



GLOBAL JOURNAL OF MEDICAL RESEARCH: F  
DISEASES

Volume 15 Issue 2 Version 1.0 Year 2015

Type: Double Blind Peer Reviewed International Research Journal

Publisher: Global Journals Inc. (USA)

Online ISSN: 2249-4618 & Print ISSN: 0975-5888

## Plasma Uric Acid Levels in Relation to Plasma Cholesterol Levels in Type-2 Diabetes Mellitus

By Goudappala Prashanthkumar, Nagendra S & Kashinath R T

*Subbaiah Institute of Medical Sciences & Research Center NH-13, India*

**Abstract-** Uric acid, the prime end product of purine catabolism, has been implicated in diabetes mellitus as well as in hyperlipidemias. Its significance in diabetic hypercholesterolemia is not established. A study was under taken to assess the relationship of plasma cholesterol with plasma uric acid in type-2 diabetes mellitus subjects. A fasting blood sample was collected from normal as well as type-2 diabetic subjects, the separated plasma was employed for the estimation of glucose, cholesterol and uric acid levels. It is observed that there is a proportional rise in uric acid in type-2 diabetic subjects, suggesting that plasma uric acid levels along with total cholesterol levels aids to asses the diabetes induced dyslipidemia as well as to control the diabetic dyslipidemia induced complications in type-2 diabetes mellitus.

**Keywords:** *plasma uric acid, plasma cholesterol, type-2 diabetes mellitus, vascular complications.*

**GJMR-F Classification :** *NLMC Code: WK 810*



*Strictly as per the compliance and regulations of:*



# Plasma Uric Acid Levels in Relation to Plasma Cholesterol Levels in Type-2 Diabetes Mellitus

Goudappala Prashanthkumar<sup>1</sup>, Nagendra S<sup>2</sup> & Kashinath R T<sup>3</sup>

**Abstract-** Uric acid, the prime end product of purine catabolism, has been implicated in diabetes mellitus as well as in hyperlipidemias. Its significance in diabetic hypercholesterolemia is not established. A study was undertaken to assess the relationship of plasma cholesterol with plasma uric acid in type-2 diabetes mellitus subjects. A fasting blood sample was collected from normal as well as type-2 diabetic subjects, the separated plasma was employed for the estimation of glucose, cholesterol and uric acid levels. It is observed that there is a proportional rise in uric acid in type-2 diabetic subjects, suggesting that plasma uric acid levels along with total cholesterol levels aids to assess the diabetes induced dyslipidemia as well as to control the diabetic dyslipidemia induced complications in type-2 diabetes mellitus.

**Keywords:** plasma uric acid, plasma cholesterol, type-2 diabetes mellitus, vascular complications.

## I. INTRODUCTION

Uric acid, the prime end product of purine catabolism is implicated in diabetes mellitus. Suggesting a possible role of insulin in nucleotide metabolism. It has been claimed by few research workers that plasma uric acid levels are elevated in diabetes mellitus (1-11). In earlier report from our laboratory the uric acid elevation in diabetes mellitus has been conclusively established as due to raised nucleotide catabolism (12).

The hyperglycemia observed in diabetes mellitus if not controlled may lead to various life threatening complications including micro and macro vascular diseases (13). A proper control, hence becomes the priority of management of diabetes mellitus. It is known that in dyslipidemia, one of the general complications of diabetes mellitus plasma total cholesterol levels are seen elevated (14). Further it is shown by few research workers that plasma uric acid levels are elevated in hyperlipidemias including hypercholesterolemia. The present work was carried out in type 2 diabetic subjects to establish the inter

relationship of plasma uric acid levels with diabetes induced Hypercholesterolemia.

## II. MATERIALS AND METHODS

The type-2 diabetic subjects (both male and females) attending the medical Out Patient Department of Subbaiah Medical College Hospital, Purle, Shimoga. were randomly selected, similarly normal subjects (both male and females) were randomly taken from employees of medical college and hospital. Fasting blood samples were collected from normal as well as selected diabetic subjects (The subjects having orthopedic & renal problems were excluded from the study) and were allowed to clot and plasma samples were separated by centrifugation at 3500rpm for 8mins, the separated samples were employed for estimation of Total Cholesterol (15), Uric acid(16) and Glucose(17).

The results obtained were statistically analyzed using student t-test.

## III. RESULTS

The diabetic subjects were divided into two groups depending on their plasma cholesterol level. Group 1-NormoCholesterolemic Diabetic Subjects-having plasma cholesterol levels <200mg/dl and Group 2-Hypercholesterolemic Diabetic Subjects-having plasma cholesterol levels >200mg/dl. The results obtained in the present study are given in Table-1 and Table-2

Table-1 narrates fasting plasma glucose levels as well as plasma uric acid levels in normal subjects and in type-2 diabetic subjects. It is evident from the table that uric acid levels are significantly elevated ( $p < 0.001$ ) in type2 diabetic subjects as compared to normal.

Table-2 depicts the values of plasma total cholesterol and plasma uric acid levels in group1 diabetic subjects (plasma cholesterol <200mg/dl) and in group2 diabetic subjects (plasma cholesterol >200mg/dl). It is clear from the table that there is significant elevation in plasma uric acid levels in hypercholesterolemic subjects as compared to normal cholesterolemic subjects.

**Author  $\alpha$ :** Research Scholar, Department of Biochemistry, Subbaiah Institute of Medical Sciences & Research Center, NH-13, Purale, Shimoga. e-mail: prashanth13jan@gmail.com

**Author  $\sigma$ :** Asso. Prof. Department of Medicine, Subbaiah Institute of Medical Sciences & Research Center NH-13, Purale, Shimoga. e-mail: smcshimoga@yahoo.co.in

**Author  $\rho$ :** Prof & HOD, Department of Biochemistry, Subbaiah Institute of Medical Sciences & Research Center, NH-13, Purale, Shimoga. e-mail: drkashinath\_1945@yahoo.co.in

**Table 1 :** Table showing fasting plasma levels of glucose and uric acid in normal subjects as well as in type-2 diabetic subjects.

	Fasting Plasma Glucose mg/dl	Uric acid mg/dl
Normals (11)	103.82 ± 13.80	3.688 ± 0.732
Diabetics (58)	196.93*** ± 15.03	7.033*** ± 1.700

Note:

1. The Values are expressed as their Mean ±S.D
2. The number in parenthesis indicate the number of subjects.
3. Statistical significance is given by \* $p > 0.05$ , \*\* $p > 0.01$ , \*\*\* $p > 0$ .

**Table 2 :** Table showing fasting plasma levels of cholesterol and uric acid in normocholesterolemicdiabetic subjects (plasma cholesterol <200mg/dl) as well as hyper cholesterolemic diabetic subjects (plasma cholesterol>200mg/dl).

	Plasma Cholesterol mg/dl	Plasma Uric acid mg/dl
Normo Cholesterolemic Diabetic subjects (25)	159.56 ± 22.99	5.676 ± 0.829
Hyper Cholesterolemic Diabetic subjects (29)	252.90*** ± 40.69	8.203*** ± 1.348

Note:

1. The Values are expressed as their Mean ±S.D
2. The number in parenthesis indicate the number of subjects.
3. Statistical significance is given by \* $p > 0.05$ , \*\* $p > 0.01$ , \*\*\* $p > 0.001$

#### IV. DISCUSSION

Uric acid, the end product of purine catabolism in humans, has been suggested to have a close relationship with cardiovascular diseases, where an increase in plasma uric acid levels have been observed (18-20). Further it has been shown that plasma uric acid levels are elevated in hyperlipidemia specifically hypertriglyceridemia (21-23). The elevated plasma uric acid levels observed in our present studies are in agreement with our earlier reports(1-11) as well as with earlier findings (12) and the rise observed may be due to increased purine turnover as suggested in our earlier communication from our laboratory (12) or may be due to diabetic dyslipidemia induced increased vascular damage(13) A parallel increase in plasma uric acid levels along with plasma cholesterol levels in the present study in type-2 diabetic subjects suggests a possible relationship between plasma uric acid level and plasma lipid profile specifically plasma cholesterol. Kelley and

Palella (24) have observed a rise in uric acid levels in hypertriglyceridemia, hypertension, obesity and diabetes mellitus (24,25)

The increase observed in uric acid levels in the present studies indicates a definite rise in uric acid levels in diabetic subjects with a close relationship to cholesterol levels. The observed increase in uric acid levels in type-2 diabetic subjects indicates a positive relationship of uric acid levels with cholesterol levels in type-2 subjects( refer Table-2) suggesting, the rise in uric acid parallel increases in cholesterol levels. Many life threatening complications of type-2 diabetes mellitus specifically micro angiopathy have been attributed to diabetes induced dyslipidemia. As there is a parallel rise in uric acid along with cholesterol levels in type-2 diabetic subjects an estimation of uric acid levels in serum may be an additional significant criteria to assess dyslipidemia as well as to control the dyslipidemia induced complications in type-2 diabetes mellitus. Hence we conclude the plasma uric acid estimation

along with serum total cholesterol levels seems highly beneficial in type-2 diabetic subjects to assess the diabetic dyslipidemia induced vascular complications.

### REFERENCE RÉFÉRENCES REFERENCIAS

- Kashinath R T & Patil K C (1972), Whole blood uric acid levels in diabetics with or without lipaemia. *J. Mys. Med. Assoc.* 36: 153-56
- Kertes P J & Johnson T M (2007), Evidence based Eye care. Philadelphia. Lippincott Williams & Wilkins.
- Butturini U, Coscelli C & Zavroni I (1977), Insulin release in hyperuricemic patients. *Acta. Diab. Lat.* 14: 73-78
- Sinagra D, Greco D, Scarpitta A M & Bonaventura V (1996). Serum uric acid, insulin secretion and resistance in non-hyperuricemia and hyperuricemic obese female subjects. *Int. J. Obes. Relat. Metab. Disord.* 20: 1041-43
- Wang M, Zhao O, Wang W, Lin J & Lin S (2007). A prospective study on relationship between blood uric acid levels, insulin sensitivity and insulin resistance. *Chinese Journal of Internal Medicine* 46: 824-26
- Quinones G A, Natali A, Baldi S, Frascerra S, Sanna G, Ciociaro D et al (1995) Effect of insulin on uric acid excretion in humans. *Am. J. Endocrinol. Metab.* 268: E1-E5
- Medelie J H, Papier C M, Goldbourt U & Herman J B (1975) Major factors in the development of diabetes mellitus in 10000 men. *Arch. Int. Med.* 135: 811-17.
- Herman J B, Medelie J H & Goldbourt U (1976). Diabetes, prediabetes and uricemia. *Diabetologia* 12: 47-52.
- Toumilehto J, Zimmet P, Wolf E, Taylor R, Ram P & King H (1988). Plasma uric acid and its association with diabetes mellitus and some biological parameters in biracial population of Fiji. *Am. J. Epidemiol.* 127: 321-36.
- Nakanishi N, Okamoto M, Yoshida H, Matsuo Y, Suzuki K & Tataru K (2003). Serum uric acid and risk for development of hypertension and impaired fasting glucose or type II diabetes in Japanese male office workers. *Eur. J. Epidemiol.* 18: 523-30.
- Boyko E J, de Courten M, Zimmer P Z, Chitson P, Tonmilheto J & Alberti K G (2000). Features of the metabolic syndrome predict higher risk of diabetes and impaired glucose tolerance – a prospective study in Mauritius. *Diabetes Care* 23: 1242-48.
- Kashinath, R. T, Nagendra S & Srinivas S (2014). Hyperuricemia in Type 2 Diabetes Mellitus. *Global Journal of Medical Research*, 14(3).
- Fowler, M. J. (2008). Microvascular and macrovascular complications of diabetes. *Clinical diabetes*, 26(2), 77-82.
- Gadi, R., & Samaha, F. F. (2007). Dyslipidemia in type 2 diabetes mellitus. *Current diabetes reports*, 7(3), 228-234.
- Roeschlau P, Bernt E, Gruber W. Enzymatic determination of total cholesterol in serum. *Z KlinChemKlinBiochem* 1974;12:226.
- Gochman, N., & Schmitz, J. M. (1971). Automated determination of uric acid, with use of auricase—peroxidase system. *Clinical chemistry*, 17(12), 1154-1159.
- Lott, J. A., & Turner, K. (1975). Evaluation of Trinder's glucose oxidase method for measuring glucose in serum and urine. *Clinical chemistry*, 21(12), 1754-1760.
- Fang, J., & Alderman, M. H. (2000). Serum uric acid and cardiovascular mortality: the NHANES I epidemiologic follow-up study, 1971-1992. *Jama*, 283(18), 2404-2410.
- Niskanen, L. K., Laaksonen, D. E., Nyyssönen, K., Alftan, G., Lakka, H. M., Lakka, T. A., & Salonen, J. T. (2004). Uric acid level as a risk factor for cardiovascular and all-cause mortality in middle-aged men: a prospective cohort study. *Archives of internal medicine*, 164(14), 1546-1551.
- Culleton, B. F., Larson, M. G., Kannel, W. B., & Levy, D. (1999). Serum uric acid and risk for cardiovascular disease and death: the Framingham Heart Study. *Annals of internal medicine*, 131(1), 7-13.
- Conen, D., Wietlisbach, V., Bovet, P., Shamlaye, C., Riesen, W., Paccaud, F., & Burnier, M. (2004). Prevalence of hyperuricemia and relation of serum uric acid with cardiovascular risk factors in a developing country. *BMC public health*, 4(1), 9.
- Nakanishi, N., Suzuki, K., Kawashimo, H., Nakamura, K., & Tataru, K. (1999). Serum uric acid: correlation with biological, clinical and behavioral factors in Japanese men. *Journal of epidemiology/Japan Epidemiological Association*, 9(2), 99-106.
- Bonora, E., Targher, G., Zenere, M. B., Saggiani, F., Cacciatori, V., Tosi, F., ... & Muggeo, M. (1996). Relationship of uric acid concentration to cardiovascular risk factors in young men. Role of obesity and central fat distribution. The Verona Young Men Atherosclerosis Risk Factors Study. *International journal of obesity and related metabolic disorders: journal of the International Association for the Study of Obesity*, 20(11), 975-980
- Kelley, N .W and Palella, T.D., Gout and Other Disorders of Purine Metabolism. *Harrison's Principles of Internal Medicine*. McGraw Hill Book Company, New York, 15th Ed., Vol.2., 2001; 1994-97.
- Milionis, H. J., & Elisaf, M. S. (2000). Management of hypertension and dyslipidaemia in patients

presenting with hyperuricaemia: case histories.  
*Current Medical Research and Opinion*®, 16(3),  
164-170.

