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Serum uric acid as obesity related indicator in young obese adults

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ABSTRACT

Uric acid is the end product of purine degradation. It is catalyzed by the enzyme xanthine oxidase, which is responsible for the production of uric acid and damaging free radicals. Uric acid being a parameter in renal function tests is in use to detect renal abnormalities by seeing its deviation from the normal values of serum uric acid. This study was in order to find whether serum uric acid level can be used as an obesity related indicator in young adults. Spectrophotometrically the serum uric acid levels were calculated, analyzed statistically. The results showing that serum uric acid level were positively correlated with BMI in both age groups of 20-30yrs and 30-40 yrs. Serum uric acid level was also found to positively correlate with age in the age group of 30-40yrs. This result giving an idea that serum uric acid level may be used as an early marker for obesity, thus trying to gain a hold on obesity related problems among the adolescents and prevent complications such as gout in the latter age group.

Key words: BMI, Fat Content, Hyperuricemia, Obese, Uric acid.

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INTRODUCTION

Uric acid is the end product of purine degradation. It is produced by xanthine oxidase from xanthine which is in turn is produced from purine. It is sparingly soluble in water. Degradation of uric acid mainly takes place in liver. Elevated serum uric acid correlated inversely with renal blood flow/m^2 body surface area and directly with renal vascular and total resistance[1] and metabolic syndrome with or without a low globular filteration rate [2]. In children with hyperuricemia it was found that in the long run there may be disturbances of tubular secretions in the nephrons in them with hyperuricosuria and without hypouricemia [3].

Hyperuricemia may marginally increase the risk of CHD events [4]. Increased serum uric acid level directly associated with cardio vascular disease (CVD) events, independently of diuretic use and other cardiovascular risk factors [7]. In Asian Indians and melanasians plasma uric acid levels were found to be elevated in men and women with impaired glucose tolerance and lowest plasma uric acid levels were found in diabetic patients, especially in diabetic men [5, 9]. Factors like obesity, alcohol intake, and multimetabolic disorders are determined to be independent predictors for the development of hyperuricemia [6]. Serum Uric acid is positively correlated with visceral fat area, subcutaneous fat area, serum total cholesterol level, serum triglyceride level, the Homeostasis Model Assessment index, and negatively correlated with the high-density lipoprotein cholesterol level [8].In nonobese persons, death from cardiovascular disease found to be higher with increased level of serum uric acid but independent of bodyweight [10]. The serum uric acid levels of the subjects with high Percentage of overweight are significantly higher than those of the subjects with low in both boys and girls [14]. A graded increase of serum uric acid rates recorded with increased body weight and waist circumference [15].

The prevalence of hyperuricemia in adults has increased over the last several decades, especially in developed countries. In adults, serum uric acid levels are positively correlated with BMI, and hyperuricemia is considered to be a common lifestyle disorder related with obesity. The prevalence of hyperuricemia in obese children and adolescents and its association with metabolic syndrome are largely unknown. This study aimed to find whether high levels of uric acid in adolescents is correlated to obesity and also if it can be used as an early marker for detecting obesity.

MATERIALS AND METHORDS

The present study was done at K.S.Hegde Medical Academy, Mangalore after getting Ethical Clearance from the Institutional Ethical Committee. For the study members of age group 20-40 yrs were included. Participants were categorized into two Groups as 20-30 and 30-40 age group. Two ml of the blood was collected after taking written consent from the participants. The height and weight was recorded and BMI was calculated. Then participants were categorized into Normal, Overweight and obese. Body fat was measured using a body Fat

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analyzer. Venous blood was collected and serum was separated by centrifugation. Serum was stored in deep freezer until the analysis was done. Assay was done at Central Research Laboratory; Nitte University. Uric acid was estimated spectrophotometrically by commercially available kit (Uricase/POD) method [16, 17]. The data was analyzed using one way ANOVA, p value <0.05 is considered to be significant

RESULTS

The present study aimed to find whether high levels of uric acid in adolescents is correlated to obesity and also if it can be used as an early marker for detecting obesity. The results are expressed in Table-1 and Fig-1, 2 and 3. In the age group 20-30, the results showed that serum uric acid levels are directly proportional to BMI and %age of fat only in the obese category i.e. elevated in comparison with normal and overweight category. BMI, fat %age and Uric acid level was found to be statistically significant (p<0.0001).

Table-1: Comparison of Body mass index, Fat percentage and Uric acid level in normal, overweight and obese individuals. Values are expressed as Mean± S.D. n= 40 in each group.

GROUP-1 20-30yrs	PARAMETERS	Normal	Overweight	Obese	p value
	BMI	19.95±1.47	26.4±1.3	32.84±3.9	p<0.0001
	Fat %	17.35±3.56	28.1±5.3	31.6±5.4	p<0.0001
	Uric acid	2.61±0.05	3.5±0.09	6.1±1.1	p<0.0001
GROUP- 2 30-40 yrs	BMI	21.31±2.2	26.7±1.1	31.3±2.1	p<0.0001
	Fat %	20.78±1.2	25.01±4.8	32.6±7.6	p<0.0001
	Uric acid	3.113±1.14	4.7±1.0	6.967±1.11	p<0.0001

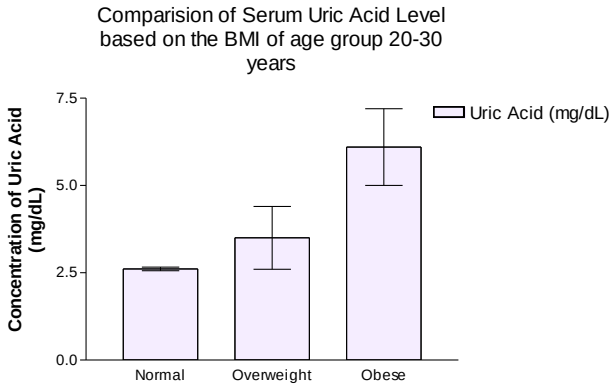

Fig-1: Comparison of Serum Uric Acid Level in normal, overweight and obese individuals of age group 20-30 years.

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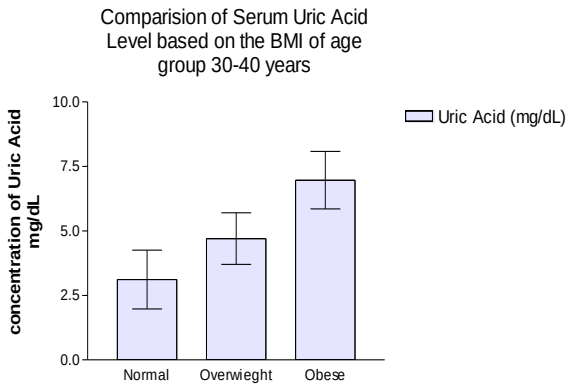

Fig-2: Comparison of Serum Uric Acid Level in normal, overweight and obese individuals of age group 30-40 years.

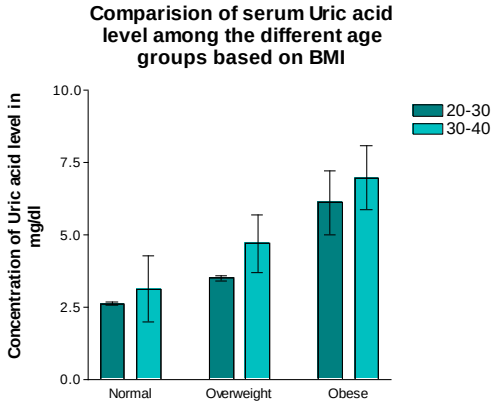

Fig-3: Comparison of Serum Uric Acid Level in normal, overweight and obese individuals of age group of 20-30 years and age group of 30-40 years.

In the age group of 30-40 years, it implies that BMI and Fat % of all three categories have positive correlation to Serum Uric Acid level i.e. uric acid level is proportional to age. As age advances uric acid level increases irrespective of BMI and Fat %age implying it has significant elevation in all the three categories. BMI, fat %age and Uric acid level is found to be statistically significant.

When the Serum Uric Acid levels of both the age groups were compared, it was found that serum uric level increased with corresponding BMI in both the age groups. When the serum uric acid levels of normal, overweight and obese categories were compared between the two age groups we observed that in the normal category there is no significant rise. In overweight and obese categories, the 30-40 age groups showed significant elevation in uric acid level.

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DISCUSSION

This study results showed that in both age group 20-30 and 30-40, uric acid level was found to be increased along with BMI and fat in overweight and obese in comparison with normal. We found significant difference between BMI, Uric acid and fat in normal, overweight and obese category. Body weight is not the only factor underlying the relation between hyperuricemia and cardiovascular disease [1].

Serum uric acid levels of the subjects with high POW (≥ 20%) are significantly higher than those of the subjects with low POW (< 20%) in both boys and girls [14].

Obesity, alcohol intake, and multimetabolic disorders were determined to be independent predictors for the development of hyperuricemia [8]. A was positively correlated with visceral fat area [18]. A graded increase of serum uric acid rates was observed with increased body weight and waist circumference [15]. These results suggest that serum uric acid levels are significantly increased with obesity and could be used as one of obesity-related indicators even in early adolescence [14].

Besides family history, which is not being considered here, obese adolescents in the age group 20-30 had a direct correlation of uric Acid with BMI & fat %. So definitely uric acid levels can be used as an early obesity related indicator among young adolescents. Whereas in the age group of 30-40, the uric acid level is not only positively correlated to BMI & Fat % but is also correlated to age and individuals with drastic elevation of uric acid can be monitored further preventing them from getting complications of gout etc.

CONCLUSION

As seen above, the graphs above not only indicate significant rise in the serum uric acid among the different categories divided according to BMI in the same age groups but also there is significant increase in the serum uric acid level with age. As age increases the uric acid level considerably increases which suggests that there is a strong possibility that with proper study of family history, life style, food habits serum uric acid level can be used as obesity related indicator thus giving a cautionary measure of getting obese in the long run. Thus by monitoring the uric acid levels obesity related problems like myocardial infarction, strokes, hypertension etc. can be prevented well in advance and brought under control. With a thorough study among obese adults the following generations can be monitored from such complications preventing them from being obese. Also, highly elevated levels can be used as an early marker among the adult age group and thus by having a control on their diet and life style further complications such as gout can be prevented.

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