

Physicians awareness of Celiac disease screening in high risk pediatric age groups in King Abdulaziz Medical City, National Guard Health Affairs, Riyadh, Saudi Arabia

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Abstract

Background: Celiac disease (CD) is an autoimmune disease triggered by a permanent sensitivity to gluten, causing a significant disturbance to the small intestines and multiple other organs. We aim in this study to assess physicians' knowledge, practice and attitude towards celiac disease screening. Assessing the physicians' knowledge will help us to understand how we can improve the practice regarding celiac disease.

Methodology: A cross-sectional study using a validated questionnaire from previous studies distributed electronically among primary care and pediatric physicians. The questionnaire consisted of: 7 questions about physicians characteristics, 15 questions about knowledge, 15 questions about attitude and 5 practice questions. Respondents were asked to identify any queries they had about the questions. Time needed to fill the questionnaire was approximately 10 minutes.

Results: The final sample was 264 participants with mean age of 32.31 years old where 79.9 % of the participants were aged under 40 years old. Moreover, 52.3 % of the participants were females. Considering specialty, we found that 48.5 % of the participants were family medicine physicians while 47.0 % were general pediatrics. Chronic/ intermittent diarrhea and weight loss were the most commonly known symptoms among the participants (85.1 % and 85.6 % respectively) followed by abdominal pain (78.1 %). Considering the best first line screening tool of celiac disease, 78.1 % of the participants

successfully identified Anti-tissue transglutaminase antibody and 85.6 % of them were able to identify bowel biopsy as the best tool in order to confirm the diagnosis of CD, however only 20.9 % correctly identified Anti-endomysium antibody as the best tool for follow-up.

Conclusion: We found that there is a deficiency in knowledge about CD among physicians with no significant difference between pediatrics and family medicine physicians. The physicians had moderate knowledge considering symptoms and risk factors of CD with good knowledge considering the diagnosis tool. More educating courses should be provided to the physicians about the diagnosis and management of CD.

Key words: awareness, Celiac disease, pediatric age group, Saudi Arabia

Introduction

Celiac disease (CD) is an autoimmune disease triggered by a permanent sensitivity to gluten, causing a significant disturbance to the small intestines and other multiple organs. Celiac arises in people carrying the class II alleles HLA-DQ2 or HLA-DQ8. It is characterized by a variable combination of elevated titers of celiac-specific autoantibodies, leading to inflammatory enteropathy with various gastrointestinal and extra-intestinal manifestations [1,2].

It is considered one of the most common autoimmune diseases worldwide, with a prevalence of 0.5-1% of the general population of the world [3]. Furthermore, the prevalence of celiac among the general healthy Arab adult population was found to range from 0.14% to 3.2%, with Saudi Arabia having the highest prevalence (3.2%) and Tunisia being the lowest (0.14%). In Arab children, the estimated prevalence was found to be ranging from 0.6% to 1.5%. Studies conducted in Saudi Arabia estimated the disease's frequency in children to be 1:250-100. A Meta-Analysis of Prevalence of Celiac disease in Saudi Arabia showed that the highest prevalence of CD in Saudi Arabia was in Al-Qaseem region (3.2%). However, Riyadh and Jeddah had the least prevalence (1.5%) [4].

Celiac disease can present at any age starting from early childhood to adulthood, with two peaks of onset; one occurs after weaning from gluten in the first two years, and the other one in the second or third decades of life [3]. In general, celiac can present with the "classical triad" symptoms such as chronic diarrhea, weight loss, and abdominal bloating. Some patients can present with atypical "non-classic" symptoms such as abdominal pain, chronic migraine, anemia, and others [1,5,6]. The absence of the classic symptoms led to celiac disease being significantly under diagnosed [4].

There are specific risk groups in which celiac is common. These risk groups include individuals with diabetes mellitus type 1 with a prevalence range from 5.5% to 20%, autoimmune thyroiditis, Down's syndrome, Turner syndrome, and first and to a lesser extent second relatives of celiac patients [4,7,8]. About 50% of the children with a first degree relative with CD develop the disease at the age of three years [7].

A study done in the eastern region of Saudi Arabia stated that gastroenterologists diagnosed about 56% of celiac patients, while other physicians 33%, and primary healthcare physicians diagnosed about 10% of the cases [5]. It has been proven that primary health care physicians' play an essential role in detecting patients' celiac disease earlier. Therefore, instructing primary health care physicians about celiac disease screening and diagnosis is crucial [9]. A study done at King Khalid University Hospital and King Saud University to assess the knowledge of CD among the medical professionals showed poor knowledge and the need to improve awareness of CD in the healthcare profession and the public too [9].

In 2018, a study was done in the US among general physicians which found that physicians tend to order unnecessary celiac serological testing, and that is overutilization of hospital resources. Also, it may lead to a false-positive result in which physicians tend to ask for a more diagnostic test, start the patient on a specific diet, and treat as a celiac disease patient [10]. In many studies, the biopsy-sparing approach showed decreases in the rate of complications of anesthesia and cost. European Society of Pediatrics Gastroenterology, Hepatology, and Nutrition (ESPGHAN) 2012 guidelines recommended against biopsy if:

- TGA-IgA is ten times more than the upper limit of normal.
- EMA-IgA test is positive in the second blood sample.
- HLA DQ 2 or DQ8 is detected [1,11].

In fact, there is little evidence from the United States Task Force about the benefits or harm of celiac screening in asymptomatic individuals. They recommend further studies to recognize the ideal screening approach and its value [11].

However, in 2018, a study conducted in New York determined the overall poor adherence to the guidelines of screening celiac disease. Additionally, it showed that if we educate the primary health care physician about the importance of testing first-degree relatives, we might increase the adherence to the guidelines [10]. On the other hand, 75 to 90% of celiac patients in western countries are unrecognized. This under diagnosis may happen due to the physician's poor awareness of the variety of the clinical presentations of celiac disease [12]. Late diagnosis has shown to have greater morbidity and mortality than the general population [3,5,7,13]. Delay in diagnosis can lead to a variety of complications such as intestinal lymphoma, small bowel adenocarcinoma, refractory celiac disease, and others [3]. Besides, it may also predispose to a low quality of life [13].

We aim in this study to assess physicians' knowledge, practice and attitude towards celiac disease screening. Moreover, we aimed to compare between specialties considering their knowledge of celiac disease screening. Assessing the physicians' knowledge will help us to understand how we can improve the practice regarding celiac disease.

Material and Methods

Study Area/Setting:

All King Abdulaziz Medical City, National Guard Health Affairs in Riyadh, Saudi Arabia and related Primary Health Care Centers (Health Care Specialty Center, King Abdulaziz City Housing, King Saud City Housing, National Guard Comprehensive Specialized Clinic, Prince Bader Residential City Clinic)

Study Subjects:

All physicians working in KAMC-NGHA from family medicine and pediatrics (Resident, Staff, Consultants) were included in the study. Pediatrics gastroenterologists and physicians who have a child with celiac disease were excluded.

Study Design:

A cross-sectional study using a validated questionnaire from previous studies was distributed electronically among primary care and pediatric physicians. It is a quantitative, observational cross-sectional study.

Sample Size:

412 physicians were included in this study; 276 Family Medicine physicians, 67 residents, 55 Consultants, and 154 Staff Physicians, in addition to, 136 Pediatric physicians, 103 residents, 23 General pediatrics consultants, and 10 Pediatricians working under the family medicine department. The total number of physicians was 412. We targeted all the study population without sampling. We assumed a total physician population of 1000 for the sake of the statistical significance. Sample size is 278 with CI 95% using the equation $Sample\ size\ n = [DEFF * Np(1-p)] / [(d2/Z21-\alpha/2*(N-1)+p*(1-p)]$. We used 50% anticipated frequency, 5% confidence interval and 1 for design effect.

Data Collection Methods, Instrument Used, Measurements:

An online survey was distributed by e-mail. The questionnaire was constructed by the authors of this study after extensive literature research. The validity of the questionnaire was ensured by exploring extensive literature review that addressed the topic of the study. After constructing the questionnaire, it was reviewed by 2 experts in the field of family medicine and pediatrics.

The questionnaire consisted of: 7 questions about physicians characteristics, 15 questions about knowledge, 15 questions about attitude and 5 practice questions. Respondents were asked to identify any queries they had about the questions. Time needed to fill the questionnaire was approximately 10 minutes.

Data Management and Analysis Plan:

Data was stored in Excel file electronic version; data was revised for errors. Excel files were stored in a password protected folder. Only the investigators had access to the data. Data was analyzed using Statistical Package for the Social Sciences (SPSS). All statistical tests were conducted at significance level ($\alpha=0.05$). Quantitative

variables were reported in the form of mean and standard deviation. T-test and ANOVA were used to compare means. Qualitative variables, were in the form of frequency and percentages. Chi-square was used to compare categorical variables.

Results

The total collected sample was 372 responses, however, 108 responses were excluded because they were a gastroenterologist, or one of their children had been diagnosed with celiac disease and because they were outside the Riyadh region. Therefore, the final sample was 264 participants with mean age of 32.31 years old where 79.9 % of the participants were aged under 40 years old. Moreover, 52.3 % of the participants were females. Considering specialty, we found that 48.5 % of the participants were family medicine physicians while 47.0 % were general pediatrics. Moreover, 61.4 % of the participants were residents while 17.8 % of them were consultants. Furthermore, 60.6 % of the participants reported that primary health care was their practice setup while 39.4 % reported specialized pediatric clinics. Only 15.2 % of the participants reported using guidelines for the diagnosis and treatment of celiac disease where 35 % of them used ACG while 17.5 % used British society of gastroenterology guidelines (Table 1).

Considering the knowledge of the participants about the symptoms of celiac disease, we found that chronic/intermittent diarrhea and weight loss were the most commonly known symptoms among the participants (85.1 % and 85.6 % respectively) followed by abdominal pain (78.1 %) with no great difference between the different specialty of the participants. However, only 28.4 % and 27.9 % knew that recurrent nausea, recurrent vomiting and chronic constipation are symptoms of celiac disease. On the other hand, 13.5 % of the participants falsely thought that acute bloody diarrhea is one of celiac disease's symptoms. Moreover, considering the difference between the different specialty of participants, we found that the general practitioners had the lowest knowledge considering the main three symptoms including chronic diarrhea (80.0 %), weight loss (70.0 %) and abdominal pain (60 %) while the pediatric physicians had the highest level of knowledge (Figure 1).

Moreover, weight loss was the most common clinical situations that raise the suspicion of celiac disease in a pediatric patient for 70.4 % of the participants, followed by stunted growth/short stature (63.3 %), and unresponsive iron-deficiency anemia (50.7 %). On the other hand, more than half of the sample failed to identify other situations. Considering the difference between specialties, we found that pediatrics tend more to consider weight loss as common symptoms that increased suspicion of CD, higher than other specialties, stunted growth/short stature for general practitioners and unresponsive iron-deficiency anemia for family medicine physicians (Figure 2).

Table 1: The general characteristics of the participants

		Count	Column N %
Age category	< 40	211	79.9 %
	> 40	53	20.1 %
Gender	Male	126	47.7%
	Female	138	52.3%
Specialty:	Family Medicine	128	48.5%
	General Practitioner	12	4.5%
	General Pediatrics	124	47.0%
Position:	Resident	162	61.4%
	Staff	29	11.0%
	Associate consultant	11	4.2%
	Assistant consultant	15	5.7%
	Consultant	47	17.8%
What is your practice setup?	Primary health care	160	60.6%
	Specialized pediatric clinics	104	39.4%
Did you use any guidelines for the diagnosis and treatment of celiac?	Yes, (please specify)	40	15.2%
	No	224	84.8%
Yes, (please specify)	AAFP	6	15 %
	ACG	14	35 %
	British Society of Gastroenterology	7	17.5 %
	Other	13	32.5 %

Figure 1: The knowledge of the participants considering symptoms of celiac disease

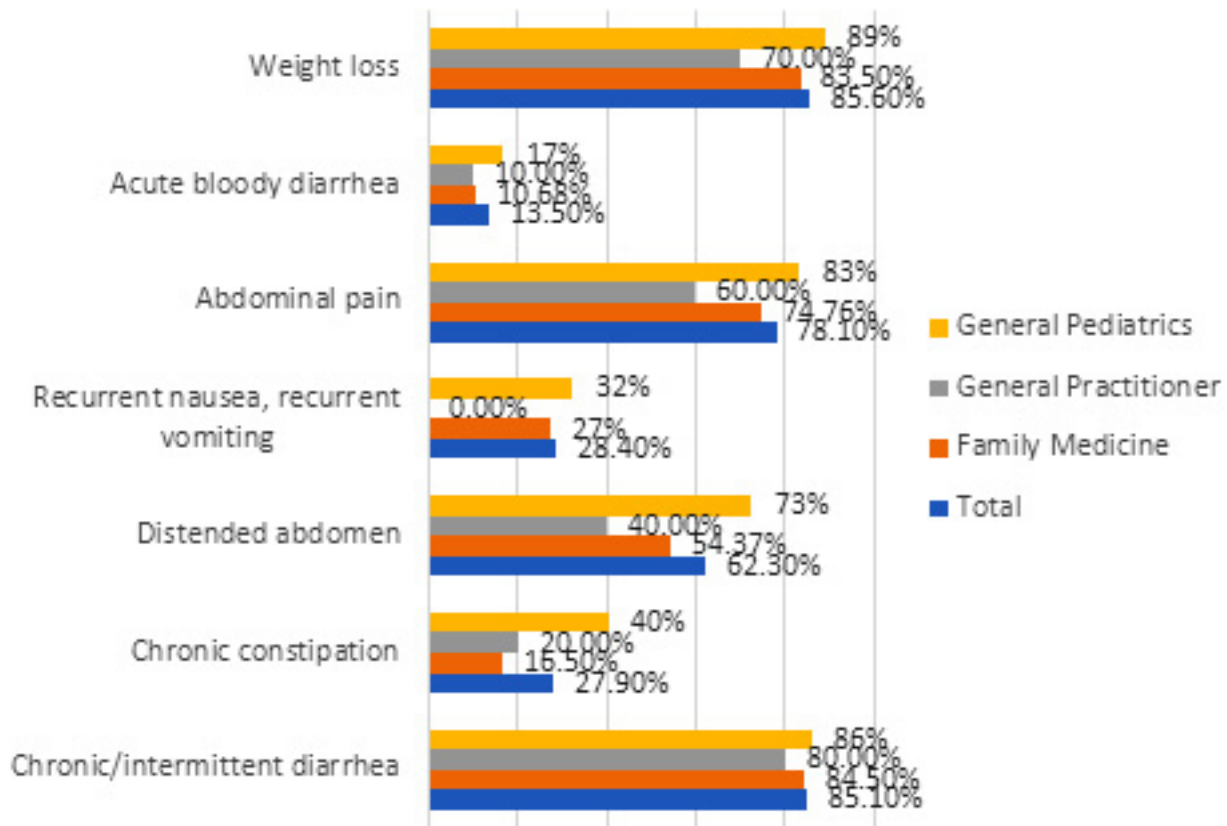
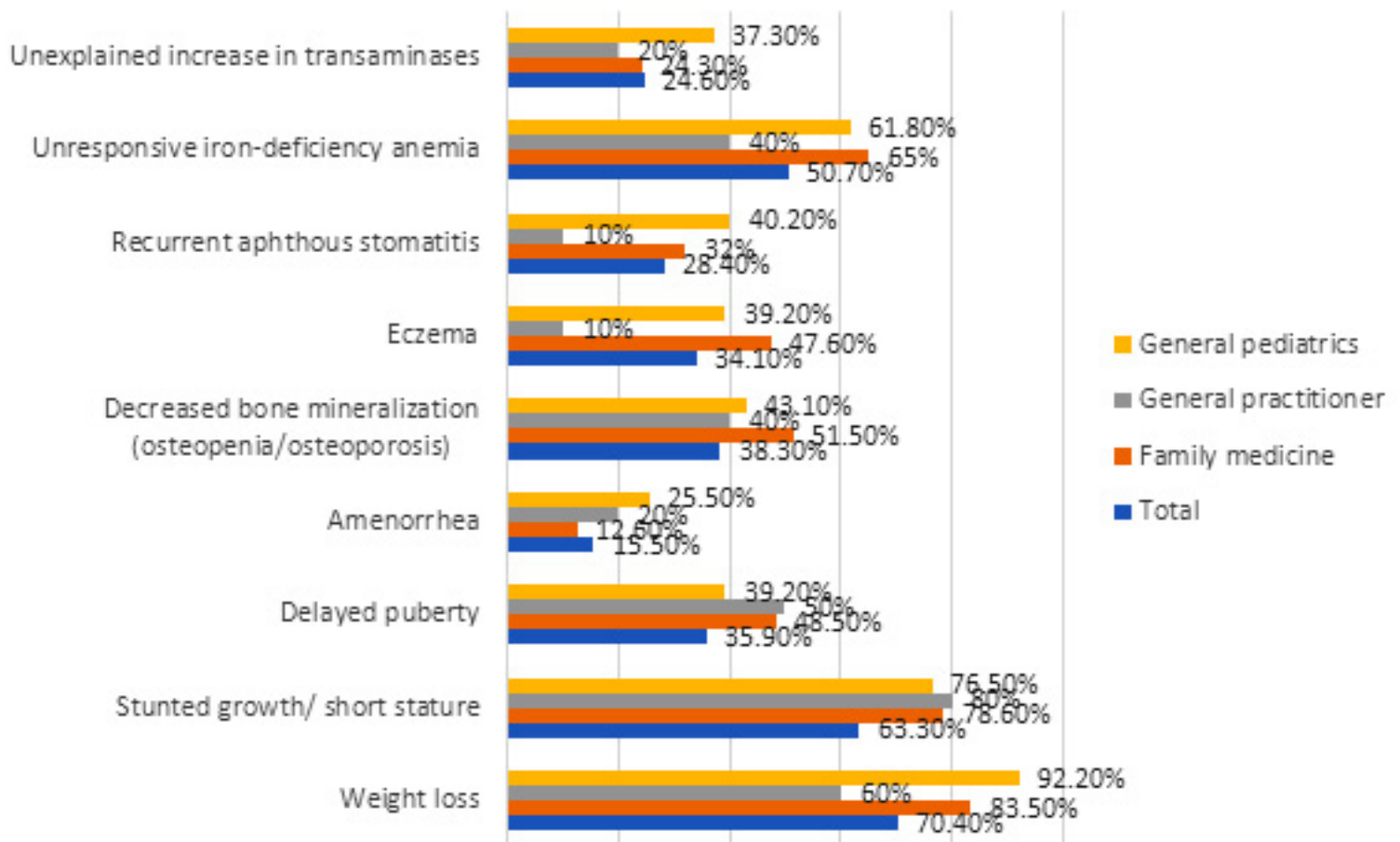


Figure 2: Clinical situations that raise the suspicion of celiac disease in pediatric patient



Moreover, 72 % of the participants knew that children with a first-degree relative with CD should be screened for CD followed by those with type 1 Diabetes mellitus (63.0 %), autoimmune thyroiditis (50.8 %), autoimmune hepatitis (45.8 %) and Down syndrome (32.6 %) (Figure 3).

It was found that general practitioners tend more to exclude Down syndrome as a risk group that was targeted for screening while pediatrics were the highest groups considered those with type 1 diabetes mellitus, autoimmune thyroiditis, Down syndrome and those with IgA deficiency as targeted groups while family medicine practitioners were more likely to be interested in those with a family history of CD (Figure 3).

Moreover, we found that 51.8 % of the participants knew that intestinal lymphoma is one of the malignancies related to CD as well as small bowel adenocarcinoma (43.9 %). Considering the best first line screening tool of celiac disease, 78.1 % of the participants successfully identified Anti-tissue transglutaminase antibody and 85.6 % of them were able to identify bowel biopsy as the best tool in order to confirm the diagnosis of CD however, only 20.9 % correctly identified Anti-endomysium antibody as best tool for follow-up. Moreover, 79.1 % of the participants knew that low total IgA level could lead to a false negative result in celiac screening while 64.7%

knew that Celiac disease can be diagnosed without duodenal biopsies in cases of symptomatic children and 74.9 % of them knew that age of onset of Celiac disease often started as early as six months. Moreover, 51.2 % of them knew that gluten-free diet is not recommended before intestinal biopsy and 52.1 % knew that it should be recommended only after results of biopsy are reported. Furthermore, 79.5 % of the participants knew that first degree relatives of CD should be screened and 84.7 % knew that patients should have regular follow-up by specialists in gastroenterology (Table 2).

Figure 3: Clinical situations in which screening for celiac disease in pediatrics patients

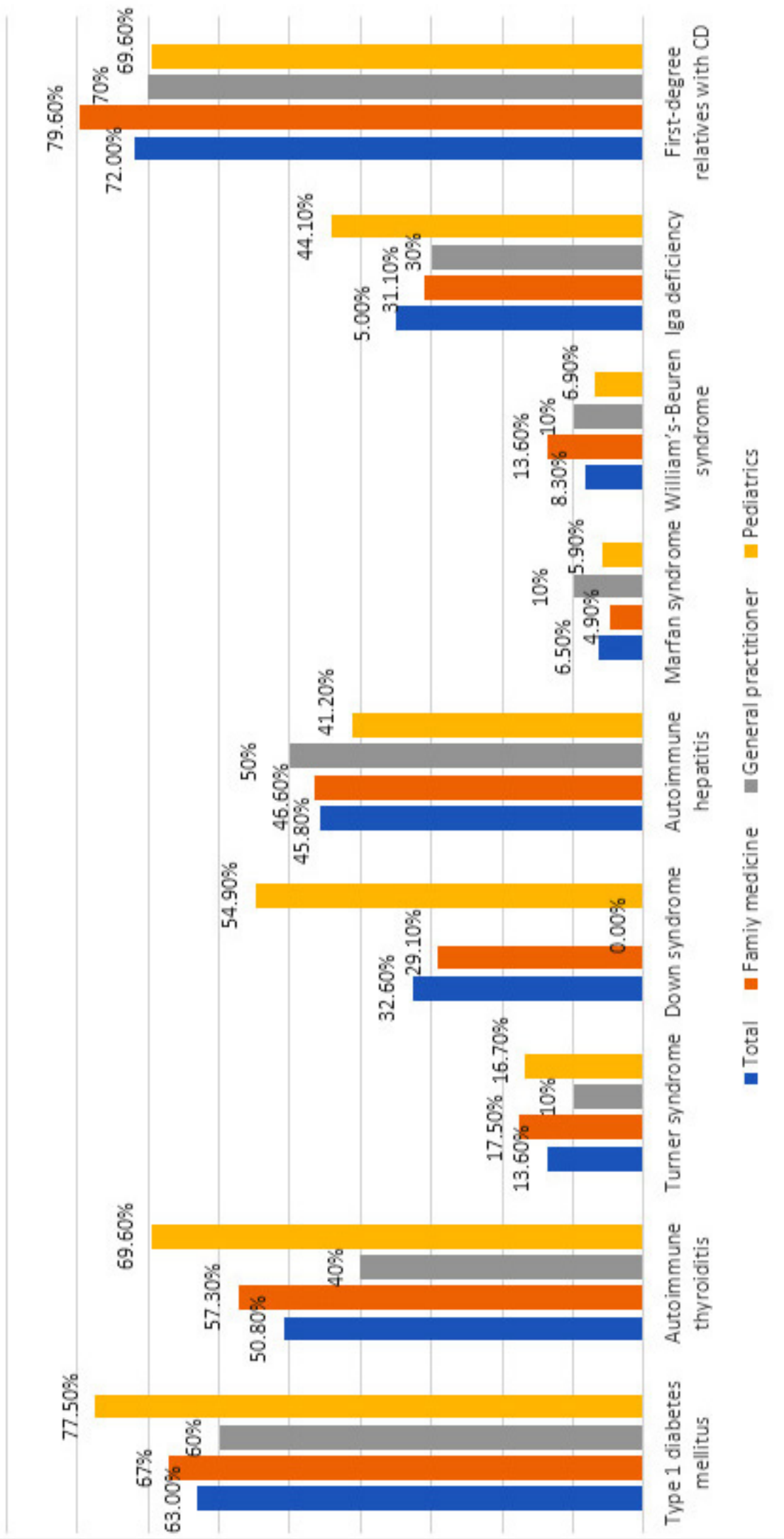


Table 2: The knowledge of the participants considering diagnosis of CD

		Count	Column N %
Which of the following malignancies are related to celiac diseases?	Hepatocellular carcinoma	23	8.7%
	Intestinal lymphoma	137	51.8%
	Small bowel adenocarcinoma	116	43.9%
Which of the following investigations, is the best as the first-line for the screening of celiac disease?	Anti-tissue transglutaminase antibody (Correct answer)	168	78.1%
	Anti-endomysium antibody	20	9.3%
	Total IgA	13	6.0%
	Abdominal ultrasound	2	0.9%
	HLA DQ 2 or DQ8	5	2.3%
	Bowel biopsy	7	3.3%
Which of the following investigations, is the best to confirm the diagnosis of celiac disease?	Anti-tissue transglutaminase antibody	9	4.2%
	Anti-endomysium antibody	10	4.7%
	Total IgA	6	2.8%
	Abdominal ultrasound	2	0.9%
	HLA DQ 2 or DQ8	4	1.9%
	Bowel biopsy (Correct answer)	184	85.6%
Which of the following investigations, is the best to follow up after diagnosis of celiac disease?	Other (please specify)	7	3.3%
	Anti-tissue transglutaminase antibody	106	49.3%
	Anti-endomysium antibody (Correct answer)	45	20.9%
	Total IgA	25	11.6%
	Abdominal ultrasound	3	1.4%
	HLA DQ 2 or DQ8	8	3.7%
	Bowel biopsy	21	9.8%
Low total IgA level could lead to a false negative result in celiac screening?	Yes (Correct answer)	170	79.1%
	No	45	20.9%
In symptomatic children, Celiac disease can be diagnosed without duodenal biopsies?	Yes (Correct answer)	139	64.7%
	No	76	35.3%
In asymptomatic children, Celiac disease can be diagnosed with duodenal biopsies?	Yes	144	67.0%
	No (Correct answer)	71	33.0%
The age of onset of Celiac disease often starts as early as six months?	Yes (Correct answer)	161	74.9%
	No	54	25.1%
Do you recommend a gluten-free diet before intestinal biopsy?	Yes	105	48.8%
	No (Correct answer)	110	51.2%
Do you recommend a gluten-free diet only after the intestinal biopsy?	Yes (Correct answer)	112	52.1%
	No	103	47.9%
First degree relatives of celiac disease patients should be screened?	Yes (Correct answer)	171	79.5%
	No	44	20.5%
Celiac disease patients should have regular follow-up by specialists in gastroenterology?	Yes (Correct answer)	182	84.7%
	No	33	15.3%

Moreover, most of the participants had a positive attitude toward the best care that can be provided to Celiac disease patients while more than half of the participants thought that CD is a serious disease. Moreover, most of the participants thought that a gluten-free diet in CD is challenging (39.4 % strongly agree and 43.3 % were agree) and most of them thought that CD affects the social life of the patients. Only 16.7 % of the participants reported a type of agreement considering that patients had enough awareness, and the same low agreement was reported considering the ease of finding gluten-free products in their country. Moreover, 46.3 % of the participants did not think that CD could be managed after diagnosis by clinical dietitians only and most of them thought that physicians in the hospital could diagnose and treat CD easily. Moreover, most of the participants did not think that CD is a curable condition and most of them thought that there are no adequate resources about CD in Arabic language (Table 3).

Table 3: Attitude of the participants toward screening and management of patients with CD

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1- Celiac disease patients are getting the best care in my hospital.	28.1%	41.4%	22.7%	5.9%	2.0%
2- Celiac disease is not a serious illness.	3.9%	14.8%	19.2%	36.9%	25.1%
3- A gluten-free diet in celiac disease is challenging.	39.4%	43.3%	11.8%	4.4%	1.0%
4- Celiac disease affects the social life of the patient.	40.4%	45.3%	9.9%	3.0%	1.5%
5- The celiac disease has enough awareness in my community.	3.9%	12.8%	30.5%	38.4%	14.3%
6- Patients with celiac disease can easily find gluten-free products in my country.	2.5%	21.2%	20.7%	35.5%	20.2%
7- Celiac disease can be managed after diagnosis by clinical dietitians only.	3.9%	11.8%	20.7%	46.3%	17.2%
8- Physicians in my hospital are able to diagnose and treat celiac disease properly.	27.1%	45.8%	21.2%	4.9%	1.0%
9- Celiac disease has a negative financial effect on the hospital and the family budget.	24.1%	46.8%	21.7%	6.4%	1.0%
10- Celiac disease support groups are essential.	35.0%	44.3%	15.8%	3.9%	1.0%
11- Celiac disease is curable.	1.5%	12.3%	24.1%	42.9%	19.2%
12- Social media contains false beliefs about celiac disease.	14.8%	34.0%	43.8%	7.4%	0.0%
13- There are no adequate resources about celiac disease in the Arabic language.	18.2%	37.4%	29.1%	13.3%	2.0%
14- A gluten-free diet can be a healthy choice for everyone.	10.3%	24.1%	33.5%	25.1%	6.9%
15- Celiac disease stigma has decreased nowadays.	9.4%	37.9%	42.9%	8.4%	1.5%

Furthermore, we found that 48.0 % of the participants reported a frequency of 1-2 times per year of seeing patients with CD while 18.7 % of them have never seen any patients with CD. Almost a third of family medicine practitioners reported never seeing a case with CD (30.1 %) compared with 22.2 % in general practitioners and 7.3 % among pediatric physicians ($P=0.000$). Moreover, 85.9 % of the participants would refer patients to Gastroenterology in case of positive serological tests for final diagnosis and 90.4 % of them would refer patients to a dietitian for a gluten free diet. A significant difference between specialists was reported in their tendency to refer patients where pediatric physicians were found to have a higher tendency to refer patients than other specialists ($P=0.005$, 0.027). Furthermore, 54.5 % of them would provide CD health education to every patient and 58.6 % would follow-up celiac disease patients, with no significant difference between different specialists (Table 4).

Table 4: Practices of the physicians considering patients with CD

		Count	Column N %
How often do you see celiac disease patients per year?	1-2 times per year	95	48.0%
	3-5 times per year	48	24.2%
	> 6 times per year	18	9.1%
	Never	37	18.7%
Do you refer the patient to gastroenterology in cases of positive serological tests for final diagnosis?	Yes	170	85.9%
	No	28	14.1%
Do you refer celiac disease patients to dietitian for a gluten free diet?	Yes	179	90.4%
	No	19	9.6%
Do you provide celiac disease health education to every patient you encounter?	Yes	108	54.5%
	No	90	45.5%
Do you follow-up celiac disease patients?	Yes	116	58.6%
	No	82	41.4%

In considering the effect of the demographic factors of the participants toward knowledge of CD, we found that there is a significant difference in level of knowledge depending on age of the participants ($P=0.000$). Younger participants seemed to have a significantly lower level of knowledge whereas 73.7 % of participants younger than 40 years had low knowledge compared with 45 % of those older than 40 years old. Moreover, we did not find a significant difference between genders however, males seem to have slightly higher knowledge with 36.1 % compared with 27.1 % of females ($P=0.156$). Furthermore, we did not find a significant difference between the different specialties of the participants ($p=0.584$) however, it seems that general pediatrics had slightly higher level of knowledge with 34.3 % compared to with 30.1 % of family medicine physicians and 20.0 % of general practitioners. Consultants seem to have the highest level of knowledge significantly ($P=0.021$) with 51.4 % compared with 25.9 % of residents. Moreover, we found that those who reported depending on guidelines for diagnosis and treatment of celiac disease had a significantly higher level of knowledge with 71.9 % compared with 24.6 % of those who did not depend on any guidelines ($P=0.000$) (Table 5).

Table 5: The relation between the level of knowledge and demographic factors

		Knowledge				P-value
		Low knowledge		High		
		Count	Row N %	Count	Row N %	
Age	< 40	129	73.7%	46	26.3%	0.000*
	> 40	18	45.0%	22	55.0%	
Gender	Male	69	63.9%	39	36.1%	0.156
	Female	78	72.9%	29	27.1%	
Specialty:	Family Medicine	72	69.9%	31	30.1%	0.584
	General Practitioner	8	80.0%	2	20.0%	
	General Pediatrics	67	65.7%	35	34.3%	
Position:	Resident	100	74.1%	35	25.9%	0.021*
	Staff	12	57.1%	9	42.9%	
	Associate consultant	6	66.7%	3	33.3%	
	Assistant consultant	11	84.6%	2	15.4%	
	Consultant	18	48.6%	19	51.4%	
Did you use any guidelines for the diagnosis and treatment of celiac disease?	Yes	9	28.1%	23	71.9%	0.000*
	No	138	75.4%	45	24.6%	

Discussion

Celiac disease had been considered an uncommon serious problem in infancy and childhood. However, recent data shows that it is one of the most common diseases affecting 0.5-1% of the population with a wide clinical spectrum. They can be symptomatic (classic, non-classical), sub-clinical (asymptomatic) or potential (latent) [2]. However, many individuals experience non-classical symptoms such as anemia, severe weakness, osteoporosis, ulcers, increased liver enzymes, rashes, migraine headaches, menstrual irregularities, and infertility as well as vomiting, dental caries, and short stature which are additional manifestations in pediatrics. Delays in diagnosis can lead to further developmental delays in children. There is a lack of information about knowledge of CD by a healthcare professional. Poor knowledge can translate into a delay in investigation because the condition is going unrecognized. In our study, 68.4 % of the participants had a low level of knowledge and failed to answer more than 60 % of the questions correctly which is alarming considering CD is a common disorder where the pediatric physicians were the most knowing group while general practitioners were the least knowledgeable group. In a recent study of CD awareness among clinicians, most clinicians considered CD a rare disease and emphasized the need for increased awareness of rare clinical symptoms, especially in clinicians outside of gastroenterology [14]. In another questionnaire based on physicians' understanding of CD, the authors noted a need for increased awareness of CD among family physicians and internists, with CD present in 11% of family physicians and obstetricians and 65% in gastroenterologists [15].

In our study, chronic diarrhea and weight loss were the two most common conditions in which CD action was found necessary, with 85.1% and 85.6% of clinicians, respectively. Chronic diarrhea is a common symptom of CD presentation [16]. It comes with malabsorption and secondary weight loss (20). Initially, in up to 80% of patients who were identified with CD, 25 of the patients continued to have diarrhea even after starting a gluten-free diet, despite the reduced severity [17]. In recent years, when there are rare clinical manifestations of CD, abnormal presentation of CD has become common, but the incidence of chronic diarrhea has decreased [18].

The incidence of chronic diarrhea and weight loss is also twice as common in patients with abdominal pain, iron deficiency anemia, osteoporosis, elevated liver enzymes, dermatitis herpetiformis, thyroid disorders and Down syndrome, chronic diarrhea and weight loss than among the general population [19].

Several groups of patients are at increased risk of developing celiac disease, including type 1 diabetes, Sjögren's syndrome, Down syndrome, thyroiditis, immunoglobulin A (IgA) deficiency, and a family history of celiac disease [20–24]. Diabetes mellitus Type I is a common disease initially managed by primary care physicians, and a prevalence of celiac disease has been

reported to be in 3% to 8% of these patients; However, only 58.3 % of the participants in this study were aware of this association. It is important to note that the association of IgA deficiency is important, and it should be considered that negative tests for anti-endometrial IgA and anti-tumor IgA antibodies do not abrogate the diagnosis in this population [9]. Iron deficiency anemia or folate deficiency is a common complication of celiac disease and presents in more than 50% of patients [25–28]. Less than two thirds of the participants in our study were aware of this association and could identify those patients with high-risk CD.

The most recommended serotype test in order to diagnose CD and which should be performed in cases of CD presumption is t TG serotype IgA with sensitivity and specificity of about 95 % [19]. In our analysis, 78.1 % of the physicians knew that Anti-tissue transglutaminase antibody should be considered in screening for CD where family medicine physicians were the most knowledgeable group (83.5%) followed by general pediatricians (75.5%) and general practitioners (50.0 %). Moreover, determination of IgA and IgG DGP are still used in children younger than 2 years with symptoms of CD [33] however, 6 % of the physicians depended on them. Moreover, for confirming of CD diagnosis, 85.6 % of the physicians knew that biopsy is the best test. This is higher than reported by a previous study where only a third of the physicians knew that biopsy is used for confirming the diagnosis of CD [34].

In this study, almost all of the participants were able to identify that there is higher risk for developing intestinal lymphoma and small bowel adenocarcinoma in patients with CD than those in general populations. In a previous study, half of the physicians participating in the study showed moderate to high risk of malignancy in patients with CD [9,29]. It is known that chronic inflammation in patients with CD despite the gluten-free diet is associated with increased susceptibility for gastrointestinal neoplasia [30]. On the other hand, there is no increased risk for development of colorectal cancer in those patients, suggesting the likelihood of untreated CD to protect against colon cancer because of the poor absorption and rapid excreting of co-carcinogens [31].

In patients with CD, it is mandatory to have a gluten-free diet and is often recommended based on positive CD serology which is one of the relatively frequent errors in daily clinical practice when conducted before intestinal biopsy [32]. In the current study, at least half of physicians considered strict gluten-free diet a prerequisite for CD patients. Moreover, half of the physicians knew that gluten-free diet should only be recommended after biopsy results. However, most of the participants in this study reported that it is difficult to find a gluten-free diet in our market. Therefore, increasing public awareness and making this type of diet available to these patients is critical.

In the current study, 85 % of physicians were not aware of guidelines on diagnosis, management and follow up of CD. Nonetheless, awareness of guidelines had significant impact on practice patterns other than improved utility of diagnostic intestinal biopsy for serology positive patients.

Depending on guidelines was found to increase the level of knowledge among the participants significantly which indicates the importance of increasing the knowledge and awareness of the physicians about these guidelines.

We could not find a significant difference between general pediatrics and family medicine physicians in their knowledge considering CD with slightly more favourable results among pediatrics.

Most cases with CD are children and infants which are proposed to be managed by pediatric physicians who are supposed to have a significantly higher level of knowledge. The insignificance between the two categories indicates that there is a deficiency among pediatrics about CD.

This study had some limitations including the small sample size which could affect the significance of some of our results and did not enable us to generalize the results. Therefore, we recommend conducting multiple province studies that include greater sample sizes. Moreover, the study depended on self-reported questionnaire which could lead to some personal bias where some participants may answer some questions randomly. Finally, CD is a condition which generally occurs among children thus, the name of the questionnaire may be more considered by pediatric physicians and family medicine physicians leading to some sampling bias toward these groups.

In conclusion, we found that there is a deficiency in knowledge about CD among physicians with no significant difference between pediatrics and family medicine physicians. The physicians had moderate knowledge considering symptoms and risk factors of the CD with good knowledge considering the diagnosis tool. More educational courses should be provided to the physicians about the diagnosis and management of CD.

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