C-reactive protein level as a Bio marker of obesity among students in The National Ribat University in (2014 – 2015)

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Abstract

Objective: this study was carried out to measure serum C-reactive protein levels among overweight (obese) students in The National Ribat University.

Methods: 47 sera samples were counseled for socio-demographic data and screened by Nycocard CRP test**.**

Results: (75%) of obese students had high C-reactive protein concentrations in which Class III obese students showed the highest CRP mean level compared to other obese classes, and this result could not be explained by inflammatory diseases or other factors or diseases.

Conclusion: higher BMI might be associated with high CRP concentrations, even among young adults and this may suggest a state of low-grade systemic inflammation in overweight and obese individuals.

Introduction

Obesity is an extremely complex disease and many processes and pathways are altered which effect the immune system and lead to impaired immune response. Previous studies have indicated that obesity has an effect on various diseases including diabetes, cardiovascular disease, high blood pressure, high cholesterol, cancer and, inflammatory disease[1,2]. Diets high in sugar and fat, or eating too many calories in general, makes an individual more prone to infection. An obese individual that eats healthy and exercises is still at risk for decreasing immune function. Obesity itself has been shown to impair immunity in some studies[3]. Some of these specific findings include: decreased cytokine production, altered monocyte and lymphocyte function, natural killer cell dysfunction, reduced macrophage and dendritic cell function, decreased response to antigen/mitogen stimulation and increased C- reactive protein level [4,5]. It has also been proposed that individuals with excess body fat are more likely to have higher levels of CRP [6,7]. Since human fat cells, particularly those that form around the abdomen , release the pro-

inflammatory cytokine 6 and interleukin 6 induces low-grade systemic inflammation. C-reactive protein is a key inflammatory factor produced by the liver in response to acute infection or inflammation and its plasma concentration can increase up to 1000 times in response to injury or infection [8]. It is synthesized mainly by hepatic ducts and regulated IL-1b, IL-6 and TNF. CRP is known to be a better indicator than other cytokines in predicting cardiovascular disease. Most studies consider measurement of CRP the only factor for identification of inflammation, however, measuring other inflammatory markers along with CRP provides a better information about the mechanisms involved in inflammation. The implications is that being fat is partly an inflammatory disorder, and body fat promotes inflammation [9]. This may be part of the reason why being overweight increases C reactive protein level and causes recurrent infections. Well known links exist between diet, exercise and immune function. Eating healthier and incorporating moderate exercise can help to increase your immune function [10].

This study aims to reflect a closer image on the effect of obesity (overweight) among college students of both sexes in The National Ribat University by looking into serum C-reactive protein levels and other behavioral aspects in addition to the possible influence of this on further capacity at the immune system in terms of inflammatory response.

Materials and methods

Data collection
Samples
Thirty two samples were collected from obese students (mean age 20.3 ± 2.2years) who attend The National Ribat university. 15 of them were overweight (obese) males and the other 17 were obese females. Another 15 non obese (normal weight) students who have their age matched was also included as control group. 5ml of venous blood was collected from each student and sera were obtained by centrifugation at 1500 rpm for 5 minutes. Students with chronic infection, bacterial infection, recent infection, diabetic patients, pregnant ladies and those who have autoimmune diseases were excluded from the study. Demographic data were collected in a data collection sheet and informed consent was obtained from each student.

Nycocard CRP single test procedure
5 µl capillary was filled with patient sample and the capillary was dropped into the tube with R1/dilution liquid, the tube was closed and mixed well for 10 seconds. Then 50µl of diluted sample was applied to TD/test device, the sample was allowed to soak into the membrane (approx 3 seconds). That one drop was applied, R3/washing solution to the TD/test device, the reagent was allowed to soak into the membrane (approx 20 seconds). The result was read within 5 minutes using Nycocard reader II.

Results
Participants were classified according to their body mass index into class I, II, III obese and normal weight students. Class I obese students represented 13 (28%), class II obese

students represented 12 (26%) and class III obese students were only 7 (15%). In the other hand 15 (31%) of normal weight students were included as the control group, figure. 1.
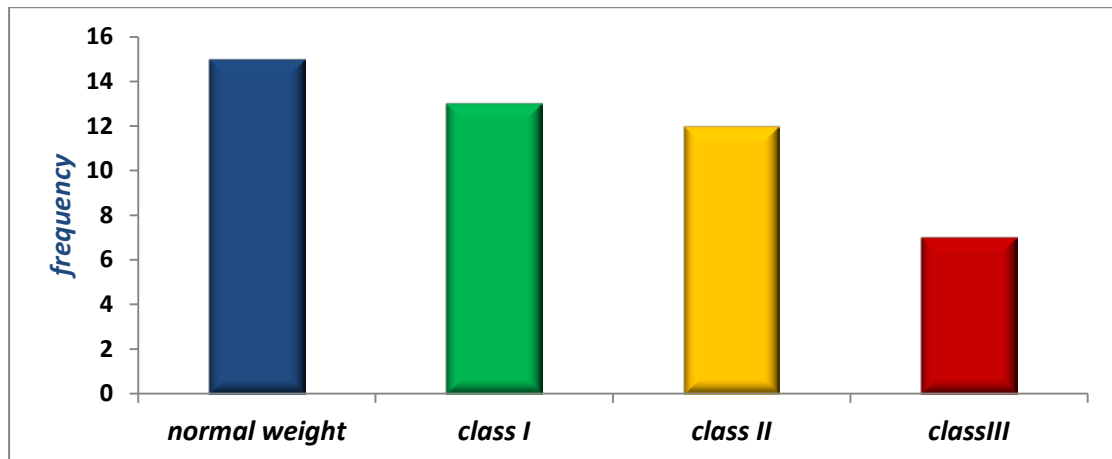

Figure. 1: Classification of participants according to their weight.

(75%) of obese students had detected an increased CRP levels (titer >5 mg/L), while only (27%) non obese (normal weight) students had an increased levels, figure. 2. Class III obese students showed the highest CRP mean level when compared to other obese classes, showing a mean level of (106 mg/L) while class II showed (94 mg/L), and class 1 obese students showed the lowest CRP mean level which was (78 mg/L), figure. 3.
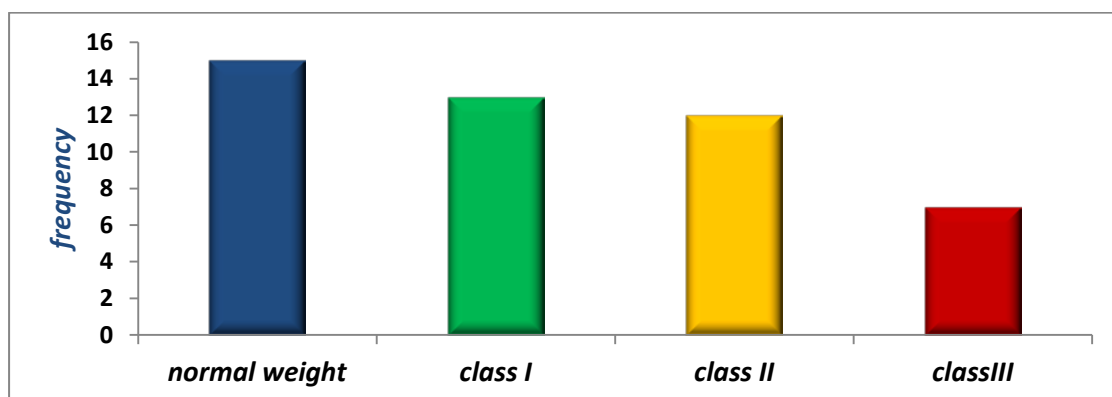

Figure. 2: Classification of participants according to their weight.
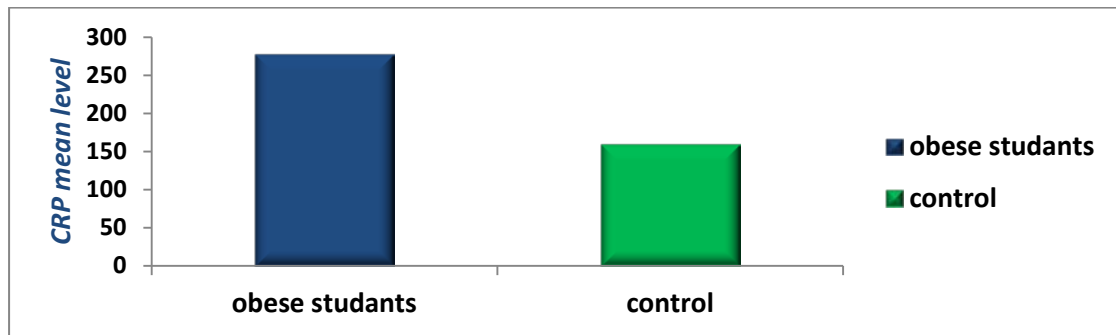
Figure. 3: Comparison between the mean of CRP level of obese and normal weight students.

Diet was shown to be the most used strategy for weight reduction among (41%) obese students, while (25%) used exercise, and medication showed to be the lowest strategy used by only (13%) obese students, in the other hand (21%) of the obese student didn't use anything to reduce their weight, figure. 4.
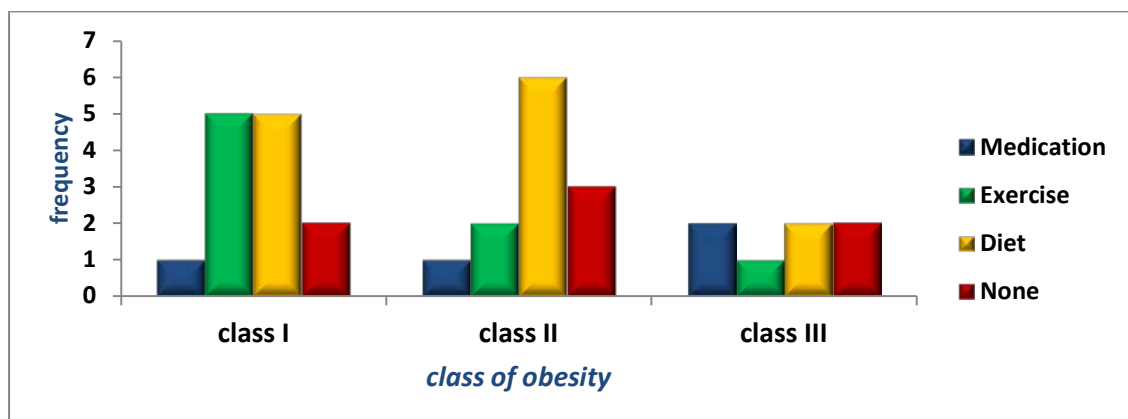
Figure. 4: Strategies used for weight reduction by students.

Discussion

The prevalence of obesity is increasing across the globe, Sudan being no exception. Obesity has traditionally been considered a cardiovascular risk factor and has been associated with an increased risk of developing immune system diseases and mortality in the general population among all ages and including both genders. Thus, it may be speculated that obese patients should have worse outcomes than their non-obese counterparts; however, recent publications have suggested that obesity may actually be

associated with low-grade systemic inflammation as measured by serum C-reactive protein (CRP) level. Thus, predict future risk of heart disease, high blood pressure, stroke, arthritis and some cancers[1].

In this study most of the students who were found to be obese had a previous family history of obesity, a possible explanation for this finding is that genetic makeup is an important factor which effect weight, in which it occurs in a rare forms due to mutations in a single gene (Monogenic obesity), and common obesity caused by mutations in multiple genes[11].

Our findings revealed that, unhealthy food with high carbohydrates uptake was the most type of food consumed among different classes of obese students, this might be the cause of their increased body mass index, thus causing harm to their immune system and its function by decreasing cytokine production, altering monocytes and lymphocytes function, , Such finding has previously been reported by other authors [3,5]. Although other potentially confounding variable like physical inactivity may have influenced and also been the cause for their increased body mass index. In addition, there was an obvious relationship between the number of meals consumed per day and the class of obesity in which class III obese students showed the highest number of meals eaten /day compared to other classes.

The present study showed an increased CRP levels among obese students when compared to normal weight students. It has also been observed that the highest CRP levels were mostly detected in sera collected from obese students of class III after that comes class II then at last class I, this might be explained by the fact that low-grade systemic inflammation is induced in individuals with increased body fat. This has been investigated an approved by other authors [6,8,9], they revealed that human adipose tissue expresses and releases the pro-inflammatory cytokine interleukin 6, potentially inducing low-grade systemic inflammation in persons with excess body fat. This study concluded that higher BMI is associated with higher CRP concentrations, even among young adults. These findings suggest a state of low-grade systemic inflammation in overweight and obese individuals. Thus, obesity among Sudanese society became a real problem with an enormous health consequences and this may increase the risk of developing further inflammatory diseases.

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