Relationship Between Uric Acid and Obesity

Ala'a A. Abdul-Majeed B.Sc ., M.Sc Biochemistry.
Department of Biochemistry, College of Medicine, Al-Anbar University, Al-Anbar , Iraq.

Abstract:

***Objective*:** To determine the relationship between obesity and the level of serum uric acid.

***Subjects*:** Blood sample was taken from 143 outpatients at Al-Basrah Hospital, they were divided into two groups, 48 blood sample of obese and 95 blood samples of control. Plasma uric acid was measured by enzymatic determination of uric acid.

***Result*:** Results showed that serum uric acid concentration was significantly increasing in obese group than that of control group ($p<0.05$), while there is significant difference between mean level of uric acid of females in the two groups ($p< 0.05$), while the difference among males in the two groups was, though not significant ($P>0.05$). Serum uric acid concentration in obese male significantly increasing in comparison with obese female ($p< 0.05$). The relations between age and concentration of uric acid in obese male significantly ($p < 0.005$) higher than obese female.

***Conclusion*:** Serum uric acid was significantly increasing in obese than that of control group. When considering obese group only, findings show mean uric acid concentration of males is significantly higher than that of females, it has been suggested that mechanism of hyperuricemia in obesity.

***Key words*:** Body mass index (BMI) and serum uric acid.

***Introduction*:**

Urate is the end product of purine metabolism in human convert the major purine nucleosides adenosine and guanosine to the excreted end product uric acid via the intermediates and reactions.The purines adenine and guanine are constituents of both types of nucleic acids (DNA and RNA). The purines used by breakdown of ingested nucleic acid mostly taken in cell-rich meat, or they may be synthesized de novo from small molecules[1,2].

The concentration of uric acid in the body fluids depends on a balance between purine synthesis puls ingestion and uric acid elimination through kidneys and intestine[3] .

When hyperuicemia was occurred either asymptomatic hyperuricemia, gout or phrolthiasis [4,5] .

Adiposity is the amount of fat in the body, expressed either as total fat mass (in kg) or the fraction (percentage) of total body fat. Overweight describes excess body weight.

Body weight is reasonably correlated with body fat is also highly correlated with height, which is weakly correlated with body fat. Therefore, weight adjusted for height is a far more useful index with which to assess overweight and is a reasonable indicator of fatness. Weight adjusted for height squared [body mass index (BMI: in kg / m^2)] is now used widely to measure adult overweight[6].

Overweight and obesity are terms commonly used to describe individuals with increased body fat. Measuring fat in human requires special instruments and so excess weight is usually defined by measuring the body mass index (BMI)[3] weight gain is due to an imbalance between energy intake and energy expenditure[.] .

Obesity can be a contributory factor and increases the likelihood of gout. High blood pressure is linked to high uric acid levels. High uric acid levels are also linked to other conditions such as heart disease[6] .

Obesity is a chronic disease that is increasing in prevalence and that poses a serious risk for the development of diabetes mellituc, hypertension, heart disease, gall bladder disease and certain forms of cancer[4].

Several studies carried out elsewhere in the world estimating the effect of weight change on the serum uric acid level[9,10] .

This study was carried out to evaluate the relationship between serum uric acid level and obesity .

Subjects and Methods :

The study involved 143 outpatients from al-Basrah hospital, they were 74 males, 24-70 years of age and 69 females, 24-60 years of age . The patients were divided into two groups : 48 obese and 95 non-obese depended on the relations between height and weight by using of BMI that is calculated by measuring a person's weight in kilograms and then dividing by that person's height in squared meters ($Kg \setminus m^2$) [3] .

Blood samples were taken from these individuals to determine the level of uric acid, plasma uric acid was measured by enzymatic determination of uric acid. The results were statistically analysed by using t-test[13].

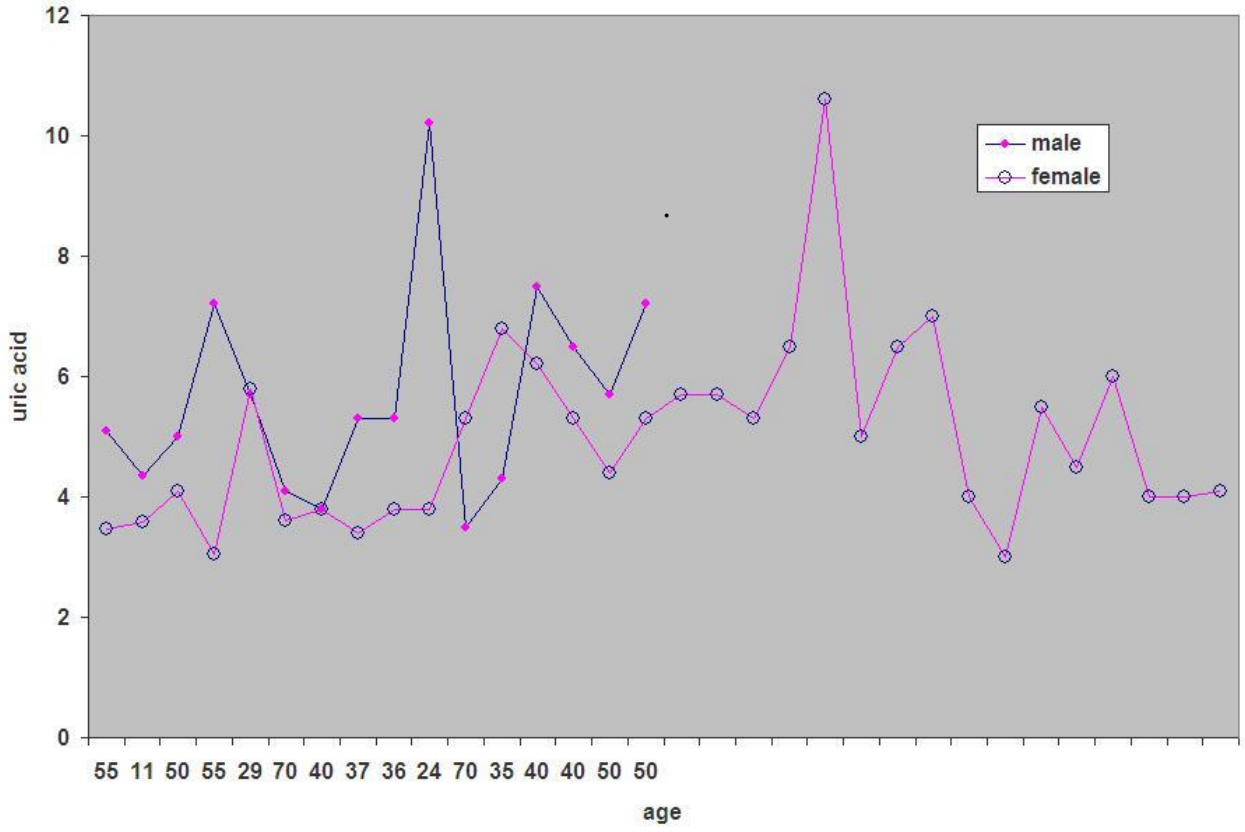
Result :

Table (1) shows findings means and standard deviation of the main 3 variables studied, uric acid concentration, age, and BMI in the two groups A and B.

Student ,t, test reveals significant difference between mean of uric acid concentrations in the two groups ($p< 0.05$). Females mean of uric acid concentrations in the obese group is significantly higher than the mean that in the control group ($p<0.05$). The difference among males in the two groups was, though not significant ($p> 0.05$). When considering obese group only, findings show mean uric acid concentration of males is significantly higher than that of females ($p< 0.05$). Fig.(1) shows a relation between age and concentration of uric acid in obese male which was significantly ($p< 0.005$) higher than obese female.

Table(1).Serum Uric Acid level in the Control Group (A) and the Obese Group (B) .

Variable	Group (A)		Group (B)	
	Female (n=37)	**Male (n=58)**	**Female (n=32)**	**Male (n=16)**
Uric acid mg/100 ml	**1.3∓3.98**	**1.27∓5.51**	**1.17 ∓4.75**	**1.72 ∓ 5.66**
Age (y)	**13.41∓ 32.35**	**13.93∓28.7**	**11.74∓43**	**15.5∓43.25**
BMI (kg/m^2)	**1.02 ∓20.32**	**1.39∓20.66**	**3.78 ∓ 30.83**	**6.45 ∓ 32.92**



Figure(1). Correlation Between Uric Acid and Age in Obese Male and Obese Female.

Discussion:

One of the most constant relations between plasma levels of uric acid and body weight, surface area or body bulk, corrected for stature, expressed as the ponderal index (height divided by cube root of weight); this has been a feature of nearly all the epidemiological surveys which have investigated the problem[7,8]. Clinical studies, too, indicate that the sufferer from gout tends to be overweight,[11] although there are many individual exceptions. Thus, as Acheson and Chan[12] have pointed out, "the associates of a high uric acid are the associates of plenty," but we do not yet know the exact nature of relationships between urate levels and such factors as obesity, surface area, intelligence, drive, blood-pressure, diet,and hemoglobin, many of which have their own complex interrelationships.

In a recent investigation into the possible effect of weight change, plasma and urinary uric acid levels were estimated (on a low-purine diet) before and after a period of weight reduction in 15 subjects. Urate level fell in 12 out of 15 subjects [9]. The result of this study is consistent and agrees with the present study .

In a study performed in the university of Florida identified fructose as part of a biochemical chain reaction that causes weight gain and other characteristics of metabolic syndrome, the precursor to type 2 diabetes .

Fructose can also cause an increase of uric acid level in the blood, this temporary rise in uric acid blocks the action of insulin, the hormone that regulates how body cells use and store the sugar they need for energy. If increased uric acid level occur .frequently enough, features of metabolic syndrome may develop over time,these

eatures include obesity, elevated blood cholesterol level and high blood pressure 5.

It has been found that, the level of blood uric acid was significantly increased in the overweight or obesity people ($p < 0.05$). The hyperuricemia incidence in the overweight or obesity people is 24.7 per cent, it is suggested that the patients with gout or hyperuricemia give up drinking alcohol, tea and taking hot foods for their health [14].

It is concluded that the mean of uric acid of obese group which is higher than the mean of uric acid of control group and statistically significant ($p< 0.05$), further female mean of uric acid in the obese group is significantly higher the mean that in the control group ($p< 0.05$), while the males mean of uric acid is also higher among obese group than the control group but difference is not statistically significant ($p> 0.05$). within the obese group the mean of uric acid in males is significantly higher than that the females ($p< 0.05$). That is probabily the urinary excretion of uric acid is slightly lower in males than in females [1].

It has been suggested that mechanism of hyperuricemia in obesity may be affected by the difference in body fat distribution and that the assessment of body fat distribution and types of hyperuricemia is crucial for the treatment of obese patients with hyperuricemia [10].

The relations between age and concentration of uric acid in obese male individuals are significantly ($p < 0.005$) higher than obese female individuals .

It has been suggested that plasma urate concentration is, in general, higher in men than in women, tends to rise with age, and usually elevated in people in the higher socioeconomic groups and in the obese [15] .

References:-

1- Zilva , J.K . and pannall ,P.R.Clinical chemistry in diagnosis and treatment .2nd ed . year book medical publishers Inc . (ends) ., Chicago. 1975

2- Murray , R .K . and Granner , D .K . Harpers biochemistry 24th ed . Lange medical book , California . 1996.

3- Haslett ,C . and Chivers , E . R . Davidson 's Principles and Practice of Medicine 18th ed .Harcourt Brace and Company .UK . 1999

4- Bray ,G.A.Harrison 's principles of internal medicine . 14th ed .part five.1998

5-Health central .Fruit sugars Might speed obesity. Available from ; health central .com.2006

6-Bellizzi, M. C., and Dietz, W. H. Workshop on childhood obesity: summary of the discussion. Am. J. clin. Nutr., 70: 173s-5s. Printed in USA.1999

7- Acheson ,R .M .and O' Brien W .M. Depndence of serum uric acid on haemoglobin and other factors in the general population , lancet 2:77.1996

8- Hall , A.P.,Barry ,P.E, Dawber , T.R .and Menamara , P.M .Epidemiology of gout and hyperuricemia :a long term population study . Am.J.M ed .42:27. 1967 .

9- Scott , J .T., and Nichollc , A. Plasma uric acid and body weight , J Aamerican heart . 87:5 . 1974 .

10- Matsuura , F ., Yamashita ,S., Nakamura , T .and Nishida ,M. Effect of viscerral fat accumulation on uric acid metabolism in male obese subjects : visceral Fat obesity linked more closely to overproduction of uric acid than subcutaneous fat obesity .Metabolism ; 47(8) : 929-33. 1998.

11- Grahame , R, and Scott , J.T. Clinical survey of 354 patients with gout , Ann .Rheum .Dis .29 :461 . 1970 .

12- Acheson, R. M., and Chan, Y. K.: The prediction of serum uric acid in a general population, J. Chronic Dis.21:543, 1966.

13- Garvounis, C.P. Handbook of biostatisties a review and text. British library. UK. 2000

14- Tang, D., and xai, B. Influence of dietary habits and body weight on blood uric acid in the elderly. Nutrition. 23(5):447-9. 1998 .

15- Marshall, W. J. Clinical chemistry. 2nd.ed. Gower medical publishing. London. Newyork. 1992.