

## The Correlation Study between Rheumatoid Arthritis and Obesity in Babylon Province

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### ABSTRACT

**Background:** The prevalence of obesity has risen dramatically in recent years. History of obesity is a significant risk factor for the development of rheumatoid arthritis (RA).

**Objective:** This study aimed to survy about obesity as a major threat for public health and attachment with other disease such as RA, and because several research refer to association to each other in differnet patients around the world.

**Subjects and Methods:** It included 64 serum samples, classified as 16 from obese patients, 16 from rheumatoid patients, 16 from patients with both rheumatoid arthritis and obesity, and 16 from healthy individuals. All of these were recruited between October 2021 and August 2022, from different government hospital laboratory and private labs in Babylon City.

**Results:** The results revealed significant differences ( $P < 0.05$ ) between control group and group of patients who had rheumatoid and obesity regarding the level of rheumatoid factor (RF), also showed positive correlation between body mass BMI and rheumatoid factor in the group of patients who had rheumatoid and obesity, but it revealed negative correlation between body mass index and rheumatoid factor in the group of patients who had obesity.

**Conclusion:** Rehumatoid factor (RF) doesn't make important role in the obesity, and there is no association between rehumatoid arthritis and body mass index.

**Keywords:** Rheumatoid arthritis, Obesity, BMI.

### INTRODUCTION

The prevalence of obesity is quickly increasing, making it a significant public health concern in many nations throughout the world<sup>(1)</sup>. Obesity and excess weight significantly increases the danger of developing several serious ailments, including diabetes, heart disease, and cancer. They have recently begun to affect emerging nations due to shifting dietary and physical activity norms and rising fast food demand<sup>(2)</sup>.

The WHO (World Health Organization) defines overweight and obesity as abnormal or excessive fat accumulation that might have negative health consequences. When a child's body mass index (BMI) is more than one standard deviation over the recognized median in child development patterns, the youngster is considered overweight. In contrast, obesity is defined as more than two standard deviations above the median. The intricacy of obesity stems from its "multi-systemic character," which makes it challenging to treat<sup>(3)</sup>. The prevalence of overweight-obesity ( $BMI > 25 \text{ kg/m}^2$ ) was 39% in 2016 across adults aged 18 and older, while the prevalence of obesity ( $BMI > 30 \text{ kg/m}^2$ ) was 13%<sup>(4)</sup>.

The risk of hypertension, hyperlipidemia, and diabetes mellitus was shown to be higher in individuals with both central obesity and compound obesity, as reported by Zhang *et al.*<sup>(5)</sup>. Another research found that being

overweight is strongly linked to developing rheumatoid arthritis (RA), perhaps because of the central role obesity plays in the obesity of autoimmune and inflammation conditions<sup>(1)</sup>.

Inflammation and hyperplasia of the synovial membrane are the hallmarks of the chronic, generalized autoimmune illness known as rheumatoid arthritis (RA). The degree of inflammation is connected with the progression of structural disruption, which results in disability, musculoskeletal deformity, and a decrease in life expectancy<sup>(6)</sup>.

Obesity may start and maintain a low-grade systemic inflammatory milieu that can exacerbate autoimmune diseases and the comorbidities that go along with them. Autoimmunity has been observed to be aggravated by metabolic alterations and inflammatory substances generated by adipose tissue, which predisposes the patient to cardiovascular disease (CVD) and metabolic comorbidities<sup>(7)</sup>.

Cutoff points for body mass index (BMI) show substantial variation in the prevalence of obesity in RA. Increased inflammatory activity, as measured by the number of tenders and swollen joints, was linked to being overweight or obese. Most measures of body fats mass were found to be positively correlated with the degree to which joints were swollen. Routine treatment for RA patients must involve assessing and working to

enhance body composition<sup>(8)</sup>, therefore, this study was aimed to explain about correlation between BMI and rheumatoid factor (RF)

## SUBJECTS AND METHODS

### Patients or subjects

Between October 2021 and August 2022, serum samples were gathered from hospital laboratory and private labs in Babylon City. The research included 64 samples, including 16 from obese patients, 16 from rheumatoid patients, 16 from patients with both rheumatoid arthritis and obesity, and 16 from healthy individuals, these sample were included different age from 16 to 63 year old and composed from 33 male 31 female.

### Ethical consent

The study protocol was assessed and approved by the Ethics Committee of Al-Mustaqbal University College, Babylon, Iraq, the research protocol did not interfere with any medical recommendations or prescriptions. Informed consent was taken from the patient's relatives or the patient himself when he was still conscious; with keeping the patients' records confidential in all stages of the study. This work has been carried out in accordance with the Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

### Chemical materials

Spinreact, a Spanish company, makes a rheumatoid latex factor kit that tests the amount of rheumatoid factor in various samples.

### Principle of the method

The RF-latex is a semi-quantitative and qualitative slide agglutination technique designed to identify RF in human serum. When combined with RF-containing materials, the latex particles coated with human gammaglobulin are agglutinated.

### Procedure

The work was performed according to the following steps:

1- Allowing reagents and samples to approach ambient temperature.

- 2- On the slide test, 50 µL of the sample and a single drop of the positive and negative controls were each put in particular circles.
- 3- After thorough mixing, one drop (50 µL) of the RF-latex reagent was injected.
- 4- A unique stirrer was used for every sample, and it was utilized to mix the drops and distribute them evenly around the circle's surface.
- 5- The slides were slowly rotated for 2 minutes.

### Reference value:

When the result is up to 8 IU/ml, that needs mitigation by normal saline, but the negative result takes less than the 8 IU/ml value.

### Body mass index calculation

Body mass index was calculated by equilibrium<sup>(9)</sup>:

$$BMI = \frac{weight}{length^2}$$

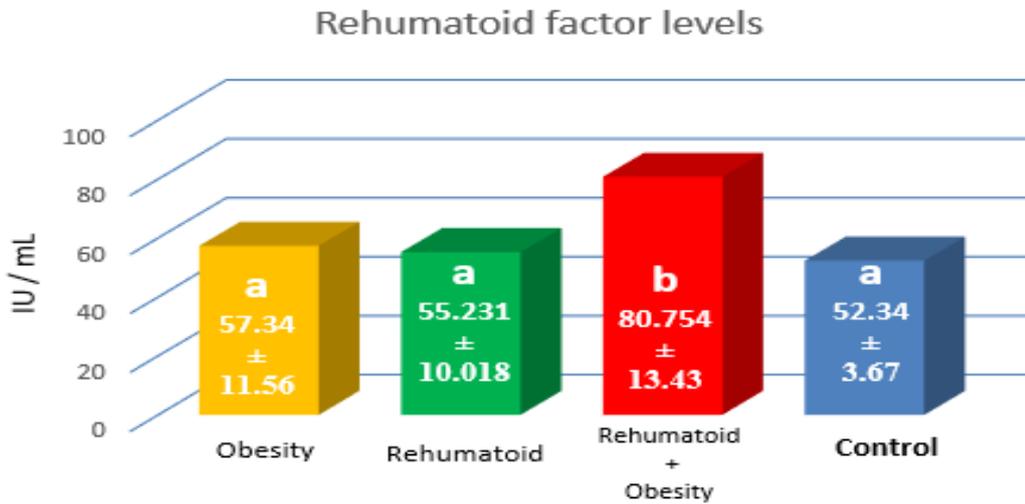
### Statistical Analysis

SPSS V. 16.0 (Statistical Package for the Social Sciences), was used to deduce the statistical significance. Mean, and standard error (SE) were used to represent quantitative parameters, which were compared by the Kruskal-Wallis test. The connections were represented in the linear regression test,  $P < 0.05$  was considered significant, which expresses these relations by linear equations and correlation coefficients for each relationship. These factors reflect the nature of the linear relations and the extent of the two axes<sup>(10)</sup>.

## RESULTS AND DISCUSSION

### 1-Rheumatoid factor (RF) level

Figure 1 presents a significant differences ( $P < 0.05$ ) between control group and the group of patients who had rheumatoid and obesity in the level of rheumatoid factor (RF). It may be referred to a high rheumatoid inflammation, leading to elevated RF levels in these patients. High-affinity RF seems to be selected from the host's native antibody repertoire by antigenic stimulation during an abnormal immune response. Many inflammatory diseases, including rheumatoid arthritis (RA) and rheumatic diseases defined by chronic antigen exposure, have been linked to this phenomenon<sup>(11)</sup>.



**Figure 1 differences between different groups of study in Rheumatoid factor levels (mean± SE) (different letters mean significant differences).**

Alternatively, it may refer to inflammations factor released from fat tissues that affect joints and may lead to rheumatoid arthritis in the future. An increase in the generation of pro-inflammatory molecules is built on adipose tissue that is more developed. The amount of pro-inflammatory peptide is also lowered in association with decreasing adiposity. Also, a rise in the concentration of anti-inflammatory molecules and, by extension, obesity is now thought to be pro-inflammatory states<sup>(12)</sup>. The pathogenesis of rheumatic diseases is thought to include adipokines, and recent research has shed light on their critical function as mediators of inflammation and the immune response<sup>(13)</sup>.

No significant differences ( $P > 0.05$ ) were seen between the control group and the rheumatoid arthritis patients also as shown in Figure 1. This may be referred to as a non-significant association between RF measurement and rheumatoid arthritis. It may also refer to another inflammation that causes an elevated level of RF, such as scleroderma, systemic lupus erythematosus (SLE), vasculitis, and Sjogren's syndrome, or infectious diseases, such as mononucleosis, malaria, tuberculosis, and syphilis. Finally, it may refer to liver diseases, such as hepatitis, cirrhosis, or other inflammations<sup>(14)</sup>.

Due to its limitations, the RF test has maintained an interest in discovering other RA biomarkers. Due to their poor sensitivity, lack of specificity, or technological difficulties, most autoantibody methods proposed in recent decades have failed to mature into mainstream diagnostics for RA. Antibody-targeting epitopes, as previously discussed, are the only approach that successfully combines high sensitivity and high specificity for RA<sup>(15)</sup>.

Obesity patients' RF levels were not significantly different from the control group's ( $P >$

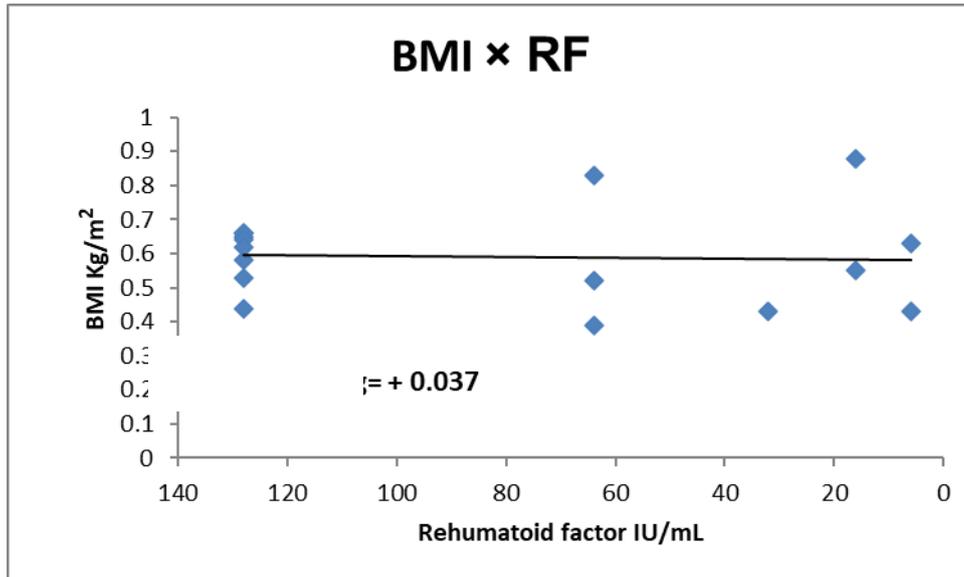
0.05). This finding indicates that obesity has no bearing on the RF measurement. Despite its moderate effect, obesity has been under-recognized as a risk factor for rheumatoid arthritis (RA), which has led to contradictory findings about obesity's influence on RA development<sup>(21)</sup>.

Research by **Tobon *et al.*** makes assumptions about possible reasons for the recent rise in the prevalence of RA. The study examines an extensive list of probable environmental factors that may contribute to the development of RA, including oral contraceptive use, occupational exposures, cigarette smoking, vitamin D deficiency, alcohol use, breastfeeding, immunizations, socioeconomic status, air pollution, and infections, among others<sup>(16)</sup>.

## **2- Body Mass Index and Rheumatoid Factor Relationship:**

Figure 2 showed a positive relationship between BMI and rheumatoid factor in the group of patients with rheumatoid and obesity, which may be referred to as the risk of increasing body mass index in the obese patients associated with rheumatoid arthritis. Findings from a meta-analysis demonstrating a link between obesity and RA suggested that regulating one's weight might be a useful method for reducing the disease's impact<sup>(17)</sup>.

A huge social and economic effect is related to obesity because of the high prevalence of inflammatory pathologies and chronic autoimmune including type 2 diabetes and rheumatoid arthritis<sup>(18)</sup>. Previous studies have shown that more than 60% of RA patients fall into the obese or overweight category ( $BMI \geq 25 \text{ kg/m}^2$ ). Furthermore, obesity is a significant and increasingly common comorbidity, even in the earliest stages of RA presentation<sup>(17)</sup>.

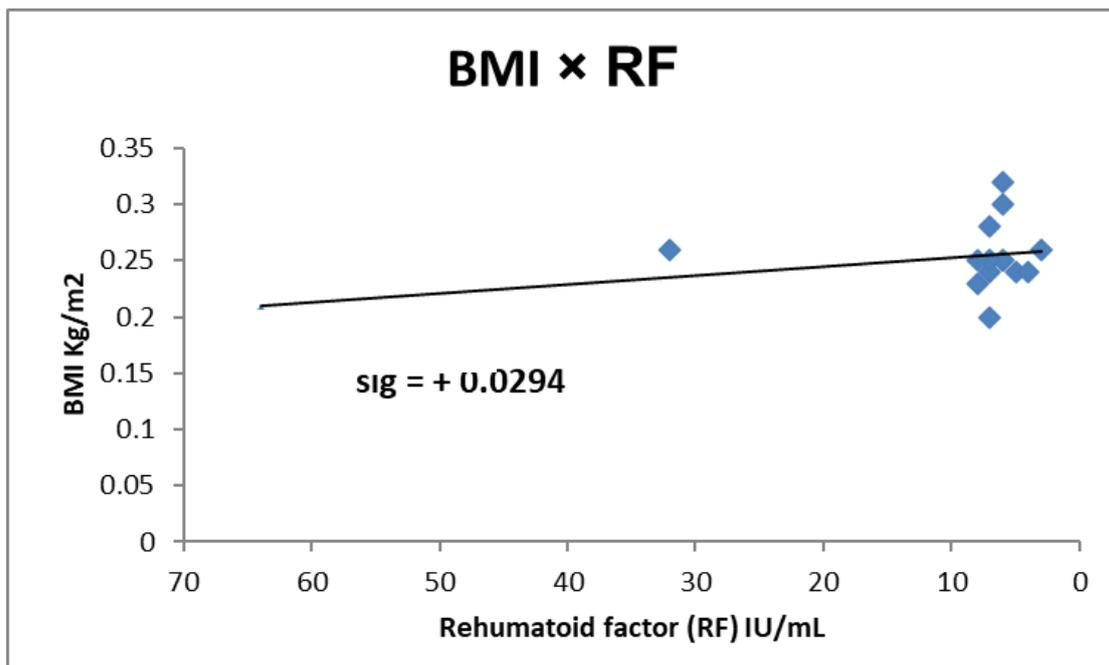


**Figure 4. Positive correlation (Sig=+0.037) between BMI and rheumatoid factor in rheumatoid and obesity patients.**

Figure 5 revealed a positive correlation between BMI and RF in the control group. Figure 6 shows insignificant positive correlation between BMI and RF in the rheumatoid arthritis group. This refers to the non-specificity of RF latex to rheumatoid, or maybe a sample of control has a high weight, or a positive correlation may refer to other factors which cause it.

Uncertainty surrounds the pathogenesis and etiology of RA. This condition is seen as a complex illness brought on by the combination of genetic and environmental variables<sup>(19)</sup>. Tobacco smoking has been

linked to an elevated incidence of RA in many investigations and is considered a well-established environmental risk factor for the disease. However, further research is needed to determine the role of other variables in the development of rheumatoid arthritis. BMI, which is computed by the ratio of a person's weight (kg) to their height (m<sup>2</sup>), is often utilized to diagnose obesity, which is described as an increase in fat at a level substantial to induce significant health implications<sup>(17)</sup>.



**Figure 5. The positive relationship (Sig=+0.0294) between BMI and rheumatoid factor in the control group**

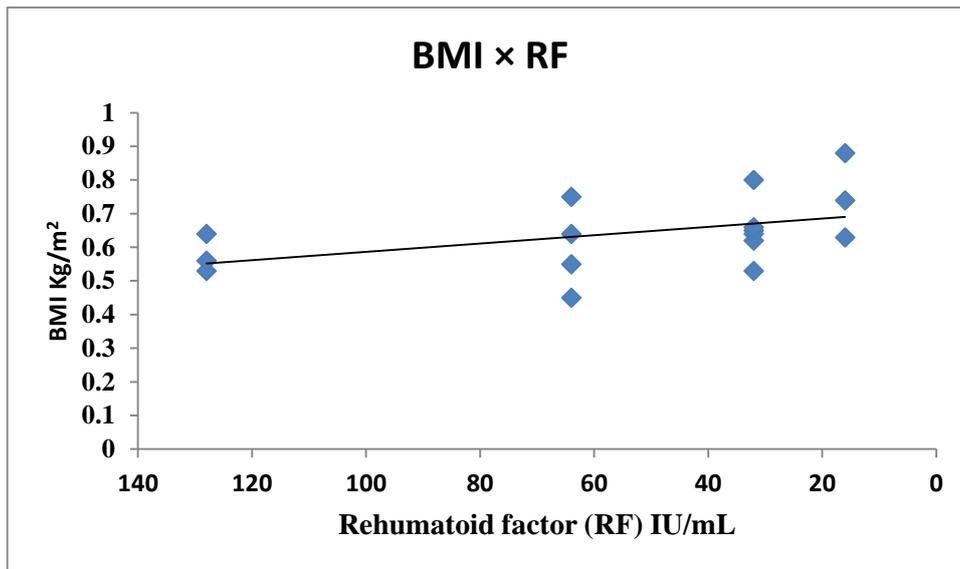


Figure 6. The positive relationship (Sig = + 0.344 )between BMI and rheumatoid factor in the group of rheumatoid patients

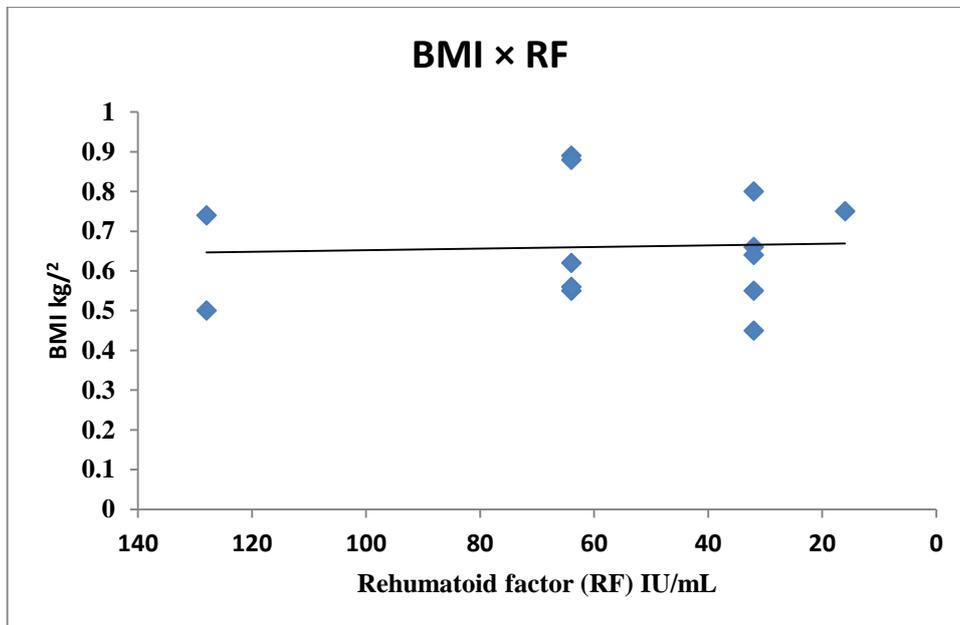


Figure 7. Negative correlation (Sig = - 0.049) between BMI and RF in the group of obesity patients.

Obesity was shown to be inversely related to rheumatoid factors in this study. There may be no connection between obesity and rheumatoid arthritis since inflammations in the body cannot begin in adipose tissues and then spread to other parts of the body, causing infections in the joints or other tissue damage. Rheumatoid arthritis does not seem to worsen with obesity. Nevertheless, clinical evaluations suggest that the chance of remission may be diminished by obesity because of its effect on disease activity indices<sup>(20)</sup>.

Obesity is quite common nowadays. A family history of rheumatoid arthritis (RA) is linked to a history of obesity. The proportional influence of obesity on the pathogenesis of RA did not appear to differ between women and men, despite the fact that the

prevalence of obesity was similar (and even higher in specific age groups)<sup>(13)</sup>. Due to a lower baseline prevalence of RA in men, the absolute effect of obesity on trends in the incidence of RA was more in women than in men. Opinions on whether or not obesity contributes to the onset of RA vary, although much high-quality research has looked at the connection<sup>(20)</sup>.

### CONCLUSION

- 1- Rheumatoid factor (RF) doesn't make important role in the obesity.
- 2- No association was found between rheumatoid arthritis and body mass index.

### Future study

- 1- Genetic study of the correlation between obesity and rheumatoid.
- 2- Using large number of patients to specifically determine the correlation coefficient between BMI and RF.
- 3- Recommended laboratory staff not to depend on RF only in the diagnosis of RA.

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### Conflicts of Interest

The authors declare no conflict of interest.

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