



Vitamin D Deficiency in Celiac Disease Patients in Pediatric Hospital in Benghazi

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ABSTRACT

A steroid hormone, vitamin D is ingested by food, although the majority of it is produced in the skin or diet and converted to 25(OH) vitamin D by the liver and 1,25-dihydroxy vitamin D by the kidneys (active form). Low vitamin D levels have been reported to increase the risk of autoimmune diseases in addition to rickets and osteomalacia. Celiac disease is an immune-mediated enteropathy that affects people who are genetically vulnerable to wheat gluten and related proteins present in rye and barley. The prevalence of celiac disease in Benghazi necessitates research on the level of vitamin D in celiac patients in pediatric hospitals.

Keywords: Celiac disease, Wheat gluten, Pediatric patients, and Vitamin D

INTRODUCTION

Celiac Disease (CD) is an immune-mediated enteropathy that affects people who are genetically vulnerable to wheat gluten and related proteins present in rye and barley.

Celiac disease is a widespread chronic illness that affects between 0.5% and 1% of the global population in several countries with female predominance. [1].

Celiac disease is a genetic condition that is passed down from parents to their children. People who have a first-degree family (parent, child, or sibling) who has celiac disease have a one-in-ten chance of having celiac disease. Celiac illness can strike anyone at any age once they begin eating gluten. Celiac disease, if left untreated, can lead to a slew of other major health issues [2].

The discovery of tissue transglutaminase as an autoantigen, confirming the autoimmune origin of celiac disease, was a breakthrough in the disease's history.

The presence of genetic background (HLA-DQ2/DQ8 positive and non-HLA genes) is a necessary predictor of illness development, which occurs with the help of environmental factors (e.g., viral infections and dysbiosis of gut microbiota). [3]

Celiac disease pathogenesis

Tissue transglutaminase (tTG) deaminates gluten peptides, which bind to HLA-DQ2 and HLA-DQ8 molecules. Antigen-presenting cells activate helper T cells, which in turn activate cytotoxic T cells, macrophages, and plasma cells, resulting in an inflammatory response. Mucosal disruption, matrix remodeling, cell death, and antibody generation to gliadin and tTG are the results [4].

Vitamin D belongs to the steroid hormone family. It has the most important forms, diet D3 (cholecalciferol) and diet D2 (er-

gocalciferol), each of which may be discovered in ingredients or supplements, even though the best diet. D3 is synthesized in pores and skin. Indeed, diet D3 is specifically produced endogenously inside the pores and skin through changing 7-dehydrocholesterol through the movement of Ultraviolet Mild B (UVB) of the solar or different UVB sources [5]. Vitamin D has been recognized for its position within the upkeep and safeguarding of skeletal gadget integrity. [6]. Indeed, biologically lively diet D complements calcium intestinal absorption by regulating calcium shipping proteins within the small intestine, stimulating osteoplastic maturation and assisting bone growth, which in flip helps collagen matrix mineralization [7,8]. Children with celiac disease are at an increased risk of developing vitamin D deficiency. Vitamin D deficiency is often caused by malabsorption or consumption of dairy products in people with lactose intolerance.

The present study aimed to investigate the level of serum 25(OH) D in patients with celiac disease in a pediatric hospital in Benghazi.

MATERIALS AND METHODS

Study design

Prospective study- Cross-sectional research design was used to collect the data from randomly selected cases of celiac disease, after Ethics Committee approval. Forty-three patients of both sex and age range (2 years-18 years) were taken from the gastrointestinal unit at the pediatric hospital in Benghazi between October 2021 to January 2022.

A complete history of any medical or surgical problems from the patients was taken (history of diarrhea, constipation, and abdominal distention), in addition to the history of a gluten-free diet and the drug taken especially if taken vitamin d supplement.

Quantitative determination of serum 25-OHD was performed using an enzyme-linked immunosorbent assay (ELISA). Vitamin D deficiency was defined as a level of vitamin 25-OHD less than 12ng/ml, insufficient vitamin D level between 12 ng/ml and -20 ng/ml, and sufficient level of more than 20 ng/ml.

Data analysis

Data were analyzed using the Statistical Package for Social Science (SPSS), Version 28 based on the following statistical methods: Descriptive statistics were done to compute frequencies and percentages, as well as mean and standard deviation.

Chi-square was used to assess the association between symptoms, age, and vitamin D levels. A P-value lower than 0.05 were regarded as significant.

RESULTS

43 participants in the study finished the questionnaire. Were the following general participant characteristics shown:

The sample according to gender

In terms of gender, more than half 62.8 % of the participants were female, whereas 37.2% of the participant were male (Figure 1).

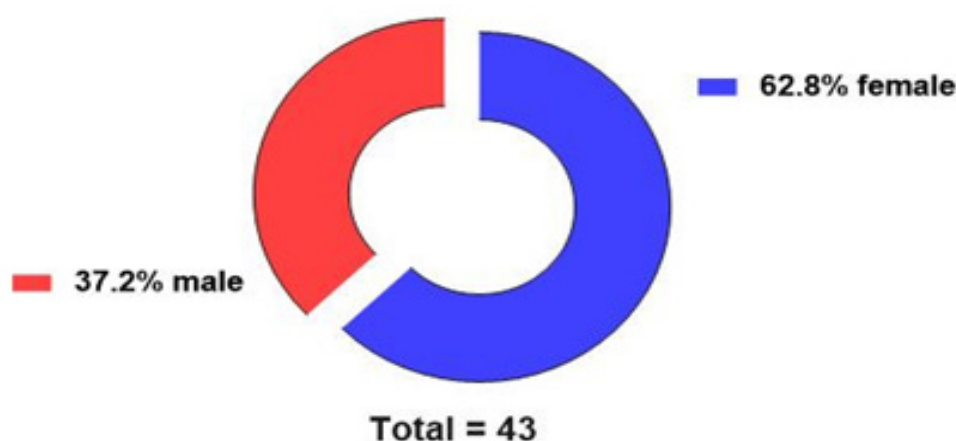


Figure 1. Number of celiac disease cases according to gender

The sample according to Age

Regarding the age, the mean age among all participants was 6.97 years \pm 3.86 years and the age ranged between 2 years-18 years. The highest percentage 53% of the study subjects were between 0-3 years old, while the lowest percentage 16.3% of the study subjects were 4 years -7 years old as shown (Figure 2).

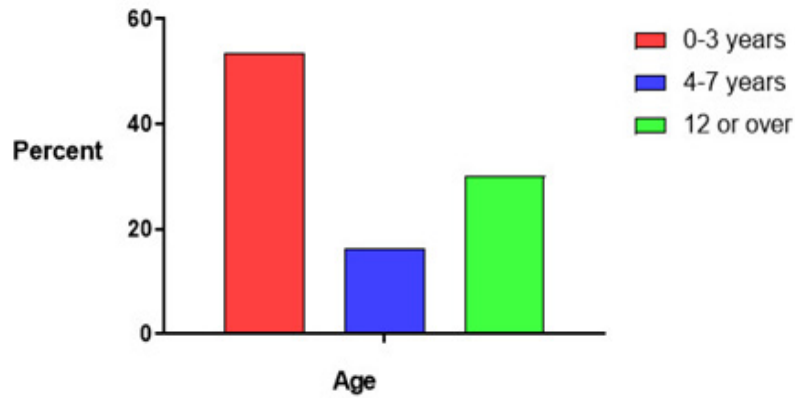


Figure 2. Number of celiac disease cases according to age

The sample according to celiac disease with vitamin D level

In terms of the case of celiac disease with vitamins, 55.8% were Deficient and insufficient 23.3%, However, sufficient were 20.9% (Figure.3)

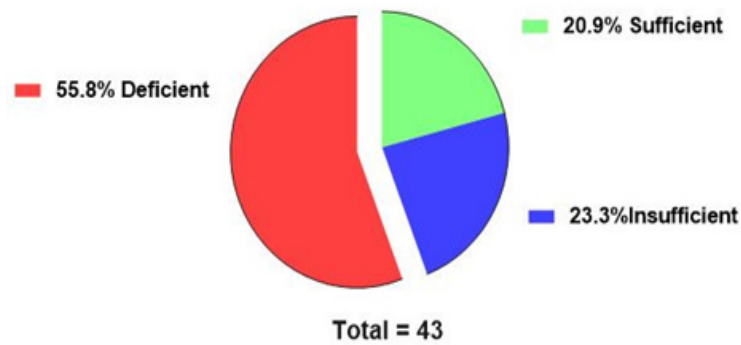


Figure 3. Cases of celiac disease with Vitamin deficiency, sufficiency, and insufficiency

The sample according to symptoms of celiac

Regarding symptoms of celiac disease, the highest percentage of 72.1% of the study subjects were Diarrhea and 27.9% were constipation (Figure 4).

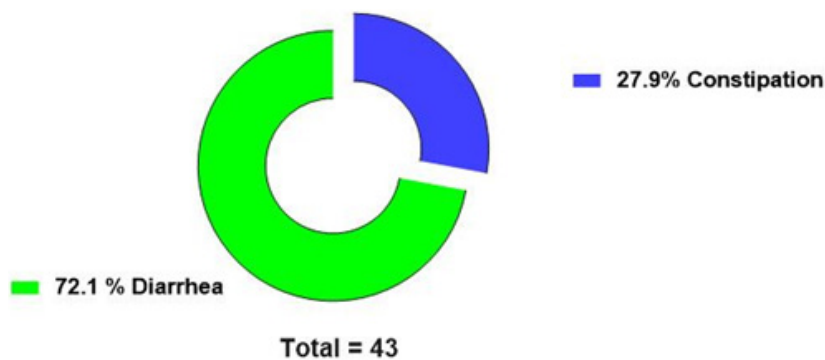


Figure 4. Symptoms of celiac disease

The Problem 1

To identify the association between Symptoms (Diarrhea, Constipation) and Vitamin D (Deficient, Insufficient, and Sufficient).

Hypothesis H_1 : There is a significant association between Symptoms and Vitamin D.

It can be seen from this table (1) Diarrhea was the most common insufficient symptom reported by study participants (58.1%), while constipation was the least common sufficient symptom (16.7%). Chi-square tests were used to examine the association between categorical variables (Symptoms and Vitamin D). There is an insignificant association at 5% significance level between Symptoms and Vitamin D of respondents ($X^2= 0.972$, $df = 2$, $p= 0.615$). Hence, H_1 was not supported.

Table 1 Association between Symptoms and Vitamin D

		Vitamin D			total
		Deficient	Insufficient	Sufficient	
Symptoms	Diarrhea	18(58.1%)	6(19.45)	7(22.6%)	31(100%)
	Constipation	6(50%)	4(33.3%)	2(16.7%)	12(100%)
	Total	24(55.8%)	10(23.3%)	9(20.9%)	43(100%)

$X^2=0.972$; $df=2$; $p\text{-value}>0.05$

The Problem2

To identify the association between Symptoms (Deficient, Insufficient, Sufficient) and age (0 year-3 years, 4 years -7 years, and 12 years or over).

Hypothesis H_1 : There is a significant association between Symptoms and Age

The age groups with the highest percentage of Deficient symptoms (0 years–3 years) and the lowest percentage of Insufficient symptoms (14.3%) and (7.7%), respectively, were 4 years –7 years and 12 years or over. The Chi-square test was used to examine the association between categorical variables (Age and Vitamin D). There is an insignificant association at a 5% significance level between Age and Level of Vitamin D of respondents ($X^2=6.358$, $df=4$, $p=0.174$). Hence, H_1 was not supported (Table 2).

Table 2. Association between Age and Level of Vitamin D

		Vitamin D			Total
		Deficient	Insufficient	Sufficient	
Age	0-3 years	11(47.8%)	8(34.8%)	4(17.4%)	23(100%)
	4-7 years	3(42.9%)	1(14.3%)	3(42.9%)	7(100%)
	12 or over	10(76.9%)	1(7.7%)	2(15.9%)	13(100%)
	Total	24(55.8%)	10(23.3%)	9(20.9%)	43(100%)

$X^2=6.358$; $df=4$; $p\text{-value}>0.05$

DISCUSSION

Vitamin D deficiency is common in our country; all age group is affected by this deficiency and celiac disease is very commonly associated with malabsorption so vitamin D deficiency is associated with celiac disease.

In our study, most cases were female patients with about 62.8% following a previous study in Brazil. This study investigated data on symptoms and clinical signs of patients ([33.3%] men and [66.6%] women) aged >18 years who were diagnosed with CD during 2000-2017 [9]. Also in further support of our study, a study done in India shows that 43% were females, and 12.5% and 10.5% were wasted and stunted, respectively [10]. Furthermore, a study was done in Italy with children with celiac disease enrolled (62% females; mean age 8.1 years \pm 1.1 years). (62% females; mean age 8.2 \pm 1.2) [11].

In the present paper age group is common between 0 years -3 years this is following study done in children was divided into four groups by age (in years) at diagnosis: 0 years -3 years (17.9%), 3 years -6 years (31.8%), 6 years -12 years (34.5%), 12 years -18 years (15.8%). The youngest age group presented more frequently with diarrhea, weight loss, abdominal distention, vomiting, and lower weight z scores, $P<0.01$. Patients in the younger age groups (0 years-3 years and 3 years-6 years) presented more frequently with Tissue Transglutaminase (TTG) levels above 10 times the upper limit of normal (ULN; $P<0.05$), and more often normalized their CD serologies by 24 months of Gluten-Free Diets (GFD) compared to older age groups ($P<0.05$). [12]

Furthermore, another study supports our results another study showed that the median (interquartile range) age at presentation was 4.45 (1.5-7.3) years. [13]

Our study's vitamin D level is low at about 79.1% (55.8 and 23.3), as micronutrient deficiency is very common in celiac disease. In this study, medical records of 140 children (mean age at diagnosis 7.8 years \pm 4.01 years, 87 girls [621%]) with CD were examined. At diagnosis, serum vitamin D was the most commonly deficient vitamin in 70% of children; most children with CD have vitamin D deficiency. The degree of micronutrient deficiencies does not correlate with the degree of villous atrophy or serum titers of anti-TTG IgA antibodies [14]. Furthermore, in support of our results study done in Turkey in this study Thirty-six patients with CD [20 girls (55%), 16 boys (45%), mean age 138.3 \pm 41.7 months], and age and sex-matched 36 controls [20 girls (55%), 16 boys (45%), mean age 136.7 \pm 39.9 months] were enrolled in the study. Median 25-OH vitamin D levels were lower in the patient group compared to the control group [13.4 (4.7–32.1) IU/L vs 30.2 (14.1–56.3) IU/L, $p<0.001$], and, vitamin D deficiency was more common in the patient group than the control group [22 (61%) vs 9 (25%), $p<0.001$] [15]. The findings showed that vitamin D deficiency is common among children with CD. Expression of VDR and epithelial barrier proteins Claudin-2 and E-cadherin which have important roles in the paracellular path-way was decreased in children with CD in correlation with histological findings of disease severity. Furthermore, deficiency of vitamin D was related to decreased expression of VDR and epithelial barrier proteins E-cadherin and Claudin-2. These findings indicate that

paracellular pathway structures responsible for calcium absorption are disturbed in CD, which is aggravated by vitamin D deficiency.

In another study 25-Hydroxy, vitamin D was low in 19.0% (44/213) compared with 18% (111/618) of controls [16].

In our study diarrhea was the most common symptom this is following study done in North India in this study diarrhea is about to 86% of cases [17]. Furthermore, in another study celiac disease was diagnosed in 54 (6.5%) of the diarrhea patients and seven (0.8%) of the controls. After 6 months of a gluten-free diet, 48 (88.8%) patients had significant improvement in symptoms and of these 41 (76.1%) were asymptomatic. Forty-two patients were allowed repeat endoscopy after 6 months of a gluten-free diet and 40 (95.2%) showed improvement in histologic findings [18]. In addition, in a study done in Iran, the classic type is a common type of CD in northeast Iran. Dyspepsia and diarrhea main clinical symptoms in these patients, consequence we recommended screening for CD in cases of whiteout classic symptoms (such as dyspepsia). Also recommended is screening for concomitant diseases such as nervous problems, bone disease, and anemia in female CD patients on the first visit [19].

CONCLUSION

Celiac disease is an immune – mediated enteropathy that affects people who are genetically vulnerable to wheat gluten and related proteins present in rye and barely. Vitamin D deficiency is common in our country as celiac disease is very common associated with malabsorption so vitamin D deficiency is associated with celiac disease.

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