# Effect of obesity on renal function test, uric acid, and gamma glutamyl transferase (GGT) in sample of Iraqi men

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## الخلاصة:

**المقدمة:** انتشار الامراض المتلازمة الايضية ومنها السمنة في جميع انحاء العالم في تزايد. وضائف الكلى هي احد الاهداف الرئيسية لهذه المتلازمة. اذ ترتبط المتلازمة الايضية مع خطر الاصابة الكلوية, وكذلك جميع امراض القلب والاوعية الدموية. كما وترتبط السمنة مع تطور المرحلة النهائية لمرض الكلى (ESRD).

**الهدف من الدراسة:** علاقة مؤشر كتلة الجسم مع بعض وظائف الكلى ، حامض اليورك و كاما- كلوتامايل ترانسفسراز في مصل دم عينة من الرجال العراقيين الاصحاء ضاهرياً.

**المواد وطرائق العمل:** اجريت هذه الدراسة على 127 من الرجال الاصحاء ظاهريا تتراوح اعمارهم (40-79) سنة ومؤشر كتلة الجسم لديهم يتراوح من (40-39.9) كغم/م$^2$. تم تقدير كل من اليوريا, الكرياتنين, حامض اليوريك و كاما-كلوتامايل ترانسفيريز بواسطة المطياف الضوئي.

**النتائج:** كانت معدل اعمار الرجال (55.5354±10.738) سنة، و كان معدل كتلة الجسم BMI (29.308±4.77) كغم/م2 وقسمت الى اربعة مجاميع بنسب كالاتي 26 رجلا (20.47 ٪) لديهم مؤشر كتلة الجسم الطبيعي (18-24.9) كغم/م$^2$ , 47 رجلا آخرين (37٪)، و 33 رجلا (25.98 ٪) و 21 رجل (16.53٪) يعانون من زيادة الوزن (25-29.9)كغم/م$^2$، السمنة (30-34.9)كغم/م$^2$ والسمنة المفرطة (35-39.9)كغم/م$^2$ على التوالي. كان متوسط معدل المتغيرات المدروسة لدى الرجال: اليوريا , الكرياتينين , حامض اليوريك و كاما- كلوتامايل ترانسفيريز (SD ± men) (42.387 ± 3.682) ملغ / 100مل، (1.004 ± 0.158) ملغ / 100مل، (6.216 ± 0.829) ملغ / 100مل و (28.844 ± 7.741) وحدة دولية/لتر على التوالي , وكان أعلى مؤشر كتلة الجسم مرتبطا معنويا مع زيادة حامض اليوريك و كاما- كلوتامايل ترانسفسرازGGT، في حين لم تكن هناك علاقة ارتباط معنوية بين مؤشر كتلة الجسم و ,اليوريا والكرياتنين في الرجال العراقيين عند ($P \leq 0.05$ لجميع العوامل). معنوية بين مؤشر كتلة الجسم و مستوى اليوريا والكرياتنيين عند مستوى الاحتمالية $P \leq 0.05$ لدى الرجال العراقيين.

**الاستنتاجات:** الرجال الذين يعانون من ارتفاع مؤشر كتلة الجسم هم أكثر عرضة لارتفاع مستويات حامض اليوريك و كاما- كلوتامايل ترانسفسراز في مصل الدم، ولا توجد علاقة بين مؤشر كتلة الجسم ومستويات كل من اليوريا في الدم والكرياتينين في مصل الدم لدى الرجال العراقيين تحت الدراسة.

## ABSTRACT

***Introduction:*** The prevalence of both obesity and other elements of metabolic syndrome (Met.S) are increasing worldwide, and the renal function is a major goal of this syndrome. Met.S is associated with a risk of renal injury, as well as all cause and cardiovascular disease (CVD)[1]. As obesity is related with the development of end-stage renal disease (ESRD)[2].

***Aim:*** This study was to correlate Body Mass Index (BMI) with some serum renal function, (blood urea, serum creatinine) and serum uric acid (S.UA) and serum gamma glutamyl transferase (GGT).

***Material and methods:*** This study involve 127 men apparently healthy, range age (40-79) years old and the BMI ranged (18-39.9) $kg/m^2$. were analyze of B.urea S.creatinine S.UA and S.GGT by spectrophotometer.

***Results:*** The mean age of men was (55.5354±10.738)years and the mean of BMI was (29.308±4.77)$kg/m^2$. There are no men underweight, 26 men (20.47%) were of normal BMI, other 47 men (37%), 33 cases (25.98%) of and 21 case (16.53%) were overweight, obese, and severe obesity, respectively. the mean of serum parameters urea, creatinine, uric acid, and gamma glutamyl transferase in study were (mean ± SD) (42.387±3.682) mg/dl, (1.004±0.158) mg/dl, (6.216±0.829) mg/dl, and (28.844±7.741) U/l respectively. Higher BMI was significantly associated with an increase S.UA and S.GGT, while not found significant associated between BMI and B.urea and S.creatinine in Iraqi men at ($P \leq 0.05$ for all factors).

***Conclusions:*** Patients with higher body mass index are more liable to have higher S.UA and S.GGT, with no relation between BMI and the levels of both blood urea and serum creatinine in Iraqi men under study.


**Key words**: *BMI, obesity, Renal function, GGT, S.UA*

## Introduction:

Metabolic syndrome (Met.S) is a collection of several metabolic and physiological abnormalities in the same person, including obesity, glucose intolerance, insulin resistance, dyslipidemia, and hypertension and is associated with rise morbidity and mortality[3]. Body mass index values exceeding 25 $kg/m^2$ have been correlated with the risk of ESRD[2].

Obesity is one of Met.S elements and is consider as a serious and independent risk factor for kidney diseases. The mechanisms dependent this association involves systemic affects like as hyperglycemia, hypertension, and dyslipidemia. In addition, intrarenal effects such as lipid accumulation and impaired fatty acid oxidation may further

contribute to chronic kidney disease assessment (CKD) pathogenesis[4]. The observed diffusion of the metabolic syndrome in National Health and Nutrition Examination Survey III (NHANES) was 5% among the persons of normal weight, 22% among the over-weight, and 60% among the obese[5]. A Framingham Heart Study report specific that a weight increase of more than 2.25 kg over a period of 16 year was related with an up to 45% increased hazard for developing the Met.S[6].

Could obesity affect associations between generation of urea and creatinine, excretory burden, and estimated body surface area with effects on CKD[7].

Other reaction indicators of renal function such as S.UA and glomerular filtration rate (GFR) have been shown to be associated with obesity or metabolic syndrome[8][9]. Uric acid is a novel and independent predisposing factor of the renal dysfunction in the general population [10].

Over-production of Uric Acid causes gout. It might also lead to gradual renal dysfunction. Hyperuricemia is also associated with Met.S like Obesity, Diabetes mellitus. Hypertension and Hypertriglyceridemia[11].

Different studies have focused on prospective risk factors of hyperuricemia, Framingham study referred to that patients with high S.UA (Gout) have significantly greater BMI[12].

GGT is expressed in the kidney, liver, and cerebrovascular endothelium and is an enzyme responsible for the catabolism of extracellular glutathione (GSH)[13]. Consequently, there has been increasing attention in the biological significance of alterations in serum GGT, which has been suggested to be useful as a general signal of oxidative stress[14]. Patients exhibiting metabolic syndrome are suffer by elevated GGT activity resulting from disordered metabolism of thiol compounds[15] In the present study, we aimed to investigate the correlation between BMI and the renal function (B.urea and S.creatinine). S.UA, and S.GGT in sample of Iraqi men apparently healthy

**Material and method:**

This study was conducted in Iraq- Anbar province from October 2016 to end of April 2017 on 127 men apparently healthy aged from 40 to 79 year. The men under study were taken from department of urology (Al-Ramadi teaching hospital). After taking informed consent from those men, the data of study was recorded according to administering a questionnaire, and provide a 10 mL blood and taken their weight and length (with their clothing and without shoes). Serum was separated then transfers it to laboratories of Al-Ramadi Teaching Hospital for Women and Children. Serum samples were divided in to 5 eppendorf and stored at -20 ºC until assayed.

The body mass index was calculated by measuring the weight and height, according to the following equation [16].

$$\textbf{Body Mass Index (BMI) Kg/m}^2 = \frac{\text{Wight (kg)}}{\text{Height (m)}^2}$$

The men under study were divided into 4 groups according to their BMI, this classification is agree with The WHO BMI classification[17], that includes: Normal BMI (18.5–24.9), other (25–29.9), (30–34.9), and (35–39.9) were overweight, obese and Severe obesity, respectively

Used ready-made kits produced by linear biochemistry company in Spain, to measure all serum parameters as the following urea[18], creatinine[19], uric acid[20], gamma glutamyl transferase[21] by depending on the colorimetric methods.

## Result:

The results of this study was showed that the range age of men under study was 40–80 year. There were no underweight, 26 men (20.47%) were of normal BMI (18–24.9 kg/m2), other 47 men (37%) overweight, 33 cases (25.98%) of obese, and 21 case (16.53%) severe obesity

Table.1 (Figs 1-3 in Appendix) shows the relationship between BMI, urea, creatinine, uric acid, and gamma glutamyl transferase there are no significant relation between BMI and the levels of urea and creatinine, but there are significant increasing in

levels of uric acid, and gamma glutamyl transferase in men with high BMI (obese and severe obesity groups) at P≤0.05.

The results in figures (1) and (2) represent scatter charts for all the men under study, showing the significant positive correlation between BMI and both UA, and GGT P≤0.05

**Table 1-** Relation between BMI and some serum renal function tests and GGT in sample of Iraqi men at P≤0.05

| | Body Mass Index (BMI) | | | |
|---|---|---|---|---|
| **Parameters** | **Normal BMI** | **Overweight** | **Obese** | **Severe Obesity** |
| S.Urea (mg/dl) | a<br>36.0-47.7*<br>41.238±3.219** | a<br>38.0-50.0<br>42.234±3.790 | a<br>38.0-50.0<br>42.997±3.866 | a<br>36.0-48.0<br>43.190±3.530 |
| S. Creatinine (mg/dl) | a<br>0.80-1.30<br>0.981±0.1327 | a<br>0.60-1.30<br>0.998±0.168 | a<br>0.60-1.40<br>1.018±0.172 | a<br>0.80-1.30<br>1.023±0.147 |
| S.Uric acid (mg/dl) | a<br>4.00-7.60<br>5.931±0.795 | ab<br>4.00-8.80<br>6.066±0.866 | ab<br>4.50-8.40<br>6.476±0.797 | b<br>5.20-7.50<br>6.495±0.665 |
| GGT (U/l) | a<br>12.10-40.00<br>24.58±6.504 | ab<br>15.00-54.00<br>28.104±7.642 | b<br>18-43.00<br>30.029±7.715 | c<br>19.83-44.0<br>33.906±6.408 |

- Similar letters mean no significant differences at P≤0.05

-*Range - ** Mean ± SD

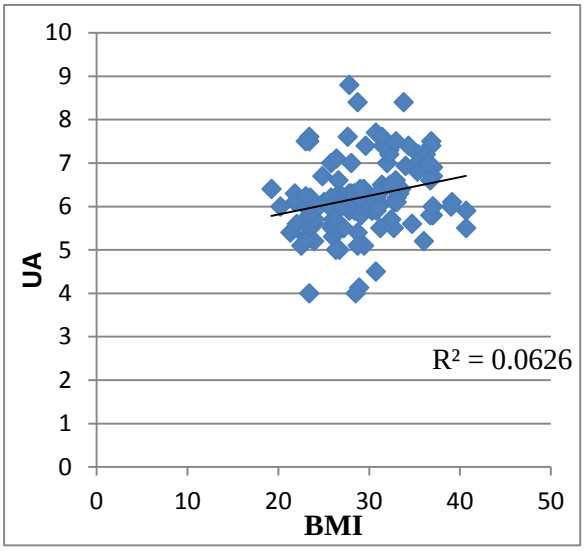


Fig. 1- Scatter chart showing the significant positive correlation between BMI and S.UA in men under study

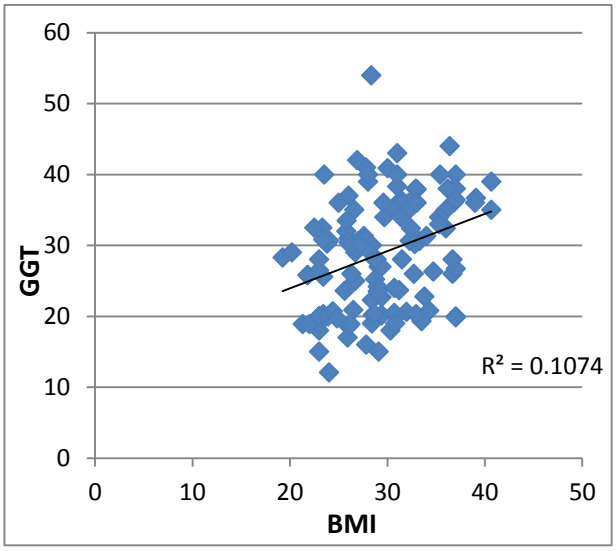


Fig. 2- Scatter chart showing the significant positive correlation between serum GGT and BMI in men under study

## Discussion:

There was no significant change in B.Urea and S.creatinine in Iraqi men with increasing BMI, this is consistent with results Li et al. (2010)[8] have found no correlation between creatinine and body mass index in their study on kidney function and obesity in adults without hypertension.

In this study was found significant increasing S.UA and S.GGT in Iraqi men with increasing BMI, which is identical to the results of study Ishizaka before five years when follow up of 3153 persons, S.UA change was related with the change of BMI[22]. Also Heyden, et al,[23] showed that there was a gradual progress in decreased S.UA levels associated with maximum weight loss to higher levels with maximum weight gain. As that BMI is an important adjustable risk factor for hyperuricemia in USA, Japan, and other countries[24], therefore weight loss was thought to be an effective non-medical strategy for S.UA level lowering in the Japanese population[22]. According to the report Tsushima's[25], that excessive fat accumulation in obesity could produce and secrete uric acid and is relatively associated with overproduction-type hyperuricemia. This may supply a possible mechanism for the relationship between BMI and SUA.

This results agree with results of Gopal, N. et, al,[26] they found that persons with high BMI were associated with significantly high levels of serum GGT, levels of serum GGT may be elevated a reversal of high degree of oxidative stress and oxidative stress is known to be associated with central obesity and age[13][27]. Elevated GGT is associated by strongly with obesity and deposition of fat surplus in the liver, termed non-alcoholic fatty liver disease, which is thought to cause hepatic insulin resistance and to contribute to the evolution of insulin resistance systemic and hyperinsulinemia[28]. also these findings suggest the prospect that increased S.GGT, might reflect metabolic alterations, generally independently of the effect of alcohol consumption, and could serve as a clinical indicator for the insulin resistance syndrome[29].

However, there are several limitations in our study. Firstly, our study was observational, we could not cancel the possibility other unmeasured factors that may share in to observed associations. Secondly, we have no information regarding the extent to which dietary habit modifications and lifestyle affect our study population. Finally, the design of study was cross sectional, and thus might not necessarily explain the role of S.UA and other study parameters as the result of high BMI. There are needed to studies for determine the role of BMI and other element of Met.S in hyperuricemia and in patient in multi centers in Iraq and long-term follow-up must be taken.

## Conclusions.

Patients with higher body mass index are more liable to have higher S.UA and S.GGT, with no relation between BMI and the levels of both blood urea and serum creatinine in Iraqi men under study

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## Appendix:

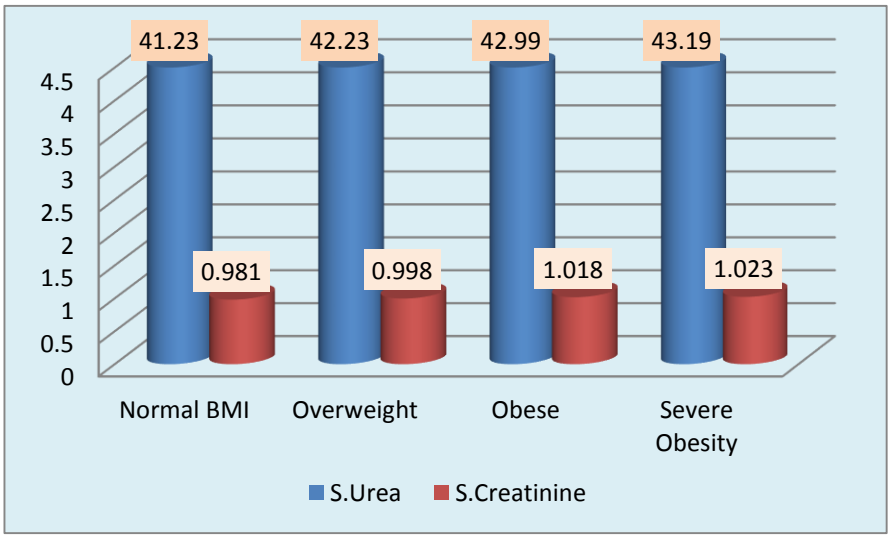


**Figure 1**. The level of serum urea and creatinine in all groups under study

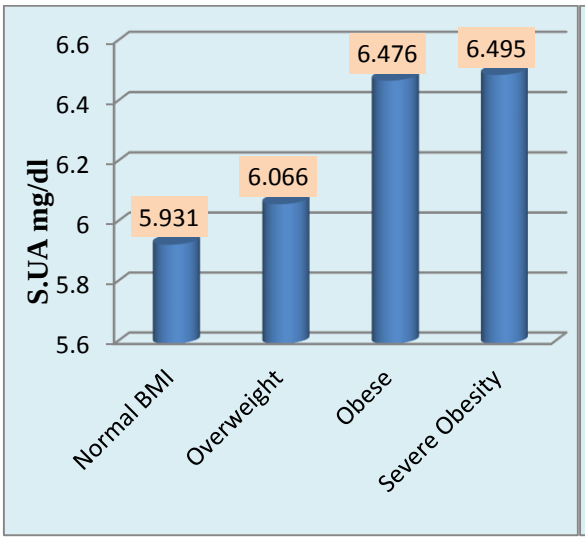


**Figure 2**. The level of serum uric acid in all groups under study

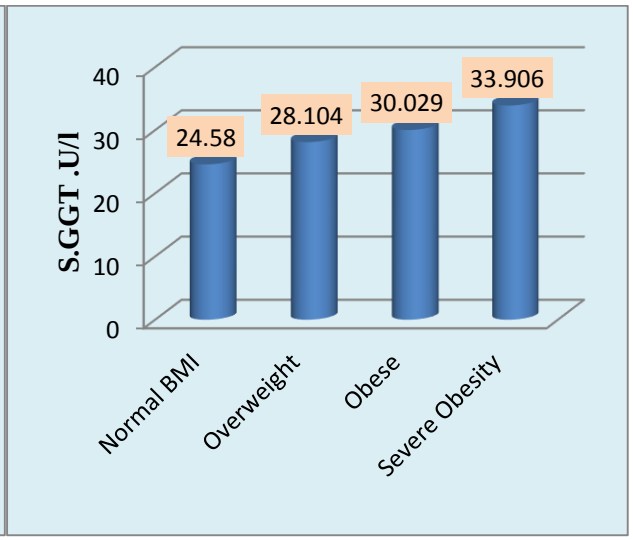


**Figure 3**. The level of serum GGT in all groups under study