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RESEARCH ARTICLE

NORMAL REFERENCE RANGES FOR SERUM URIC ACID IN POPULATION OF NORTH BIHAR

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Abstract

Aim: To establish the reference range of serum uric acid levels in this population among healthy individuals.

Design: Prospective study done at Darbhanga Medical College, Bihar from December 2006- January 2009.

Materials and Methods:

1000 individuals above 30 years of age were included in the study. There were equal no of males and females. 55% (n=550) were vegetarians and 45% (n=450) were non vegetarians. 45% (n=450) were of low socioeconomic group, 40% (n=400) were of middle socioeconomic group and 15% (n=150) were of high socioeconomic group. 70.2% (n=702) were of normal weight, 19.8% (n=198) were overweight, 5.3% (n=53) were underweight and 3.7% (n=37) were obese.

Serum uric acid was estimated by modified phototungstate method, end point assay.

The values of serum uric acid were statistically analyzed in relation to age, sex, BMI, socio economic group and eating habits.

Results:-

- The observed reference range of uric acid in the population in male is 3.5-6.5mg% and in females is 2.5-6mg%.
- The mean serum uric acid in males was 4.959 ± 1.029 and in females 3.99 ± 1.042 . There is significant difference ($t=11.07, p<0.001$)
- Mean serum uric acid in non vegetarians was slightly higher than vegetarians but not significant ($t=1.48, p>0.05$)
- Serum uric acid was significantly higher in overweight and obese ($t=11.07, p<0.001$) in comparison to underweight and normal weight.
- Serum uric acid was higher in high socioeconomic strata compared to low socioeconomic group ($t=10.42, p<0.001$).

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Introduction:-

Serum uric acid concentrations are distributed in community as continuous variable and are determined by a number of demographic factors of which age, sex, body mass index, nature of diet, and socioeconomic class are most important. Serum uric acid levels are positively correlated with intelligent social class, weight, alcohol consumption and high protein diet. Also it has positive correlation with hyperlipidaemia, atherosclerosis, diabetes mellitus, kidney disease, primary hypertension and as component of metabolic syndrome.

It is interesting to study the uric acid levels in our population which has not been done extensively. In western world men have mean serum uric acid values of 6.8 mg/dL, and women have mean serum uric acid values of 6 mg/dL. In our population mean serum uric acid levels in male is 4.9 mg/dl and in women is 3.9 mg/dl both of which is significantly lower than the western world. This implies that serum uric acid depends on divergent factors like demographic factors and various metabolic states.

So the normal reference range of serum uric acid has been reported to be different in different populations by different workers at different places.

The present work aims at estimation of serum uric acid levels in adult population (over 30 years) so that we can suggest the normal reference range of serum uric acid in population of North Bihar.

Material and Methods:-**Material:-**

The people were selected from general staff of Darbhanga Medical College and also from the healthy relatives of patients presenting at Darbhanga Medical College and Hospital. Their age was above 30 yrs and they were from both sexes. All of them were screened for renal function and those with impaired renal function were excluded as that would impair uric acid excretion.

A large no of cases were taken to increase the specificity and to establish the normal reference range of uric acid in this region which includes a large population.

Sampling:-

Unhaemolysed serum or plasma was used in case of plasma EDTA was used as anticoagulant. Sample was taken after 12 hrs of overnight fasting. Serum and plasma were prepared by centrifugation at 3000 rpm for 15 minutes and analysis was done within 2 hrs of collection.

Methods:-

Serum uric acid was estimated by modified phototungstate method, end point assay.

Principle:-

In alkaline medium uric acid in the sample reduces phototungstate to produce tungstate blue colour. Absorbance of coloured compound is measured at 660nm and is directly proportional to the amount of uric acid concentration in the sample. This method uses a special surfactant, which eliminates sample deproteinisation step prior to analysis.

Uric acid + phototungstate = tungstate blue colour

Statistical Calculation:-

The values of serum uric acid were statistically analyzed by determining the mean, standard deviation (S.D), Standard Error of Mean (S.E.M), t value, p value. All statistical tests were 2-sided and a $P < 0.05$ was recognized as the statistically significant.

Observation and Results:-

The study group included 1000 healthy individuals above 30 years of age and with no renal impairment.

Table no 1:- Showing age distribution of study group.

Age group(years)	MALE		FEMALE	
	Number	Percentage	Number	Percentage
30-39	105	21	80	16
40-49	180	36	195	39
50-59	115	23	125	25
60-69	65	13	70	14
70 and above	35	7	30	6

Table no 2:- Showing serum uric acid levels in 500 males and 500 females among general healthy population

Serum uric acid levels(mg%)	MALES		FEMALES	
	Number of case	Percentage	Number of case	Percentage
<3	5	1	17	3.4
3-3.9	50	10	100	20
4-4.9	230	46	190	38
5-5.9	150	30	160	32
6-6.9	40	8	25	5
7-7.9	15	3	5	1
8-8.9	10	2	3	0.6

Table no 3:- Showing mean serum uric acid levels.

Group of subjects	No of cases	Serum uric acid in mg/100ml			t value	P value
		Mean	S.D.	S.E.M.		
Both sexes	1000	4.48	1.035	0.040	Between the means of males and females 14.75	<0.001 Significant
Males	500	4.95	1.029	0.046		
Females	500	3.99	1.042	0.047		

The mean serum uric acid in 1000 healthy individuals was 4.48 ± 1.035 .

The mean serum uric acid in male was 4.65 ± 1.029 which was significantly higher than that of females (3.94 ± 1.042).

Table no 4:- Showing serum uric acid levels in relation to socioeconomic status.

Socioeconomic status	No of cases	Percentage	Serum uric acid (mg/100ml)			t value	P value
			Mean	S.D	SEM		
High	150	15	5.28	1.32	1.107	10.42	<0.001 significant
Middle	400	40	4.67	1.145	0.062	4.96	<0.001 significant
Low	450	45	4.09	0.890	0.040	7.86	<0.001 significant

Table no 5:- Showing serum uric acid in relation to body mass index (BMI).

Body weight based on BMI	No of cases	Percentage	Serum uric acid (mg/100ml)			t value	P value
			Mean	S.D	S.E.M		
Underweight (17-19)	53	5.3	3.75	0.90	0.123	4.15	<0.001 (significant)
Normal weight (20-24)	702	70.2	4.27	0.95	0.036	8.56	<0.001 (significant)
Overweight (25-28)	198	19.8	5.03	1.20	0.085	11.07	<0.001 (significant)
Obese (29+)	37	3.7	6.54	1.35	0.222	13.09	<0.001 (significant)

Table No 6:- Showing serum uric acid in relation to eating habits

Eating habits	No of cases	Percentage	Serum uric acid (mg/100ml)			t value	P value
			Mean	S.D	S.E.M		
Vegetarian	550	55	4.43	1.047	0.045	1.48	>0.05 (not significant)
Non vegetarian	450	45	4.54	1.247	0.059		

Summary and Conclusion:-

The present work “Normal Reference Ranges for Serum Uric Acid In population of North Bihar” has been done on 1000 subjects.

- The summary of the work is as follows: The observed reference range of uric acid in the population in male is 3.5-6.5mg% and in females is 2.5-6mg%.
- The mean of serum uric acid level in our population is 4.48 ± 1.035
- The mean serum uric acid in males was 4.959 ± 1.029 and in females 3.99 ± 1.042 . There is significant difference ($t=11.07, p<0.001$).
- Mean serum uric acid in non vegetarians was slightly higher than vegetarians but not significant ($t=1.48, p>0.05$)
- Serum uric acid was significantly higher in overweight and obese ($t=11.07$), $p<0.001$ in comparison to underweight and normal weight.
- Serum uric acid was higher in high socioeconomic strata compared to low socioeconomic group ($t=10.42$, $p<0.001$).

So we propose that every community should decide their own normal reference range.

We propose the following reference range of serum uric acid in population of north Bihar:

Males:-

- 3.5-6.5mg% (normal)
- 6.6-7mg% (high normal)
- >7mg% (hyperuricaemia)

Females:-

- 2.5-6mg% (normal)
- 6.1-6.5mg% (high normal)
- >6.5mg% (hyperuricaemia)

We also recommend that further work, based upon screening of more subjects, on multicentric field study should be undertaken to reach more precise consensus on the debatable topic.

Conflicts Of Interest:-

The authors declare that there is no conflict of interests regarding the publication of this paper.

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