Evaluation of Total White Blood Cells in Obese Subject in Khartoum State 2017

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Abstract

Background: This research aimed to investigate the effect of obesity WBCs count and to compare WBCs count of obese subjects early in the morning and in the late evening to explore the effect of normal activates on TWBCs.

Methods: Across sectional facility-based study was conducted in the Khartoum state during the period of Sep 2017 to Nov 2017 among Sudanese obese subjects of age between 15-45 years old

Result: There is variation in number of TWBS early in the morning comparing to late in the evening.The mean value of TWBCs for morning was 6.29 with standard deviation of 1.75 and the mean of TWBS result for evening is 7.37 with standard deviation of 1.78. The pair sample T test was significant with a P value 0.00

Conclusion: There is significant increase in number of TWBCs at the end of the day in obese subject, the cause may be due to the normal activity of obese considered as exercise.

Keywords: BMI; White blood cells; World health organization

Abbreviations: CRP: C-reactive Protein; WHO: World Health Organization; WBCs: White Blood Cells; IGT: Impaired Glucose Tolerance; BMI: Body Mass Index.

Introduction

In the last decade, obesity has become one of the most significant public health crises in the United States for both adults and children [1]. According to world health, organization (WHO), obesity is classified as chronic and severe disease in developed and under developing countries, affecting both adult and children. Obesity is associated with increased incidence of type 2 diabetes mellitus, hypertension, coronary heart disease, arthritis, sleep apnea, and certain form of cancer. Recent research data suggest that the global incidence of obesity has increased more than 75% since 1980 [2]. The normal physiological range for white blood cells and differential count are essential for diagnosis, treatment, follow up and screening. The WBCs count of Sudanese people was found to be lower than that of Caucasians and similar to reports from other African countries; Taha, et al. performed a study and they found the mean of WBC count was $5.1\pm1.5\times10^3/$ µl with a range of $3.6 \times10^3/$µl to 6.6

×103/µl. Also, they reported in their study the WBCs count was directly proportional to BMI [3].

WBCs count in obese subjects were significantly higher than in non-obese subjects [4]. The positive relationship between WBC count, insulin resistance, hypertension, and cardiovascular disease has been observed in several studies [5]. Adipose tissue is a major source of inflammatory factors, such as IL-6 and C-reactive protein (CRP), which also are well established markers of systemic inflammation [6]. Pro-inflammatory cytokines, such as interleukin 6 (IL-6) and interleukin 8 (IL-8), are important inducers of WBCs production [7]. Higher WBC counts may be associated with the development of retinopathy, albuminuria, and peripheral arterial disease [8].

White blood cells (WBCs) count is elevated in obesity and is risk factor for atherosclerosis and is present in impaired glucose tolerance (IGT) which is associated with Marco and Micro-angiopathic complication in type 2 diabetes, the effect is more marked in obese patient [9]. Research has shown that obese adults, (BMI--30 kg/m^2), have elevated total leukocytes [3] elevation of leukocytes appears to be related to monocytes [10]; however, neutrophils, eosinophils, and lymphocytes may be elevated [11]. And weight loss is important in reducing WBCs count in morbid obesity, simple or complicated by IGT or type 2 Diabetes [9]. Total leukocyte and monocyte count were significantly increased in obese young adult, total leucocyte count was associated with liver enzyme level, insulin resistance as well as visceral and subcutaneous fat thickness.

Neutrophil count was associated with insulin resistance; lymphocyte count was associated with serum liver enzyme, insulin resistance, and dyslipidemia. Monocyte count was associated with serum liver enzyme insulin resistance, visceral and subcutaneous fat thickness, body fat mass, and percentage body fat. Chronic low-grade systemic inflammation is associated with obesity related complication such as non-alcoholic fatty liver disease, insulin resistance and dyslipidemia in young adult [12]. Increased total WBCs and WBCs differential count particularly lymphocyte and granulocyte are associated with risk of transition of type 2 diabetes in obese Mexican American, after adjusting for other potential confounders [10]. A high interpersonal variation in white blood cell (WBC) counts has also been reported in physically active individuals [13] physical exercise may promote changes in the immune system [14] and can alter the number and function of leukocytes [15]. The degree of WBC trafficking depends on the intensity and duration of exercise [16]. It has been postulated that exercise increases stress-induced changes in the immune-neuroendocrine axis and in the circulating levels of metabolites that directly influence the function of immune cells [17]. This research aimed to investigate the effect of obesity WBCs count and compare WBCs count of obese subjects early in the morning and in the late evening to explore the effect of normal activates on TWBCs.

Methods

A cross sectional facility-based study was conducted in the Khartoum - Sudan during Sep 2017 to Nov 2017 among the Normal Sudanese obese subject. Medical record of 20 adult subject were reviewed all of them considered obese subject. Information obtained from the medical record include age gender height, weight and body mass index (BMI). BMI was calculated by dividing (weight in kg) over (height in m^2). Subject with BMI above 30 were considered obese while those with BMI less 30 were non-obese according to WHO. Twenty subjects were included; five of them were males and fifteen were females with age between (15-45) years old. Arterial blood pressure was checked for each volunteer to exclude hypertension. Blood samples were analyzed for TWBCs by SPSS version 24 for statistical analysis.

Results

Within the framework of study of obese subject, we count TWBCs in early of morning and late at evening among 20 obese subject who BMI 30 or more than 30. The mean of age was 45 with standard deviation of 8.36 years (Table 1). The mean of body mass index of participants was 30.4±5.0 with minimums of 30.4 and maximums of 46.6. The mean value of TWBCs for morning was 6.29 with standard deviation of 1.75 and the mean of TWBS result for evening is 7.37 with standard deviation of 1.78 (Table 2). The pair sample T test was significant with a P value 0.00 (Table 3).

Variable	N	Minimum	Maximum	Mean	Std. Deviation
BMI	20	30.4	46.6	35.6515	5.00823
Age	20	15	45	31.7	8.367

Table 1: Descriptive Statistics of age and BMI.

Variable	N	Minimum	Maximum	Mean	Std. Deviation
BMI	20	30.4	46.6	35.6515	5.00823
Age	20	15	45	31.7	8.367

Table 2: TWBC reference intervals in early morning and late evening among obese subject.

Sample	Difference (%)	T	P. value
TWBCs morning	23% ± 5.7%	4.62	0
TWBCs Evening			

Table 3: Paired Samples Statistics.

Discussion

In this study, we count the number of TWBCs in obese subject and compare it early in the morning and late in the evening, and to observe the relation between BMI and TWBCs in cross sectional study. Our study was showed that the mean TWBCs at morning is significantly different than in evening and there is significant increase in TWBCs at evening. More recent study linked the TWBCs to obesity, in recent ongoing study on normal hematological study in Sudanese population it had been observed that the WBCs was found to be more in obese subjects, as exercise is known to increase the WBC count physiologically it has been suggested that the normal daily movement for obese subject could be take an increase for them [3].

Conclusion

There is significant increase in number of TWBCs at the end of the day in obese subject, the cause may be due to the normal activity of obese may considered as exercise. TWBCs is affected by normal activates in obese subject. The current study comprised a single study thus additional design study is required. The result providing supporting evidence for recent report that recommended measured TWBCs level at early in the morning and late of the day in obese subject who BMI ≥ 30. Also, Additional study is required to measured TWBCs level at early in the morning and late of the day in pregnant ladies.

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