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LINKING PLATELET LARGER CELL RATIO (P-LCR) AND URIC ACID LEVEL WITH VARIOUS COMPONENTS OF METABOLIC SYNDROME

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ABSTRACT

Serum uric acid and Platelet larger cell ratio play a significant role in cardiac and metabolic disorders in developing countries like India. The metabolic syndrome is associated with diabetes and other cardiovascular diseases, but the link between such blood parameters and metabolic syndrome have not been demonstrated decisively.Total 87 consecutive patients (44 metabolic syndrome positive and 43 metabolic syndrome negative) were recruited. Uric acid, P-LCR and other variables were measured using latest available methods. Metabolic syndrome was diagnosed using criteria given as joint statement by many international groups in 2009.Uric acid level and P-LCR both are significantly higher in individuals with metabolic syndrome.Serum uric acid and P-LCR level may be used as an additional component of metabolic syndrome.

KEYWORDS: **Uric acid, metabolic syndrome, platelet larger cell ratio, P-LCR**

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INTRODUCTION

The importance of the metabolic syndrome is that it shows at least a twofold increase in the risk of cardiovascular disease and at least a fivefold increase in risk for subsequent development of diabetes mellitus[1]. In 2011, almost half of the disease burden in low and middle-income countries like India is due to non-communicable diseases[2]. The cardinal symptoms of metabolic syndrome include abdominal obesity, hypertension, hyperglycemia and dyslipidemia[3]. The metabolic syndrome is now an accepted disorder and has a code in the International Classification of Diseases, Ninth Revision (277.7). The insulin resistance, hyperinsulinemia, dyslipidemia, and obesity precede the progression to type 2 diabetes in 75% to 85% of patients[4]. Several studies observed that various components of diabetic dyslipidemia including raised LDL cholesterol, low HDL cholesterol and raised triglycerides were independently associated with hyperuricemia. The association of serum uric acid level and P-LCR with various components of metabolic syndrome will make a better way for understanding the pathogenic role. However, the direct relation between uric acid levels and components of metabolic syndrome remains controversial, and most clinical guidelines do not recommend treating asymptomatic hyperuricemia[5]. The recent guidelines given as the joint interim statement (2009) of the International Diabetes Federation Task Force on Epidemiology and Prevention, National Heart, Lung, and Blood Institute (NHLBI), the American Heart Association, the World Heart Federation, the International Atherosclerosis Society, and the International Association for the Study of Obesity is used to diagnose metabolic syndrome.[6] Among hematological parameters, platelet count plays an important role in the development of atherosclerosis, thrombi, and cardiovascular diseases. Large platelets are metabolically and enzymatically more active than small platelets and produce more thromboxane A2[7]. We have tried to show relation of larger platelets and serum uric acid level with various components of metabolic syndrome by determination of P-LCR and serum uric acid.

MATERIALS AND METHODS

This was a cross-sectional study conducted from April 2012 to October 2013. A total of 203 individuals who attended 'whole body health check-up scheme' at a multispecialty teaching hospital in Gujarat, were screened for the presence of metabolic syndrome. Total 87 consecutive patients (44 metabolic syndrome positive and 43 metabolic syndrome negative) were recruited. However, patients with, ischemic diseases (like acute coronary syndrome, acute myocardial infarction, pulmonary embolism), renal diseases, liver diseases and with any type of malignancy were excluded from the study.

Blood sampling

Blood samples were collected in plain tube for lipid profile analysis, EDTA vaccutainer for platelet larger cell ratio (P-LCR) and fluoride tube for fasting glucose analysis under standard aseptic procedure. Samples were taken after 10-12 hours fasting so triglyceride and fasting glucose level doesn't get affected. All haematological parameter were processed using Sysmex KX-21 automated cell counter. Individuals with low platelet count below 150(10^9/L) were excluded from the study. All the laboratory tests have been performed in NABL (National Accreditation Board for Testing and Calibration Laboratories) accredited laboratory following strict criteria for internal and external quality assurance (IQC and EQAS). All Biochemistry parameters have been analyzed using fully automated analyzer Roche's COBAS INTEGRA 400 plus. FPG (fasting plasma glucose) was measured by hexokinase method and HDL-C, Total Cholesterol and Triglycerides were measured by enzymatic methods. Blood Pressure was measured in the upper arm in sitting position. The waist circumference was measured at a level midway between the lowest rib and iliac crest. Ethical approval was taken from human research ethical committee of our institute. The obtained parameters were evaluated using descriptive statistical analysis. Statistical analyses were performed using the IBM SPSS (v 20.0) and MedCalc (v 12) software. The p value <0.05 was taken as significant.

RESULTS

The mean age of the patients was 51 (±10) and mean age of the control group was 49 (±15).The distribution of uric acid and P-LCR in both study groups has been shown in Table 1. Uric acid level and P-LCR both were significantly higher in individuals with metabolic syndrome.

Table 1
Distribution of Uric acid level and P-LCR in both groups.

PARAMETERS	Metabolic Syndrome Positive	Metabolic Syndrome Negative	p-value
Uric acid	6.14(0.98)*	4.12(0.89)	<0.001
platelet larger cell ratio (P-LCR)	29.03 (1.29)	20.71 (1.59)	<0.001

**** Values are Mean (SD)***

Table 2
Bivariate correlation analysis of Uric Acid and P-LCR with various parameters

VARIABLES	Uric Acid		P-LCR	
	r	*P value*	*r*	*P value*
Age	0.066	0.542	0.051	0.641
Waist circumference (cm)	0.563	0.001	0.679	0.001
Systolic Blood Pressure (mm Hg)	0.391	0.001	0.479	0.001
Diastolic Blood Pressure (mm Hg)	0.498	0.001	0.570	0.001
Fasting Plasma Glucose (mg/dl)	0.414	0.001	0.483	0.001
Triglyceride (mg/dl)	0.510	0.001	0.677	0.001
Total Cholesterol (mg/dl)	0.059	0.586	0.070	0.522
High Density Lipoprotein-C (mg/dl)	-0.526	0.001	-0.749	0.001
Uric Acid		-	0.745	0.001
Platelet larger cell ratio (P-LCR)	0.745	0.001		-

r = Pearson's correlation coefficient

As shown in Table 2, Uric acid and P-LCR was not significantly correlated with age and total cholesterol. Uric acid and P-LCR both correlated positively with each other and also with WC, SBP, DBP, FPG and TG while both were negatively correlated with HDL-C.

DISCUSSION

Our Study showed that among subjects with metabolic syndrome, increasing serum UA levels, even in the normal range, were associated with consistently increased levels of a range of cardiovascular risk factors, including central obesity, adverse lipid profile, higher blood pressure, fasting glucose and inflammatory marker (P-LCR) levels. Additionally, there were also significant positive associations between the P-LCR and various metabolic syndrome parameters. Increased level of P-LCR[8] and Uric acid is very strongly associated with the complexity of cardio-metabolic syndrome. As described in study of Facchini F et al., Insulin resistance can build up hyperuricemia by reducing renal excretion[9] or indirectly through other effects on lipid profiles, such as triglycerides or HDL-cholesterol which has been discovered by Chen LY et al.[10] Bedir A et al. revealed that uric acid may constrict leptin-negotiated facilitation of insulin sensitivity and sympathetic hyperactivity and renal sodium excretion by increasing proximal tubular sodium reabsorption[11] which may be the reason of many metabolic consequences due to increased uric acid level. Ruggiero C et al. indicated that elevated UA levels, even in the normal range, were also associated with an increase in levels of inflammatory markers including C-reactive protein or white blood cell count[12]. We have taken P-LCR as a marker of inflammation because larger platelets are more reactive, they can contribute to an increased risk for cardiovascular diseases as a complication of metabolic syndrome[13]. Our study showed that higher normal uric acid level and P-LCR are associated with many metabolic conditions, but clinically it is very difficult to treat such type of patients without establishment of direct link. We have found no similar study showing relation of P-LCR and

uric acid with individual component of metabolic syndrome.

CONCLUSION

We conclude that Uric acid level and P-LCR higher in individuals with metabolic syndrome and they are directly correlated with individual parameters of metabolic syndrome. So these parameters may be used in future as a part of metabolic syndrome components. As very few studies are available showing relation of P-LCR and metabolic syndrome, more studies with prospective and large subject size is required in future to confirm the association between these parameters and metabolic syndrome.

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