

A STUDY OF CORRELATION OF SERUM URIC ACID LEVELS IN DIABETES MELLITUS AND ITS SIGNIFICANCE IN PRE-SURGICAL EVALUATION

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ABSTRACT

BACKGROUND

Raised serum uric acid has been associated with a lot of diseases like hypertension, cardiovascular diseases, chronic kidney disease, peripheral vascular diseases and metabolic disorders.

But the association of serum uric acid levels to that of diabetes mellitus has not been successfully understood. A sincere effort has been put in this study to find out the serum uric acid levels in normal individuals, pre-diabetics and diabetics and come to a conclusion on the correlation of serum uric acid in diabetes mellitus. The pre-surgical evaluation of such conditions forms an important basis for conducting surgeries. As stress levels in surgeries are supposed to be high which may further worsen the diabetes, or serum glucose levels may increase which may ultimately result in postsurgical complications. So it should be mandatory to check the serum uric acid levels which may suggest the pre-diabetes which may ultimately lead us to prevent the post-surgical complications.

METHOD

One hundred eighty people who visited the Department of Surgery were selected.

The study included ninety males and ninety females and in each group, there were thirty non-diabetics, thirty pre-diabetics and thirty diabetics.

Pre-diabetics were considered as 110 to 125 mg/dL (6.1 mmol/L to 6.9 mmol/L) i.e. WHO criteria was followed. All the subjects were aged between 40-60 years.

The correlations were made between the serum uric acid levels and serum fasting glucose, serum postprandial and HbA1c.

RESULT

The results show a rise in the serum uric acid levels in the pre-diabetic and not so much in the non-diabetics and the confirmed diabetics.

CONCLUSION

The serum uric acid level measurements can be used as a powerful tool in identifying the pre-diabetic condition and help an individual to make the necessary lifestyle adjustments so that the progression of the diseases can be stopped or may be infinitely delayed.

KEYWORDS

Serum Uric Acid, Diabetes Mellitus, Pre-diabetic, Purine Nucleotide Catabolism.

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INTRODUCTION: The end product of purine nucleotide catabolism is uric acid. The degradation is taking place in the liver. The xanthine oxidase is a metalloflavoprotein containing FAD, molybdenum and iron. As xanthine is oxidised to uric acid, the electrons are transferred first to molybdenum, then to FAD, and finally to molecular oxygen, when hydrogen peroxide (one of the reactive oxygen species) is produced. Strecker in 1857 showed the presence of uric acid in urine. In 1892, Sir Frederick Hopkins (Nobel

prize, 1929) estimated uric acid. In 1895, Emil Fischer (Nobel prize, 1902) showed that uric acid is derived from purine.

Normal blood level of uric acid ranges from 2-5 mg/dL in females and 3-7 mg/dL in males. The daily excretion varies from 500-700 mg. Nucleic acid content is more in non-vegetarian diet. Uric acid is sparingly soluble in water. Uric acid is an antioxidant.¹

Raised serum uric acid has been associated with a lot of diseases like hypertension,^{2,3,4} cardiovascular diseases⁵, chronic kidney disease,⁶ peripheral vascular diseases⁷ and metabolic disorders.⁸

But the association of serum uric acid levels to that of diabetes mellitus has not been successfully understood. In some studies, the results showed a positive association between high serum uric acid levels and diabetes,⁹⁻¹⁴ whereas other studies reported no association,¹⁵ or an

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inverse relationship.^{16,17} With this background, a sincere effort has been put in this study to find out the serum uric acid levels in normal individuals, pre-diabetics and diabetics and come to a conclusion on the correlation of serum uric acid in diabetes mellitus. The correlation of serum uric acid with that of fasting serum glucose level, postprandial serum glucose level and HbA1c was also done to get a correct answer for the above discussed problem. The pre-surgical evaluation of such conditions forms an important basis for conducting surgeries. As stress levels in surgeries is supposed to be high which may further worsen the diabetes, or serum glucose levels may increase which may ultimately result in post-surgical complications. So it should be mandatory to check the serum uric acid levels which may suggest the pre-diabetes which may ultimately lead us to prevent the post-surgical complications.

AIMS AND OBJECTIVES:

1. To estimate the serum uric acid level in normal, pre-diabetic and diabetic subjects.
2. To correlation of serum uric acid with that of fasting serum glucose level, postprandial serum glucose level and HbA1c.

MATERIALS AND METHODS: One hundred eighty people who visited the Department of Surgery from September 2013 to June 2014 were included in the study.

The study was done in the Department of Surgery, Government Medical College, Nizamabad.

The study included ninety males and ninety females and in each group, there were thirty non-diabetic, thirty pre-diabetics and thirty diabetics.

Pre-diabetics were considered as 110 to 125 mg/dL (6.1 mmol/L to 6.9 mmol/L) i.e. WHO criteria was followed.

All the subjects were aged between 40-60 years.

Informed consent was taken.

All the subjects underwent serum uric acid estimation. Then the mean serum fasting glucose, mean serum postprandial and mean HbA1c was estimated in pre-diabetics and diabetics.

The correlations were made between the serum uric acid levels and serum fasting glucose, serum postprandial and HbA1c.

Inclusion Criteria:

1. The subjects were between 40-60 years old.
2. WHO criteria was taken into consideration. So 100-125 mg/dL serum fasting glucose levels were considered as pre-diabetics and were considered for study.

Exclusion Criteria:

1. Other muscle wasting, starving, liver disease patients were omitted.
2. Patients with serum creatinine >1.0 mg/dL (sign of renal failure) were excluded.

RESULTS:

Sex	Number of patients	Mean Uric acid Level
Male	30	3.84±0.62
Female	30	4.77±0.71

Table 1: Mean Serum Uric acid Levels in Non-diabetic Subjects

Sex	Number of patients	Mean Uric acid Level
Male	30	5.96±0.17
Female	30	7.43± 0.54

Table 2: Mean Serum Uric acid Levels in Pre-Diabetic Subjects

Sex	Number of patients	Mean Uric acid Level
Male	30	4.32±0.73
Female	30	4.79±0.12

Table 3: Mean Serum Uric acid Levels in Diabetic Subjects

The results show a rise in the serum uric acid levels in the pre-diabetic and not so much in the non-diabetics and the confirmed diabetics.

Sex	Pre-Diabetics (Fasting glucose level)	Pre-Diabetics (Uric acid level)	Diabetics (Fasting glucose level)	Diabetics (Uric acid level)
Male	114±0.73	5.96±0.17	179±0.54	4.32±0.73
Female	109±0.21	7.43±0.54	194±0.71	4.79±0.12

Table 4: Mean Fasting Blood Glucose Levels and Mean Uric Acid Levels

Sex	Pre-Diabetics (Post prandial glucose level)	Pre-Diabetics (Uric acid level)	Diabetics (Fasting glucose level)	Diabetics (Uric acid level)
Male	182±0.73	5.96 ±0.17	206±0.62	4.32±0.73
Female	167±0.21	7.43±0.54	243±08	4.79±0.12

Table 5: Mean Post-prandial Blood Glucose Level and Mean Uric Acid Level

Sex	Pre-diabetics (HbA1c)	Pre-diabetics (Uric acid level)	Diabetics (HbA1c)	Diabetics (Uric acid level)
Male	5.9±0.2	5.96±0.17	7.4±0.5	4.32±0.73
Female	6.2±0.6	7.43± 0.54	7.6±0.3	4.79±0.12

Table 6: Mean HbA1c and Mean Uric Acid Level

There is a significant relation between the pre-diabetes condition and the serum uric acid levels.

DISCUSSION: Impaired fasting glucose or pre-diabetes refers to a condition in which the fasting blood glucose is elevated above what is considered normal levels, but is not high enough to be classified as diabetes mellitus. It is associated with insulin resistance and increased risk of cardiovascular pathology. It is thought to be lesser risk than impaired glucose tolerance (IGT). In 50% cases, it progresses to type 2 diabetes mellitus. There is a 50% risk over 10 years of progressing to overt diabetes.

Studies have shown that uric acid is significantly elevated in pre-diabetic stages and low in diabetes, and rises again after the development of renal insufficiency.¹⁸ Measurement of uric acid is easy in terms of screening, can be performed with simple methods in routine laboratories, and is inexpensive. Thus, a preventive, cost effective approach is available with potential implications for public health. It can be used as a powerful tool in identifying the pre-diabetic condition and help an individual to make the necessary lifestyle adjustments so that the progression of the diseases can be stopped or may be infinitely delayed.

CONCLUSION: The serum uric acid level measurements can be used as a powerful tool in identifying the pre-diabetic condition and help an individual to make the necessary lifestyle adjustments so that the progression of the diseases can be stopped or may be infinitely delayed. The pre-surgical evaluation of such conditions forms an important basis for conducting surgeries. As stress levels in surgeries is supposed to be high which may further worsen the diabetes, or serum glucose levels may increase which may ultimately result in post-surgical complications. So it should be mandatory to check the serum uric acid levels which may suggest the pre-diabetes which may ultimately lead us to prevent the post-surgical complications.

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