Estimation of Serum Urea, Creatinine and Uric Acid in Obese Subjects

Humaira N. Khan[1], Anjali Pergulwar[*2], A. M. Siddiqui[3], A. R. Shinde[4]

[1]Associate Professor and Head of the Department, [*2]Resident, [3]Associate Professor, [4]Assistant Professor
Department of Biochemistry, Dr. S.C. Government Medical College, Nanded, Maharashtra

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Abstract:

Introduction - *Obesity is often a neglected renal risk factor. It may play a important role in progression of renal disease.*

Aim and Objectives - *To estimate blood urea, serum creatinine, serum uric acid in Obese and control group.*

Method and Material - *Total 50 obese subjects and 50 controls were taken for study. Serum /plasma urea ,serum creatinine and serum uric acid was measured on fully automated XL-640 , using Erba diagnostic kits.*

Observation and Results - *The mean values of study parameters was found to be elevated in obese group as compared to controls .Result was expressed in Mean ± S.D.*

Conclusion - *Renal profile was altered in obese subjects with increased levels of serum/plasma urea, serum creatinine, serum uric acid.*

Introduction

Obesity is a condition of abnormal or excessive fat accumulation in adipose tissue, to the extent that health may be impaired. According to Zajak et al obesity is an abnormal growth of the adipose tissue due to an enlargement of fat cell size (hypertrophic obesity) or an increase in fat cell number (hyperplastic obesity) or a combination of both.[1] Obesity is a known risk factor for adverse health outcomes including common kidney diseases, diabetes and hypertension.[2] Obesity is often a neglected renal risk factor. It appears to play a central contributory role in the genesis of hypertension, focal and segmental glomerulosclerosis and renal cell carcinoma. Obesity appears to have a favourable impact on the long-term dialytic therapy and an unfavourable effect on the long term renal allograft and patient survival.[3]

Compensatory renal vasodilation, increased glomerular filtration rate and higher blood pressure associated with obesity are important in overcoming increased sodium reabsorption. In the long term, however, these compensatory responses may cause glomerular injury.[4]

A few authors have proposed that obesity has significant decline in renal functions. Studies on isolated role of obesity causing renal impairment are only a few. Hence the present study is undertaken to evaluate the level of serum/plasma urea , serum creatinine and serum uric acid as measure of renal function in obese subjects.

Aim and Objectives

To estimate serum / plasma urea, serum creatinine, serum uric acid in Obese and control group.

Method and Material

The study was carried out in Dr. Shankar rao chavan government medical college and hospital, nanded. Total 50 obese subjects and 50 controls were selected, from the patients visiting in medicine OPD.

Body mass index was calculated by formula weight (kg) / height^2 (mtr)^2 after measuring height and weight.

Serum / plasma urea was measured by using Erba diagnostic kit and Enzymatic Urease - Glutamate dehydrogenase (GLDH) method ,serum creatinine was measured by using Erba diagnostic kit and Modified Jaffe's method (Kinetic method). Serum uric acid was measured by using Erba diagnostic kit and Modified Uricase method (End point). These three parameters were measured on fully automated XL-640 in our lab .There normal values were considered as per guidelines provided in kit.

Normal values -

Serum / Plasma urea 13-45 mg/dl
Serum creatinine: 0.7-1.5 mg/dl
Serum Male - 4.0 to 7.2 mg/dl

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Sample Collection -

5 ml venous blood was drawn aseptically from the anticubital vein and was collected in plain bulb for estimation of mentioned test parameters. The sample in plain bulb was kept undisturbed for one and half hour so that it clots. Then the clotted blood was subjected to centrifugation at 5000 rpm for 5 minutes. The serum thus separated is used for investigation.

Statistical analysis -

Descriptive statistical analysis was carried out in the study. Results on continuous measurements are expressed in Mean ± Standard deviation (Min-Max).Statistical analysis was done using Graph pad prisam - 7 software .

'p' value was considered as statistically significant when $p < 0.05$ and

Highly significant when $p < 0.01$

Observations and Results

Present study comprises of 100 subjects, among whom 50 were controls having age 47.4 ± 5.0 years, 50 were Obese subjects having age 48.7 ± 4.7 years.

Table 1: Showing Distribution of subjects in study groups

Study Groups	Number	Age in Mean ±SD
Control	50	47.4 ± 5.0
Obese	50	48.7 ± 4.7

Table 2: Comparison of study parameters was done using Turkey's multiple comparison test in the study groups

Study Parameters	Values expressed as mean ± SD	
	Study Groups	
	Control	**Obese**
Weight (Kilograms)	52.6 ± 5.5	81.0 ± 8.0
Height (meter2)	1.67 ± 0.07	1.6 ± 0.04
BMI (Kg/m2)	18.7±1.9	30.6 ± 2.7
Serum urea	21.8 ± 3.9	49.9 ± 10.9
Serum creatinine (mg/dl)	0.6 ± 0.09	2.0 ± 0.5
Serum uric acid (mg/dl)	3.4 ± 0.271	5.5 ± 0.74

p < 0.05 - Statistically significant
p < 0.01 - Statistically highly significant

Table no.2: Shows highly significant difference ($p< 0.01$) among study parameters, i.e. Weight, Height, BMI, Serum urea, Serum creatinine, Serum uric acid. Mean values of the study parameters were significantly increased in obese group as compared to control group.

Discussion

Obesity is associated with multiple other conditions that are known to cause compromised renal function, including hypertension, hyperuricemia and the metabolic syndrome that can independently have a harmful effect on renal function.

Obesity seems to cause a change in the renal hemodynamics that promotes progressive kidney disease. These changes begin early in the course of obesity, even before overt renal manifestations of obesity are clinically apparent.[5]

The present study was done in age matched Obese group and controls to find out its adverse effect on renal functions from parameters urea, creatinine, and uric acid.

Body mass index

In our study mean value of BMI in Controls was in the range 18.7± 1.9 kg/m^2 and in obese group it was in the range 30.6 ± 2.7 kg/m^2. Body mass index, in obese subjects was significantly high as compared to Controls i.e. ($p < 0.01$).

The overweight condition enhances the influence of arterial pressure on target organ kidney, which causes renal injury leading to severe damage to the kidney and loss of renal function.

The rising prevalence overweight and obesity in India has a direct correlation with the increasing prevalence of obesity-related co-morbidities; hypertension, the metabolic syndrome, dyslipidemia, type 2 diabetes mellitus (Type 2 DM), and cardiovascular disease (CVD).[6]

Study parameters

In our study, mean values of blood urea, serum creatinine, serum uric acid in controls, were in the range 21.8 ± 3.9 mg/dl, 0.6 ± 0.09 mg/dl, 3.4± 0.2 mg/dl.

While in obese group, they were in the range 39.9 ± 10.9 mg/dl, 1.3 ± 0.5 mg/dl, 4.5 ± 0.7 mg/dl. The mean values of blood urea, serum creatinine, serum uric acid were significantly increased in Obese group as compared to controls i.e. ($p < 0.01$).

Increased body mass index , raises blood pressure and causes structural changes and metabolic demands by the kidney which first results in renal hyper fusion and then in renal hyperfiltration . Basically renal hyperfusion state leads to glomerular re-absorption of blood urea, creatinine, uric acid. However considering the strong association between hyperfiltration and risk of rise in these biochemical (Blood urea, creatinine, uric acid) parameters it should be regarded as a precursor of loss of renal function in obese condition.

The result may be a vicious cycle of renal damage and nephron loss leading to more severe hypertension, glomerular hyperfiltration and further renal damage. Glomerular pathology progresses to glomerulosclerosis and eventually the renal tubules may also become ischemic and gradually atrophic.

Anvekar N.S. et al, summarized that, an elevated serum BUN may represent an independent marker of renal dysfunction, which would further support the well-established association between renal disease and CAD.[7]

Raised Body mass index causes increased blood pressure which produces unfavourable effects and such a change in kidney resulting in increased tubular secretions leading to increased blood urea and creatinine and uric acid level.

Russo LM et al, described that, the increase in serum uric acid may be due to the decrease in renal blood flow, which stimulates urate reabsorption in obese and hypertensive individuals.[8]

All above theories, our tables and results illustrate that obesity is a clinical condition responsible for accumulation of urea, creatinine and uric acid.

Conclusion

From the present study we can conclude, that obesity causes a decline or loss of renal function. Loss of renal function can be evaluated by measuring serum/ plasma urea, serum creatinine and serum uric acid levels.

We therefore suggest that regular evaluation of renal function tests can help in detection of early renal damage and abrupt deterioration of renal function in obese subjects.

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Corresponding Author -

Dr. Anjali Pergulwar
Dr. Shankar Rao Chavan Government Medical College, Vishanupuri, Nanded, Maharashtra