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Evaluation of Serum Uric Acid Level among Sudanese Obese Subjects

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Abstract

Background: Besides gout, elevated uric acid level is related to a variety of other conditions including increase alcohol and purine rich food consumption and obesity. Hyperuricemia is considered to be a considered to be a common lifestyle disorder related with obesity.

Objectives: To evaluate serum uric acid level in Sudanese obese subjects.

Materials and Methods: Analytical case control study conducted at Khartoum state during the period from July to August 2021. Fifty obese subjects as a case group and 50 as a control groups . Uric acid level was assayed using spectrophotometer. The data analyzed using SPSS version (25).

Results: The serum uric acid and BMI in obese is a significantly higher than non obese with p value = 0.000. In obese group show mean uric acid concentration of males is significantly higher than females ($p< 0.05$). The risk of developing CVD is 8 time higher in obese subjects with high uric acid levels. Serum uric acid level showed strong significant positive correlation with BMI($r=0.79$, $p= 0.000$), and no correlated with age ($r=0.03$, $p= 0.7$).

Conclusion: The obese had **a** significantly higher of serum uric acid. The elevation of uric acid level is sex dependent and is positively correlation with BMI.

Key words: uric acid**,** obese**,** cardio disease, hypertension, hyperuricemia

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Introduction

Obesity is becoming a more serious public health issue on a global scale, as global mortality and the incidence of chronic diseases continue to rise. Obesity is linked to a variety of disorders (such as hypertension, atherosclerosis, cardiopulmonary disease, metabolic syndrome, and cancer) and is also a risk factor for cardiovascular disease and all-cause mortality (1). Sudan has a population that is obese, ranking 174th in the world. Obese patients had a 2.1 fold increased risk of hyperuricemia (high uric acid [HUA]) compared to non-obese patients, according to research. Uric acid is also a byproduct of purine metabolism in the human body.Increased serum uric acid (SUA) is not only a risk factor for gout, but it is also an important risk factor for obesity, which can lead to an increased risk of cardiovascular disease. SUA has been shown to be associated with the risk of obesity in an independent and favorable manner (2). There are a number of mechanisms

that could explain the link between HUA and obesity. Obesity or extra body fat may be linked to increased uric acid synthesis and inadequate excretion as a result of insulin resistance (IR), leading in impaired uric acid metabolism and even HUA. Meanwhile, HUA can cause obesity by increasing the formation of liver and peripheral fat. Disorders of glycolipid and uric acid metabolism may encourage the coexistence of the twovariables. HUA appears to be a risk factor for hypertension, cardiovascular disease, and cerebrovascular disease (3, 4). SUA levels are strongly linked to the occurrence of CVDs and its components. In Bangladeshi adults, a substantial positive association between SUA and obesity has been demonstrated (5). According to the most recent data, HUA has become a major health problem in southern China among urban people aged 35–79 years, with men receiving special attention. Further research on the comorbidities and causality of HUA is warranted (6). In study conducted by (7), Serum Uric Acid Levels in Overweight and Obese University Undergraduate Students In Relation To Anthropometric Indices Obese and overweight males had considerably higher serum uric acid levels than females and control subjects, according to the study. .Also in study done by (8), the researchers wanted to see how serum uric acid levels differed between normal-weight people and severely obese people. When compared to the control group, laboratory markers, particularly blood uric acid levels, were shown to be greater in morbidly obese patients. The objective of present study was to evaluate serum uric acid level in Sudanese obese subjects.

Materials & Methods

Analytical case control study conducted at Khartoum state during the period from July to August 2021. Fifty obese subjects as a case group and 50 as a control groups. BMI more than 30 and no history of any medical condition. Other 50 healthy individuals were used as a control group, whose age and sex matched healthy. Overweight subjects and obese subjects with history of medical condition were excluded from the Study. Informed consent was taken from the patients and subjects who participated in the present study. Ethical committee approval has also been obtained from Omdurman Islamic university. In both groups serum uric acid was estimated using uricase method and BMI was calculated by dividing by weight (kg) by height squire (m^2).

Statistical Data: The result was expressed as mean ± SD. Student T test was used to compare the mean concentration of uric acid; chi-squire test was used for risk estimate and person correlation coefficient to examine the relationship. P value less than or equal 0.05 was consider statistically significant.

Results

The study revealed that the average age of case and control was (40.5 ± 9.2) and (38.7 ± 7.9) respectively, with no significant difference (P=0.311). The mean BMI was significantly (0.000) higher in obese (34.7 ± 3.4) compared to control group (21.5 ± 1.9) (Table 1). Among the

50 obese individuals who participated, (50% men and 50% women), the mean serum concentrations was significantly higher in case (7.2 ± 0.27) compared to control group (5.3 ± 0.86) with p value (0.000) (Table 2). According to gender, Females and males mean of uric acid concentrations in the obese group is significantly higher than the mean that in the control group ($p<0.05$) (Table 3). When considering obese group only, findings show mean uric acid concentration of males is significantly higher than that of females ($p< 0.05$), while no significant difference was observed when compared according to age (Table 4).

This Study also showed that the risk of developing cardiovascular disease is 8 times higher in obese subjects with hyperuricemia than those with normal uric acid levels (table 5).

Serum uric acid level showed strong significant positive correlation with BMI($r=0.79$, $p= 0.000$), and no correlated with age ($r=0.03$, $p= 0.7$). (Figure 1, 2).

Table 1: Demographic and anthropometrics Characteristics of Study population

variables	case group (50)	control group (50)	*p value*
Age	40.5 ± 9.2	38.7 ± 7.9	0.311
BMI	34.7 ± 3.4	21.5 ± 1.9	0.000

Table 2: Compare mean uric acid concentration in study population

parameter	case group (50)	control group (50)	*p. value*
uric acid	7.2 ± 0.27	5.3 ± 0.86	0.000

Table 3: Serum Uric Acid level in the male and the female of case and control group

parameter	male		*p value*	female		*p value*
	obese	normal		obese	normal	
uric acid	7.6 ± 0.29	5.4 ± 0.87	0.04	7.2 ± 0.27	5 ± 0.85	0.00

Table 4: Compare mean uric acid concentration in case group according to variables risks (age & gender)

variables		uric acid	*p value*
age	above than 40 years less than or equal to 40 years	7.1 ± 0.26 7.2 ± 0.29	0.31
gender:	male (25) female (25)	7.21 ± 0.28 6.3 ± 0.22	0.04

Table 5: Show the Association of hyperuricemia with CVD in obese subjects

parameter	value	obese	OR	*p value*
uric acid	high	46	7.9	0.000
	normal	4		

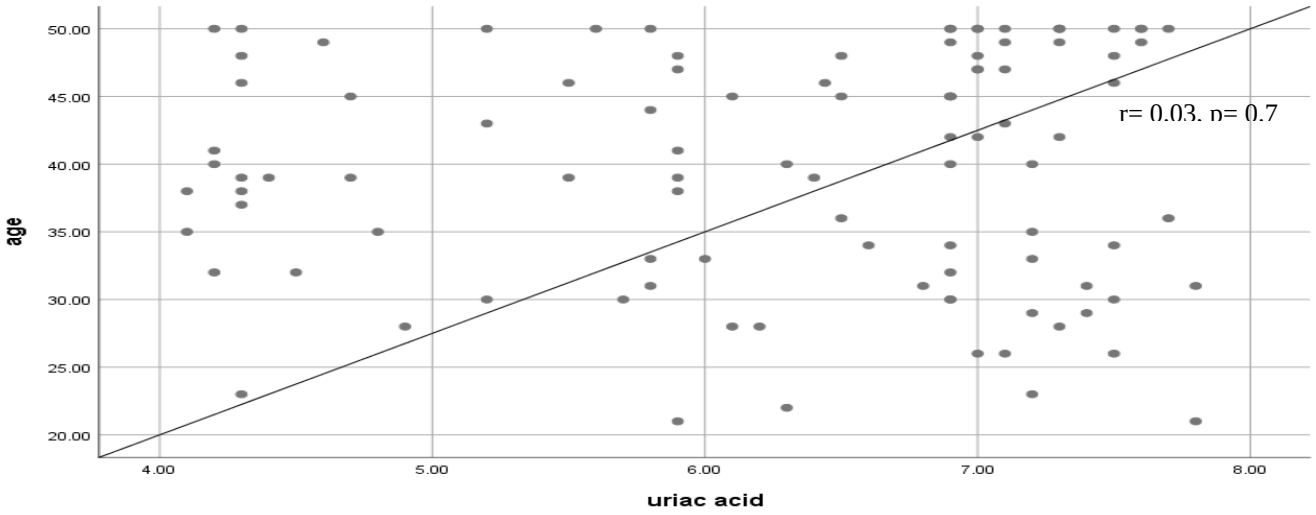

Figure 1: Correlation of serum uric acid with age

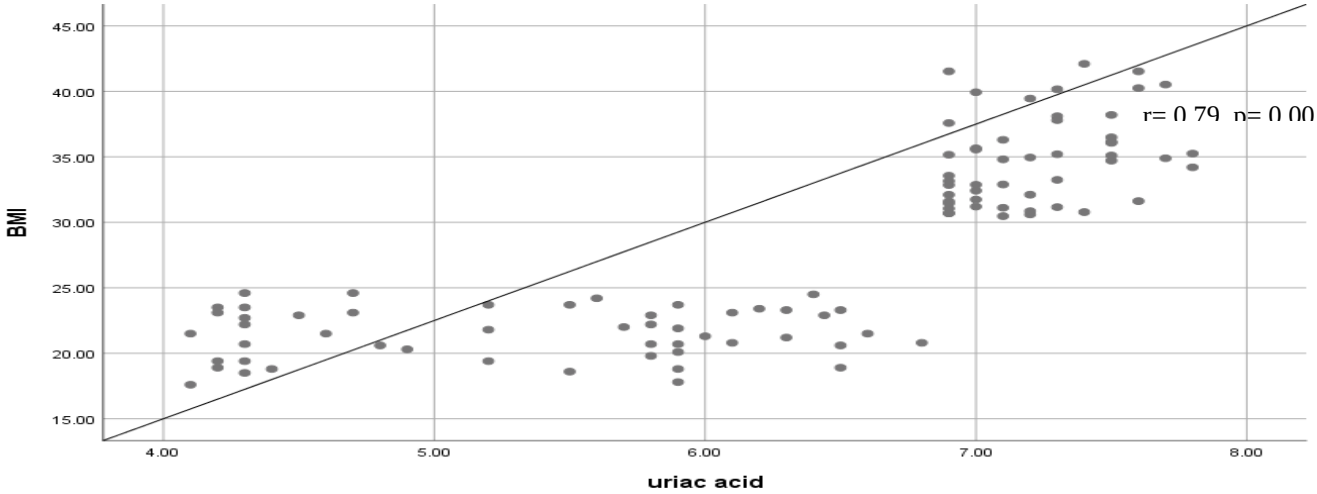

Figure 2: Correlation of serum uric acid with BMI

Discussion

Obesity in the last decade become a global problem and has been recognized as a risk factor with a variety of clinical conditions and adverse health consequences; hyperuricemia is one of these conditions. Nowadays, obesity and hyperuricemia and its complications, such as metabolic syndrome and cardiovascular diseases, have raised serious concern for public health in the international community because of their high prevalence, health consequences and substantial economic burden 6). Several epidemiological studies have assessed the relationship between SUA and obesity in different population; however, to our knowledge, this is the first study that focused on SUA and obesity for the Sudanese population. The present study was carried out to measure the serum uric acid level among obese Sudanese subjects attending sabreen market of Khartoum during the period of July to august 2021.One hundred (100) heparin blood sample collected from the cases (obese)

and from the control (Healthy Subjects); so fifty (50) were Sudanese subjects with obesity whereas fifty (50) were apparently health Subjects. The results contribute a clearer understanding of effect obesity on fibrinogen levels. Compared with subjects with normal weight, obese subjects have significantly higher levels of SUA, which is consistence with study of (Mehmet İnanir, 2020) (8) who report that uric acid was found to be higher in morbidly obese patients compared to the control group. Increased serum uric acid in these participants may be due to reduced renal clearance and excessive secretion and production of uric acid from adipose tissues through xanthine oxidoreductase.On the other hand, this study revealed that obese males and females have significantly higher serum uric acid when compared with their control. These finding were consistence with report of (Simiao *et al*., 2019)(9) who found that variation on serum uric acid is sex dependent. Also the study found that the mean uric acid concentration is significantly higher in obese male than female which in consistence with study of (EMMANUEL *et al*., 2018) (7) who observed significantly higher serum uric acid in obese and overweight males than females. These finding maybe due to sexual dimorphism in female serum uric acid as result of higher renal clearance of urate, possibly due to theirhigher plasma oestrogen levels. In addition, This Study also showed that the risk of developing cardiovascular disease is 8 times higher in obese subjects with hyperuricemia than those with normal uric acid levels. Ours finding in consistence with study of (Hefei *et al*., 2019)(10) who says that hyperuricemia is an independent risk factor for the development of cardiovascular disease and its presence is associated with increased mortality. High uric acid level increases the activity of renin angiotensin aldosterone system causing more vasodilation and finally hypertension. Furthermore, the increased activity of RAAS is associated with an increased activation of activated mitogen protein kinase leading to an increase of apoptosis of cardiac muscles fibber. Thus hyperuricemia through these mechanisms may contribute to the pathophysiological process of heart failure and arterial fibrillation.As shown in Figure (2), along with increased BMI, SUA in obese patients increased gradually. This is similar to previous research of (Liu F *et al*., 2020)(11) who concludes that SUA in in overweight/obese patients was significantly higher than in normal-weight subjects. The specific mechanism of the interaction between obesity and HUA be related to an imbalance of inflammatory factors and fat factors caused by chronic inflammation and oxidative stress, as well as IR. Finally, The BMI is a commonly recognized index to evaluate obesity. In this study, it was discovered that increased SUA was correlated with BMI in obese patients.

Conclusions

This study concluded that serum uric acid is significantly higher in obese compared to control.

The elevation of uric acid level is sex dependent and is risk factor for development of CVD.

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