Obesity among Rheumatoid Arthritis Patients and its Relation to Disease Activity: Cross-sectional Study among the Egyptian Population

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Abstract

Background: The "100 Million Health" survey performed in 2019 in Egypt, which examined 49.7 million adult individuals aged 18 years and above, revealed that 39.8 percent have obesity, with female predominance. Further research into the effect of obesity in RA is necessary due to the established link between obesity and inflammation as well as changes in the body composition of RA patients. *Objectives:* To determine obesity prevalence in RA cases and its effect on the functional outcome as well as the disease activity score (DAS). *Patients and Methods:* The current cross-sectional study included 104 RA cases who met the 2010 ACR/EULAR classification criteria. Subjects underwent laboratory investigations, clinical examinations, and anthropometric measures (Body mass index BMI and waist circumference/hip circumference WC/HC ratio). Patient functional status was assessed utilizing the health assessment questionnaire disability index (HAQ-DI). *Results:* It was found that 23.1% of RA patients cases have average weight, while 27.9% were overweight and 49% were obese, with significant female predominance. There was a significant increase in the scores of HAQ-DI and DAS- 28 in overweight as well as obese subjects than those with normal BMI. *Conclusion:* Obesity is prevalent in RA cases, and it substantially affects DAS-28 score and functional status.

Keywords: Obesity, RA, DAS-28, HAQ-DI.

Introduction

Obesity is a disorder caused by a persistent quantitative imbalance between energy expenditure as well as energy intake, which results in increased accumulated body fat. According to the WHO, the prevalence of obesity among adults was 13.1 in 2016[1]. RA is a chronic inflammatory autoimmune systemic illness that primarily affects the tiny joints and is erosive in nature. RA has been linked to significant metabolic alternations such as inulin sensitivity, myokines, lipid levels, as well as adipokines, inducing changes in muscle and fat mass, as well as body mass index (BMI)[2]. Several parameters may be involved in poor disease outcomes and high DAS[3]. Generally, adipose tissue increase is linked with elevated pro-inflammatory molecule production; hence obesity is currently considered a pro-inflammatory

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condition. Likewise, differences in body composition reported in RA cases indicate that obesity in RA cases is a significant research aspect[4]. The present research focused on determining obesity incidence in RA cases, as well as its impact on functional outcomes as well as the DAS.

Patients and Methods

This cross-sectional study included 104 RA patients presented to the Outpatient Clinics of the Physical Medicine, Rheumatology and Rehabilitation Department, Suez Canal University Teaching Hospitals in the period from May 2021 to November 2021.

Inclusion and exclusion criteria
Participants in the current study were those who fulfilled the 2010 American college of Rheumatology (ACR)- European League Against Rheumatism (EULAR) categorization RA criteria. This study was conducted after obtaining approval from the Institutional Research Board (IRB). The study included RA patients who were already had RA or newly diagnosed according to the 2010 ACR-EULAR categorization RA criteria. Of both genders (Males and Females) and age (16-65) years. We excluded patients with other autoimmune diseases, evidence of malignancy, chronic illness (liver, renal, etc.), diabetes mellitus, concurrent infection, pregnant and lactating women, oral contraceptive pills as it affects BMI and other hormonal therapy, patients younger than 16 years old and older than 65 years old, thyroid dysfunctions, and patients with chronic liver diseases.

Medical history
All subjects underwent complete history taking (age, gender, marital status, educational level, residency, occupation, duration of the disease, any extra-articular manifestations like interstitial lung disease or subcutaneous nodules, treatment of RA including DMARDs and steroids, symptoms of the recent chest, GIT, urinary infections, history of any joint trauma, operations, hospitalization, blood transfusion and chronic diseases.

Clinical examination
All subjects underwent general examination as well as rheumatologic evaluations for the number of tender and swollen joints, functional disabilities, and deformities utilizing:

Disease activity assessment (DAS28-ESR score)
The DAS28-ESR (erythrocyte sedimentation rate) score was utilized to measure RA patients' activity, which was accomplished by counting the number of tender as well as swollen joints (out of the 28), assessing (ESR), and global evaluation of health fulfilled by the participant (ranging from 0 to 10 denoting very good to very bad). A specific formula was utilized to obtain these results and determine the overall DAS. A DAS28 value of less than 2.6 denotes remission, 2.7 to 3.1 indicates mild DAS, 3.2-5.1 implies moderate DAS, and a score higher than 5.1 denotes severe DAS[5].

Evaluation of Quality of life
A validated Arabic version of the HAQ-DI was utilized to determine the functional status as well as the quality of life of RA cases functional disability[6]. It includes 20 items, and the score was assigned to a specific category based on disability severity; severe to very severe (2.1–3.0), moderate to severe (1.1–2.0), and mild to moderate (HAQ score of 0–1.0)[7].

Laboratory examination
All patients underwent through investigations (ESR, glycated hemoglobin (HbA1c), C- reactive protein (CRP), fasting and 2-

hour postprandial blood sugar, liver function tests (AST, ALT), Full blood count (FBC), kidney function tests (serum creatinine), urine analysis, TSH, free T3, and free T4).

Body anthropometric measurements
Body mass index
Subjects were weighed without shoes while dressing in light clothes; their height was estimated utilizing a single stadiometer, whereas BMI was determined by dividing the weight (kg) by the height squared (m2) to determine obesity. The utilized BMI values were: obese (≥30), overweight (25–29.9), and normal (18.5–24.9)[8].

Waist- to- hip ratio
It was estimated through the division of the circumference of waist by the circumference of the hip. Obesity using WHR (≥0.85 for women and ≥0.90 for men) was characterized based on the guidelines of the WHO[9].

Statistical Analysis

After obtaining all the anthropometric measures(BMI) from all RA patients, prevalence of obesity was calculated as the number of overweight and obese RA patients as the time of examination divided by the total number of RA patients in the study[10]. After measuring BMI, WC/HC ratio, and HAQ-DI for all 104 patients, subjects were subsequently categorized into three groups based on BMI and were compared utilizing their Arabic version of the HAQ-DI as well as the DAS score 28(DAS-28). These data were analyzed, and utilizing their baseline BMI, the RA cases were assigned to three cohorts: 1) Subjects with BMI < 25 kg/m² (Normal-weight RA cohort). 2) Subjects with BMI ranging from 25 to 29.9 kg/m² (overweight

RA cohort). 3) Subjects with BMI ≥ 30 kg/m2 (obese RA cohort). Statistical analysis was performed using statistical SPSS for window software (version 26.0) for all statistical analyses, and it included: 1) Descriptive statistics (a) The arithmetic mean was used as a measure of central tendency.(b) Standard error of deviation was used as a measure of dispersion. 2) Comparative methods (a) Student's t-test was utilized to compare the mean of the continuous data and the significance level was determined at p value < 0.05. (b) The Chi-square test was utilized to compare frequencies between the studied groups' categorical data. (c) Post-Hoc and the one-way ANOVA tests were utilized to compare between groups. (d) Pearson test was used to find out the correlation between variables, with significance level was determined at p-value <0.05.and (e) Logistic regression analysis.

Ethical consideration

Measures adopted by ethics committee of Faculty of Medicine; Suez Canal University were followed. The reported experiments on humans were in accordance with the ethical standards of the central ethical committee (Ethical approval number is 4448 in 18/01/2021), and with the Helsinki Declaration of 1975, as revised in 2008. A written informed consent was obtained from all the participants before taking any data or doing any investigations. The consent contained Explanation of the study aim in a simple manner to be understood by the common people. No harmful manoeuvres were performed or used. All data were considered confidential and were not used outside this study without subjects' approval. Researcher phone number and all possible communicating methods were identified to the participants to re-

turn at any time for any explanation. All participants were announced by the result of the study. Participants had the right to withdraw from the study at any time without giving any reason. Signature or fingerprints of the participants.

Results

In this study, 104 RA cases were enrolled; 87.5% were females, and 12.5% were males, with 42.49 ± 11.75 years mean age. Based on subjects' BMI, 23.1% had normal weight, while 27.9% had overweight and 49% were obese (Figure1). The patients'

mean BMI was 30.69±6.69, and the mean DAS28 was 3.80±1.2. While 13.5% of the patients suffered from high disease activity, approximately half of the participants had moderate disease activity, 13.5% had low disease activity and 16.3% were in remission. Obese as well as overweight patients had elevated ESR, DAS, and HAQ-DI scores (P < 0.05) when compared to patients with normal BMI with significantly female predominance (P < 0.05). However, no substantial association was detected between obesity and disease duration nor patients' age (P > 0.05) (Table 1).
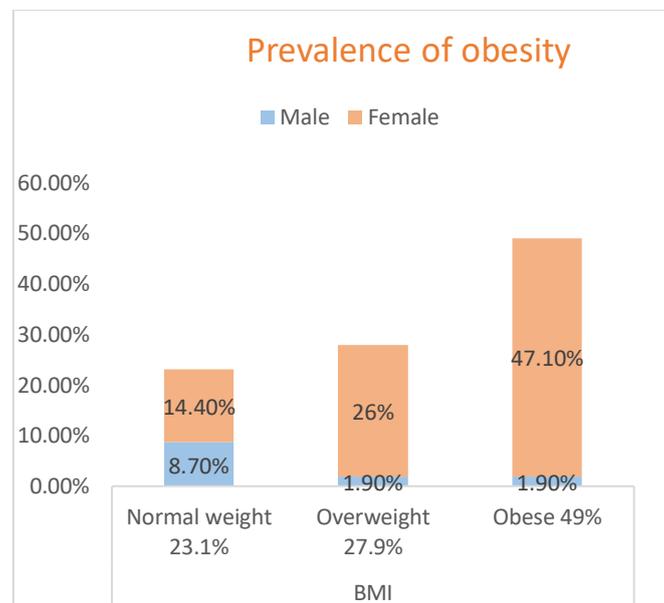

Fig. 1. Percentage distribution of RA patients by BMI status.

According to WC/HC ratio, 54.8% of the patients had a low risk of developing (CVD, type2 DM), 25% had moderate risk, and 20.2% had a high risk (Fig. 2).

Discussion

The current study aimed to assess obesity prevalence among a small sample of Egyptian RA cases and its impact on DAS as well as functional outcomes. One-hundred and four RA patients were enrolled, 87.5% were females, and 12.5% were males, with an age of 42.49 ± 11.75 years. Compared to another study[11], where 200 RA cases were enrolled, 86% were females, 14% were males, and their mean age was 45.1 ± 14.2 years. The high prevalence of RA among females was attributed in that study to the effect of genes (x-linked) and the role of sex hormones. Based on patients' BMI, 23.1% had normal weight, 27.9% were overweight, and 49% were obese. In contrast, the study of Yousra Ibn Yacoub[13] reported that 53.2%

of the patients were normal, 30% were overweight, and 16.8% were obese. This higher BMI in the Egyptian population can be attributed to lack of exercise, eating habits, geographical factors, and lifestyle. Regarding laboratory parameters, the mean ESR was significantly increased in our overweight and obese patients.

| Table 1: Comparison between study groups according to their BMI and other study variables				
	Normal weight	Overweight	Obese	P-value
Age (years)	42.37 ± 13.5	41.10 ± 11.15	43.33 ± 11.33	0.72
Gender				
Male	9 (8.7%)	2 (1.9%)	2 (1.9%)	< 0.0001
Female	15 (14.4%)	27 (26%)	49 (47.1%)	
Disease duration	8.6 ± 5.22	6.61 ± 4.42	7.47 ± 5.15	0.35
ESR (mmhr)	28.13 ± 15.57	29.62 ± 14.35	35.98 ± 12.97	< 0.0001
DAS28	3.21 ± 1.22	3.68 ± 1.31	4.15 ± 1.01	< 0.0001
HAQ-DI	0.29 ± 0.46	0.57 ± 0.6	0.64 ± 0.56	< 0.0001
WC/HC ratio	0.78 ± 0.07	0.79 ± 0.05	0.85 ± 0.07	0.001
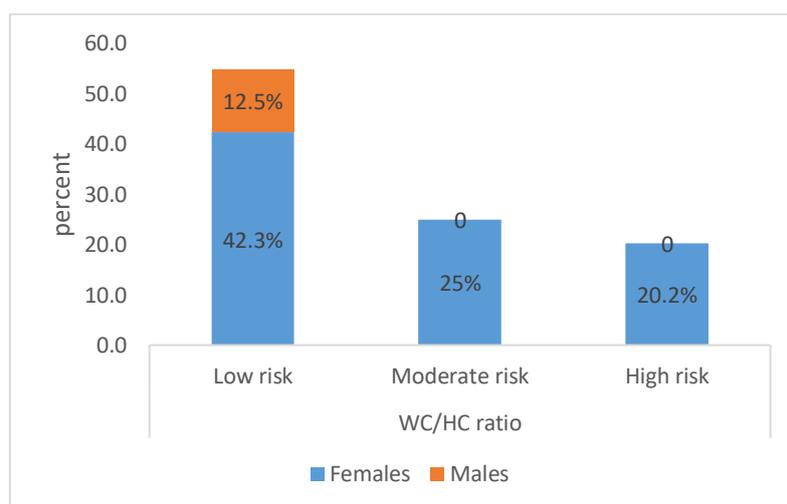
Figure 2: Distribution of WC/HC ratio by sex among RA patients.

This agrees with Abdou Ellabban study[14], which reported that ESR was significantly higher among obese RA patients than non-obese. Besides, the study of Rasha Mahmoud Hammoda[11] observed a higher ESR level among obese RA patients. Contrary to these findings, another study of Khadeeja Ramadhan Younis[4] did not find significantly higher levels of ESR among obese RA patients and attributed high DAS28 scores among those patients to the high number of tender as well as swollen joints. Elevated ESR levels in over-weight and obese RA patients can be explained by the adipose tissues, A region that synthesizes several inflammatory mediators, including interleukin 6 (IL-6), leading to elevated acute phase reactants in obese population[15]. In the current study, WC/HC ratio was higher in obese and overweight RA cases compared to the normal-weight group, and there was a statistically significant relationship between WHR as well as BMI and DAS28, aligning with Mahshad Ali Karoosi study[16], finding that WHR was significant-

ly higher in patients with rheumatoid arthritis than healthy subjects. Prior research findings reported a substantial increase in DAS 28 and HAQ-DI scores in obese and overweight subjects than in cases with normal BMI, which agrees with the current study data[11]. This study had some limitations, such as limited generalizability as the sample size is relatively small. In addition, cases were selected through convenience sampling, which resulted in selection bias. Furthermore, BMI does not accurately predict body fat quantity. Consequently, more precise measurements may be necessary. The clinical significance of these results is that weight loss and regular exercise helps in preventing RA. Furthermore, avoiding obesity by exercise and diet control in RA cases is critical for better disease management and long-term remission, as well as lowering the risk of diseases as cardiovascular disease.

Conclusion

Finally, we can conclude that obesity is prevalent in our study among RA patient and was found to affect DAS and functional status significantly.

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