



A Study on The Association of Serum Uric Acid Level With Type 2 Diabetes Mellitus

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ABSTRACT

Uric acid is the end product of purine metabolism in humans. Excess serum accumulation can lead to various diseases, so this present study was undertaken to observe the association of serum uric acid with type 2 diabetes mellitus. This study was carried out in 50 type 2 diabetes mellitus patient and 50 apparently normal individuals. The study showed a positive correlation between level of uric acid and duration of diabetes mellitus

KEYWORDS : Type 2 diabetes mellitus, uric acid

Introduction:-

In humans uric acid is the final oxidation product of purine catabolism with the loss of uricase. The association of hyperuricaemia with hyperglycemia was first describe in 1923¹ and ever since there has been a growing interest in the studies related to association of hyperuricaemia with hyperglycemia.²⁻⁶ The putative association between serum uric acid levels and diabetes mellitus is not clear. Some studies reported that there is a positive association between high serum uric acid levels and diabetes⁷⁻¹² whereas other studies reported no association¹³, or an inverse relationship¹⁴⁻¹⁵. In this context, the main purpose of our study was to examine the association between serum uric acid and type II diabetes mellitus and its change with increase duration of disease.

Materials and methods:-

The study was conducted in the Department of Physiology, Assam medical college, Dibrugarh. A total of 50 type II diabetes mellitus patient and 50 apparently normal individuals, participated in the study. Their mean age was 42±3 years. Their ages, smoking habits, physical status and health conditions were recorded by using a questionnaire. The ethical committee clearance and an informed consent of the subjects were taken. Diabetes was defined based on the guidelines of the American Diabetes Association as a serum glucose ≥126 mg/dL after fasting for a minimum of 8 hours, a serum glucose ≥200 mg/dL for those who fasted <8 hours before the test, or a self-reported current use of oral hypoglycaemic medication or insulin. Type 2 diabetes mellitus with complications were excluded from the study. Serum uric acid was estimated by enzymatic (uricase) method. The data was analyzed by using Microsoft Excel and Statistical Package of Social Sciences (SPSS version 20.0). The mean and standard deviation (SD) were calculated and reported for the quantitative variables. The statistical difference in the mean values was tested by using one way ANOVA (analysis of variance) with post-hoc turkey tests. A p-value of < 0.05 was considered as statistically significant.

Result:-

The study population was consisted of 50 normal individuals and 50 individuals with diabetes mellitus. The diabetes mellitus group was divided into two groups, group 1 with diabetes mellitus for less than 5 years and group 2 with diabetes mellitus more than 5 years. The frequency distribution of the study population is shown in figure 1. The mean±SD values of uric acid in the different groups is shown in table 1. On comparison between control, Groups I and Group II a rise was observed, which was statistically highly significant. The Pearson's co-efficient showed a significant positive correlation (r=0.896) between the level of uric acid and duration of type 2 diabetes mellitus. The positive correlation can be seen in figure 2.

Figure 1:- Frequency distribution of the study population

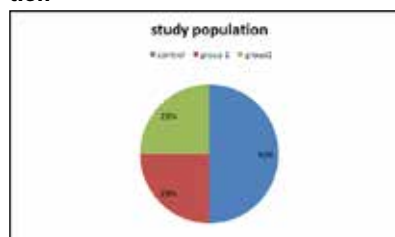
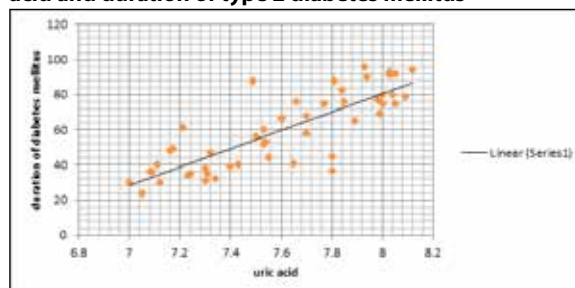


Table 1:- Showing the mean±SD values of uric acid in the different groups

groups	mean	±SD
control	6.23	0.39
Group 1	7.35	0.23
Group 2	7.85	0.22

Figure 2:- showing the correlation between level of uric acid and duration of type 2 diabetes mellitus



Discussion:-

In this study it is seen that the level of uric acid is positively associated with duration of type 2 diabetes mellitus. This finding is in consistent with the findings of A. Dehghan et al⁷, K. L. Chien et al⁸, C. K. Kramer et al⁹ and others¹⁰⁻¹⁵, whereas some other study reported no positive association between serum uric acid and diabetes mellitus¹⁶. Also, some studies reported that serum uric acid is inversely associated with diabetes mellitus^{17,18}. It has been shown that patients with insulin resistance or impaired glucose tolerance have reduced values of urinary uric acid clearance¹⁹ and chronically increased extracellular adenosine concentrations, thereby contributing to increasing uric acid synthesis²⁰. So, Both the factors that increase serum uric acid synthesis (e.g., an increased activity of the hexose monophosphate shunt and thereby purine biosynthesis) or those that decrease urinary uric acid excretion rate (e.g., an increased tubular reabsorption and/or diminished tubular secretion) might be involved in leading to hyperuricemia.

Conclusion:-

From this study it can be concluded that the uric acid may serve as a potential biomarker of deterioration of glucose metabolism, so its detection and prevention at the earliest is of utmost importance.

References:-

1. Kylin E. Studien ueber das hypertonie-hyperglykamiehyperurikamiesyndrom. *Zentralblatt fuer Innere Medizin* 1923; 44: 105–127.
2. Medalie JH, Papier CM, Goldbourt U, Herman JB. Major factors in the development of diabetes mellitus in 10,000 men. *Arch Intern Med* 1975; 135: 811–817.
3. Herman JB, Medalie JH, Goldbourt U. Diabetes, prediabetes and uricaemia. *Diabetologia* 1976; 12: 47–52.
4. Tuomilehto J, Zimmet P, Wolf E, Taylor R, Ram P, King H. Plasma uric acid level and its association with diabetes mellitus and some biological parameters in a biracial population of Fiji. *Am J Epidemiol* 1988; 127: 321–336.
5. Nakanishi N, Okamoto M, Yoshida H, Matsuo Y, Suzuki K, Tataru K. 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* 2003; 18:523–530.
6. Boyko EJ, de Courten M, Zimmet PZ, Chitson P, Tuomilehto J, Alberti KG. Features of the metabolic syndrome predict higher risk of diabetes and impaired glucose tolerance: a prospective study in Mauritius. *Diabetes Care* 2000; 23:1242–1248.
7. A. Dehghan, M. Van Hoek, E. J. G. Sijbrands, A. Hofman, and J. C. M. Witteman, "High serum uric acid as a novel risk factor for type 2 diabetes," *Diabetes Care*, vol. 31, no. 2, pp. 361–362, 2008. View at Publisher · View at Google Scholar · View at Scopus
8. K. L. Chien, M. F. Chen, H. C. Hsu et al., "Plasma uric acid and the risk of type 2 diabetes in a Chinese community," *Clinical Chemistry*, vol.54, no. 2, pp. 310–316, 2008. View at Publisher · View at Google Scholar · View at Scopus
9. C. K. Kramer, D. Von Mühlen, S. K. Jassal, and E. Barrett-Connor, "Serum uric acid levels improve prediction of incident type 2 diabetes in individuals with impaired fasting glucose. the Rancho Bernardo Study," *Diabetes Care*, vol. 32, no. 7, pp. 1272–1273, 2009. View at Publisher View at Google Scholar · View at Scopus
10. N. Nakanishi, M. Okamoto, H. Yoshida, Y. Matsuo, K. Suzuki, and K. Tataru, "Serum uric acid and risk for development of hypertension and impaired fasting glucose or Type II diabetes in Japanese male office workers," *European Journal of Epidemiology*, vol. 18, no. 6, pp. 523–530, 2003. View at Publisher · View at Google Scholar · View at Scopus
11. S. Kodama, K. Saito, Y. Yachi et al., "Association between serum uric acid and development of type 2 diabetes," *Diabetes Care*, vol. 32, no. 9, pp. 1737–1742, 2009. View at Publisher · View at Google Scholar · View at Scopus
12. M. Modan, H. Halkin, A. Karasik, and A. Lusky, "Elevated serum uric acid—a facet of hyperinsulinaemia," *Diabetologia*, vol. 30, no. 9, pp. 713–718, 1987. View at Google Scholar · View at Scopus
13. Y. Taniguchi, T. Hayashi, K. Tsumura, G. Endo, S. Fujii, and K. Okada, "Serum uric acid and the risk for hypertension and type 2 diabetes in Japanese men: the Osaka health survey," *Journal of Hypertension*, vol. 19, no. 7, pp. 1209–1215, 2001. View at Publisher · View at Google Scholar · View at Scopus
14. E. Oda, R. Kawai, V. Sukumaran, and K. Watanabe, "Uric acid is positively associated with metabolic syndrome but negatively associated with diabetes in Japanese men," *Internal Medicine*, vol. 48, no. 20, pp. 1785–1791, 2009. View at Publisher · View at Google Scholar · View at Scopus
15. H. Nan, Y. Dong, W. Gao, J. Tuomilehto, and Q. Qiao, "Diabetes associated with a low serum uric acid level in a general Chinese population," *Diabetes Research and Clinical Practice*, vol. 76, no. 1, pp. 68–74, 2007. View at Publisher · View at Google Scholar · View at Scopus
16. Y. Taniguchi, T. Hayashi, K. Tsumura, G. Endo, S. Fujii, and K. Okada, "Serum uric acid and the risk for hypertension and type 2 diabetes in Japanese men: the Osaka health survey," *Journal of Hypertension*, vol. 19, no. 7, pp. 1209–1215, 2001. View at Publisher · View at Google Scholar · View at Scopus
17. E. Oda, R. Kawai, V. Sukumaran, and K. Watanabe, "Uric acid is positively associated with metabolic syndrome but negatively associated with diabetes in Japanese men," *Internal Medicine*, vol. 48, no. 20, pp. 1785–1791, 2009. View at Publisher · View at Google Scholar · View at Scopus
18. H. Nan, Y. Dong, W. Gao, J. Tuomilehto, and Q. Qiao, "Diabetes associated with a low serum uric acid level in a general Chinese population," *Diabetes Research and Clinical Practice*, vol. 76, no. 1, pp. 68–74, 2007. View at Publisher · View at Google Scholar · View at Scopus
19. Facchini F, Chen YD, Hollenbeck CB, Reaven GM. Relationship between resistance to insulin-mediated glucose uptake, urinary uric acid clearance, and plasma uric acid concentration. *JAMA* 1991; 266:3008-11.
20. Bakker SJ, Gans RO, ter Maaten JC, Teerlink T, Westerhoff HV, Heine RJ. The potential role of adenosine in the pathophysiology of the insulin resistance syndrome. *Atherosclerosis* 2001; 155:283-90.