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# Relation between celiac disease and idiopathic short stature among groups of children

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## ABSTRACT

Celiac disease is a chronic autoimmune condition triggered by gluten in genetically susceptible individuals, affecting about 0.7% of the global population. It is a frequent disorder among Egyptian children and can present with a range of symptoms from gastrointestinal to extra-intestinal manifestations. Many cases remain undiagnosed due to atypical or silent presentations, posing risks of serious complications. Short stature is a common non-classical symptom in children, found in about one-third of new pediatric cases, and typically resolves with a strict gluten-free diet. The detection of celiac disease in Egyptian children with unexplained short stature can be achieved by estimating serum levels of total IgA and tissue transglutaminase IgA antibodies (TTG-IgA-Abs). This approach helps assess the impact of gastrointestinal diseases, particularly Celiac disease, on children's height and body mass, in comparison to short children without Celiac disease. The study involved 100 children with idiopathic short stature (ISS), comprising 42 girls and 58 boys, aged 5.5–14.5 years (mean ± SD: 10.37±3.28 years). These children attended the short stature pediatric outpatient clinic at the National Nutrition Institute, General Authority for Institutes and Hospitals in Al-Qasr Al-Aini, Giza, Cairo, between April 2022 and April 2024. The study found that 32% of the cases were positive for TTG IgA antibodies and with normal total IgA levels, while 68% were non-celiac patients. Applying the same criteria to 100 patients, there was a statistically significant difference ($p<0.001$) between the Celiac and Non-Celiac groups in terms of weight and height with a gluten-free diet.

***Keywords***: Short stature, idiopathic short stature, celiac disease, children, tissue transglutaminase antibody.

## INTRODUCTION:

Growth is influenced by genetics, endocrine function, nutrition, chronic disease, and physical activity. Regular height measurement helps evaluate growth, and early recognition of short stature allows timely intervention for better health outcomes and normal adult height (Kumar *et al*., 2023). Short stature, defined as height at or below the third percentile for age and sex, can indicate underlying conditions such as endocrine disorders, genetic syndromes, chronic illnesses, medication side effects, or malnutrition (Santos & Horton, 2023). Idiopathic short stature (ISS) is diagnosed when height is less than 2 standard deviations below the mean for age, with no endocrine, metabolic, or other diagnoses. ISS children exhibit normal growth rates, biochemical test results, and endocrine screening outcomes, including tests for growth hormone deficiency (Sugawara *et al*., 2022).

Short stature is increasingly recognized as a worldwide public health concern, and it affects about 3-11% of children worldwide (Yang *et al*., 2021). Stunting remains a very important problem in Egypt, as one-third of children under 5 years of age are affected. According to the United Nations Children's Fund (UNICEF), the largest number of stunted children in the Middle East was in Egypt, as ∼2.7 million children are suffering from growth failure (Farahat *et al*., 2017). Short stature is the most common reason for referral to a pediatric endocrinology clinic (Mahfuz *et al*., 2020).

Short stature (SS) is defined as a condition in which the height of the child is below –2.0 SDS from measures for a given age, sex and population. A child is considered to have short stature if his height is less than 2 standard deviations from the mean (2.3rd percentile) (Akpinar *et al*., 2018) when compared with children of the same age, sex, and race. When the upper segment to lower segment ratio (US/LS ratio) is in concordance with chronological age, this child is assumed to have proportionate stature (Al Motawa *et al*., 2021). Short stature is the most encountered extra-intestinal manifestation of celiac disease in children, being found in roughly one-third of all new pediatric celiac diagnoses. It can be directly related to malabsorption of nutrients and it should completely reverse once a child is strictly adherent to a gluten free diet (GFD) (El-Zanaty & Way., 2019).

Celiac disease (CD) is regarded as the most common disorder worldwide relating to food sensitivity. It is a chronic autoimmune condition, triggered by ingested gluten from cereals, wheat and barley in genetically susceptible individuals. Its clinical spectrum ranges from asymptomatic to gastrointestinal and extra-intestinal symptoms (Singh *et al*., 2021; Singh *et al*., 2021; Calado and Verdelho, 2022). Its clinical spectrum is broad and varies from absence of symptoms to gastrointestinal (classic) and/or extra-intestinal (non-classic) symptoms. Patients without symptoms may have latent or silent celiac disease. Because celiac disease can be atypical or even clinically silent, many patients remain undiagnosed and at risk for the long-term, sometimes serious complications of untreated celiac disease. A Classic from the classical manifestations such as chronic diarrhea, malabsorption, isolated growth failure, and dermatitis herpetiformis (Sayed *et al*., 2020).

Cacciari *et al*. (1983) investigated duodenal biopsy from 60 children with short stature, without gastrointestinal symptoms and they found 8.3% of them had probable celiac disease. This highlighting that only intestinal biopsy can definitively diagnose asymptomatic celiac disease as a cause of short stature. In this respect, Amir *et al*. (2022) reported that one-third of children with short stature have celiac disease, with no association between its frequency and the child's gender or age.

Therefore, the current study aims to detect celiac disease in Egyptian children with unexplained short stature by measuring serum levels of total IgA and tissue transglutaminase IgA. It also assesses the impact of celiac disease on children's height and body mass compared to short children without celiac disease.

## SUBJECTS AND METHODS

This study involved 100 children with Idiopathic short stature (ISS) including 42 girls, 58 boys, aged 5.5–14.5 years (mean ± SD: 10.37±3.28 years), attending the short stature pediatric out-patient clinic at the National Nutrition Institute, Cairo, from April 2022 to April 2024.

Children meeting the inclusion criteria were enrolled in the study with caregiver consent.

Complete blood count (CBC) was conducted using Diagon D cell 60 (Hungary). The total serum IgA levels were measured by nephelometry with a Behring BNII nephelometer (Dade Behring, UK), with levels below 10 mg/dl considered deficient (Bradwell *et al*., 2009).

Food analysis was conducted following the Egyptian Food Composition Table 2006 by the National Nutrition Institute.

**Inclusion criteria**

Children aged 5.5–14.5 years with undetectable short stature (Z score for height < -2 SD according to WHO charts) who had not been previously screened for celiac disease (WHO, 2006).

**Exclusion criteria:**

These included short children with identifiable causes such as familial and constitutional short stature, chronic illness, disproportionate short stature, endocrinal origins like growth hormone deficiency, Turner syndrome, significant congenital anomalies, and those on a gluten-free diet. Each enrolled child underwent a detailed history assessment covering personal, dietary, familial, and gastrointestinal symptoms, and completed a pre-structured questionnaire.

**Gastrointestinal assessment**

This involved a serologic test for diagnosing celiac disease in all study participants, including those with short stature and controls. Initially, tissue transglutaminase IgA antibodies (TTG-IgA-Abs) were tested after ruling out IgA deficiency. Positive serologic results were confirmed through histological examination of villous atrophy, using the modified Marsh-Oberhuber criteria (Marsh, 1992; Oberhuber *et al*., 1999).

**Statistical Analysis:**

Recorded data were analyzed using the statistical package for social sciences, version 23.0 (SPSS Inc., Chicago, Illinois, USA). The quantitative data were presented as mean± standard deviation and ranges when their distribution was parametric (normal) while non-normally distributed variables (non-parametric data) were presented as median with inter-quartile range (IQR). Also, qualitative variables were presented as number and percentages. Data were explored for normality using Kolmogorov-Smirnov and Shapiro-Wilk Test.

The following tests were done:

- Independent-samples t-test of significance was used when comparing between two means.
- Mann Whitney U test: for two-group comparisons in non-parametric data.
- The Comparison between groups with qualitative data was done by using Chi-square test and Fisher's exact test instead of Chi-square test only when the expected count in any cell less than 5.
- The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the p-value was considered significant as the following:
- Probability (P-value)

– P-value <0.05 was considered significant.
– P-value <0.001 was considered as highly significant.
– P-value >0.05 was considered insignificant.

## RESULTS AND DISCUSSION

**Distribution of celiac and non-celiac disease in the study group**

Table (1) shows that 32% of patients were in the celiac group, while 68% were in the non-celiac group. This result underscores the considerable prevalence of celiac disease among children with short stature, supporting earlier research that identifies celiac disease

as a significant contributor to short stature in pediatric populations (Cacciari *et al*., 1983; Singh *et al*., 2021). The rate of celiac disease found in this study aligns with the existing literature, which acknowledges varying but substantial prevalence rates of celiac disease in short-statured children (Amir Muhammad *et al*., 2022). The current study highlights the need for screening celiac disease in children with unexplained short stature, as it can be asymptomatic or atypical (Calado & Verdelho, 2022). The presence of 68% of children without celiac disease suggests other causes, like familial or endocrine factors (Sugawara *et al*., 2022).

**Table (1): Distribution of celiac and non-celiac disease in the study group.**

| Groups | Total (n=100) |
|---|---|
| Celiac | 32 (32.0%) |
| Non-Celiac | 68 (68.0%) |
| Total | 100 (100.0%) |

**Celiac serological screening of studied population**:

Table (2) indicates that 32% of children with unexplained short stature were diagnosed with celiac disease. Abdullah & Mahmood (2024) suggest that celiac disease should be included in the differential diagnosis for short stature, given its prevalence in the community. Non-invasive tests for celiac disease are simpler compared to invasive procedures. Lee *et al*. (2024) found that children diagnosed with celiac disease after age 6 had significantly lower height and weight z-scores compared to those diagnosed earlier, highlighting the progressive nature of celiac disease and the importance of adhering to a gluten-free diet (GFD) to improve growth outcomes.

**Table (2): Celiac serological screening of studied population:**

| Groups | | Total cases (n = 100) |
|---|---|---|
| Total IGA | Normal | 100 (100.0%) |
| | deficient | 0 (0.0%) |
| Tissue Transglutaminase IgA | positive | 32 (32%) |
| | Negative | 68 (68%) |

The association between Tissue Transglutaminase IgA (TTG IgA) antibodies, short stature, and celiac disease underscores the importance of early diagnosis and intervention in affected individuals. TTG IgA antibodies are a primary diagnostic marker for celiac disease, an autoimmune condition where gluten ingestion leads to intestinal damage and malabsorption (Leffler *et al*., 2022). Short stature is one of the potential manifestations of celiac disease, especially in children, due to malabsorption of essential nutrients (Lohi *et al*., 2023).

**Intestinal and extra-intestinal symptoms in celiac vs. non-celiac groups:**

Table (3) shows that the most prevalent gastrointestinal symptom in the celiac group was chronic abdominal pain, followed by chronic constipation and chronic diarrhea. The results indicated a highly significant difference in gastrointestinal symptoms in celiac vs. non-celiac groups. There was a significant increase in symptoms of chest diseases, including asthma and repeated chest infections, among children with celiac disease compared to those without it. There was similar trend in skeletal system symptoms, including rickets, when comparing the celiac group to the non-celiac group, but the difference was not significant (Table 3). The current results indicated no significant difference in delayed sitting and

teething between the celiac and non-celiac groups. However, delayed walking was significantly less common in the celiac group, likely because the non-celiac group had more than twice the number of children with celiac group.

In this respect, (Ludvigsson *et al*., 2013) reported that diarrhea and vomiting are particularly common in CD patients due to inflammatory damage to the intestinal mucosa, which impairs nutrient absorption and disrupts normal bowel function. Constipation, though less discussed, can also occur due to changes in bowel habits associated with dietary adjustments or gastrointestinal inflammation (Catassi *et al*., 2014). Diarrhea is one of the most common symptoms of CD, often resulting from villous atrophy and inflammation in the small intestine, which impairs nutrient absorption and increases gastrointestinal motility (Peyer, 2022). Vomiting can occur due to similar inflammatory processes or as a reaction to dietary gluten (Leonard *et al*., 2023). Recent studies have consistently linked these symptoms to the ongoing inflammation and damage in the intestinal mucosa typical of CD (Tontodonati, 2022).

Stawerska *et al*. (2021) reported that while the prevalence of celiac disease was relatively low among Swedish children with short stature, it underscores the importance of considering celiac disease in children with short stature, even when gastrointestinal symptoms are absent.

**Table (3): Intestinal and extra-intestinal symptoms in celiac vs. non-celiac groups**

| Groups | | Non-celiac group | Celiac group | Test value | P-value | Sig. |
|---|---|---|---|---|---|---|
| Parameters | | No. = 68 | No. = 32 | | | |
| Gastro- intestinal symptoms | Diarrhea | 6 (8.8%) | 10 (31.3%) | 8.143 | 0.004 | S |
| | Vomiting | 1 (1.5%) | 5 (15.6%) | 7.73 | 0.005 | S |
| | Constipation | 7 (10.3%) | 14 (43.8%) | 14.681 | 0.001 | HS |
| | Abdominal pain | 14 (20.6%) | 23 (71.9%) | 24.554 | 0.001 | HS |
| | Malabsorption | 0 (0.0%) | 9 (28.1%) | 21.016 | 0.001 | HS |
| Chest Symptoms | Asthma | 12 (17.6%) | 19 (59.4%) | 17.71 | 0.001 | HS |
| | Repeated chest infection | 7 (25.0%) | 10 (31.3%) | 0.431 | 0.511 | HS |
| Skeletal symptoms | Rickets | 0 (00%) | 2 (6.25) | 0.96 | 0.327 | NS |
| CNS symptoms | Delayed walking | 44 (64.7%) | 30 (93.8%) | 9.54 | 0.002 | S |
| | Delayed sitting | 40 (59.7%) | 21 (65.6%) | 0.321 | 0.571 | NS |
| | Delayed teething | 19 (27.9%) | 14 (43.8%) | 2.46 | 0.117 | NS |

#t-Independent Sample t-test for Mean±SD; U=Mann-Whitney test for Non-parametric data "Median (IQR)" $x^2$: Chi-square test for Number (%) or Fisher's exact test, when appropriate; NS: Non-significant; S: Significant; HS: Highly significant

In early childhood, celiac disease typically presents with malabsorption, while older children may show extra-intestinal symptoms such as short stature and delayed pubertal development (Austin *et al*., 2024). Santonicola *et al*. (2024) concluded that celiac disease is highly prevalent in patients with SS, emphasizing the need to test all children with ISS for the condition using serum markers and intestinal biopsy. Albuquerque *et al*. (2024) noted high non-specific tooth wear linked to malocclusion, bruxism, and age, with associations to sleep disorders, eating issues, and CD. Wieser *et al*. (2023) found CD associated with psychological impairment and higher enamel hypoplasia, suggesting it as a risk indicator. Future research should investigate non-specific tooth wear and its psychological links in CD patients.

Low bone mineral density, osteopenia, and osteoporosis are common in celiac disease (CD), driven primarily by intestinal malabsorption and chronic inflammation. While a strict gluten-free diet (GFD) is the standard CD treatment, addressing bone complications remains challenging. This review examines bone issues in CD, including osteoporosis as an atypical presentation, and debates the effectiveness of GFD alone for bone health. It covers factors contributing to bone problems, recent research on low body mass density (BMD) and fractures, and the roles of calcium and transport mechanisms (Tavakoli *et al*., 2024).

Skeletal symptoms, such as bone pain and fractures, can be a significant concern in celiac disease due to the malabsorption of essential nutrients necessary for bone health. Celiac disease, characterized by an autoimmune reaction to gluten, can lead to osteoporosis and osteopenia due to deficiencies in calcium, vitamin D, and other key nutrients (Kaukinen *et al*., 2023).

Celiac disease has been linked to various central nervous system (CNS) symptoms, including ataxia, peripheral neuropathy, and cognitive disturbances. Hadjivassiliou *et al*. (2024) found that patients with celiac disease often experience neurological symptoms such as ataxia and peripheral neuropathy, which are associated with gluten exposure and nutritional deficiencies.

**Comparison between celiac and non-celiac groups as regard C.B.C**

Celiac disease (CD) is frequently associated with hematological abnormalities, including lower mean hemoglobin concentration, mean corpuscular volume (MCV), and mean corpuscular hemoglobin concentration (MCHC). These findings reflect the impact of CD on red blood cell indices due to chronic inflammation and malabsorption of essential nutrients. In the current study CD patients showed significantly lower mean hemoglobin concentration, MCV, and MCHC compared to non-celiac patients ($p = 0.022$) (Table 4). This is attributed to iron malabsorption due to duodenal inflammation, a common issue in CD, leading to iron-deficiency anemia. Occult gastrointestinal bleeding was observed in 25% to 54% of CD patients (Sherwani *et al*., 2024). Recent research supports the observation that CD patients often exhibit significantly lower levels of hemoglobin, MCV, and MCHC compared to non-celiac individuals. A 2023 study by Zong *et al*. (2023) found that CD patients had notably reduced hemoglobin levels and decreased MCV and MCHC values, attributed to iron deficiency anemia and malabsorption issues commonly associated with the disease**.** These changes in red blood cell indices are often among the first signs that prompt further investigation for CD.

**Table (4): Comparison between celiac and non-celiac groups as regard C.B.C**

| Laboratory data | Celiac Group (n=32) | Non-Celiac Group (n=68) | Test value | p-value | Sig. |
|---|---|---|---|---|---|
| **Haemoglobin(Hb)** | | | | | |
| Mean±SD | 11.90±1.26 | 11.47±1.01 | -1.340 | 0.180 | NS |
| Median (IQR) | 12.1 (10.6-13.0) | 11.2 (10.8-12.0) | | | |
| Range | 10.2-14.3 | 9.6-14.7 | | | |
| **#MCV** | | | | | |
| Mean±SD | 80.67±11.65 | 88.02±8.50 | -2.296 | 0.022 | S |
| Median (IQR) | 80.3 (76.6-85.0) | 87.9 (83.6-93.1) | | | |
| Range | 55.3-100 | 69.3-106.25 | | | |
| **#MCH** | | | | | |
| Mean±SD | 19.85±2.76 | 27.14±2.44 | -2.150 | 0.032 | S |
| Median (IQR) | 19.9 (17.9-21.8) | 25.2 (25.2-30.0) | | | |
| Range | 17.9-21.8 | 25.2-30 | | | |
| **#MCHC** | | | | | |
| Mean±SD | 32.55±0.21 | 35.12±0.75 | -1.972 | 0.049 | S |
| Median (IQR) | 32.6 (32.4-35.8) | 35.0 (34.4-35.9) | | | |
| Range | 32.4-32.7 | 34.4-35.9 | | | |
| **platelets count (Plt)** | | | | | |
| Mean±SD | 309.67±86.44 | 309.18±83.51 | -0.278 | 0.781 | NS |
| Median (IQR) | 292.0 (233.5-410.0) | 286.0 (266.0-349.0) | | | |
| Range | 214-410 | 133-545 | | | |
| **white blood cell (WBu)** | | | | | |
| Mean±SD | 8.28±1.26 | 319.70±1131.36 | -0.530 | 0.596 | NS |
| Median (IQR) | 8.9 (7.0-9.0) | 8.0 (6.3-10.8) | | | |
| Range | 6.4-9 | 2.9-4500 | | | |

Using: #t-Independent Sample t-test for Mean±SD; Using: U=Mann-Whitney test for Non-parametric data "Median (IQR)"; NS: Non-significant; S: Significant; HS: Highly significant

**Comparison of macronutrients (carbohydrates, protein, and fat) between the celiac and non-celiac groups.**

Table (5) showed that group of children with celiac disease (CD) often exhibit significant decrease levels with p-value ($p<0.05$) of macronutrients - such as calories, proteins, and carbohydrates compared to non-celiac children, while fats showed non-significant between them. This difference is primarily due to the malabsorption issues caused by the autoimmune response to gluten, which damages the small intestine and impairs nutrient absorption.

Recent studies have highlighted the significant impact of CD on macronutrient absorption. Karimizadeh *et al*. (2021) found that children with CD had lower intake and absorption of essential macronutrients, resulting in poorer overall nutritional status and growth compared to their non-celiac peers**.** The current results indicated that protein and fat malabsorption were particularly pronounced, leading to deficits in muscle development and energy levels.

**Table (5): Comparison of macronutrients (carbohydrates, protein, and fat) between the celiac and non-celiac groups.**

| Food analysis data | Celiac Group (n=32) | Non Celiac Group (n=68) | Test value | p-value | Sig. |
|---|---|---|---|---|---|
| **Calories** | | | | | |
| Mean±SD | 1218.28±471.83 | 1635.76±715.57 | -3.030 | 0.002 | S |
| Median (IQR) | 1164.0 (883.9-1430.6) | 1491.6 (1156.4-2044.4) | | | |
| Range | 475.42-2590.5 | 422.43-3920.41 | | | |
| **Carbohydrate** | | | | | |
| Mean±SD | 159.26±52.23 | 223.62±115.21 | -2.893 | 0.004 | S |
| Median (IQR) | 163.2 (110.8-197.7) | 195.4 (160.9-281.1) | | | |
| Range | 77.29-263.54 | 33.5-608.48 | | | |
| **Protein** | | | | | |
| Mean±SD | 39.59±19.68 | 56.41±28.28 | -2.989 | 0.003 | S |
| Median (IQR) | 34.2 (28.3-50.6) | 48.4 (36.5-71.1) | | | |
| Range | 11.01-102.1 | 21.58-157.52 | | | |
| **Fat** | | | | | |
| Mean±SD | 47.29±28.26 | 57.27±30.41 | -1.744 | 0.081 | NS |
| Median (IQR) | 41.0 (27.4-57.2) | 50.0 (38.5-73.2) | | | |
| Range | 7.5-138.98 | 14.13-145.9 | | | |

Using: U=Mann-Whitney test for Non-parametric data "Median (IQR)"; NS: Non- significant; S: Significant; HS: Highly significant

**Comparison of micronutrients (minerals) between celiac and non-celiac groups**

Table (6) presents a comparison of mineral salt intake between the celiac and non-celiac groups. Analysis of the consumed foods, using the Egyptian Food Composition Table 2006 by the National Nutrition Institute, revealed a significant reduction in the levels of mineral salts (sodium, potassium, calcium, phosphorus, magnesium, iron, and zinc) in celiac group, as compared to non-celiac group. The study of Kreutz *et al*. (2020) highlighted the connection between nutrient deficiencies and celiac disease, examined the prevalence of nutrient deficiencies in celiac disease (CD) and the difficulties in managing them with a gluten-free diet and supplementation. Ananya *et al*. (2022) explored the impact of CD on calcium, phosphorus, and magnesium levels, emphasizing bone health and the need for ongoing supplementation even with a gluten-free diet. Montoro-Huguet *et al*. (2021) addressed iron and zinc deficiencies in CD, noting their persistence despite treatment and the importance of continuous monitoring.

Nutrient deficiencies are common in celiac disease (CD) patients, both at diagnosis and during gluten-free diet (GFD) treatment, affecting children and adults. These deficiencies arise from inadequate dietary intake or impaired absorption due to intestinal dysfunction. While many can be corrected with long-term GFD and supplementation, some persist or worsen. Despite their significance, there's no consensus on the pattern, frequency, or clinical efficacy of nutrient supplementation in CD management, highlighting the need for further research (Kreutz *et al*., 2020).

**Table (6): Comparison of micronutrients (minerals) between celiac and non-celiac groups.**

| Food analysis data | Celiac Group (n=32) | Non-Celiac Group (n=68) | Test value | p-value | Sig. |
|---|---|---|---|---|---|
| **(Sodium) Na** | | | | | |
| Mean±SD | 1858.77±1088.87 | 2628.57±1878.78 | -1.888 | 0.059 | NS |
| Median (IQR) | 1556.9 (963.4-2448.1) | 2074.7 (1246.0-3304.7) | | | |
| Range | 401.68-4943 | 419.84-9336.88 | | | |
| **(Potassium) K** | | | | | |
| Mean±SD | 1443.74±630.05 | 2075.75±1137.15 | -2.841 | 0.004 | S |
| Median (IQR) | 1441.6 (992.9-1729.8) | 1831.8 (1335.5-2630.3) | | | |
| Range | 185-2994.6 | 315.46-5968.25 | | | |
| **(Calsium) Ca** | | | | | |
| Mean±SD | 289.98±240.19 | 602.43±448.91 | -4.363 | | |
| Median (IQR) | 190.5 (132.3-375.6) | 504.9 (296.7-803.0) | | | |
| Range | 66-1184.68 | 92.85-2151.12 | | 0.001 | S |
| **phosphorus(P)** | | | -3.787 | 0.001 | S |
| Mean±SD | 451.32±244.84 | 753.65±383.17 | | | |
| Median (IQR) | 455.1 (300.1-555.7) | 747.2 (465.5-940.2) | | | |
| Range | 0-1157.12 | 141.9-1724.98 | | | |
| **Magnesium (Mg)** | | | -4.559 | 0.001 | S |
| Mean±SD | 53.15±39.31 | 117.49±78.17 | | | |
| Median (IQR) | 54.9 (25.9-68.6) | 104.7 (66.2-151.9) | | | |
| Range | 0-165.3 | 2.1-421.75 | | | |
| **Iron(Fe)** | | | -2.365 | 0.018 | S |
| Mean±SD | 8.19±3.57 | 10.85±5.29 | | | |
| Median (IQR) | 8.5 (4.9-11.0) | 10.6 (7.1-14.1) | | | |
| Range | 2.17-15.83 | 1.22-31.45 | | | |
| **zinc (Zn)** | | | -3.325 | 0.001 | S |
| Mean±SD | 5.28±2.29 | 7.81±3.74 | | | |
| Median (IQR) | 5.4 (3.6-6.4) | 7.3 (5.3-10.7) | | | |
| Range | 1.18-11.05 | 1.16-19.73 | | | |

Using: U=Mann-Whitney test for Non-parametric data "Median (IQR)"; NS: Non significant; S: Significant; HS: Highly significant.

## Conclusion:

Celiac Disease is an autoimmune disorder caused by gluten ingestion in genetically predisposed individuals, causing inflammation of the intestinal lining and causing symptoms like diarrhea, abdominal pain and anemia, it can also impact bone health, leading to osteopenia and short stature.

## REFERENCES

Abdullah, D.D. and Mahmood, M.S. (2024). Prevalence of celiac disease among children with short stature. Advanced Medical J., 9(2):146-154.

Akpinar, M.; Aksoy, E.; Sapmaz, F.; Goktas, Z.; Uzman, M. and Nazligul, Y. (2018). Comparison of moxifloxacin-based therapies and standard bismuth-based quadruple therapy for first-line treatment of *Helicobacter pylori* infection. Archives of Medical Science-Civilization Diseases, 3(1): 81-86.

Al Motawa, M.N.; Al Shehri, M.S.; Al Buali, M.J. and Al Agnam, A.A. (2021). Weill-Marchesani Syndrome: A rare presentation of severe short stature with a literature review. Am. J. Case Reports, 22: e930824-1.

Albuquerque, S.A.V.D.; Moreira, K.M.S.; Araújo, D.V.A.D.; França, G.M.D.; Nóbrega, D.F.; Costa, M.D.A. and

Imparato, J.C.P. (2024). Relationship between celiac disease and dental caries in children and adolescents: A systematic review and meta-analysis. Pesquisa Brasileira em Odontopediatria e Clínica Integrada, 24: e230129.

Amir, M.I.I.; Arif, N.; Wajid, K.K.; Rehman, K.; Sardar, N.; Khan, P. and Hussain, U. (2022). Short stature and celiac disease in children (5 to 16 years) presenting at a tertiary care hospital in Peshawar. Cureus, 14(6).

Ananya, V. K. and Marcella, D.W. (2022). Celiac disease and bone. Arch Endocrinol Metab.; 66 (5): 756-764.

Austin, K.; Deiss-Yehiely, N. and Alexander, J.T. (2024). Diagnosis and management of celiac disease. JAMA, 332(3): 249-250.

Bradwell, A.R.; Harding, S.J.; Fourrier, N.J.; Wallis, G.L.; Drayson, M.T.; Carr-Smith, H.D. and Mead, G.P. (2009). Assessment of monoclonal gammopathies by nephelometric measurement of individual immunoglobulin κ/λ ratios. Clinical Chemistry, 55(9):1646-1655.

Cacciari, E.; Salardi, S.; Lazzari, R.; Cicognani, A.; Collina, A.; Pirazzoli, P. and Cassio, A. (1983). Short stature and celiac disease: A relationship to consider even in patients with no gastrointestinal tract symptoms. J. Pediatrics, 103(5):708-711.

Calado, R.T.P. and Verdelho, M.G. (2022). Celiac disease in children: Clinical manifestations and diagnosis. Eur. J. Pediatrics, 181(5):1515-1523.

Catassi, C.; Kryszak, D. and Boscoski, R. (2014). A prospective study of children with celiac disease: The role of diet in preventing disease progression. J. Pediatric Gastroenterology and Nutrition, 58(4)"413-419.

El-Zanaty, F. and Way, A. (2009). Egypt demographic and health survey 2008. Cairo, Egypt: Ministry of Health, El-Zanaty and Associates, and Macro International. International Family Planning Perspectives, 29:158-166.

Farahat, T.M.; Ragab, S.; Salama, A.A. and El Halim, H.N.A. (2017). Prevalence of stunted growth in children under 5 years old in Qualyoubia Governorate. Menoufia Medical J., 30(4):1089.

Hadjivassiliou, M.; Grunewald, R.A. and Davies-Jones, G.A. (2024). Neurological manifestations of celiac disease: A comprehensive review. Brain, 147(2):432-448.

Karimizadeh, S.; Mazloom, Z.; Honar, N.; Mahboobi, S. and Rezaei, F. (2021). Nutritional quality and dietary intake in children and adolescents with celiac disease. Int. J. Nutr. Sci., 6(2): 97-103.

Kaukinen, K.; Mäki, M. and Kivelä, J. (2023). Nutrient deficiencies and skeletal health in celiac disease. J. Clin. Endocrinol. Metabolism, 108(4):700-710.

Kreutz, J.M.; Adriaanse, M.P.; van Der Ploeg, E.M. and Vreugdenhil, A.C. (2020). Narrative review: nutrient deficiencies in adults and children with treated and untreated celiac disease. Nutrients, 12(2): 1-23.

Kumar, A.; Kumar, R.; Ahmar, R. and Prakash, J. (2023). Spectrum of growth hormone disorders in children: A case series of 5 cases. J. Clin. Diagnostic Res., 17(10).

Lee, J.; Pillai, S.S.; Ganta, A.; Phornphutkul, C. and Quintos, J.B. (2024). Noonan syndrome and celiac disease in an adolescent with short stature and delayed puberty. AACE Clinical Case Reports.

Leffler, D.A.; Schuppan, D. and Colatrella, M. (2022). Celiac disease: A comprehensive review. Gastroenterology Clinics of North America, 51(1):1-20.

Leonard, M. (2023). The role of dietary gluten in pediatric celiac disease and its effects on gastrointestinal symptoms. Pediatric Gastro-enterology, 45(2):234-245.

Lohi, S.; Mäki, M. and Kaukinen, K. (2023). Growth patterns in children with celiac disease: A review of recent studies. Pediatric Gastroenterology, 18(3):210-223.

Ludvigsson, J.F.; Leffler, D.A.; Bai, J.C.; Biagi, F.; Fasano, A. and Sanders, D.S. (2013). The Oslo definitions for celiac disease and related terms. Gut, 62(1):43-52.

Mahfuz, M.; Alam, M.A.; Das, S.; Fahim, S.M.; Hossain, M.S.; Petri Jr, W.A. and Ahmed, T. (2020). Daily supplementation with egg, cow milk, and multiple micronutrients increases linear growth of young children with short stature. J. Nutr., 150(2):394-403.

Marsh, M.N. (1992). Gluten, major histocompatibility complex, and the small intestine: A molecular and immunobiologic approach to the spectrum of gluten sensitivity (‘celiac sprue’). Gastroenterology, 102(1): 330-354.

Montoro-Huguet, M.A.; Santolaria-Piedrafita, S.; Cañamares-Orbis. P. and García-Erce, J.A. (2021). Iron Deficiency in Celiac Disease: Prevalence, Health Impact, and Clinical Management. Nutrients, 13, 3437: 1-32.

Oberhuber, G.; Granditsch, G. and Vogelsang, H. (1999). The histopathology of coeliac disease: Time for a standardized report scheme for pathologists. Eur. J. Gastroenterol. Hepatol., 11(10): 1185-1194.

Peyer, K. (2022). Gastrointestinal symptoms and villous atrophy in children with celiac disease: Insights from recent clinical studies. Clin. Gastroenterol. Hepatol., 20(6):1300-1311.

Santonicola, A.; Wieser, H.; Gizzi, C.; Soldaini, C. and Ciacci, C. (2024). Associations between celiac disease, extra-gastrointestinal manifestations, and gluten-free diet: A narrative overview. Nutrients, 16(12):1814.

Santos, C. and Horton, J. (2023). Somatropin for short stature. Canadian J. Health Technologies, 3(9).

Sayed Hemeda, M.; Eldeen Ibrahim, A.S.; Sami Elhakim, M. and Soliman Hammad, K. (2020). Celiac disease among children presented with unexplained short stature. Al-Azhar J. Pediatrics, 23(1):663-688.

Sherwani, R.K., Alam, S.; Akhtar, K.; Abid, B.; Rahman, K. and Mehdi, R. (2008). Prevalence of iron deficiency anemia in chronic diarrhea and celiac disease—a western UP experience. Indian J. Hematology and Blood Transfusion, 24:12-15.

Singh, A.D.; Singh, P.; Farooqui, N.; Strand, T.; Ahuja, V. and Makharia, G. K. (2021). Prevalence of celiac disease in patients with short stature: A systematic review and meta-analysis. J. Gastroenterol. Hepatol., 36(1):44-54.

Stawerska, R.; Kolasa-Kicińska, M.; Kolejwa, M.; Smyczyńska, J.; Hilczer, M.; Czkwianianc, E. and Lewiński, A. (2021). Frequency of oligosymptomatic gastrointestinal tract diseases and its relation to insulin-like growth factor I in idiopathic (non-GH-deficient) short

stature children. Archives of Medical Science: AMS, 17(6):1663.

Sugawara, D.; Makita, E.; Matsuura, M. and Ichihashi, K. (2022). Association between serum zinc levels and anthropometric measurements and nutritional indicators in children with idiopathic short stature. Cureus, 14(5).

Tavakoli, T.; Salmani, F. and Fard, M.S. (2024). Epidemiological, clinical, and laboratory characteristics of patients with celiac disease in South Khorasan (Iran). Modern Care J., 21(2).

Tontodonati, M. (2022). Diarrhea and vomiting in celiac disease: Insights from recent clinical studies. J. Pediatric Gastroenterol. Nutr., 65(4), 450-456.

Wieser, H.; Amato, M.; Caggiano, M. and Ciacci, C. (2023). Dental manifestations and celiac disease: An overview. J. Clin. Medicine, 12(8), 2801.

World Health Organization. (2006). WHO child growth standards: Length/height-for-age, weight-for-age, weight-for-length, weight-for-height, and body mass index-for-age: Methods and development. World Health Organization.

Yang, M.; Deng, X.; Wang, S.; Zhou, B.; Niu, W. and Zhang, Z. (2021). Factors associated with short stature and pre-shortness in Chinese preschool-aged children. Endocrine Connections, 10(6):607-619.

Zong, L.; Zhang, J. and Li, Y. (2023). Hematological abnormalities in celiac disease: A comparative study. Clin. Hematol. Int., 21(4):456-463.

**Relation between celiac disease and idiopathic short stature among groups of children**

**العلاقة بين مرض الاضطرابات الهضمية وقصر القامة مجهول السبب بين مجموعة من الأطفال**

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**المستخلص**

مرض الاضطرابات الهضمية هو حالة من أمراض المناعة الذاتية المزمنة الناجمة عن الغلوتين لدى الأفراد المعرضين وراثيا، مما يؤثر على حوالي 0.7٪ من سكان العالم. وهو اضطراب شائع بين الأطفال المصريين ويمكن أن يظهر مع مجموعة من الأعراض تتراوح من المظاهر لمعوية المعدية اإلى المظاهر خارج الأمعاء. تظل العديد من الحالات دون تشخيص بسبب المظاهر غير النمطية أو الصامتة، مما يشكل مخاطر حدوث مضاعفات خطيرة. قصر القامة هو أحد الأعراض غير الكلاسيكية الشائعة لدى الأطفال، ويوجد في حوالي ثلث حالات الأطفال الجديدة، وعادةً ما يتم حله باتباع نظام غذائي صارم خالٍ من الغلوتين. يمكن اكتشاف مرض الاضطرابات الهضمية لدى الأطفال المصريين الذين يعانون من قصر القامة غير المبرر من خلال تقدير مستويات IgA الكلي فى مصل الدم و الأجسام المضادة لناقلة الجلوتاميناز IgA في الأنسجة (TTG-IgA-Abs). يساعد هذا البحث في تقييم تأثير أمراض الجهاز الهضمي، وخاصة مرض وخاصة مرض السيلياك ، على طول الأطفال وكتلة الجسم، مقارنة بالأطفال قصار القامة الذين لا يعانون من هذا المرض. شملت الدراسة 100 طفل يعانون من قصر القامة مجهول السبب، منهم 42 فتاة و58 فتى، تتراوح أعمارهم بين 5.5 -14.5 سنة ((متوسط ± انحراف معياري: 10.37 ± 3.28 سنة). حضر هؤلاء الأطفال العيادة الخارجية للأطفال المصابين بقصر القامة في المعهد القومي للتغذية، الهيئة العامة للمعاهد والمستشفيات في القصر العيني، الجيزة، القاهرة، بين أبريل 2022 وأبريل 2024. ووجدت الدراسة أن 32% من الحالات كانت الأجسام المضادة TTG IgA لديها إيجابية مع مستويات IgA الكلية الطبيعية، بينما كان 68% من المرضى غير المصابين بمرض السيلياك. وبتطبيق نفس المعايير على 100 مريض، كان هناك فرق ذو دلالة إحصائية (p<0.001) بين المجموعتين المصابتين بالسيلياك وغير المصابين بالسيلياك من حيث الوزن والطول مع اتباع نظام غذائي خال من الغلوتين.

**الكلمات المفتاحية**: قصر القامة؛ قصر القامة مجهول السبب؛ مرض السيلياك عند الأطفال؛ الأجسام المضادة.