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Article

Assessment of Immunological Parameters of Early Osteoporosis in Patients With Celiac Disease in Wasit Governorate

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Abstract: The study analyses the immunological markers, especially Interleukin-6 (IL-6) and Interleukin-18 (IL-18), in elderly Iraqi patients with early osteoporosis linked to coeliac disease (CD). Coeliac disease, an autoimmune condition induced by gluten, may adversely affect bone density via inflammatory and hormonal pathways. Seventy-five blood samples were collected: twenty-five from patients with osteoporosis and coeliac disease, and fifty from age- and sex-matched controls. The samples were categorised into two age groups (55–65 and 65–75 years) and assessed using ELISA methods for IL-6 and IL-18 concentrations. The research identified a statistically significant elevation ($p < 0.001$) in IL-6 and IL-18 concentrations in the patient cohort relative to the control group. Moreover, a notable gender-based disparity in IL-18 levels was observed, especially among female patients, indicating a hormonal impact on cytokine expression. These results highlight the potential of IL-6 and IL-18 as early immunological indicators for osteoporosis in people with coeliac disease. The findings support the use of immune profiling into clinical evaluations to enhance bone health management in coeliac patients. Additional longterm studies are required to elucidate causative pathways and assess the advantages of immunomodulatory treatments.

Keywords: Osteoporosis, Immunological, Interleukin 6, Interleukin 18, Celiac Disease

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1. Introduction

Osteoporosis is a significant health concern affecting the skeletal system, characterised by alterations in bone tissue and strength, rendering it susceptible to fractures. This condition is widespread and may affect individuals of various ethnicities, particularly elderly men and women [1]. Coeliac disease (CD) is an autoimmune disorder whereby, in predisposed individuals, the consumption of gluten provokes an immunological response against the small intestine, accompanied by a serological reaction. In contrast to other autoimmune illnesses, the immunogenic antigens that elicit the immune response in coeliac disease have been discovered and extensively characterised. Consequently, eliminating those antigens by adherence to a gluten-free diet (GFD) is a recognised effective therapy for coeliac disease (CD)[2].

Research has shown a heightened incidence of coeliac disease in individuals with diminished bone mineral density. The estimated frequency of CD is 2–3% among persons with poor BMD, compared to around 1% in the overall population [3].The objective of the research is to evaluate the immunological markers of early osteoporosis in patients with coeliac disease (CD) and to ascertain the impact on the average values of these parameters in both conditions [4].

2. Materials and Methods

2.1 Study Design

The study was conducted in the Gastrointestinal unit the of Al- Zahraa Teaching Hospital and in coordination with the Osteoporosis clinic/Al kut reabilitatation center & Prosthetics and Unit Joints in Al-Karama Teaching Hospital in Wasit Governorate during period October 2024 to February 2025. And their ages ranged from (55-75) years old . This study included for blood samples were collected from elderly men and women Iraqi, including blood samples from the group of patients with osteoporosis associated with celiac disease. blood samples from females, blood samples from male, and blood sample from the control group [5]. These samples were divided into two age groups, with (55-65) years represents the first age group, and (65-75) years represents the second age group.

Samples were collected based on data recorded for all patients: height, weight, age, sex, other diseases, inheritance of the disease in the family, questions about medical history, symptoms of the disease and treatment methods. Immunological parameters in the blood were measured [6].

2.2 Blood Sampling

5 ml of venous blood samples were withdrawn in gel tube and clot activator for check the level of Interleukin-18 and Interleukin -6.

Determination of (Interleukin -18 , Interleukin -6) ELISA Kit: The Sandwich ELISA principle is utilized in this ELISA kit.

Statistical Analysis: : The statistical method used one way analysis of variance (ANOVA). The appropriate statistical method for testing hypotheses is F Statistics, accepting or rejecting the test hypothesis based on the probability value method associated with the F Statistics, based on the statistical significance level of 5% or 1%. A t-test was also used to compare two sets of readings for the same sample, where the effect of this factor or indicator can be inferred [7].

3. Results

Table 1. It shows a comparison between patients of early osteoporosis with celiac diseases and control group of immunological parameters.

Parameters	Patients(n=25) Mean±SE	Control(n=50) Mean±SE	P-value	Significance level
IL-6(ng/ml)	21.79 ± 0.40	11.198± 0.246	0.0001	***
IL-18(pg/ml)	304.20 ± 13.39	131.467± 10.094	0.0000	***

* Significant ($p < 0.05$) , ** Significant ($p < 0.01$)

*** Highly significant ($p < 0.001$) , ns : Not statistically significant

Table 1. Shows the distribution of values for immunological parameters used in studying the early osteoporosis with celiac disease and comparing these results with the control [8].

According to the immunological parameters, The statistical tests for early osteoporosis with celiac disease, the test value showed that (P. value) was less than the level of significance (0.05) in(IL-6 , IL-18), which means that there are significant differences between these values for patients and control groups.

Table 2. shows effect of gender on immunological parameters for early osteoporosis with celiac disease for both patients and control.

Parameters	Gender	Patients Mean±SE	Control Mean±SE	P-value	Significance level
IL-6 (ng/ml)	Male	22.351± 0.535	11.305±0.274	0.0001	***
	Female	21.190± 0.575	10.990±0.501	0.0001	***
P-value		0.152	0.550		
IL-18(pg/ml)	Male	278.314± 17.830	132.216±14.331	0.0001	***
	Female	332.237± 17.387	130.136±2.241	0.0001	***
P-value		0.0415	0.918		
Significance level		*	ns		

* Significant ($p < 0.05$) , ** Significant ($p < 0.01$)

*** Highly significant ($p < 0.001$) , ns : Not statistically significant

Table 2. Shows the distribution of values of used in studying the effect of gender on immunological parameters for early osteoporosis with celiac disease for both patients and control [9].

The immunological parameters indicated that the statistical tests for early osteoporosis in patients with coeliac disease revealed a P-value for IL-18 that was below the significance threshold of 0.05, signifying significant differences between the means of the parameters for males and females.In the control group, the values for IL-6 and IL-18 indicated that the p-value exceeded the significance threshold of 0.05 across all parameters, indicating no significant difference between the means of men and females.The P value for IL-6 in patients exceeded the significance threshold of 0.05 across all parameters, indicating no significant difference between the means of men and females [10].

4. Discussion

Interleukin (IL) -6 , Interleukin (IL) -18

In this study, it was observed that there was a significant decrease in the levels of (IL-6, IL-18) in early osteoporosis with celiac disease. The reason for this is effect of a gluten – free diet can reduce intestinal inflammation , which may lead to lower levels of IL-6 , IL-18. Also, reducing chronic inflammation [11].It has effects on the immune system. It may be due to the effect of treatments used for osteoporosis , such as bisphosphonates. Hormonal changes such as changes in estrogen levels . The decrease in these interleukinase levels affects bone density [12], [13], [14].

In addition to the effect of gender on immunological parameters it may be caused by increase and decrease of IL-6 , IL-18 for several reasons . including hormonal changes such as estrogen and testosterone , especially in women after menopause. Also , cause of physiological changes is the body ś response to inflammation and stress. It may be due to genetic influences that affect the body ś response to disease [15].

5. Conclusion

This research concludes that individuals with early osteoporosis linked to coeliac disease have much higher levels of the immunological markers IL-6 and IL-18 than healthy controls, with statistical significance at $p < 0.001$. Studies indicate that gender affects IL-18 levels more significantly than IL-6, especially in female patients, perhaps owing to

hormonal and genetic variables. These findings highlight the relevance of evaluating immunological measures as early indicators for osteoporosis in patients with coeliac disease. This research suggests the potential benefit of introducing immunological evaluations into diagnostic and therapy methods for at-risk groups, particularly older individuals with autoimmune disorders. Future study need to examine longitudinal studies with bigger cohorts to identify causal linkages and evaluate the effectiveness of tailored immunomodulatory medications in alleviating osteoporosis development in coeliac patients.

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