Research article

Study of some physiological and hematological parameters in obese women with arthritis

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ABSTRACT

Introduction and Aim: Obesity and overweight refers to excessive buildup of fat in the body. Arthritis is a group of medical disorders associated with obesity and being overweight. Obesity associated with rheumatoid arthritis is more pronounced in women. In this study, we aimed to evaluate some physiological and hematological parameters in obese women with arthritis.

Materials and Methods: This study included 90 women aged between 18 and 68 years. The women were divided into three groups based on their BMI as Obese (n=30), Obese+RA (n=30) and normal lean women as controls (n=30). Blood drawn from each participant was tested for their complete blood tests, lipid profiles, C-reactive protein reaction and presence of rheumatoid factor. Data was subjected to statistical analysis.

Results: Our study revealed the mean +SE for age, WHR and BMI to be elevated in women in the obese as well as Obese+RA groups and to be significantly higher in comparison to women in the control group. Except for HDL, all the other lipid parameters were seen elevated in the obese and Obese+RA group and showed significant difference from the control group. Similarly, among the complete blood count indices only ESR, WBC and PLT were found to be significantly elevated in obese and Obese+RA groups. The prevalence percentage for CRP and RF was seen to be highest in individuals belonging to the Obese+RA group.

Conclusion: Obese women as well as obese women with RA have elevated hematological and physiological parameters when compared to lean women.

Keywords: Obesity; rheumatoid arthritis; BMI; WHR; lipid profile; C-reactive protein; rheumatoid factor.

INTRODUCTION

Obesity and overweight are medical conditions characterized by an inappropriate and excessive buildup of body fat, which can result in negative health consequences (1). According to epidemiological research, obesity and overweight could lead to a variety of comorbidities, such as diabetes, malignant tumors, heart and blood vessels illness, and hypertension (2). Obesity which was once considered a problem of the developed countries is seen to rise globally. In America, obesity is reported to affect 33% of the population, with the number anticipated to rise to over 50% by 2030 (3). Prevalence rates of childhood obesity are also on rise, fueling this crisis (4). The burden lies on the healthcare system, which needs to track obesity within a population, and providing essential treatment. The Body Mass Index (BMI) is a crucial indicator of excess weight measurement and used in determining whether an individual is obese, overweight, normal weight, or underweight. According to the WHO, BMI ≥25" is considered as overweight while a BMI ≥30 is considered as obese (5). Obesity is preventable, and recent studies show that lowering of BMI could reduce the risk of major non-communicable diseases associated with obesity (4).

Obesity is considered a risk factor for developing arthritis, the symptoms of which include inflammation, pain, stiffness and diminished movement of joints (6). The most common type of arthritis includes osteoarthritis, rheumatoid arthritis, gout, and fibromyalgia, which is often seen to affect individuals aged 65 years and above (7).

Epidemiological and genetics have shown that rheumatoid arthritis is more prevalent among older women than men (8). Rheumatoid arthritis (RA) is an autoimmune and inflammatory disease in which the body's immune system attacks its own healthy cells causing damage to join tissues. The signs and symptoms of RA include swelling, chronic pain, stiffness of the affected joints (9).

MATERIALS AND METHODS

Study subjects and samples

The study included 90 women, 30 with obesity, 30 with obesity and rheumatoid arthritis (RA), and 30 healthy control women ranging in age from 18 to 68 years old. The 30 obese women were recruited from the staff and patients of the Albaladiaat Health Center in Baghdad, while the 30 obese women with rheumatoid arthritis (RA) were recruited from the patients of the Medical City/Baghdad teaching hospital/Division of Biological Therapy for Arthritis Diseases in Baghdad.

The height and weight of each participant was measured and their Body mass index (BMI) calculated. BMI was calculated using the formula BMI = kg/m^2 where kg is a person's weight in kilograms and m^2 is their height in meters squared. Based on the BMI value the participants were grouped as overweight (BMI≥ 25) or obese (BMI≥ 30). The waist and hip ratio (WHR) were also determined by measuring the waist and hip circumference.

After obtaining written consent from patients, blood samples were collected. The patient was appraised about the objective of the work and ensured complete confidentiality. Patients were given the liberty to withdraw from the experiment at any time.

Blood (5ml) was drawn from fasting patients after 8-12 hours via vein puncture using sterile 10ml syringes. Blood drawn was distributed into 3 tubes, one containing EDTA (k2-EDTA, No.920202, AFCO, Jordan) and used in the complete blood count test, the second containing sodium citrate (3.8%) and used in ESR analysis, and the third tube containing gel and clot activator (AFCOVAC, Jordan) and used in serum separation. The complete blood count test was analyzed using a hematology analyzer (Abbott CELL-DYN Ruby hematology analyzer, USA), while ESR was measured using the auto ESR analyzer (VITAL diagnostics, Unimedica, Iraq). Serum was separated after allowing blood to clot for 10-15 mins, followed by centrifugation at 3000 rpm for 10 mins. The serum separated was subjected to biochemical analysis. The lipid profile was determined using a kit (Taytec kit, Canada) and the readings read using a spectrophotometer (APEL, PD-303, Japan). The CRP and RF were tested using kits (Taytec kit, Canada).

Statistical analysis

The obtained data was statistically analyzed using the Statistical Analysis System- SAS (2018) program. The Least Significant Difference (LSD) test (Analysis of Variation, ANOVA) was used to compare means statistically. The Chi-square test was used throughout this study and the significance calculated at p value of 0.05 and 0.01.

RESULTS

Anthropometric parameters revealed a significant (P≤0.01) difference in age between obese, obese with RA, and control group (Table 1). Similarly, the mean WHR values and BMI (kg/m2) values in the obese group and the obese RA group demonstrated a high significant difference (P≤0.01) when compared to the control group (Table 1).

Table 2 represents the results for lipid profile in the present study. As seen from Table 2, the Total Cholesterol (TC) mg/dl showed significant difference (P≤ 0.05) in obese women (169.00 ±5.96) and obese +RA women (164.84 ±7.53) in comparison to control women (147.16 ±4.73). Similarly, in comparison to controls, the triglyceride levels also showed a significant difference in obese as well as obese+RA women (Table 2). The mean values for LDL and VLDL were observed to be elevated in obese and obese +RA women, with a significant difference seen for the two groups when compared to controls (Table 2). However, the HDL levels were seen to be lowered in obese+RA women and almost same in obese women when compared to controls (Table 2).

Table 1: The Mean +SE of age, WHR and BMI for individuals in different groups

	Mean ± SE		
Group	**Age (year)**	**WHR (cm)**	**BMI (kg/m^2)**
Obese	45.16 ±1.95[a]	0.862 ±0.01[a]	37.18 ±1.37[a]
Obese +RA	46.13 ±2.40[a]	0.877 ±0.01[a]	34.49 ±1.34[a]
Control	28.60 ±1.48[b]	0.775 ±0.01[b]	28.60 ±1.47[b]
LSD value	5.570 **	0.0349 **	3.937 **
P-value	0.0001	0.0001	0.0001

** (P≤0.01); lower case letters indicate the significance between groups studied

Table 2: Comparison of the levels of lipid profiles in the study groups

	Mean ± SE (mg/dl)				
Group	**Cholesterol**	**Triglyceride**	**HDL**	**LDL**	**VLDL**
Obese	169.00 ±5.96[a]	130.38 ±9.17[a]	40.32 ±1.63[a]	160.41 ±5.92[a]	26.11 ±1.83[a]
Obese +RA	164.84 ±7.53[a]	127.50 ±12.28[a]	30.13 ±2.01[b]	158.98 ±7.48[a]	25.60 ±2.45[a]
Control	147.16 ±4.73[b]	96.53 ±5.54[b]	40.10 ±1.82[a]	139.02 ±4.68[b]	19.47 ±1.10[b]
LSD value	17.391*	26.451*	5.134**	17.257*	5.281*
P-value	0.0341	0.0223	0.0001	0.0263	0.0246

* (P≤0.05), **(P≤0.01)

Table 3: Comparison of the levels of complete blood count indices in the study groups

Group	Mean ± SE (mg/dl)				
	ESR	**WBC ($\times 10^3$)**	**RBC ($\times 10^6$)**	**Hb**	**PLT ($\times 10^3$)**
Obese	43.96 ±3.78[a]	8.27 ±0.35[a]	4.45 ±0.11	11.47 ±0.36	322.96 ±17.90[a]
Obese +RA	45.36 ±4.60[a]	8.09 ±0.54[a]	4.49 ±0.09	11.93 ±0.32	290.66 ±17.18[ab]
Control	11.40 ±1.37[b]	6.85 ±0.41[b]	4.46 ±0.05	12.23 ±0.21	271.76 ±12.69[b]
LSD value	9.927 **	1.139 *	0.255 NS	0.863 NS	45.238 *
P-value	0.0001	0.050	0.945	0.216	0.051
* (P≤0.05), ** (P≤0.01).					

ESR: Erythrocyte sedimentation rate; WB: White blood count; RBC: Red blood count; Hb: hemoglobin; PLT: Platelet count

We also studied the complete blood count (CBC) indices (ESR, WBC, RBC, Hb, PLT) in all individuals in the various study groups. Table 3 shows the mean±SE value for the CBC indices in the groups studied. As observed from Table 3, the mean values for ESR, WBC and PLT were significantly elevated in obese and obese+RA women when compared to individuals in the control group. As for hemoglobin (Hb) and RBC counts, the values were almost the same in all the groups showing no significant difference (Table 3).

The percentage prevalence of women positive for C-reactive protein was higher (43.33%) in obese +RA women, followed by women in the obese (16.57%) group (Table 4). When compared to controls, there was a very significant difference (P≤0.01) between the numbers for CRP-positive and CRP-negative results in the two groups (Table 4).

Table 4: Prevalence of women positive for C-Reactive Protein (CRP) in the study groups

Group	No	C-Reactive Protein		P-value
		Positive No. (%)	**Negative No. (%)**	
Obese	30	5 (16.67%)	25 (83.33%)	0.0001**
Obese +RA	30	13 (43.33%)	17 (56.67%)	0.0392*
Control	30	1 (3.33%)	29 (96.67%)	0.0001**
P-value	-	0.0007**	0.0007**	-

* (P≤0.05), ** (P≤0.01).

Obese and Obese+RA were tested for the presence of Rheumatoid factor (RF). Our study revealed that all obese women (n=30) were negative for the RF factor, while women with obesity+RA were all (n=30) positive for the RF-factor (Table 5). A high significant difference was observed between the groups for the RF factor and when compared to the controls (Table 5).

Table 5: Prevalence of women positive for Rheumatoid factor (RF) in the study groups

Group	No	Rheumatoid factor		P-value
		Positive No. (%)	**Negative No. (%)**	
Obese	30	0	30 (100%)	0.0001**
Obese +RA	30	30 (100%)	0	0.0001**
Control	30	0	30 (100%)	0.0001**
P-value	-	0.0001 **	0.0001**	-

**(P≤0.01).

DISCUSSION

In medicine, obesity is known as a state of accumulation of fatty bodies in the body, which leads to an increase in cases of diseases, leading to death, especially in people who suffer from obesity (10) As for rheumatoid arthritis, it is an auto-immune disorder that infect women more than men, especially in the old age (11). Our study evaluated body measurements, including (WHR and BMI), which showed a severe increase in obese women and obese women with RA in comparison to control women and this finding agrees with results of a previous study (12). The BMI has a positive correlation to BF% and thus the BMI increases with increase of BF%. The WHR have also low correlation with BF%. Women have been shown to have a higher BF% than man (13). Gandhi *et al*., concluded through their study that BMI and WHR values are largely overlapping in females than in males, which illustrates that females have greater lipid concentration in the bottom part of the body while men have body fat around abdominal area (14).

The results of lipid profile which include (TC, TG.LDL, and VLDL) in present study were seen increased in obese and obese women with RA, compared to healthy women except the result of (HDL) which showed a decrease, and this finding is in

agreement with earlier studies (15,16) which revealed that there is disturbance in lipid profile in obese and obese RA adult. One of the disease that obesity lead to it, is dyslipidemia which are abnormalities in lipid profiles including increase in level of serum triglyceride, VLDL, apolipoprotein B, and non-HDL-C. Due to raised production of VLDL particles from liver and decreased triglyceride rich lipoproteins will be increase TG, HDL-C will decrease because of increase TG , normal range of LDL-C with increase in LDL ,The treatment of dyslipidemia in obese individuals reduces the risk of cardiovascular and heart diseases (17). Our study demonstrated a significant difference in WBC in obese women and obese RA compared to control women and this observation is in accordance with a previous study (18) which revealed there is an increase in WBC count in obese individuals throughout association increasing in WBC count with higher BMI. This study also mentioned that obesity is an inflammatory condition and that most inflammatory cases are characterized by high WBC count.

Several studies have indicated that adipose tissue has the ability to produce many molecules that are classified among the types of cytokines and are called adipokines, which comprise leptin, adiponectin, resistin, tumor necrosis factor-α (TNF-α), and interleukin-6 (IL-6), as well as several others, and which work on the inflammatory response and immune regulation, thus raise the production of such adipokines making the number of white blood cells elevated (19). The result of RBC and Hb show no significant difference between three groups and these findings were consistent with previous study (20). The platelets show significant differences in obese women compared to control, and that matched with study by Samocha-Bonet *et al*., which revealed that the platelets numbers increase in obese than non-obese women (21). One of the mechanisms that explain elevated platelets in obese women is production fatty tissues to IL-6 which have role in increase platelets by supported and stimulated thrombopoietin which is hormone regulated platelets number which produce from megakaryocyte in bone marrow by process megakaryocytopoiesis and IL-6 have role in all this processes. (22).

The platelet counts were highly increased in obese RA women, the thrombocytosis is correlated with degree of RA activity and the increase of platelets count occurred in RA patients (23). The present study showed a high significant difference in inflammatory markers that include ESR, RF and CRP in obese RA women compared to control women and these results matching with study (16) that reached to that obese RA patients show significant difference in inflammatory markers such as ESR, CRP, and RF. Also, another study concluded that CRP is a good predictor for obesity in addition to BMI (24).

CONCLUSION

After evaluated hematological and physiological parameter we found significant difference in most parameters which include (age, WHR, BMI, TC, TG, HDL, LDLVLDL, WBC, PLT, CRP, ESR and RF) but also the other parameters show no significant difference which include (Hb and RBC) between obese and obese RA women compared to healthy non-obese women (control).

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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