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Original Research Article

The Role of CRP and BODY MASS INDEX (BMI) in Iraqi Premenopausal Women Osteoarthritis Patients

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Abstract: Osteoarthritis (OA) is the most common form of arthritis, affecting 1 in 3 people over the age of 40 and women more so than men The goal of the study is to identify the relationship between body mass index (BMI), and C-reactive protein (CRP), with osteoarthritis (OA) in woman premenopausal subjects. In the study, 30 healthy woman without OA and 60 women patients with OA from general Balad Hospital in Salah Al-Den governorate were both included. Each subject was a premenopausal woman between the ages of 40 and 50. Clinical examination, X-ray diagnosis, and biochemical tests with ELISA and COBOS 6000 were used to determine the diagnosis of OA. This study proved that there is a significant increase in BMI (29.56+ 0.64) and CRP (0.703+ 0.09) mg/ml in premenopausal OA females than their level in the healthy control group (26.58) Kg/m2 and (0.379+0.11) mg/dl respectively. It's noted that BMI has a negative correlation with CRP. Osteoarthritis in premenopausal women is strongly affected by BMI and CRP levels and it's recommended to manage obesity and take CRP into consideration in routine OA tests.

Keywords: Body mass index, C - reactive protein, premenopausal women, Osteoarthritis.

INTRODUCTION

The prevalence of osteoarthritis is extensive and incapacitating, posing a substantial and increasing health load with noteworthy consequences for affected individuals, healthcare systems, and overall socioeconomic costs [1, 2]. The prevalence of this syndrome is on the rise due to the compounding effects of aging, raising obesity rates, and an increase in joint injuries. Current estimates suggest that approximately 250 million individuals are presently afflicted by this limiting condition. The majority of individuals with osteoarthritis do not obtain proper management therapies in this environment of high stress [3]. There are two main types of osteoarthritis: Primary and secondary. Primary osteoarthritis is more generalized, affecting varied parts of the body, while secondary osteoarthritis occurs after an injury, typically one that causes inflammation in a joint [4, 5]. The prevalence of OA is higher in women than men, and the incidence increases around menopause. Several authors have suspected the role of hormonal factors in the development of OA. However, results are conflicting, and the difference between men and women could be explained by other factors (reduced volume of cartilage, bone loss, or lack of muscle strength [6]. Severe dysplasia exhibits a significant correlation with hip osteoarthritis and precipitates its onset at a relatively young age (below 50 years) [7]. Obesity is a risk factor for osteoarthritis, particularly of the knee. Obesity is still the leading risk factor for the onset and progression of osteoarthritis (OA). Overloading the joints due to increased weight was thought to be the major cause of OA, which led to the loss of articular cartilage. Recent research has shown that other variables such as adipose deposition, insulin resistance, and, in particular, the poor coordination of innate and adaptive immunological responses might lead to the beginning and progression of obesity-associated OA [7]. C reactive protein (CRP), along with erythrocyte sedimentation rate (ESR), is perhaps the most common laboratory marker of activity in joint disorders.

C-reactive protein is an inflammatory marker that is typically not detected in the blood unless there is some degree of inflammation in the body. It is produced by the monocytes of the tissue factor classified as an acute phase

reactant, regulated by pro-inflammatory cytokines such as IL-6 and TNF-, and is regulated by pro-inflammatory cytokines such as IL-6 and TNF-.C.

A spike in CRP is one of the key features of inflammatory arthropathies, although CRP has previously been regarded worthless in OA, which is typically characterized as a "non-inflammatory" arthropathy. However, serum CRP determination has recently been advocated as a measure of disease severity in hip and knee OA. C-reactive protein, but not erythrocyte sedimentation rate, is related to clinical severity in patients with knee or hip osteoarthritis [8, 9].

MATERIALS AND METHODS

Determination of Body Mass Index

The height and weight of each patient were documented to determine the body mass index of patients, Body Mass Index is a simple calculation based on a person's height and weight. The formula: BMI = kg/cm^2 where kg is a person's weight in kilograms and centimeters is their height in centimeters squared, the BMI range as indicated in WHO, [10] as indicated in table (1):

Table 1: The BMI range [10]

Sr. No	BMI levels	range
1.	18.5 to 24.9	Normal healthy weight
2.	25.0 – 29.9	Overweight
3.	30 or more	Obesity

C - reactive protein Kit Components

CRP Kit Principle

Particle-enhanced immunoturbidimetric assay Human CRP agglutinates with latex particles coated with monoclonal anti-CRP antibodies. The aggregates are determined turbidimetrically [11].

CRP Procedure

1. 2 µL of serum patient serum blood samples were added to each well, while control tubes remained empty.
2. 150 µL of R1 was added to each well of patient and control samples.
3. 48 µL R2 was diluted with 24 µL H2O the mixture was incubated for 10min at room temperature then the absorbance was determined at 800/570 nm wavelength (sub/main).

Expected value: Consensus reference interval for adults: 14 < 5 mg/L (< 47.6 nmol/L).

Analytical Statistics

The SAS System program was employed to modify several study parameter elements. A meaningful comparison between means (0.05 and 0.01 probability) was made using the T-Test. Using the SPSS_21 program, the correlation coefficient; ROC, AUC, sensitivity, and specificity were calculated.

RESULTS AND DISCUSSION

Sample Collection

The patients in the two groups were comparable in terms of age and sex. The samples were obtained from General Balad Hospital, which included 30 healthy volunteers and 60 premenopausal women with OA who were between the ages of 40 and 50. Along with correlation coefficients, the mean and standard deviation were estimated.

Correlation between Melatonin levels and BMI in premenopausal osteoarthritis female patients and control group

Obesity was a robust risk factor for OA, therefore BMI was evaluated in this study to determine its effect on premenopausal females over 40 years old. Results indicated in Figure (1) and Table (2) indicated that body mass index significantly increased (P≤0.01) in female premenopausal patients in comparison to healthy control groups (29.56 vs 26.58) kg/m^2. Zheng, *et al.*, [12] also agree with this study, it illustrated that obesity level and overweight were significantly linked with higher OA concerns (p<0.001). The risk of knee OA increases by 35% with a 5 kg/m^2 increase in BMI.

Table 2: Comparison between premenopausal female patients and Healthy groups in BMI

Group	Mean ± SD (BMI) (kg/m^2)
Female patients	29.56 ± 0.64
Healthy Control	26.58 ± 0.94
** (P≤0.01).	

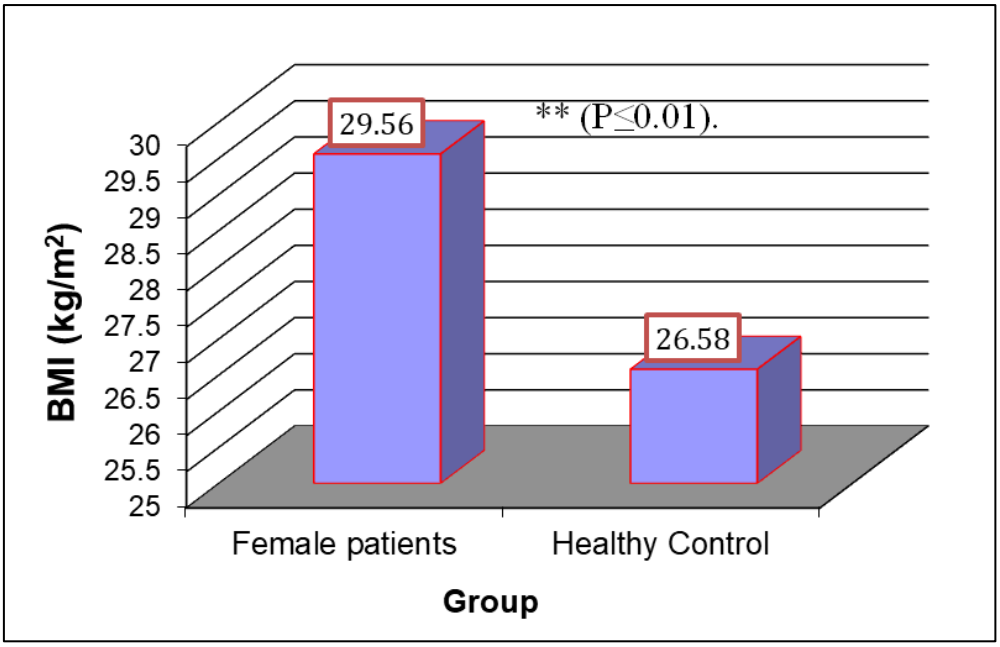

Figure 1: The BMI level in premenopausal Osteoarthritis female patients and control groups

The effect of CRP levels in premenopausal osteoarthritis female patients and control groups

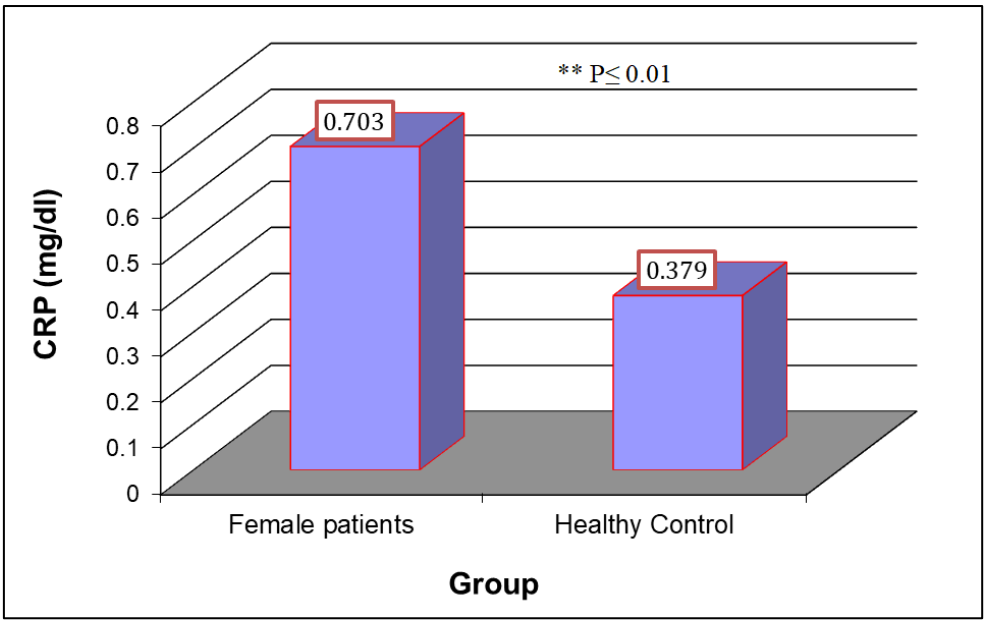

Figure 2: Comparison between premenopausal female patients and Healthy groups in CRP

Osteoarthritis is a complicated process of joint degeneration [13]. The inflammation maybe plays a critical role in interleukin upregulation, which arises following the aging of the immune system or obesity [14], therefore, CRP was evaluated in this study. As illustrated in Figure 2 results showed significant differences between female premenopausal patients and the control group concerning C-reactive protein levels (0.703 ±0.09 vs 0.379 ±0.11) as shown in Table 2.

CRP increased in patients with OA. Koziin *et al.*, [15] reported that Elevated levels of C-reactive protein (CRP) have been observed in individuals diagnosed with osteoarthritis (OA). Apart from working as an indicator of systemic inflammation, it has been proposed that C-reactive protein (CRP) may have a beneficial function in the pathogenesis of osteoarthritis (OA). On another hand, results showed a significant correlation between BMI and CRP as indicated in female premenopausal patients, figure 3.

Wasserbauer, [16] confirmed that The presence of obesity and metabolic syndrome constitutes significant risk factors for osteoarthritis (OA) and simultaneously produces increased levels of C-reactive protein (CRP). Suyasa *et al.*,

[17] found that Elevated levels of plasma hs-CRP and IL-6 were concluded as risk factors for symptomatic lumbar OA in post-menopausal women.

It reported that CRP, one of the most useful markers of systemic inflammation, has recently been identified as a marker of OA with clinical significance as CRP levels are modestly elevated in patients with OA as compared with normal controls [18].

Table 3: Comparison between premenopausal female patients and Healthy groups in CRP

Group	Mean ± SD CRP (mg/dl)
Female patients	0.703 ±0.09
Healthy Control	0.379 ±0.11
** (P≤0.01).	

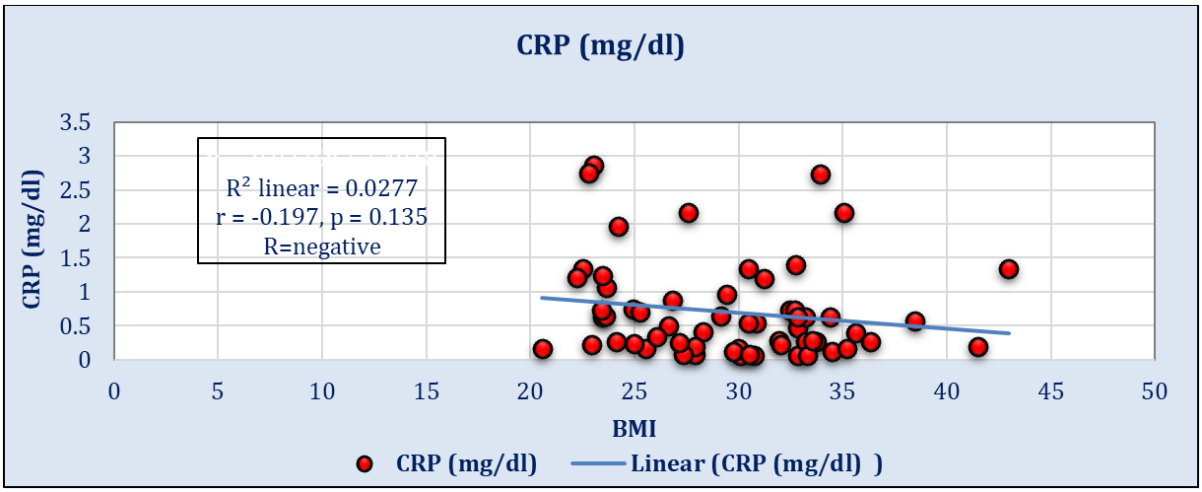

Figure 3: Scatter plot to show the correlation between BMI and CRP in the patient's group.

The findings shown in Table 3 demonstrated a statistically significant negative correlation between C-reactive protein (CRP) and body mass index (BMI) among premenopausal females with osteoarthritis (OA). These results underscore the significance of BMI manazgement in this patient population.

According to Strumer *et al.*, [19], women with early osteoarthritis (OA) exhibited slightly elevated levels of C-reactive protein (CRP), which were found to be a significant predictor of radiographic progression. This association remained significant even after controlling for potential confounding variables such as age and weight.

Nonetheless, previous studies [20] have demonstrated that the correlation between C-reactive protein (CRP) levels and symptoms of osteoarthritis (OA) is stronger than that between CRP levels and radiographic alterations. Furthermore, it has been observed that CRP levels are not linked to OA in the absence of body mass index (BMI), which is a robust predictor of OA. The severity of pain in patients with severe hip or knee osteoarthritis (OA) was found to be associated with elevated serum levels of high-sensitivity C-reactive protein (hs-CRP), while radiographic extent did not show any significant correlation. According to a previous study, it has been observed that there is a possibility of elevated levels of C-reactive protein (CRP) in individuals diagnosed with osteoarthritis (OA).

Furthermore, it has been postulated that C-reactive protein (CRP) could be linked to the pathogenesis of osteoarthritis (OA), in addition to serving as a marker of systemic inflammation. The presence of obesity and metabolic syndrome constitutes significant risk factors for the development of osteoarthritis (OA) and concurrently elicits elevated levels of C-reactive protein (CRP).

Kozin *et al.*, [21] to 3 out of 50 healthy controls (6%), 41 out of 50 knee osteoarthritis patients (82%) had positive C-reactive protein levels (P = 0.001). Body mass index, a positive family history of knee osteoarthritis, the length of the illness, and the Kellgren and Lawrence grade were all significantly linked with C- reactive protein positivity in individuals with knee osteoarthritis (P 0.05). Dai *et al.*, [22] reported C-reactive protein (CRP) levels can be elevated in osteoarthritis (OA) patients. In addition to indicating systemic inflammation, it is suggested that CRP itself can play a role in OA development. Obesity and metabolic syndrome are important risk factors for OA and also induce elevated CRP levels.

CONCLUSION

- There is a significant increase in body mass index in female premenopausal patients.
- Results showed significant differences between female premenopausal patients and the control group concerning C-reactive protein levels.
- It showed that there is an inverse significant correlation between CRP and BMI.

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