

# A STUDY OF SOME NITROGENOUS CONSTITUENTS IN THE NEWBORN INFANTS AND THEIR MOTHERS

UMA JOSHI AND M. L. GUPTA\*

*Department of Physiology, S.P. Medical College, Bikaner-334001*

**Summary:** Blood chemistry of 50 newborn infants and their mothers were studied for nitrogenous constituents of blood, i.e. urea, uric acid, creatinine, total proteins and their fractions. Total serum proteins, albumin and fractions of globulin of infants were found significantly lower than their mothers though the cord blood showed direct relationship to that of the maternal serum proteins. Values of total serum proteins of Indian infants were low as compared to their foreign counterparts. By contrast, globulin level was higher. Though the blood urea levels of infants and their mothers were within the normal range, the mean blood urea level of infants was significantly higher than their mothers. No significant difference was found in the mean uric acid and mean creatinine levels of the cord blood and maternal blood.

<b>Key words:</b>	proteins	metabolic products	blood
	urea	uric acid	creatinine
	infants	mothers	relationship

## INTRODUCTION

Very little is known about the normal levels of the biochemical constituents of the blood in the newborn infants, particularly as regards protein and their metabolic product like urea, and creatinine. A few studies of this nature have been carried out in some parts of India, (8, 12, 17). However, in Rajasthan which has its own racial, nutritional and socio-economic peculiarities, no such survey has been carried out. The present investigation was carried to establish the normal values of proteins and other nitrogenous constituents of the blood in the newborn infants and to correlate them with that of maternal blood.

## MATERIALS AND METHODS

Fifty newborn infants and their mothers who had normal delivery in the Maternity and Child Welfare Centres at Jaipur were included in the study.

The fetal blood was collected from the umbilical cord immediately after the birth of the child, but prior to the ligation. The mother's blood was drawn from a vein within 2

---

\*Present address : Principal, R.N.T. Medical College, Udaipur (Rajasthan)

to 4 hours of the delivery. The blood samples were collected in two clean and dry oxalated and non-oxalated glass vials, in order to carry out the estimations of urea (18), uric acid (4), creatinine (5), total protein (6) and electrophoretic pattern of proteins (16).

## RESULTS AND DISCUSSION

In the present study the total serum proteins of the cord is  $5.2 \pm 0.6$  gm% with a range of 4.3 to 6.2 gm%. This is slightly lower than those reported by Kulkarni 5.64 gm% (8), Dutta-Chowdhary, 5.52 gm% (3) and Udani, 5.87 gm% (17). Our values are in agreement with that of Ramakumar *et al.* 5.46 gm% (12) possibly because their observations were carried in Northern India, i.e., in the same region in which Rajasthan is situated. These values are comparable to 5.31 gm% reported by Stainier *et al.*, (15) from Africa, but are considerably lower than those reported by Longworth *et al.*, 6.18 gm% (10) and Brown *et al.*, 6.2 gm% (2) from U.S.A. The low values in Indians are possibly due to poor nutritional status. No significant difference in these values has been observed in the male and female infants.

In premature infants the values of urea, and creatinine are higher while that of total proteins and their fractions, except gamma globulin are lower than that of full term infants. The differences are statistically significant only in cases of blood urea, serum total proteins and serum albumin, the 'P' values being  $<0.001$ ,  $<0.01$  and  $<0.05$  respectively (Table I).

TABLE I: Mean values of blood urea, uric acid, creatinine, serum total proteins and their fractions in newborn according to their birth weight.

Birth weight		Urea mg %	Uric acid mg%	Creatinine mg%	Total proteins gm%	Albumin gm%	Globulins			
							Alpha <sub>1</sub>	Alpha <sub>2</sub>	Beta gm%	Gamma gm%
More than 2.5 kgs	Mean	27.39	2.90	1.27	5.30	2.90	0.27	0.45	0.59	1.03
	SD	$\pm 4.10$	$\pm 0.08$	$\pm 0.48$	$\pm 0.51$	$\pm 0.40$	$\pm 0.16$	$\pm 0.15$	$\pm 0.16$	$\pm 0.22$
2.5 kgs and less	Mean	34.41	2.76	1.41	4.90	2.57	0.26	0.42	0.52	1.13
	SD	$\pm 4.10$	$\pm 0.67$	$\pm 0.59$	$\pm 0.33$	$\pm 0.39$	$\pm 0.06$	$\pm 0.14$	$\pm 0.18$	$\pm 0.34$

The total serum proteins of infants varies between 4.3 and 6.2 gm% with a mean of  $5.2 \pm 0.6$  gm%. These levels are lower than that of mothers which lies in the range of

5.1 to 7.0 gm% with a mean of  $6.1 \pm 0.5$  gm%. The difference is highly significant ( $P = < 0.001$ ) and is in agreement with the results of most of the other studies in India and abroad.

A comparison of the maternal and cord blood serum proteins revealed that the total proteins in the cord blood are constantly lower. However, total serum proteins of the cord blood show a progressive rise with the increase in the total protein content of the maternal blood. This observation is in agreement with the results of most of the other workers (7,9,10,12,15).

The serum albumin level of infants is also significantly lower than their mothers. This finding is at a variance to those reported by others. The globulins are also found to be correspondingly lower in the cord (infant's) blood than that of mothers. The observation in respect to their globulin fractions are interesting. The mean gamma globulin concentration in the present study is 1.01 gm% in infants which is at a lower level when compared with the observations of Ramakumar *et al.* (12) who reported a mean gamma globulin level of 1.29 gm% from Patiala. However, these are higher than those reported from temperate zones of U.S.A. by Longsworth *et al.* (10), Orlandini (11) and Siato (13), the mean values being 0.97 gm% and 0.84 gm% respectively. The higher gamma globulin levels in Indian infants may possibly reflect higher exposure of the general population including pregnant women to various infectious diseases leading to a raised titre of gamma globulin in the newborn, achieved by transfer from maternal to fetal circulation (9). The nutritional status of an average Indian woman is lower than that of her Western counterpart and this is reflected in lower levels of serum total protein and albumin observed in the present study.

The mean blood urea level of the infants is higher than that of their mothers which is statistically significant ( $P < 0.05$ ). This shows a concentration gradient across the placenta from foetal to the maternal side. Smith (14) also has reported a slightly higher concentration of urea in fetal blood. The mean blood uric acid level is slightly lower in the cord blood when compared to the maternal blood, whereas the reverse is true in case of mean blood creatinine level. The slight difference in both the cases is not statistically significant ( $P = < 0.5$  and  $< 0.6$  respectively). The blood urea levels of infants are in the range of 19.9 to 35.6 mg% with a mean of 27.88 mg% which corresponds closely to the usually accepted range in adults (20 to 40 mg%). In this respect the present findings are in agreement with Acharya and Payne (1) who reported a mean value of  $29.37 \pm mg$  for the infants.

An attempt has also been made to see the effect of parity on these values. Accordingly, the infants have been classified into three groups. Group A consisted of infants

born to primipara, Group B of infants born to 2nd to 4th gravida, whereas Group C consisted of infants born to 5th or more gravida mothers (Table II).

TABLE II: Mean values of serum total proteins and their fractions (*gm/100 ml*) and of blood urea, uric acid and creatinine in the infants of different birth groups and their mothers.

Birth groups	Subjects		Total protein	Albumin	Globulins				Blood urea	Blood uric acid	Blood creatinine
					Alpha <sub>1</sub>	Alpha <sub>2</sub>	Beta	Gamma			
A	Infants (16)	Mean	5.40	2.95	0.26	0.49	0.61	1.01	26.68	2.81	1.48
		SD	±0.54	±0.38	±0.03	±0.18	±0.21	±0.22	±2.94	±0.37	±0.45
	Mothers (16)	Mean	6.30	3.09	0.33	0.71	0.84	1.28	25.88	2.76	1.17
		SD	±0.40	±0.40	±0.07	±0.23	±0.24	±0.20	±4.40	±0.48	±0.46
B	Infants (21)	Mean	5.10	2.85	0.27	0.43	0.54	0.97	28.16	2.78	1.19
		SD	±0.47	±0.54	±0.09	±0.19	±0.13	±0.24	±4.60	±0.78	±0.55
	Mothers (21)	Mean	6.00	3.10	0.33	0.56	0.84	1.17	24.50	2.84	1.32
		SD	±0.43	±0.45	±0.06	±0.15	±0.14	±0.18	±3.10	±0.62	±0.59
C	Infants (13)	Mean	5.10	2.75	0.29	0.42	0.60	1.07	28.91	3.03	1.29
		SD	±0.80	±0.50	±0.14	±0.22	±0.22	±0.22	±5.90	±0.67	±0.44
	Mothers (13)	Mean	5.80	3.10	0.25	0.49	0.63	1.25	28.47	3.41	1.23
		SD	±0.50	±0.36	±0.07	±0.26	±0.22	±0.30	±3.30	±0.80	±0.54

Figure in parenthesis shows number of observations.

It is evident from these findings that with the increase in the parity, the level of total proteins in the maternal blood as well as in cord blood decreases. The difference in all birth groups was found to be highly significant, the 'p' values being less than 0.001, 0.001 and 0.02 respectively in Groups A, B and C.

The inverse relation between the parity and the blood protein levels of infants and mothers may be explained on the basis of a number of factors contributing to a decline in the level of serum proteins in mothers, like prolonged lactation, lowered standards of diet with increase in the number of children, lack of care of the mothers and short spacing between consequent pregnancies may all add up leading to a decline in the mothers' health in general.

No relationship can, however, be deduced between parity and blood levels of urea, uric acid and creatinine of infants and mothers.

No difference is seen between blood values of male and female infants in the present study.

## REFERENCES

1. Acharya, P.T. and W.W. Payne. Blood chemistry of normal full term infants in 1st forty eight hrs. *Arch. Dis. Child.*, **40** : 430-435, 1965.
2. Brown, D.F., R. B. Mo Gandy, E. Gillie and J.T. Doyle. *Amer. J. Obst. Gynec.*, **77** : 556-561, 1959.
3. Dutta-Choudhari, Rebatti Choudhari, Bijon and Nikhil Roy. Simultaneous study of gamma globulin in Bangali mothers and their newborn infants. *Tran. Roy. Soc. Trop. Med. and Hyg.*, **53** : 91-94, 1959.
4. Folin, O. *J. Biol. Chem.*, **17** : 475, 1914. (Cited in Handbook of Leitz Photometer No. 24022, 1948).
5. Folin and Newton. *J. Biol. Chem.*, **101** : 111, 1933. (Cited in Handbook of Leitz Photometer No. 24022, 1948).
6. Greenberg. *J. Biol. Chem.*, **82** : 545, 1924. (Cited in Handbook of Leitz Photometer No. 24022, 1948).
7. Jenchs, W.P., E.R.B. Smith and E.L. Durrum. The clinical significance of the analysis of serum protein distribution by filter paper electrophoresis. *Amer. J. Med.*, **21** : 387-405, 1956.
8. Kulkarni, B.S., R. S. Satoskar, M. N. Parikh and R. G. Chitre. Electrophoretic studies of serum protein patterns in newborn Indian infants. *Arch. Dis. Child.*, **34** : 393-397, 1959.
9. Kulkarni, B.S., R. S. Satoskar and V. K. Sethi. Electrophoretic serum protein patterns in health and disease. *Ind. J. Physiol. Pharmac.*, **7** : 117-139, 1963.
10. Longworth, L.G., R. M. Curtis and R. H. Pembroke (Jr). The Electrophoretic analysis of maternal and fetal plasma and sera. *J. Clinical Invest.*, **24** : 46-53, 1945.
11. Orlandini, O.T., A. Sass-Kortsak and J. H. Ebbs. Serum gamma globulin level in normal infants. *Pediatrics*, **16** : 575-583, 1955.
12. Ramakumar, L., H. Singh and S.C. Sood. Serum proteins in newborn infants. *Indian Paediatrics*, **1** : 421-427, 1964.
13. Saito, M., I.F. Gittleman, J.B. Pincus and A.E. Sobel. Plasma protein patterns in premature infants of varying weights on the first day of life. *Paediatrics*, **17** : 657-661, 1956.
14. Smith, C.A. The Physiology of newborn infants, 3rd ed. C.C. Thomas, U.S.A. 1959.
15. Stanier, M.W., M.D. Thomson. The serum protein levels of newborn African infants. *Arch. Dis. Child.*, **29** : 110-112, 1954.
16. Tiselius, A. A new apparatus for electrophoretic analysis of colloidal mixtures. *Trans. Faraday Soc.*, **33** : 524-531, 1937. (Cited in A manual of paper chromatography and paper electrophoresis. 2nd Ed. 1958).
17. Udani, P. M. and R. S. Panvalkar. A study of serum protein patterns in children in health. *Indian J. Child Health*, **12** : 496-501, 1963.
18. Varley, H. Practical Clinical Biochemistry (E.L.B.S.) 4th ed. page 158-159, 1969.