BLOOD URIC ACID IN NORMAL MENSTRUATING WOMEN, NORMAL PREGNANCY AND TOXAEMIC PREGNANCY IN INDIAN SUBJECTS

by

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Conflicting observations have been found in the literature regarding the levels of uric acid in blood in pregnancy. Williams (1912), Killian and Sherwin (1923), King and Dennis (1924), Plass (1924) and Crawford (1939, 1940, 1941) observed that the uric acid in blood remains normal throughout the pregnancy while Bunker and Mundell (1924), Harding, Allen and VanWyek (1924) found a rise in blood uric acid in later months of pregnancy and it continued progressing until the labour ended. Nayar (1940) found that in normal pregnancy, blood uric acid remains within normal limits. Crawford (1941) and Schaffer, Dill and Cadden (1943) found a high uric acid level in toxaemic pregnancy. It was shown by Stander, Duncan and Sisson (1925) that uric acid metabolism is altered during toxaemic pregnancy although the concentration of other known nitrogenous elements remains within normal limits. It was, therefore, thought worth while to study whether blood uric acid concentration changes in normal and toxaemic pregnancy.

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As no data have been available for blood uric acid for normal menstruating Indian women and as these data are necessary for comparison with the state of pregnancy in Indian women, study of blood uric acid level in normal menstruating Indian women was also undertaken along with normal and toxaemic subjects.

Experimental

Forty-one normal menstruating Indian women were studied for their blood uric acid contents for comparison with blood uric acid in normal and toxaemic pregnancy.

For normal pregnancy 113 normal pregnant subjects, varying from 6th month to 9th month, and 35 normal post-partum subjects were studied.

For toxaemic pregnancy 65 toxaemic subjects, varying from 6th to 9th month, and 18 post-partum toxaemic subjects were studied. The ages of all these subjects varied from 20 to 35 years. The pregnant subjects were from the Wadia Maternity Hospital, Bombay. The normal menstruating subjects were from Nursing Staff of the same Hospital.

Diet of all the subjects was a mixed one with occasional meat. All the subjects consumed milk.

The estimation of blood uric acid was done according to Brown (1926) on a fasting blood sample.

Results and Discussions

Table 1 shows the blood uric acid averages in normal menstruating, normal and toxaemic pregnancy.

The average blood uric acid in normal menstruating Indian subjects was 2.92 mg. per cent. The frequency distribution of these 41 normal menstruating Indian subjects showed that 57.7 per cent lie within the range of significant variation.

In case of all the 113 cases of normal pregnancy, the blood uric acid content averaged to 2.94 mg. per cent with a standard deviation of ±0.34. Frequency distribution of these normally pregnant subjects showed that 70.4 per cent lie within the range of significant variation; 35 normal post-delivery subjects gave a blood uric acid average of 2.98 mg. per cent with a standard deviation of ± 0.23.

In case of the 65 toxaemic subjects studied, the blood uric acid content was 3.46 mg. per cent with a standard deviation of ± 0.49. Of these 65 toxaemic subjects 25 were within the range of significant variation. The blood uric acid of 18 toxaemic subjects after delivery was 3.21 mg. per cent with a standard deviation of ± 0.33.

It will be seen that the average blood uric acid for normal menstruating Indian subjects of this study is 2.92 mg. per cent with a range of 2.32 to 3.38 mg. per cent. According to Hawk and Bergeim (1938), Folin and Swedberg (1930) the average blood uric acid is 2.5 mg%. Gokhale (1939) gives an average of 3.02 mg. per cent with a range of 2.02 to 3.82 mg. per cent for his series of 126 normal Indian subjects.

The blood uric acid in normal pregnancy for all months grouped together is 2.94 mg. per cent in the present study showing that there is no change during normal pregnancy. Nayar (1940) after his study of blood uric acid in 43 normal pregnant subjects in Madras found that blood uric acid in all cases lies within normal limits. He gives an average of 3.15 mg. per cent for normal pregnancy.

Statistical analysis of the results obtained in the present study, evaluated according to Hill (1950), shows that there is no difference in the blood uric acid level in normal pregnancy and normal menstruating subjects and during the progress of pregnancy.

The blood uric acid in all months grouped together in toxaemic pregnancy is 3.46 mg. per cent as against 2.92 mg. and 2.94 mg. per cent in normal menstruating and normal pregnancy respectively. Statistical comparison of the blood uric acid level in normal menstruating and normal pregnancy with toxaemic pregnancy showed that the difference is statistically significant. According to Stander (1932) the blood uric acid can be regarded as a fairly safe criterion of the severity of toxaemia. According to Stander and Cadden (1934) the average concentration of blood uric acid in eclampsia and pre-eclampsia is 6.5 mg. and 4.5 mg. per cent respectively. According to Chesley (1939, 1943, 1944 & 1950) the ratio of uric acid to non-protein nitrogen is increased in toxaemia. Nayar (loc. cit) reported the average blood uric acid to be 5.3 mg. per cent in eclampsia after a study in Indian subjects in Madras.

TABLE I

Comparison of Blood Uric Acid in Normal Menstruating, Normal and Toxaemic Pregnancy Subjects

	Normal Pregnancy					*Toxaemic Pregnancy*				
Month	No. of cases	Range mg.%	Average mg.%	Standard deviation	Standard error	No. of cases	Range mg.%	Average mg.%	Standard deviation	Standard error
6th	30	2.40 to 3.66	2.98	± 0.30	0.055	13	2.90 to 4.96	3.52	± 0.38	0.1054
7th	29	2.00 to 3.56	2.88	± 0.35	0.056	12	2.88 to 4.06	3.38	± 0.36	0.1047
8th	27	2.40 to 3.68	2.91	± 0.28	0.055	22	2.65 to 4.80	3.55	± 0.56	0.1211
9th	27	2.28 to 3.73	2.98	± 0.30	0.0515	18	2.33 to 4.25	3.35	± 0.48	0.1147
All months together	113	2.00 to 3.73	2.94	± 0.34	—	65	2.33 to 4.96	3.46	± 0.49	—
Post-delivery	35	2.45 to 3.72	2.98	± 0.23	0.041	18	2.14 to 3.86	3.21	± 0.33	0.0799
Normal menstruating	41	2.32 to 3.38	2.92	± 0.20	0.036	—	—	—	—	—

In the course of the present study, in one patient admitted with severe toxaemia (B.P. 200/120) and accidental haemorrhage, the blood uric acid shot up to 10.0 mg. per cent from the initial 6.0 mg. per cent when she died.

Summary and Conclusions

(1) Results of blood uric acid contents in the case of 272 Indian female subjects has been presented statistically.

41 Normal menstruating subjects.
113 Normal pregnancy.
35 Post-delivery, normal subjects.
65 Toxaemic pregnancy.
18 Post-delivery, toxaemic subjects.

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(2) The blood uric acid values obtained for normal menstruating Indian subjects:— 2.92 mg. per cent — have been found to fairly agree with those obtained for normal Indian men and for American and European normals.

(3) The results showed that the blood uric acid level is not affected at all in normal pregnancy. The results obtained for the different durations of pregnancy showed that the duration has no effect on blood uric acid level.

(4) In toxaemic pregnancy, the uric acid level is increased as compared to that in normal menstruating and normal pregnant Indian subjects. The duration of pregnancy, however, has no effect on initial increase in blood uric acid obtained in toxaemic pregnancy.

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References

1. Brown, D. D.: J. Biol. Chem. **38**: 123, 1926.
2. Bunker, C. W. O. and Mundell, J. J.: J.A.M.A. **82**: 826, 1924.
3. Chesley, L. C.: Am. J. Obst. & Gynec. **38**: 430, 1939.
4. Chesley, L. C.: Surg. Gynec. & Obst. **76**: 589, 1943.
5. Chesley, L. C.: Am. J. Obst. & Gynec. **48**: 565, 1944.
6. Chesley, L. C.: Am. J. Obst. & Gynec. **59**: 960, 1950.
7. Crawford, M. D.: J. Obst. & Gynec. Brit. Emp. **46**: 549, 1939.
8. Crawford, M. D.: J. Obst. & Gynec. Brit. Emp. **47**: 63, 1940.
9. Crawford, M. D.: J. Obst. & Gynec. Brit. Emp. **48**: 60, 1941.
10. Folin, O. and Svedberg, A.: J. Biol. Chem. **88**: 715, 1930.
11. Gokhale, S. K.: I.J.M.R. **26**: 675, 1939.
12. Harding, V. D., Allen, K. I. and Van Wyek, H. B.: J. Obst. & Gynec. Brit. Emp. **31**: 595, 1924.
13. Hawk, P. B. and Bergeim, O.: Practical Physiological Chemistry ed. 11, J. & A. Churchill Ltd.
14. Hill, B.: Principles of Medical Statistics. London, 1950, The Lancet Ltd.
15. Killian, J. A. and Sherwin, C. P.: Am. J. Obst. & Gynec. **5**: 67, 1923.

16. King, E. A. and Dennis, W.: Am. J. Obst. & Gynec. **7:** 409, 1924.
17. Nayar, A. S. M.: J. Obst. & Gynec. Brit. Emp. **47:** 404, 1940.
18. Plass, E. D.: J.A.M.A. **82:** 266, 1924.
19. Schaffer, N. K., Dill, L. V. and Cadden, J. F.: J. Clin. Invt. **22:** 201, 1943.
20. Stander, H. J.: Am. J. Obst. & Gynec. **23:** 373, 1932.
21. Stander, H. J. and Cadden, J. F.: Am. J. Obst. & Gynec. **26:** 856, 1934.
22. Stander, H. J., Duncan, E. E. and Sisson, I. E.: Bull. John Hop. Hosp. **36:** 411, 1925.
23. William, J. L.: J.A.M.A. **76:** 1297, 1912.