

STUDIES ON NORMAL AND ABNORMAL EXCRETION PATTERNS OF URIC ACID IN BAHAWALPUR

Pages with reference to book, From 266 To 269

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Abstract

Uric acid concentration in serum and urine of 296 persons of Bahawalpur city is reported. Although the general pattern corresponds to the studies in other regions of the world but the range of uric acid concentration in male and female serum and uric acid is slightly higher. Correspondingly the incidence of uricemia is also high in the region with some cases of gout. Statistically, the serum urate level were more compact and had smaller coefficient of variance. Only persons with serum urate level above 125mg/100ml showed signs and symptoms of gout (JPMA 37: 266 , 1q87).

INTRODUCTION

Uric acid is a nitrogenous waste product of amino acid metabolism¹ and plays a significant role in the evolution and ecology of vertebrate life². Uric acid nitrogen constitutes 60-90% or more of the total urinary nitrogen³. Urate appears in blood mainly in free form and the serum urate concentration represents a dynamic balance between uric acid production and its disposition². In normal human beings renal excretion accounts for 57-77% of the body's daily production of uric acid⁴. Most of the remainder is excreted into gastrointestinal tract where it is degraded by enteric bacteria⁵. Its production may be regulated by the amount of various substrates which include ribose-5-phosphate, glutamine, glycine and aspartic acid and their induction of increased activities and amounts of enzyme involved in uric acid synthesis⁶. Serum uric acid may be considerably increased in starvation due to accelerated tissue turnover and decreased renal excretion of uric acid resulting probably from acidosis that accompanies starvation⁷. Bahawalpur region, a hot area with low annual rainfall, is considered as water deficient area. Low intake of water and consequently smaller volume of urine, results in higher uric acid concentration in the urine and poor uric acid secretion within the nephron, causing increased serum urate levels. The present studies were carried out to observe the normal and abnormal excretory pattern of uric acid in Bahawalpur Region and to correlate the results with increased incidence of uricemia and gout in the region.

MATERIAL AND METHOD

A total of 296 (159 male and 137 female) persons were randomly selected for this study. Samples of blood and urine were collected from the Pathology Department of Quaid-i-Azam Medical College, Bahawalpur, different localities and private clinical laboratories in Bahawalpur city. Uric acid in blood, serum and urine was estimated by phosphotungstic reduction method and the concentration of uric acid/100ml of the sample was determined photometrically⁸ (Tables I—IV).

RESULTS AND DISCUSSION

Normal uric acid levels have been quoted as 375 moles/litre in women and 425 moles/litre in men⁸. These values are equivalent to 63mg/100ml and 7.14mg/100ml of uric acid (Mol. Wt: 168) for females

and males respectively.

The subject were divided into two groups:

Group-I: Subject with normal uric acid level in blood serum. These were 157 in number i.e., 87 males and 70 females.

Group-II: Subject with abnormal uric acid level in blood serum. These were 139 in total i.e., 72 males and 67 females.

In the present study 45.3% of the male and 48.9% of the female subjects under the survey were found hyperuricemic. The prevalence of hyperuricemia varies among the people of the world. In England only 23% of females were found hyperuricemic⁹: In France 17.6% of the total men surveyed were found hyperuricemic¹⁰. However, more than 40% of serum urate values of the three Polynesian groups exceeded the limits for the normal uric acid serum levels¹¹. By corn parison, the serum urate values obtained in the present survey were comparable to those for the Polynesian people and much higher than the corresponding values for the people from the West. Subjects were further classified into different age groups (Table I-IV).

TABLE -I
Serum Urate Levels in Males.
(mg/100ml)

Age (years)	No.	Normal Levels			Abnormal Levels			
		Range	Average	C.V.*	No.	Range	Average	C.V.*
15-30	34	3.2-6.7	5.2	16.15	-	-	-	-
31-45	41	3.4-6.9	5.3	19.50	26	7.5-10.4	8.9	7.98
46-60	12	3.4-7.0	5.7	22.81	38	7.7-12.4	9.7	11.03
61-70	-	-	-	-	8	8.9-12.6	10.1	11.09

* Coefficient of Variance.

TABLE - II
Urine Urate Levels in Males.
(mg/100ml)

Age (years)	No.	Normal Serum Urate Levels			Abnormal Serum Urate Levels.			
		Range	Average	C.V.*	No.	Range	Average	C.V.*
15-30	34	20.0-43.3	30.7	24.50	-	-	-	-
31-45	41	22.3-58.5	34.1	23.62	26	21.6-59.7	41.3	22.79
46-60	12	28.0-72.8	42.0	30.55	38	28.0-99.5	48.6	29.58
61-70	-	-	-	-	8	41.0-62.0	51.0	14.95

* Coefficient of Variance

TABLE – III
Serum Urate Levels in Females.
(mg/100ml)

Age (years)	No.	Normal Levels			No.	Abnormal Levels.		
		Range	Average	C.V.*		Range	Average	C.V.*
15–30	38	2.0–5.8	4.2	22.68	5	6.8–10.3	7.9	7.93
31–45	27	2.6–5.9	4.3	22.59	24	6.3–12.5	9.1	17.07
46–60	5	4.1–5.5	4.8	10.21	34	6.3–12.6	8.9	18.54
61–70	–	–	–	–	4	6.8–11.7	8.8	23.41

* Coefficient of Variance

TABLE – IV
Urine Urate Levels in Females.
(mg/100ml)

Age (years)	No.	Normal Serum Urate Levels			No.	Abnormal Serum Urate Levels		
		Range	Average	C.V.*		Range	Average	C.V.*
15–30	38	19.5–48.0	29.4	25.6	5	32.0–39.0	36.0	6.31
31–45	27	23.6–42.8	30.7	19.26	24	27.3–82.7	46.1	25.64
46–60	5	23.9–39.2	31.1	16.67	34	25.4–120.0	51.4	38.99
61–70	–	–	–	–	4	30.4–114.0	63.6	48.47

* Coefficient of Variance

A trend for increased uric acid values in serum and urine was observed with the advancing age and with a difference in values between the sexes. These results conform with those reported by other workers^{7,9,12}. We found serum uric acid and urinary uric acid levels higher in males than in females, in all the age groups. Age and sex relationship strongly suggested endocrine influence on serum uric acid¹¹. Androgens may be important regulatory factors. Estrogen and possibly progesterone are also of importance as indicated by the fact that female subjects have lower uric acid level.

As both the serum urate and urine urate levels increased progressively with age, it can be concluded that hyperuricemia aggravates with age. It was also observed that with the increase in the serum urate level there was a corresponding increase in the urine urate level, indicating that the amount of uric acid transported from plasma to tubular fluid was mainly dependent on the initial serum urate level.

Statistical analysis showed that the abnormal urate levels were more compact than the corresponding

values for the normal serum urate levels for males as well as for females. Serum urate levels of the subjects showed higher percentage of scatter of individual values around the mean of samples group observations. However, such a comparison was not possible for urine urate levels. Urine urate levels were found not only higher than the corresponding serum urate levels for all the age groups, these also showed higher coefficient of variance. It was, therefore, concluded significant in determining the cases of hyperuricemia and untreated gout. A higher fraction of the subjects under the present study was also hyperuricemic.

High serum urate levels of the subjects may be due to low water intake, hot weather, purine rich diet and genetics. Bahawalpur region is a hot area with low annual rainfall and is considered as water deficient area. Low intake of water or heavy perspiration may result in smaller volume of urine with higher concentration of uric acid, also in poor uric acid secretion within the nephron thus causing increased serum urate level. That hot climate is a factor responsible for higher uric acid concentration can be deduced from comparison of our results with those of a similar study carried out in Karachi¹². As Bahawalpur has a much severe dry hot climate as compared to Karachi, the urate levels in serum and urine in all age groups under study, both male and female, respectively, were higher for Bahawalpur than for Karachi. However, the raised levels of serum urate occur in wide variety of the circumstances and do not necessarily establish the diagnosis of gout. In the present study patients only with serum urate levels above 12mg/100ml showed signs and symptoms of gout (1.69%).

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