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A REVIEW ON CORRELATION BETWEEN SERUM URIC ACID AND TRIGLYCERIDE LEVEL AND ITS ASSOCIATION WITH BODY MASS INDEX IN TYPE 2 DIABETIC PATIENTS

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Abstract: Uric acid is a novel risk factor for diabetes. Diabetes mellitus is a chronic metabolic disorder and a major public health problem around the world. Hyperurecemia is commonly associated with traditional risk factors like hyperglycemia, dyslipidemia and central obesity. Patients with type2 diabetes, increased level of uric acid may be an early sign of diabetic kidney disease. As there are only few studies in Indian literature regarding the correlation between serum uric acid and triglyceride level and its association with body mass index in type2 diabetes patients, the present review is undertaken. This review is designed to investigate the correlation of uric acid and triglyceride level with BMI in type 2 diabetes patients. The review shown that there exists a correlation uric acid and triglyceride level with body mass index

Keywords: Serum uric acid, Triglycerides, Type2diabetes, BMI



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INTRODUCTION

Diabetes mellitus is a group of metabolic disorder in which there are high blood sugar levels over a prolonged period of time. It is a group of disorders characterized by chronic hyperglycemia associated with disturbance of carbohydrate, fat and protein metabolism due absolute or relative deficiency of insulin secretion or its action. The prevalence of T2DM is a chronic metabolic disease that is a major public health problem around the world. With rapid economic growth, increases in life expectancy and changes in lifestyle, the incidence of diabetes mellitus has increased. Obesity and weight gain are the recognized causes of T2DM. ⁽¹⁾

Uric acid is the end product of human purine metabolism. Hyperuricemia is a condition in which the subject has increased serum uric acid levels. Studies have noted that an elevated level of uric acid predicts the development of diabetes, obesity, hypertension and the metabolic syndrome. People who had higher uric acid levels are more likely to get type 2 diabetes. The diabetic patients with increased serum uric acid level appear to be at increased risk of developing diabetic complication. Hyperurecemia is an independent risk factor for kidney dysfunction in diabetic patients. Hyperurecemia is probably associated with glucose intolerance due to various mechanisms, however most important is association between insulin an renal resistance to absorption of urate.

Metabolic syndrome is considered a collection of cardiovascular risk factors that generally includes central obesity, hypertension, high triglyceride and low HDL cholesterol levels. Some studies suggest that uric acid may be a consequence of the presence of hyperinsulinemia and/or oxidative stress which is present in patients with metabolic syndrome. Serum uric acid level is associated with the individual components of metabolic syndrome such as obesity, dyslipidemia. Various components of diabetic dyslipidemia including raised LDL cholesterol, low HDL cholesterol and raised triglycerides were independently associated with hyperuricemia in type II diabetes mellitus. Serum uric acid has been shown to be associated with oxidative stress and production of tumor necrosis factor- α which are both related to the development of diabetes. Hyperuricemia is a metabolic consequence originating with a wide range of etiology concerned with production and excretion of uric acid and also as a combination of both. By definition, hyperuricemia is the increase in urate concentration $>420\mu\text{mol/L}$ (7.0 mg / dl) in blood. Hyperuricemia is said to be a mediator of proinflammatory endocrine imbalance in the adipose tissue which may be one of the factors for dyslipidemia and the inflammatory process leading to atherogenesis. The association of uric acid with almost all risk factors for CVD has made it very difficult to determine whether uric acid has a causal role in these conditions or whether it is simply a marker for individuals at increased risk. ⁽²⁾

Diabetic patients with type 2 diabetes mellitus are at greater risk of developing vascular diseases because of lipid changes. It has been well observed that controlling diabetes and lipid levels provide great benefit to diabetic patients. Impaired function of endothelium is an early indicator of cardiovascular disease. A normal endothelium is defined as blood flow response to a vasodilator which is denoted as increased vascular risk. Lipid abnormalities in type 2 diabetic patients with increased serum triglycerides, very low density lipoproteins, low density lipoproteins and lowering of high density lipoproteins. Insulin resistance syndrome has been widely found that it is associated with type 2 diabetes mellitus in which high density lipoprotein is quite reduced and chances of cardiovascular complication.

Obesity and type 2 diabetes are always complicated by insulin resistance; obesity is also associated with a state of chronic, low-grade inflammation that contributes to insulin resistance, type 2 diabetes, and increased risk for hyperuricemia and gout. Many clinical studies have shown a separate impact of fat distribution on insulin action, and an accumulation of fat in abdominal viscera has been reported to be strongly associated with insulin resistance independent of total adiposity. In both humans and animal studies, inflammatory cells accumulate in adipose tissue with increasing body weight, and evidence is mounting that implicates these inflammatory cells as significant contributors to obesity-associated insulin resistance. The most widely used method to gauge obesity is the body mass index (BMI) which is equal to $\text{weight}/\text{height}^2$ (in kg/m^2)^[5]. This study was conducted to evaluate the correlation between serum uric acid and triglyceride level with BMI in type 2 diabetic patients^[3].

REVIEW OF LITERATURE

Neha Sharma, Rajkumari Rathore⁽⁴⁾ et al (2015) was conducted a study to investigate the prevalence and determinants of hyperuricemia in type 2 diabetes mellitus (T2DM) patients with central obesity. A hospital-based cross-sectional study was carried out at Index Medical College, Hospital and Research Centre, Indore. T2DM patients with central obesity who were aged over 20 years, whose serum uric acid levels were measured, were recruited. Hyperuricemia was defined as serum uric acid >0.42 mmol/L in men and >0.36 mmol/L in women. The purpose of the present study was to investigate the prevalence of hyperuricemia and the association between uric acid levels and the various diabetic risk factors. This study included 100 diabetic subjects aged 25 to 80 years. The body mass index (BMI), waist circumference, total and HDL cholesterol, serum triglycerides and serum uric acid were measured. Data were analyzed using student t-test, Pearson's coefficient and linear regression model. The prevalence of a serum uric acid level >0.42 mmol/L in men was 18.32% and the prevalence of a serum uric acid level >0.36 mmol/L was 15.9% in women. Serum uric acid was strongly related to serum triglycerides in men as well as in women ($r = 0.255$ in men and $r = 0.254$ in women, $p < 0.001$). Uric acid levels were also significantly associated but to a lesser degree with age, BMI and waist

circumference. This study shows that serum uric acid is markedly associated with diabetic risk factors, in particular serum triglycerides. Hyperuricemia is significantly associated with type II diabetes mellitus and can significantly increase morbidity and mortality from diabetes if not managed in time.

Suryawanshi.K.S, Dr.Jagtap. P.E⁽⁵⁾et al(2015)was conducted a study to understand more about hyperuricemia, dyslipidemia, microalbuminuria and its complications in type 2 diabetes mellitus patients. In present study, 565 type 2 diabetes mellitus patients and age and sex matched controls were included as study material. We found increased levels of serum uric acid,total cholesterol, LDL-cholesterol, triglycerides and decreased levels of HDLcholesterol in type 2 diabetic patients as compared to controls ($p<0.001$). Due to long term duration of diabetes the serum uric acid and lipid profile are not only early diagnostic markers for atherogenic cardiovascular disease and renal disease but also prognostic monitoring of the disease in type 2 diabetes mellitus patients.

Dana StefanaPopescu⁽⁶⁾et al(2014)was conducted a study to whether serum uric acid levels are significantly associated with the parameters that contribute to the metabolic syndrome in a rural community from Iasi County, Romania. We observed that the components associated most with the serum levels of uric acid were body mass index, triglycerides, waist circumference and hip circumference. Significant correlations were found for the levels of uric acid and total cholesterol, fasting glycemia, systolic blood pressure and diastolic blood pressure. Results showed significant correlations between the serum levels of uric acid and BMI ($n=254, r=0.280, p<0.0001$) uric acid and triglycerides($n=254, r= 0.305, p<0.0001$) , uric acid and waist circumference($n=254, r= 0.335, p<0.0001$) and uric acid and hip circumference ($n=254$,The observed correlations point to uric acid as a potential marker of the metabolic syndrome.

Seema L Jawalekar⁽⁷⁾et al;(2016)was conducted a study to investigate association of serum uric acid level in diabetic patients. Serum uric acid has been shown to be associated with oxidative stress and production of tumor necrosis factor- α [2], which are both related to the development of diabetes.Uric acid levels were measured in both, serum and urine samples, and then urine/serum ratio of uric acid levels was calculated and compared between Type 2 diabetic patients and control subjects. Our results demonstrated a profound increase in uric acid urine/serum ratios in Type 2 diabetic patients as compared to healthy controls.Our data demonstrated significant positive correlation betweenUrine and serum uric acid and serum glucose levels in patients diagnosed with Type 2 diabetes. Our results demonstrated no effect of sex on uric acid levels in serum and urine in both control and diabetic patients. Body mass

index had a significant and independent impact on plasma uric acid levels both in non-diabetic and diabetic men and women. This prospective study suggests a positive association between the plasma concentration of uric acid and the incidence of type 2 diabetes. The uric acid may serve as a potential biomarker of deterioration of glucose metabolism.

Uwakwe J.N⁽⁸⁾.et al;(2015) was conducted a study hyperurecemia in obese type 2 diabetic patients. Uric acid is metabolite from the breakdown of purines. Elevated serum levels (hyperuricaemia) is known to have an association with cardiovascular risk factors that are often seen in obesity, such as hypertension, dyslipidaemia and glucose intolerance. This study will attempt to give an insight into this association among individuals with Type 2 Diabetes mellitus. 100 patients with Type 2 diabetes visiting a private health facility in Jos, North Central Nigeria participated in this study. The data obtained for analysis from each participant were anthropometric indices (body mass index, waist circumference) and laboratory parameters (serum lipids and uric acid). 64% of participants were males. 79% of the population were obese and 45% had hyperuricaemia. The proportion of females with obesity (94.4%) was significantly greater than that for males (70.3%) but there was no significant difference between the proportion of males and females with hyperuricaemia. Serum uric acid showed significant positive correlation with waist circumference ($p=0.04$) and age ($p=0.03$) and had no significant relationship with other variables. Early detection and treatment of hyperuricaemia in obese patients will help reduce their overall risk of cardiovascular events. This is achieved by both non pharmacological and pharmacological means.

J. Sarvesh Kumar⁽¹⁾ et al;(2014) The aim of the study is to review the association between diabetes Mellitus and serum uric acid levels. The objective is to review how uric acid level is related to diabetes Mellitus. Diabetes is an increasingly important disease globally. New data from IDF showed that there are 336 million people with diabetes in 2011 and this is expected to rise to 552 million by 2030. It has been suggested that, diabetic epidemic will continue even if the level of obesity remains constant. The breakdown of foods high in protein into chemicals known as purines is responsible for the production of uric acid in the body. If there is too much of uric acid in the body it causes variety of side effects. Thus identifying risk factors of serum uric acid is required for the prevention of diabetes. The review was done to relate how serum uric acid level is associated with the risk of diabetes.

CONCLUSION

Uric acid is the final product of purine metabolism and hyperurecemia is an independent risk factor for kidney dysfunction in diabetes patients. Hyperurecemia is a mediator of proinflammatory endocrine imbalance in adipose tissue which leads to dyslipidemia. Inflammatory cell accumulate in adipose tissue are significant contributor of obesity associated

insulin resistance. So lowering uric acid and triglyceride and controlling BMI play significant role in management of diabetes. This review concluded that there exist a correlation between serum uric acid and triglyceride level and its association with BMI in type 2 diabetes patients.

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