

Estimation of Some Hematological Parameters, Liver Enzymes and Iron Mineral in Adult of Celiac Disease Patients

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Abstract

Celiac disease is one of the most prevalent chronic illnesses. It is produced due to gluten, a protein found in wheat, rye, and barley that damages the villi, so the body cannot adequately absorb nutrients. This study was undertaken to determine of some hematological parameters, liver enzyme and iron (Fe) in celiac disease patients compared with the healthy group. The results indicated a high significantly increase ($p \leq 0.01$) in levels of ALT (alanine transferase), ALP (alkaline phosphatase), ESR (erythrocyte sedimentation rate), AST (aspartate transferase) in age category (41-60) and WBC (white blood cells) in age category (41-60), while significantly increased ($p \leq 0.05$) in levels of AST and WBC in age category (20-40) in celiac disease patients as compared with healthy group. High significantly decreased ($p \leq 0.01$) in levels of hemoglobin in age category (20-40), RBC (red blood cells) and Fe, while levels of hemoglobin in age category (41-60) was significantly decreased ($p \leq 0.05$) in celiac disease patients as compared with healthy group. In celiac disease patients of age category (20-40) as compared with age category (41-60), there was a high significant difference ($p \leq 0.01$) in ESR, AST and Fe and significant difference ($p \leq 0.05$) in ALT and ALP, while no significant in hemoglobin, RBC and WBC in celiac disease patients of age category (20-40) as compared with age category (41-60). This study concludes that untreated celiac disease causes nutrient deficiencies due to malabsorption, which causes anemia, inflammations, and elevated liver enzymes

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1. Introduction

Celiac disease (CD) is one of the most prevalent chronic illnesses, with a frequency of 1–2% on the rise [1], [2]. It also has other terms, gluten sensitive enteropathy or celiac sprue. It is a common disease, already described mainly in children. Now it is significantly being diagnosed in people of all ages [3]. Celiac disease is produced due to gluten, a protein found in wheat, rye and barley, when persons, who have CD, eat gluten their body produce antibodies which attack the small intestine [4]. This attack damages the villi, a series of little finger-like bumps that border the small intestine and aid in nutrition absorption, when the villi are injured, nutrients cannot be adequately absorbed by the body. [5]. Celiac disease has a wide range of clinical symptoms dependent on the patient's age, the length and extent of the disorder, and the occurrence of extra-intestinal manifestations [6]. CD symptoms can vary from no symptoms to extreme symptoms. Major CD patients experience blatant malabsorption symptoms, which are frequently accompanied by autoimmune illness. Diarrhea, gastrointestinal distension, vomiting, constipation, weight loss, tiredness, short stature, flatus, muscular wasting, and hypotonia are all signs of CD in babies, teens, and adults., general irritability and unhappiness are found [3]. Silent celiac is characterized by small abnormalities of the intestinal mucosa and in the majority of cases are caused by a positive serology test., but appears to be without symptoms [7]. Antibodies to anti-endomysial and transglutaminase are two sensitive and specific serological indicators used as a first non-invasive test for CD. While positive test results may help confirm a diagnosis, an upper GI (Gastrointestinal) tract biopsy is expected and the only way to make a conclusive diagnosis is to see compatible intestinal mucosal lesions on histology [8]. Although celiac disease has been known for decades as a disease that affects some children, but the increase in diagnosis cases in adults, for this reason this study was undertaken to determine the severity of celiac disease between two age category patients, the first group (20-40) years and the second group (41-60) years and compared with healthy people and study possible long term complications by estimation some hematological parameters (Hb, RBC, WBC and ESR), liver enzyme (ALT, AST and ALP) and iron.



2. Materials and methods

2.1. Study design and subjects

This study is a clinical experiment. Samples were collected from Al-Sader Teaching Hospital, Basrah, Iraq from November 2020 to June 2021. It included (42) patients (8 males and 34 females) suffering from CD and matched with the controls group, which comprised (39) healthy individuals (15 male and 24 female).

2.2. Hematological analysis

CBC was determined by an auto analyzer (Sysmex, Japan) [9]. ESR was measured by Westergren method, where blood was placed in the tube, and the rate of blood sedimentation was measured after an hour [10].

2.3. Biochemical analysis

ALT, AST and ALP were determined by ready kit (AGAPPE, Switzerland) [11]–[13]. Fe was measured by flame atomic absorption spectrometry [14].

2.4. Statistical analysis

The current study's findings were evaluated utilizing the one-way covariance (ANOVA) test. The statistical program SPSS v.16 was used to perform all statistical calculations. The data were presented as means and standard deviations (mean±SD), with a significance level of $p \leq 0.05$.

3. Results

3.1. Hematological parameters

Levels of ESR and WBC in age category (41-60) were high significantly increase ($p \leq 0.01$), while WBC levels in the 20-40 age range were significantly higher ($p \leq 0.05$) in CD than in the healthy group. Levels of hemoglobin in age category (20-40) and RBC were high significantly decreased ($p \leq 0.01$), while levels of hemoglobin in age category (41-60) was significantly decreased ($p \leq 0.05$) in CD as compared with healthy group as shown in Table 1.

In CD patients of age category (20-40) as compared with age category (41-60) there was a high significant difference ($p \leq 0.01$) in ESR, while no significant in hemoglobin, RBC and WBC



in CD patients of age category (20-40) as compared with age category (41-60) as shown in Table 2.

Table 1: Levels of hematological parameters in celiac patients and healthy group

Parameters	Control (20-40) year	Patients (20-40)year	p-value	Control (41-60) year	Patients (41-60) year	p-value
	mean±SD	mean±SD		mean±SD	mean±SD	
Hemoglobin (g/dL)	12.27±1.55	**10.24±2.07	p≤0.01	12.60±1.38	*10.93±2.43	p≤0.05
RBC (10 ⁶ /UI)	4.81±0.68	**4.11±0.68	p≤0.001	4.60±0.46	**3.87±0.74	p≤0.01
WBC (10 ³ /UI)	6.55±1.29	*7.75±2.51	p≤0.05	5.90±1.08	**8.88±2.13	p≤0.001
ESR (mm/h)	8.96±6.05	**17.07±5.45	p≤0.001	10.83±5.42	**30.00±13.31	p≤0.001

Table 2: Levels of hematological parameters in both age categories of celiac disease patients

parameters	Patients (20-40)year	Patients (41-60) year	p-value
	mean±SD	mean±SD	
Hemoglobin (g/dL)	10.24±2.07	10.93±2.43	p>0.05
RBC (10 ⁶ /UI)	4.11±0.68	3.87±0.74	p>0.05
WBC (10 ³ /UI)	7.75±2.51	8.88±2.13	p>0.05
ESR (mm/h)	17.07±5.45	**30.00±13.31	p≤0.001



3.2 Liver enzyme

Levels of, ALT, ALP and AST in age category (41-60) were high significantly increased ($p \leq 0.01$), while levels of AST was significant increased ($p \leq 0.05$) in CD than in healthy group as shown in Table 3. In CD patients of age category (20-40) as compared with age category (41-60), in AST, there was high significant difference ($p \leq 0.01$), and in ALT and ALP, there was a significant difference ($p \leq 0.05$) as shown in Table 4.

3.3. Iron

The results indicated high significant decrease ($p \leq 0.001$) in serum level of Fe in both age categories CD patients as compared with healthy group as shown in table (3) and high significance difference ($p \leq 0.001$) between both age categories of patients group as shown in Table 4.



Table 3: Levels of liver enzyme and iron in celiac disease patients and healthy group.

parameters	Control (20-40) year	Patients (20-40)year	p-value	Control (41-60) year	Patients (41-60) year	p-value
	mean±SD	mean±SD		mean±SD	mean±SD	
ALT(U/L)	21.53±3.04	24.61±2.64**	p≤0.01	23.60±4.04	27.73±8.26**	p≤0.001
AST(U/L)	20.81±2.69	22.11±1.73*	p≤0.05	21.23±2.75	24.85±2.47**	p≤0.001
ALP(U/L)	68.51±9.12	72.73±3.81**	p≤0.01	65.84±4.39	77.43±2.75**	p≤0.001
Fe (µg/ml)	1.70±0.06	0.89±0.03**	p≤0.001	1.60±0.05	0.77±0.12**	p≤0.001

Table (4): levels of liver enzyme and iron in both age categories celiac disease patients

parameters	Patients (20-40)year	Patients (41-60) year	p-value
	mean±SD	mean±SD	
ALT(U/L)	24.61±2.64	27.73±8.26*	p≤0.05
AST(U/L)	22.11±1.73	24.85±2.47**	p≤0.001
ALP(U/L)	72.73±3.81	77.43±2.75*	p≤0.05
Fe (µg/ml)	0.89±0.03	0.77±0.12**	p≤0.001

4. Discussion

4.1. Hematological Parameters

Celiac disease is common causes various hematologic disorders , the most common of which is anemia [15] Hemoglobin is known as the iron –containing protein in blood [16] in the present study observed high significant decrease of hemoglobin level in CD patients of age category (20-40) year and significant decrease of age category (41-60) year as compared with healthy groups. This result may be due to iron deficiency because of the patients' blood loss and failure of the proximal intestine's enterocytes to absorb iron from the food [17] and this result agreement with [18]. High significant decrease in RBC count of CD patients as compared with healthy groups as shown in table (1) this result an agreement with [3] this result may be due to iron deficiency ,it is required for adequate erythropoietic function ,Erythropoietin (EPO) is a key regulator of erythropoiesis, supporting the survival, proliferation, and differentiation of erythroid progenitor cells while also controlling the quantity of erythrocytes in the peripheral circulation. In adults, the kidneys are the primary source of EPO, while in fetuses the liver is the principle site of EPO gene expression [19]. CD is characterized by the production of smaller red blood cells due to a low hemoglobin content [15] White blood cells counts indicated that significant increase in CD patients as compared with healthy groups this results agreement with [20] an increased susceptibility of peripheral blood lymphocytes from untreated celiac disease patients. CD is a small intestine mucosal illness that causes malabsorption as a result of an inflammatory reaction to gluten; neutrophils and lymphocytes are key players in inflammatory processes. [21].

High significant increase in erythrocyte sedimentation rate in CD patients agreement with [22]. The sedimentation rate is a common indicate and monitor an increase in inflammatory activity within the body [23]. The difference of ESR in age categories indicates the severity of the disease . As the earlier it is detected, the less severe it is, as in some cases the disease is discovered recently because some cases of disease are silent celiac and without clinical symptoms, and the more severe the villous atrophy, the higher the level of inflammation. This may be attributed to the deference between age categories in the level of ESR [24], [25].



4.2 Liver Enzymes

The results showed that increase in serum level of liver enzymes in celiac patients as compared with control groups as well as within celiac patients in both age category as shown in tables (2) this result agreement with [26]. This increase may be due to abnormal intestinal permeability are thought to play pathogenic roles [27] Toxins, cytokines, and antigens can enter the portal circulation and induce liver damage as a result of increased intestinal permeability, the increased permeability of the intestinal mucosa, which allows antigens to be absorbed from the gut. These antigens might elicit an immunological response in a genetically predisposed person, resulting in mucosal injury and anti-endomysial antibody exposure of the tissue transglutaminase (TTG) enzyme. This autoimmune antibody is a key factor in causing liver damage [28]. The range of liver impairment in celiac disease is particularly broad, including mild inflammation of the liver parenchyma that can be reversed with a gluten-free diet (celiac hepatitis), chronic inflammatory liver injury that can lead to fibrosis or cirrhosis, and severe liver failure that can be reversed with a gluten-free diet [29]. Elevation serum level of ALP is also attributed to causes According to increased bone ALP isoenzymes, hyperparathyroidism, hypocalcemia, excessive parathyroid hormone, and poor bone mineral density are some of the conditions that can occur [26]. The difference of liver enzymes between age categories indicates the severity of the disease. As the late detection of the disease because one of the types of celiac disease is silent and without clinical symptoms increases the severity of the disease and thus increases inflammations and toxins that cross to portal circulation and this may be attributed to the deference between age categories in level of liver enzymes [24], [25], [30].

4.3 Iron

The result showed that there was decrease in the concentration of iron in celiac disease compared with control group. The study of [31] agreement with this results where they showed that there is a deficiency in the levels of iron. In CD, reduced surface area, particularly in the proximal small intestine, has been caused to iron insufficiency [32]. Celiac disease is characterized by an abnormal immune response, persistent inflammation of the mucosa of the small intestine, and the disappearance of intestinal villi with time, all of which lead to a decrease in iron absorption. When iron deprivation and the body's need



for iron are not fulfilled by dietary supplies, the organism's iron storage is reduced, resulting anemia. Since the concentration of hemoglobin is abnormally low, this pathological mechanism is marked by smaller red cell generation [15]. The difference of iron in age categories indicates the severity of the disease. some cases of celiac disease are silent and without clinical symptoms, therefore some cases the time of diagnosis celiac disease is discovered recently and the villous atrophy are more severe and and this may be attributed to the cause of deference between age categories in the level of iron. The earlier of celiac disease is detected, the fewer complications [24], [25].

5. Conclusions

Untreated celiac disease causes nutrient deficiencies due to malaabsorbtion, which causes anemia. A positive relationship between untreated celiac disease and hypertransaminase, ALP, ESR and WBC.

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تقدير بعض معايير الدم ، أنزيمات الكبد و الحديد لدى المرضى البالغين المصابين بمرض الداء الزلاقي

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المستخلص

يعد مرض الداء الزلاقي من أكثر الأمراض المزمنة انتشارًا. ينتج مرض الداء الزلاقي عن تناول الغلوتين ، وهو بروتين موجود في القمح، الجاودار والشعير الذي يسبب تلف الزغابات وبالتالي لا يمكن للجسم امتصاص المواد الغذائية بشكل كافي. أجريت هذه الدراسة لتحديد بعض معايير الدم ، إنزيمات و الحديد في مرضى الداء الزلاقي مقارنة بمجموعة الاصحاء. اظهرت النتائج ان هناك ارتفاع عالي المعنوية ($p \leq 0.01$) في مستوى AST, ESR, ALP, ALT في الفئة العمرية (60-41) و WBC في الفئة العمرية (60-41) و ارتفاع معنوي ($p \leq 0.05$) في مستوى AST, WBC في الفئة العمرية (40-20) في مرضى الداء الزلاقي مقارنة مع مجموعة الاصحاء. كما لوحظ انخفاض عالي المعنوية ($p \leq 0.01$) في الهيموغلوبين في الفئة العمرية (40-20)، و RBC، Fe وانخفاض معنوي ($p \leq 0.05$) في الهيموغلوبين في الفئة العمرية (60-41) في مرضى الداء الزلاقي مقارنة مع مجموعة الاصحاء. هناك فرق عالي المعنوية ($p \leq 0.01$) في ESR, AST و Fe و فرق معنوي ($p \leq 0.05$) في ALT و ALP بينما لا يوجد فرق معنوي في الهيموغلوبين، RBC و WBC في مرضى الداء الزلاقي في الفئة العمرية (40-20) مقارنة مع الفئة العمرية (60-41). استنتج أن مرض الداء الزلاقي غير المعالج يسبب نقص في المغذيات بسبب سوء الامتصاص الذي يسبب فقر الدم، الالتهابات وارتفاع إنزيمات الكبد.