supplementary Materials

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Ethics Approval Statement

Ethical review and approval were not obtained for this study. The study involved an anonymous, non-interventional questionnaire, collected no directly identifying information, and posed no more than minimal risk to participants.

Informed Consent Statement

Participants were informed about the purpose and voluntary nature of the study, the confidentiality of their responses and their right to withdraw. Verbal informed consent was obtained before participation.

Data Availability Statement

The raw data supporting the conclusions of this article will be made available by the authors on request.

Declaration of Generative AI Use

During the preparation of this manuscript, the authors used ChatGPT (ver. 5.6 Sol) for language editing. The authors subsequently reviewed and edited the content and take full responsibility for the final version of the manuscript.

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Conflict of Interest Statement

The authors declare no conflict of interest.