ATTAHADI MEDICAL JOURNAL
Journal homepage:
http://attahadi.edu.ly/journal/index.php/amj/index

Evaluation of Community Pharmacists' Knowledge towards Celiac Disease

Ghufran Emhemmed[1], Mawda Alsgayer[1], Nisreen Ashour[1], Najat Almokdmi[2]*

[1]Department of Pharmaceutical Sciences, Tripoli Collage of Medical Sciences, Tripoli, Libya.
[2]Faculty of Pharmacy, Attahadi University of Medical Sciences, Tripoli, Libya.

Keywords:
Community Pharmacists, Celiac Disease, Knowledge, Tripoli.

Received *17 April 2024*
Accepted *05 June 2024*
Published *16 June 2024*

ABSTRACT

Celiac disease is one of the diseases in which patient follow-up and counseling are essential, and number of studies dealing with the roles of pharmacists in this disease is very limited. This study aims to fill this gap by evaluating community pharmacists' knowledge for celiac disease. A cross-sectional design using a convenient sample of 146 volunteer pharmacists in different regions of Tripoli was conducted over a period of three months from July to October. The questionnaire was divided into two sections: the first section consists five items, comprised basic demographic characterization of participants. The second section is about pharmacists' knowledge, included questions on 4 major domains of knowledge. A total 132 registered pharmacy practitioners respond to the survey. Majority of participants were female (93.2%) and aged between 22 - 31 years (62.9%), with 51.5% of pharmacists had an experience of more than 9 years. In general, Libyan Tripoli pharmacists were informed in the major topics related to CD, many of them still lack the very basic knowledge about this disease which could jeopardize the wellbeing of their patients. Specifically, many of the pharmacists acquired a high level of knowledge about causes ((98.5%) and complications of CD, yet they still lack the knowledge of distinguishing between CD and wheat allergy (79.5% vs. 20.5%). Results of our study showed that pharmacists holding higher degrees are more knowledgeable about CD than those holding a diploma degree. However, gender might affect CD knowledge since male pharmacists had higher mean knowledge scores than females.

Citation info. Emhemmed G, Alsgayer M, Ashour N, Almokdmi N. Evaluation of Community Pharmacists' Knowledge towards Celiac Disease. Attahadi Med J. 2024;1(2):15-21. https://doi.org/10.69667/amj.24201

INTRODUCTION

Celiac disease, defined by the Anatolian physician Aretaus in the second century, is known as wheat allergy and gluten sensitivity [1]. The incidence of celiac disease in adults is 0.1%, which is a disease that generally presents with findings such as urticaria, angioedema, nausea, and abdominal pain in children and gastrointestinal symptoms in adults [2]. It can also be described as an autoimmune disease that causes damage and inflammation in the small intestine in individuals with hypersensitivity to gluten [3].

Celiac disease can be congenital, or it can be seen especially in the 30s and 40s, depending on the individual's diet [4]. Gottlieb et al. mentioned new treatment approaches with drugs being developed recently, although a gluten-free diet is the only known and effective treatment for celiac disease [5]. According to Rajput and Molder et al., the worldwide prevalence of celiac is nearly 1 %, but the number of undiagnosed patients cannot be ignored [6,7].

As Lerner et al. mentioned, it is necessary to increase awareness of primary care sectors like physicians and dietitians to improve the detection rate of celiac disease and patient compliance [8]. In this regard, accurately informing and accurately directing individuals with celiac disease is also closely related to pharmacists, who are accepted as the closest and most accessible healthcare providers, and awareness of the disease's signs and symptoms. Therefore, pharmacists are expected to primarily provide healthy life support related to gluten-free nutrition, drugs, and nutritional supplements [9].

It is known that long-term vitamin and mineral supplements are recommended for celiac patients. Patients should be carefully monitored to determine whether existing nutritional deficiencies are being resolved and whether new deficiencies do not develop. Pharmacists should be able to cooperate with nutritionists in selecting the gluten-free nutritional supplements needed [10]. A study on pharmaceutical companies concluded that five out

*Corresponding E-mail addresses: natimoki@yahoo.com

of 100 companies have a policy that provides gluten-free status for their drugs and that most companies believe their products are gluten-free [11].

Pharmacists have an important role in counseling patients about the disease and how to manage symptoms. They will be sought out as drug experts for the disease state, as well as excellent resources for information about gluten-free foods and medications. Pharmacists must know about drug absorption and gluten content of pharmaceutical products, especially in celiac patients, and provide consultancy services to patients on these issues and increase their quality of life.

The knowledge and attitude of pharmacists play an essential role in the patient counseling services of pharmacists. Celiac disease is one of the diseases in which patient follow-up and counseling are essential, and the number of studies dealing with the roles of pharmacists in this disease is very limited. This study aimed to evaluate pharmacists' knowledge for celiac disease.

METHODS

Study design

A cross-sectional design using a convenient sample of 146 volunteer pharmacists in different regions of Tripoli was conducted over a period of three months from July to October 2023.

Study population and data collection

The target population was pharmacy professionals who have been working in pharmacies and drug stores. Eligible respondents were those who were Libyan nationals, willing to participate and provided verbal consent, filled and answered all questions. All participants were contacted and explained the purpose of the study, its nature, methodology and confidentiality. Random sample of 132 registered pharmacy practitioners respond to the survey.

The questionnaire was divided into two sections: the first section consists five items, comprised basic demographic characterization of participants, including age, gender, years of practice, education level and number of celiac patients per year. The second section is about pharmacists' knowledge, included questions on 4 major domains of knowledge including: causes, complications, diagnosis and nutritional management of CD consisting of 17 questions. There were multiple answers to each one of the questions included in each of the four domains, including some incorrect answers and the choice of "I don't know". Data was analyzed qualitatively by calculating the percentage of participants who answered that they were aware of each characteristic known to be associated with CD. Additionally, questions related to knowledge and attitude were grouped to generate overall scores. The overall knowledge scores were grouped according to age, gender, education level and experience of pharmacists. Correct answers were given a score of one (1), incorrect answers zero (0) and "unsure"or "I don't know" half a score (0.5). The average score of each answer for each question within each group of pharmacists was calculated. The maximum general score was 17 i.e., the total number of questions correctly answered.

Statistical analysis

Statistical analyses were performed using SPSS version 20.0 software. Categorical variables were summarized by descriptive statistics, including total numbers and percentages. Significance was analyzed using a Chi-Square test. Continuous variables were summarized by the mean and standard deviation (SD), with significant differences between two categories analyzed using the Mann-Whitney U-test. A p-value of less than 0.05 was considered statistically significant.

RESULTS AND DISCUSSION

Demographic characteristics of the selected sample of pharmacists

A total of 132 completed questionnaires were returned i.e., 90% response rate. Descriptive data and demographic characteristics of the studied sample are presented in table 1.

Majority of participants were female (93.2%) and aged between 22 - 31 years (62.9%), with 51.5% of pharmacists had an experience of more than 9 years. The pharmacists participating in the study are generally experienced, and more than half of them fill more than five celiac patient prescriptions in a year.

Pharmacists' knowledge about the causes and complications of CD

Table 3 shows the pharmacists' knowledge about causes and the associated complications of CD. The majority of the pharmacists in our sample (98.5%) were able to correctly identify the major cause of CD. ($P \leq 0.01$). However, a significantly high percentage (79.5% vs. 20.5%) of respondents confused CD with wheat allergy ($P \leq 0.01$). The main dissimilarity between both conditions is that wheat allergy is an IgE-mediated reaction to the ω-5 fraction of gliadin found only in wheat [12] while CD is caused by an immune response to all prolamins (wheat gliadin, barley hordein, rye secalin and oat avenin).

Therefore, unlike CD patients, people with a wheat allergy do not have to avoid oats, rye and barley containing foods. However, a significantly ($P \leq 0.01$) high percentage (52.3 %) of pharmacists were aware

of the CD cause "Gliadin" compared to "Lecithin", "Collagen", and "Ceruloplasmin" (19.7%, 9.1 % and 6 %, respectively).

Table 1. Demographic characteristics of pharmacists (n=132)

Characteristics	Frequency	%
Gender		
Male	9	6.8
Female	123	93.2
Age		
22-31y	83	62.9
32-41y	39	29.5
≥ 42y	10	7.6
Years of practice		
< 5	43	33.6
6-9	21	15.9
> 9	68	51.5
Education level		
Diploma	53	40.1
Bachelor's degree	67	50.8
Master's degree	12	9.1
Number of celiac patients per year		
< 5	62	47.0
6-19	33	25.0
>20	37	28.0

Table 3. Pharmacists' knowledge about causes and complications of CD (n=132)

Questions and their provided answering choices	NO	%	P-value
1. CD is caused due to an immunological reaction to			
Albumin	0	0	0.000
Globulin	2	1.5	
Gluten, gliadin / prolamine	130	98.5	
2. CD is a food allergy:			
Yes	105	79.5	0.01
No	27	20.5	
3. The type of glycoprotein found in wheat mainly causes CD:			
Gliadin	69	52.3	0.000
Lecithin	26	19.7	
Collagen	12	9.1	
Ceruloplasmin	8	6	
Do not know	17	12.9	
4. Gluten is a type of carbohydrate that reacts with CD and gluten-sensitive patients:			
True	56	42.5	0.09
False	76	57.5	
5. There are other diseases associated with CD.			
True	105	79.5	0.000
False	27	20.5	
6. Diseases that can develop if CD is not treated			
Cancer of the lymph nodes	14	10.6	0.00
Osteoporosis	34	25.8	
Thyroid disease	13	9.9	
All of the above	65	49.2	
Do not know	6	4.5	
7. CD can cause anemia			
True	109	82.6	0.00
False	23	17.4	
Highly significant (P ≤ 0.05) according to Chi-Square test			

The answer indicates that the majority of participants acquired a high level of knowledge regarding the main cause of CD. However, of the 132 pharmacists, those who chose "False" for the statement "Gluten is a type of carbohydrate that reacts with patients with celiac and gluten-sensitive patients" constituted high but not significant (P> 0.05) percentage (57.5%) than those who chose "True" (42.5%).

Table 2 also shows the pharmacists' knowledge about complications of CD. The percentage of pharmacists who correctly answered the question "whether CD is associated with other diseases or not" was significantly higher (79.5 %) than those who did not (20.5 %) (P ≤ 0.01). CD is linked to many diseases and health conditions such as malignancies [13], ecchymosi and petechia (lack of vitamin K), osteoporosis [14], anemia [15] secondary hyperparathyroidism, osteomalacia and hemorrhage (due to malabsorption of vitamin K) [16], in addition to infertility and spontaneous and recurrent abortions [17]. Approximately 49.2 % of the participants were aware of all possible CD-associated diseases and complications, similarly, the percentage of participants who correctly identified a single disease/complication including osteoporosis, cancer of the lymph nodes, thyroid disease was (25.8 %, 10.6% and 9.9 %, respectively; P ≤ 0.01). However, only 4.5 % of the participants were not aware of any of these diseases and complications.

CD patients are highly susceptible to the development of malignancy with 8-10% risk rate. The disease is also highly associated with lymphoproliferative malignancy, Osteoporosis [13] hyperparathyroidism and hypocalcaemia [14] which could develop in CD patients due to malabsorption of calcium and or vitamin D. Also, CD patients show a 3-fold increased risk of non-Hodgkin's lymphoma [18] and other types of malignancies [13]. They also should be monitored for common complications, including neurologic complaints and the development of other autoimmune diseases, especially of the thyroid and liver [19,20].

Our findings indicate that the respondents acquired a good level of knowledge when it comes to the types of diseases that may accompany CD. Likewise, a highly significant percentage (82.6 %) of pharmacists recognized that CD can cause anemia (P ≤ 0.01), which indicates that most of them know the relationship between CD and anemia. Anemia is a common haematological disorder of CD which is not resolved by iron therapy [14] and results from the malabsorption of iron, folic acid and vitamin B 12 or loss of the gastrointestinal blood in patients with total villous atrophy [21].

Assessment of pharmacists' knowledge about the diagnosis of CD.

Among pharmacists, a percentage of 62.1% was knowledgeable about the techniques used for the screening and diagnosis of CD, whereas 37.9 % of them had no idea about these techniques.

Participants were also asked about the most reliable test for diagnosing CD. The highest percentage of participants (40.9 %) significantly (P ≤ 0.01) chose the answer "antibody testing" compared to 39.4% who answered "Biopsy of the twelve tissues "and 12.1% checked the choice "Genetics". On the other hand, the lowest percentage of participants (0.8%) checked the answer "Diagnosis of the iris". Only 6.8 % had no idea about the most reliable test for diagnosing CD.

CD is characterized by varying degrees of atrophy of the intestinal mucosa, with reduced height, or complete disappearance of the villi [22]. This may explain the controversial answers of participants.

Of all respondents (61.4%), regardless of study group, chose the incorrect responses stating that they recommended a change in diet to people suspected with celiac disease before the diagnosis was confirmed. More pharmacists 38.6% (n=51) reported never recommending a change in diet to those suspected to have the disease before the diagnosis was confirmed (*p*=.008).

Table 4. pharmacists' knowledge about CD diagnosis (n=132)

Questions and their provided answering choices	**NO**	**%**	**P-value**
8. Screening/diagnosis techniques of CD			
Yes	82	62.1	0.01
No	50	37.9	
9. The most reliable test (100%) in CD diagnosis:			
Antibody testing	54	40.9	0.000
Genetics	16	12.1	
Iris diagnosis	1	0.8	
Biopsy of the twelve tissues	52	39.4	
Do not know	9	6.8	
10. pharmacists recommended a change in diet to people suspected with celiac disease before the diagnosis was confirmed.			
Yes	81	61.4	0.008
No	51	38.6	
Highly significant (P ≤ 0.01) according to Chi-Square test			

Assessment of pharmacists' knowledge about the management of the CD.

Dietary modifications and GFD approach constitute the only available current treatment for CD. Information on GFD and dietary adherence is crucial and should be provided in collaboration with a dietitian [23]. In this context, almost all pharmacists (98.5%) in our sample were able to identify the best treatment approach of CD indicating their high level of knowledge about CD treatment. In contrast, only 1.5 % of respondents in our sample were not able to correctly identify the best treatment approach of CD and considered "Antibiotics" as the best treatment method, which indicates grave lack of basic knowledge of the way CD is managed (Table 4). The gluten-free diet is the only proven treatment for CD as it results in improving the symptoms and complications that accompany the disease [24].

The present study also examined the pharmacists' knowledge about foods that should be avoided by CD patients and their ability to read and interpret food labels. Almost all pharmacists in our study (95.4%) were able to correctly classify three (3) listed food/grains and cereal foods including barley, macaroni and crispy biscuits made with wheat flour as items that should be avoided by CD patients. However, only 3.8 % of participants considered only "Crispy biscuits made with wheat flour" as an item that should be avoided (P ≤ 0.01) (Table 5).

All forms of wheat and wheat milling products and byproducts must be avoided by CD patients including wheat bran, wheat starch, wheat germ, emmer wheat, einkorn wheat, farina, semolina, durum wheat, graham flour, spelt wheat, faro, gluten, wheat bread, gliadin and cracked wheat [23]. In addition to some locally-consumed products like Burghul, Couscous, Maftool, Farikah, Middle eastern sweets and pastries etc. Avoidance of all these food items by CD patients is a must [25].

A very high percentage of pharmacists in our sample successfully and correctly identified food items that should be avoided by CD patients. This indicates that most of our selected sample of Libyan phatmacists have a high level of knowledge when it comes to food products that should be avoided by CD patients. Although all grain products contain prolamins (including rice), only the prolamins in wheat, rye and barley are confirmed to cause the immunological reactions to CD [26]. Thus, the rice should not be avoided in the CD diet. Accordingly, the proportion of respondents (80%) in our sample who were able to classify rice correctly was significantly higher than those (~ 20%) who did not (P ≤ 0.01).

The rate of pharmacists following current developments in the treatment of celiac disease was also discussed, and it was determined that this rate was low (5.3%). Different treatment approaches are discussed in various studies in the literature, and it is important to follow current developments and to have information about alternative treatment methods for celiac disease. In this context, it is thought that by integrating current treatment approaches with systems such as electronic drug information resources, which are frequently used in pharmacies, it will be easier for pharmacists to access this information and the frequency of counselling practices related to celiac disease can be increased.

62.3 % (n=82) of respondents correctly selected natural flavouring and/or starch of unknown origin as excipients in non-prescription and prescription medications that may be a problem for patients with celiac disease if ingested. Comparatively, only 37.7 (n=50%) of pharmacists able to correctly identify the excipients that may pose a problem (*p*=.011). The maximum gluten level allowed in food to be labelled gluten-free is "20 ppm" [20]. Significant (P ≤ 0.01) percentage of participants (83.4 %) did not correctly identify the maximum gluten level allowed in food labelling as compared to only (8.3%) of those who accurately did (P ≤ 0.01). This indicates that most

participants lack the knowledge about nutrition labelling according to FDA.

Knowledge of about the ability of the selected sample of Libyan pharmacists to identify unsafe ingredients in a food label was also examined. Respondents who were not sure about the correct information regarding unsafe components in a food label represented the highest significant (P ≤ 0.05) proportion of the sample (81.8%).

(P ≤ 0.05). Only 6.1 % of the participants were not able to correctly identify whether a food product provides unsafe ingredients or not from a provided food label. The ingredients that usually appear on the labels of food products that contain or may contain gluten are whole - grain cereals, flour, modified starch, starch, fibre, thickeners, semolina, protein, vegetable protein, hydrolysed protein, malt, malt extract, yeast or yeast extract, spices and aromas [27]. Most pharmacists were not sure about the list of ingredients that should be avoided indicating their lack of knowledge when it comes to the unsafe ingredients and food chemistry. Again, this could have grave consequences on patients who resort to these pharmacists for advice.

Table 5. Pharmacists' knowledge of the nutritional management of CD (n=132)

Questions and their provided answering choices	NO	%	P-value
11. Treatment approach of CD:			
□ Antibiotics	2	1.5	0.000
□ Surgical operation	0	0	
□ Change in diet	130	98.5	
□ Radiation therapy	0	0	
12. CD patients should completely avoid the following:			
□ Barley	1	0.8	0.000
□ Macaroni	0	0	
□ Crispy biscuits made with wheat flour	5	3.8	
□ All of the above	126	95.4	
13. Are dried potatoes, corn oil, sea salt, natural flavors, sucrose, fructose, spices, wheat flour, tomato paste, grapefruit, maltodextrin and citric acid unsafe ingredients in the celiac diet information card			
□ True	8	6.1	0.000
□ False	16	12.1	
□ Not sure	108	81.8	
14. Pharmacists identify the excipients in non-prescription and prescription medications that may be a problem for patients with celiac disease if ingested			
□ True	82	62.1	0.01
□ False	50	37.9	
15. Pharmacists follow current developments in the treatment of celiac disease			
□ True	7	5.3	0.000
□ False	125	94.7	
16. To check if a medication contains gluten. I would			
□ Contact the manufacturer	33	25.1	0.12
□Check the package insert	33	24.9	
□Look at the bottle labeling.	32	24.6	
□All of the above	34	25.4	
17. FDA guidelines of "Gluten Free" food labeling			
□ 5 ppm	19	14.5	0.000
□ 10ppm	21	15.9	
□ 20ppm	11	8.3	
□ 0ppm	70	53	
□ Do not know	11	8.3	

Assessment of pharmacists' knowledge overall scores about CD according to their demographic indicators

Table 6 shows the mean knowledge scores of a pharmacist about their demographic characteristics. Results indicate that there are no significant differences (P> 0.05) in mean knowledge scores of the respondents to their different age, gender and/or experience. However, as expected, it was noticed that pharmacists holding university degrees (Master's and Bachelor's degree) had significantly (P ≤ 0.01) exhibited higher mean knowledge scores than those holding a diploma degree (9.9± 1.3 and 9.3± 1.3 vs. 8.7 ± 1.4, respectively). Other workers [28,29], female pharmacists to have lower knowledge scores compared to males. Furthermore, pharmacists in the age group of 42 years or older had higher, though not significantly, general knowledge scores than younger ones probably due to their long experience in the field rather than age.

Table 6. Mean overall knowledge scores of pharmacists according to their demographic data

Characteristics	**Knowledge Score Mean ± SD**	**P-value**
Gender		
Male	9.8± 0.5	0.08
Female	9.1±1.4	
Age		
22-31y	9.1± 1.3	0.40
32-41y	9.0 ± 1.6	
≥ 42y	9.4 ± 1.5	
Years of practice		
< 5	9.0 ± 1.4	0.96
6-9	9.1 ± 1.0	
> 9	9.1 ± 1.5	
Education level		
Diploma	8.7± 1.4	0.00
Bachelor's degree	9.3± 1.3	
Master's degree	9.9± 1.3	

CONCLUSION

To our knowledge, this is the first study to assess the knowledge of Libyan pharmacists as evaluated by a validated KAP model. The present study revealed that although, in general, Libyan Tripoli pharmacists were informed in the major topics related to CD, many of them still lack the very basic knowledge about this disease which could jeopardize the wellbeing of their patients. Hence, it highlights the need for training programs aiming to improve dietary counselling in CD management.

REFERENCES

1. Lebwohl B, Ludvigsson JF, Green PH. Celiac disease and non-celiac gluten sensitivity. BMJ. 2015 Oct 5;351:h4347. doi: 10.1136/bmj.h4347.
2. Sevinç E, Çetin FH, Coşkun BD. Psychopathology, quality of life, and related factors in children with celiac disease. J Pediatr (Rio J). 2017 May-Jun;93(3):267-273. doi: 10.1016/j.jped.2016.06.012.
3. Fera T, Cascio B, Angelini G, Martini S, Guidetti CS. Affective disorders and quality of life in adult coeliac disease patients on a gluten-free diet. Eur J Gastroenterol Hepatol. 2003 Dec;15(12):1287-92. doi: 10.1097/00042737-200312000-00006.
4. Ravikumara M, Tuthill DP, Jenkins HR. The changing clinical presentation of coeliac disease. Arch Dis Child. 2006 Dec;91(12):969-71. doi: 10.1136/adc.2006.094045.
5. Gottlieb K, Dawson J, Hussain F, Murray JA. Development of drugs for celiac disease: review of endpoints for Phase 2 and 3 trials. Gastroenterol Rep (Oxf). 2015 May;3(2):91-102. doi: 10.1093/gastro/gov006.
6. Makharia GK, Chauhan A, Singh P, Ahuja V. Review article: Epidemiology of coeliac disease. Aliment Pharmacol Ther. 2022 Jul;56 Suppl 1:S3-S17. doi: 10.1111/apt.16787.
7. Molder A, Balaban DV, Jinga M, Molder CC. Current Evidence on Computer-Aided Diagnosis of Celiac Disease: Systematic Review. Front Pharmacol. 2020 Apr 16;11:341. doi: 10.3389/fphar.2020.00341.
8. Miller FW. The increasing prevalence of autoimmunity and autoimmune diseases: an urgent call to action for improved understanding, diagnosis, treatment, and prevention. Curr Opin Immunol. 2023 Feb;80:102266. doi: 10.1016/j.coi.2022.102266.
9. Sverker A, Ostlund G, Hallert C, Hensing G. Sharing life with a gluten-intolerant person--the perspective of close relatives. J Hum Nutr Diet. 2007 Oct;20(5):412-22. doi: 10.1111/j.1365-277X.2007.00815.x.
10. Mangione RA, Patel PN. Caring for patients with celiac disease: the role of the pharmacist. J Am Pharm Assoc (2003). 2008 Sep-Oct;48(5):e125-35; quiz e136-9. doi: 10.1331/JAPhA.2008.08014.
11. Crowe JP, Falini NP. Gluten in pharmaceutical products. Am J Health Syst Pharm. 2001 Mar 1;58(5):396-401.
12. Mumolo MG, Rettura F, Melissari S, Costa F, Ricchiuti A, Ceccarelli L, de Bortoli N, Marchi S, Bellini M. Is Gluten the Only Culprit for Non-Celiac Gluten/Wheat Sensitivity? Nutrients. 2020 Dec 10;12(12):3785. doi: 10.3390/nu12123785.
13. Pelizzaro F, Marsilio I, Fassan M, Piazza F, Barberio B, D'Odorico A, Savarino EV, Farinati F, Zingone F. The Risk of Malignancies in Celiac Disease-A Literature Review. Cancers (Basel). 2021 Oct 21;13(21):5288. doi: 10.3390/cancers13215288.
14. Corazza GR, Villanacci V. Coeliac disease. J Clin Pathol. 2005 Jun;58(6):573-4. doi: 10.1136/jcp.2004.023978.
15. Gnodi E, Meneveri R, Barisani D. Celiac disease: From genetics to epigenetics. World J Gastroenterol. 2022 Jan 28;28(4):449-463. doi: 10.3748/wjg.v28.i4.449.
16. Gnodi E, Meneveri R, Barisani D. Celiac disease: From genetics to epigenetics. World J Gastroenterol. 2022 Jan 28;28(4):449-463. doi: 10.3748/wjg.v28.i4.449.
17. Casella G, Orfanotti G, Giacomantonio L, Bella CD, Crisafulli V, Villanacci V, Baldini V, Bassotti G. Celiac disease and obstetrical-gynecological contribution. Gastroenterol Hepatol Bed Bench. 2016 Fall;9(4):241-249.
18. Bascuñán KA, Vespa MC, Araya M. Celiac disease: understanding the gluten-free diet. Eur J Nutr. 2017 Mar;56(2):449-459. doi: 10.1007/s00394-016-1238-5.
19. Jackson JR, Eaton WW, Cascella NG, Fasano A, Kelly DL. Neurologic and psychiatric manifestations of celiac disease and gluten sensitivity. Psychiatr Q. 2012 Mar;83(1):91-102. doi: 10.1007/s11126-011-9186-y.
20. Kaukinen K, Halme L, Collin P, Färkkilä M, Mäki M, Vehmanen P, Partanen J, Höckerstedt K. Celiac disease in patients with severe liver disease: gluten-free diet may reverse hepatic failure. Gastroenterology. 2002 Apr;122(4):881-8. doi: 10.1053/gast.2002.32416.
21. Naegeli H, Birch AN, Casacuberta J, De Schrijver A, Gralak MA, Guerche P, et al. Guidance on allergenicity assessment of genetically modified plants. EFSA J. 2017 Jun 22;15(6):e04862. doi: 10.2903/j.efsa.2017.4862.
22. Zanchetta M, Longobardi V, Bai J. Bone and Celiac Disease. Curr Osteoporos Rep. 2016 Apr;14(2):43-8. doi: 10.1007/s11914-016-0304-5.
23. Ludvigsson JF, Card T, Ciclitira PJ, Swift GL, Nasr I, Sanders DS, Ciacci C. Support for patients with celiac disease: A literature review. United European Gastroenterol J. 2015 Apr;3(2):146-59. doi: 10.1177/2050640614562599.
24. Pietzak M. Celiac disease, wheat allergy, and gluten sensitivity: when gluten free is not a fad. JPEN J Parenter Enteral Nutr. 2012 Jan;36(1 Suppl):68S-75S. doi: 10.1177/0148607111426276.
25. Rai S, Kaur A, Chopra CS. Gluten-Free Products for Celiac Susceptible People. Front Nutr. 2018 Dec 17;5:116. doi: 10.3389/fnut.2018.00116.
26. Caeiro C, Pragosa C, Cruz MC, Pereira CD, Pereira SG. The Role of Pseudocereals in Celiac Disease: Reducing Nutritional Deficiencies to Improve Well-Being and Health. J Nutr Metab. 2022 Feb 9;2022:8502169. doi: 10.1155/2022/8502169.

27. Abdi F, Zuberi S, Blom JJ, Armstrong D, Pinto-Sanchez MI. Nutritional Considerations in Celiac Disease and Non-Celiac Gluten/Wheat Sensitivity. Nutrients. 2023 Mar 19;15(6):1475. doi: 10.3390/nu15061475.
28. Al-Herz W, Husain K, Al-Khabaz A, Moussa MA, Al-Refaee F. Awareness of food allergies: a survey of pediatricians in Kuwait. BMC Pediatr. 2017 Jan 11;17(1):11. doi: 10.1186/s12887-016-0773-9.
29. Alsaffar AA. Validation of a general nutrition knowledge questionnaire in a Turkish student sample. Public Health Nutr. 2012 Nov;15(11):2074-85. doi: 10.1017/S1368980011003594