

A STUDY TO COMPARE URIC ACID AND LIPID PROFILE IN NORTHERN POPULATION

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Received : 15/03/2023
Received in revised form : 25/04/2023
Accepted : 01/05/2023

Keywords:

Uric acid, lipid profile and vegetarian.

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DOI: 10.47009/jamp.2023.5.5.103

Source of Support: Nil,

Conflict of Interest: None declared

Int J Acad Med Pharm
2023; 5(5); 525-530



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Abstract

Background: The last byproduct of purine metabolism in the human body is uric acid. The liver is where it is produced. Purine nucleotides break down into hypoxanthine and guanine, some of which can be recycled and phosphorylated into hypoxanthine nucleotides, while the remainder is broken down by an enzyme activity called xanthine dehydrogenase/oxidase (XDH/XO) to produce uric acid as the final byproduct. **Materials and Methods:** A total of 100 subjects with known history of hyperlipidemia & hyperuricemia were recruited from IPD of Rama Medical college hospital, 100 age, and gender matched healthy control were included in the study. **Result:** While comparing our subject according to age group we divided our subject in different age group in which age group 20-30 there was 15 male and 10 female, in age group 30-40 there were 13 male and 12 female, in age group 40-50 there were 19 male and 6 female in age group 50-60 there were 13 male and 12 female which details show in table number 2 shows different age group and number of subjects. We provided naming of different age group as follow group A for age between 20-30, Group B for age Group 30-40, group C for age group 40-50 and for 50-60 we name it as group D. **Conclusion:** The present study process that hyperuricemia is associated with dyslipidemia which can lead to a possible cardiovascular event. So prevention of hyperuricemia and associated dyslipidemia can reduce the incidence of cardiovascular diseases in such subject.

INTRODUCTION

In the human body, uric acid is the ultimate product of purine metabolism. It is generated in the liver. Purine nucleotides decompose to hypoxanthine and guanine, some of which can be recycled and phosphorylated into hypoxanthine nucleotides, while the remaining part is metabolized by xanthine dehydrogenase/oxidase (XDH/XO) enzymatic reaction to the terminal product uric acid. XDH/XO is mainly expressed in the parenchymal cells of the liver and small intestine. XDH has low reactivity and can be converted to XO. Uric acid production primarily depends on the amount of substrate and the activity of XO. In the end, XDH/XO promotes the final steps in purine metabolism which convert hypoxanthine to xanthine and xanthine to UA. The kidney also plays an important role in the regulation

of blood uric acid levels.^[1] The circulating uric acid is easily filtered from the glomeruli into the renal tubule. About 90% of filtered UA is reabsorbed by the middle of the proximal convoluted tubule mainly by urate transporter 1 (URAT1) and a glucose transporter 9 (GLUT9), and the remaining excreted 10% is responsible for 60-70% of total body uric acid excretion. A small amount of uric acid secreted in the intestine is responsible for 30-40%. The production and excretion rate of uric acid is relatively constant in the healthy people. Changes in the uric acid content in body fluids can reflect the state of metabolism, immunity and other functions of the human body.^[2] In human excessive uric acid production and its decreased excretion by the kidneys are one of the major causes of hyperuricemia. The prevalence of hyperuricemia rapidly increasing in the international communities;

emerging evidence shows that hyperuricemia is now more frequent in the developing nation.^[3] Epidemiological studies showed that elevated levels of uric acid in serum are increasingly related to hypertension, such as blood lipids, metabolic syndrome and diabetes, cardiovascular disease.^[4] Hyperuricemia is considered to be a mediator of proinflammatory endocrine imbalance in the adipose tissue which may be one of the important factors for Dyslipidemia and the inflammatory process that leads to atherogenesis.^[5] Serum uric acid is a strong predictor of stroke,^[6] Coronary artery disease,^[7] And metabolic syndrome.^[8] The exact role of SUA in these diseases is still the debate and subject of much discussion because it is always accompanied by other risk factors such as diet, Dyslipidemia and obesity.^[9] The role of abnormalities of blood lipids and uric acid has been mentioned in relationship to the etiology of coronary artery disease. The relationship between serum uric acid and dyslipidemia is also complex and not fully elucidated. A few studies have been conducted to investigate the association between SUA and lipid profiles in the adult population of India. In this study, we aimed to assess the independent relationship between SUA and lipid profile in Indian adult.^[10] In previous studies, SUA concentrations were higher in individuals with coronary heart disease than in healthy subjects and elevated SUA was found to be associated with increased cardiovascular morbidity and mortality in the general adult population.^[11] The relationship between serum uric acid and dyslipidemia is also complex and not fully elucidated. A few studies have been conducted to investigate the association between SUA and lipid profile in the adult population of India. In this study, we aimed to assess the independent relationship between SUA and lipid profile in Indian adult. In previous studies, SUA concentrations were higher in individual with coronary heart disease than in healthy subjects and elevated SUA was found to be associated with increased cardiovascular morbidity and mortality in the general adult population.^[12] The variability in SUA levels in multi-factorial and influenced by both genetic and environment factors. The level of serum uric acid increased accompanied with increment of serum LDL cholesterol, triglyceride, total cholesterol, and apolipoprotein-B levels.^[13] The major lipids present in blood are cholesterol, fatty acid, and triglycerides. Lipid disorders are common and are associated with an increased risk of atherosclerotic cardiovascular disease. Lipid are insoluble in plasma and are therefore transported in circulation in association with proteins known as lipoproteins, Dyslipidemia is disorder of lipoprotein metabolism. Major lipoprotein comprises of Low-Density lipoproteins (LDL), Very Low- Density lipoproteins (VLDL), and High- Density lipoprotein (HDL). Triglycerides (TG) are carried out by chylomicron, VLDL, LDL, while Cholesterols are carried out by LDL, and HDL. Dyslipidemia has

been long recognized as a major biochemical event predisposing to atherogenicity and cardiovascular disease. It is manifested by elevation of plasma concentration of lipoproteins India is currently experiencing increasing trends in mean Cholesterol, LDL Cholesterol, and Triglyceride levels.^[14] The relationship of uric with CVD risk factors has made it very complicated to determine whether uric acid has a causal role in these conditions or simply a marker for individuals at risk, reflecting the association with other traditional risk factors such as blood lipids, metabolic syndrome and diabetes. The exact role of SUA in this disease is still the debate and subject of much discussion because it is always accompanied by other risk factors such as diet, dyslipidemia and obesity. A few studies have been conducted to investigate the association between SUA and lipid profiles in the adult population of India, Italy, USA.^[15] The purpose of my study to assess the independent relationship between SUA and lipid profile and correlate their association along with age, gender and diet.

MATERIALS AND METHODS

Study Setting: This study was conducted in department of Biochemistry, Rama Medical College Hospital & Research Centre Kanpur sample from IPD & OPD of medicine department Rama Medical College Hospital was collected.

Study Subjects: 100 subjects with known history of hyperlipidemia & hyperuricemia were recruited from IPD of Rama Medical college hospital, 100 age, and gender matched healthy control were included in the study .

Study Design: Case control study.

Study Period: This study was conducted from July 2021 to June 2022.

Inclusion Criteria

1. Healthy volunteers.
2. People & individuals who went to OPD for routine health checkup.
3. Newly diagnosed patients hyperlipidemia or hyperuricemia.

Exclusion Criteria

1. Patients with endocrinological disorders.
2. Patients with liver disorder, renal insufficiency, congestive cardiac failure, pregnant women.
3. Also acutely ill patients, patients on statins and other medications that alter lipid levels.
4. Participants with myeloproliferative disorders and in therapy with cytotoxic drugs, pregnant women lactating mothers & individuals on antihypertensive, hypolipidemic, alcoholics. Known cardio vascular disorder, renal or hepatic disorders and those on anti-gout therapy.

Study Tool: A pretested questionnaire based on semi-constructed proforma was used as study tool to collect the data including basic profile of participants i.e. age, sex, blood pressure and intake of any lipid lowering drugs.

Ethical Clearance: As per Institutional Medical Ethical Committee conducted on 17/08/2021, at Rama Medical College Hospital and Research Centre Kanpur, Ethical clearance was given

Specimen Collection: 5ml of blood sample will be collected from antecubital vein into plain vial for uric acid & lipid profile.

Specimen processing:

Allow clotting at room temperature and centrifuge at 3000 rpm for 15 minutes in the biochemistry department. Serum was separated for analysis of serum uric acid and lipid profile. The sera were stored at -20°C until assayed.

Investigations

In the present study the following analysis were conducted:

Lipid Profile Assay	Total Cholesterol(TC) Triglycerides (TG) High Density Lipoprotein-Cholesterol(HDL-C) Low Density Lipoprotein-Cholesterol(LDL-C) Very-Low Density Lipoprotein-Cholesterol(VLDL-C)
Serum parameters	Uric Acid

Statistical Analysis: All the parameters of two groups were analyzed for mean and standard

deviation. The results were expressed as Mean ± standard deviation. Data was analyzed by statistical software SPSS Version 22.0. Comparison among two groups was done by using t- Test. Pearson's correlation coefficient was used to find the correlation between Uric Acid and Lipid profile.

RESULTS

In our current we taken 200 subject in which 60 where male and 40 where female which percentage where 60% for male subject and 40% for female subject which were show in the [Table 1].

While comparing our subject according to age group we divided our subject in different age group in which age group 20-30 there was 15 male and 10 female, in age group 30-40 there were 13 male and 12 female, in age group 40-50 there were 19 male and 6 female in age group 50-60 there were 13 male and 12 female which details show in [Table 2] shows different age group and number of subjects. We provided naming of different age group as follow group A for age between 20-30, Group B for age Group 30-40, group C for age group 40-50 and for 50-60 we name it as group D.

Table 1: Distribution of male and female in case group according to their age.

Study of subject	Age (Year)	Male	(%)	Female	(%)
Group A	20-30	15	15%	10	10%
Group B	30-40	13	13%	12	12%
Group C	40-50	19	19%	6	6%
Group D	50-60	13	13%	12	12%

Table 2: Distribution of male and female in control group according to their age.

Study of subject	Age (Year)	Male	(%)	Female	(%)
Group A	20-30	15	15%	10	10%
Group B	30-40	13	13%	12	12%
Group C	40-50	19	19%	6	6%
Group D	50-60	13	13%	12	12%

Table 3: Distribution of dietary pattern in male and female in case group.

Study of subject	Dietary Pattern	Male	Female	Percentage
Group A	Veg	9	7	100%
	Mixed diet	6	3	
Group B	Veg	10	8	
	Mixed diet	3	4	
Group C	Veg	12	4	
	Mixed diet	7	2	
Group D	Veg	9	8	
	Mixed diet	4	4	

Our current study was performed on 200 subjects in which 100 control and 100 cases, which was further divided into 4 group according to their age belonging with 20-30, 30-40, 40-50 & 50-60.

We give name that as group A, B, C, D. we performed Lipid profile and uric acid on them and all group were compared with each other after comparing we found that the mean value of the total Cholesterol value is high in cases.

Group A (20-30)

Correlation between HDL and Uric Acid Significant p value was observed for control. We found correlation between VLDL and Uric Acid

Significant p value was observed for control. Similarly, correlation between Triglyceride and Uric Acid Significant p value was observed for control. In the Total Cholesterol value is high in cases Group A in control 167.84 ± 410.2 and in control group it 161.16 while HDL was 50.16±27.17 in case and 45.32±12.94, LDL 97.12±31.854 and 94.76±31.966, VLDL 28.24±15.990 and 21.88±13.544 TG 126.72±63.731 and 111.16±68.102 Uric Acid 8.76±13.466 and 4.89±1.551. Similarly, significant value was observed between Total Cholesterol and uric acid of cases and control.

Similarly, No significant value was observed between LDL and uric acid of cases and control.

Group B (30-40)

Present study shows the correlation between HDL and Uric Acid Significant p value was observed for cases. Similarly, correlation between LDL and Uric Acid Significant p value was observed for cases. Similarly, correlation between Triglyceride and Uric Acid Significant p value was observed for control. In group B we found the TC 180.48 ± 33.618 in case and in control 168.96 ± 26.385 , HDL 46.52 ± 14.961 & 48.84 ± 12.866 , LDL 109.80 ± 34.651 & 95.48 ± 25.080 , VLDL 23.32 ± 11.089 & 26.08 ± 9.643 TG 120.20 ± 57.370 & 123.28 ± 53.072 And uric acid 5.46 ± 1.360 & 5.35 ± 1.304 as show in table no 2. Similarly, No significant value was observed between Total Cholesterol and uric acid of cases and control. Similarly, No significant value was observed between VLDL and uric acid of cases and control.

Group C (40-50)

Present study shows the correlation between Total Cholesterol and Uric Acid Significant p value was observed for cases. Correlation between HDL and Uric Acid Significant p value was observed for control. Similarly, correlation between LDL and Uric Acid Significant p value was observed for cases. Similarly, correlation between VLDL and Uric Acid Significant p value was observed for control. Similarly, correlation between Triglyceride and Uric Acid Significant p value was observed for control. While comparing Total Cholesterol value in control and cases group we find the Total Cholesterol value is high in cases group C it was 182.84 and in control group it 182.84 while HDL was 48.8 and 44.72 LDL 105.62 and 83.32 VLDL 27.2 and 27.88 TG 137.82 & 139.72 Uric Acid 6.08 & 5.07.

Group D (50-60)

Present study shows the correlation between LDL and Uric Acid Significant p value was observed for cases. While comparing Total Cholesterol value in control and cases group we find the Total Cholesterol value is high in cases group D it was 176.9 and in control group it 154.72 while HDL was 46.88 and 42.92 LDL 102.32 and 84.68 VLDL 28.24 and 30.36 TG 142.08 & 145.04 Uric Acid 5.72 & 5.34 .as show in table no 4. Present study shows the No significant value was observed between Total Cholesterol and uric acid of cases and control. Significant value was observed between HDL and uric acid of cases and control. No significant value was observed between VLDL and uric acid of cases and control. Similarly, significant value was observed between Triglyceride and uric acid of cases and control.

DISCUSSION

The present study was conducted at Rama Medical Collage, Hospital & Research Center Kanpur, Uttar

Pradesh India with the objective to compare uric acid & lipid profile in Northern population. Serum Uric Acid has been observed to be highly associated with the development of cardiovascular disease for more than 50 years. CVDs are consequences of atherosclerosis and are related to oxidative stress.^[16] Uric acid represent a marker for high level of damaging oxidative stress associated with increased xanthine oxidase activity.^[17] It is a product of purine nucleotide catabolism, the process catalyzed by hepatic enzyme xanthine oxidoreductase (XOR), which enables the oxidation of hypoxanthine to xanthine and its further oxidation to uric acid.^[18] It not only catalyzes the production of uric acid but also nitric oxide and reactive oxygen species, which potentially damage nucleic acids and proteins and converts polyunsaturated fatty acids to lipids.^[19] Above findings are similar to findings of B. C. bansal they showing a statistically significant correlation between serum uric acid and serum triglycerides, serum uric acid and serum phospholipids and serum uric acid and pre-beta lipoprotein. A rise in serum uric acid and serum triglyceride may play some part in the etiology of ischemic thrombotic cerebrovascular disease, another study of Simant Baliarsingh.et al 2012. Showed that serum uric acid levels in the normal range might be a good indicator of the level of triglycerides and a statistically significant positive correlation was observed between serum uric acid and serum triglyceride in men. In men <45 years in age, those having high serum uric acid levels had a higher serum total cholesterol (p=0.003), low density lipoprotein cholesterol (p=0.005) triglycerides (p=0.02),and very low-density lipoprotein cholesterol(p=0.02) than those having low serum uric acid. where as in the >45 year age group when subjects having high serum uric acid were compared to those having low uric acid levels,the only parameters that showed an increase were triglycerides (p=0.009) and very low density lipoprotein cholesterol(p=0.008)A statistically significant positive correlation was observed between serum uric acid and serum triglycerides in men of both age groups separatel. Data was similar with our study another study of Tao-chung peng. Showed that serum LDL, cholesterol, triglycerides, total cholesterol, apolipoprotein-B levels, ratio of triglycerides to HDL, cholesterol, and ratio of apolipoprotein-B to AI are significantly associated with serum uric acid levels, whereas serum HDL, cholesterol levels are inversely associated.

R. Sathiya. showed significant increase in serum total cholesterol levels and LDL -C levels were noted in patients with CAD.A decreased HDL-C concentration with high serum uric acid concentration was observed in CAD patients compared to the controls. Another study Shilpa Suneja. showed significant higher levels of uric acid in dyslipidemic subjects. Since dyslipidemia predicts the risk of CAD, it is important to consider uric acid levels in these patients for more

comprehensive strategic management of risk factors. Vice-versa, while establishing the diagnosis of hyperuricemia, clinical suspicion of coexistent dyslipidemia should also be considered. Uric acid levels (6.40 ± 1.27 vs 4.89 ± 0.21 mg/dl, $p < 0.001$) were significantly higher in patients as compared to those in controls. There was significant increase in the levels of total cholesterol, triglycerides, LDL-C, VLDL-C, non-HDL cholesterol (< 0.001 in each case), in patients of dyslipidemia. However, significant decrease in the levels of HDL-C ($p < 0.001$) was seen in Patients compared to controls. Their study was similar with our study. Another study of Minkook Son demonstrated that the dyslipidemia components of serum total cholesterol, triglyceride and LDL-C levels are positively associated with serum uric acid levels. Whereas serum HDL-C levels are inversely related. A total of 1061 participant were identified as having hyperuricemia, with a prevalence of 12.2%. Multivariable-adjusted GLM demonstrated a significant trend between individual dyslipidemia component and serum uric acid levels ($p < 0.05$). A positive association between the numbers of dyslipidemia component and the increments of serum uric acid levels was also observed. In multivariable-adjusted logistic regression analysis, odds ratio (OR) and 95% confidence interval (CI) of all dyslipidemia components to hyperuricemia were shown to be statistically significant ($p < 0.05$). When further adjusted for the combined component themselves, each 10 mg/dl increments of total cholesterol, triglycerides, and HDL-C, retained significant correlation with hyperuricemia. In table no we observed that the LDL value showing significant while comparing LDL with uric acid it may cases due to diabetic mellitus type 2 while comparing there may be that some patients may be diabetic mellitus. While observing our study we found the high triglycerides value it is significant with high uric acid it may due to some patient were suffering from high blood pressure. The present study was conducted at Rama Medical Collage, Hospital & Research Center Kanpur, Uttar Pradesh India with the objective to compare uric acid & lipid profile in Northern population. Serum Uric Acid has been observed to be highly associated with the development of cardiovascular disease for more than 50 years. CVDs are consequences of atherosclerosis and are related to oxidative stress uric acid represent a marker for high level of damaging oxidative stress associated with increased xanthine oxidase activity.

CONCLUSION

The main strengths of our study include its population-based nature, inclusion of a representative multiethnic sample, and the availability of data on confounders for multivariable adjustment. We had a large sample size that enabled

us to perform separate analysis by gender. Furthermore, all data were collected following a study protocol with standardized quality control checks. The main limitation of our study is the cross-sectional nature of National Health and Nutrition Examination Survey (NHANES). Which precludes conclusions regarding the temporal nature of the association between serum uric acid levels and Lipid profile.

Therefore, even though we are able to detect an association that is statistically independent of traditional confounding factors such as age, BMI, and serum cholesterol, we are not able to establish which one is the cause and which is an effect. Prospective studies are needed to establish the time sequence relationship.

Measurements of four plasma lipid fractions and uric acid have been performed in a series of patients. A modest elevation of the lipid fractions was noted, especially marked in aspect of triglycerides.

Correlation coefficients show that all the lipids tend to be elevated together, but these changes do not correlate with hyperuricaemia. The significance of these findings is discussed.

The present study process that hyperuricemia is associated with dyslipidemia which can lead to a possible cardiovascular event. So prevention of hyperuricemia and associated dyslipidemia can reduce the incidence of cardiovascular diseases in such subject.

The study was conducted only on Northern population so more studies with variable subjects and population from other zones should be done for better conclusion.

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