A COMPARATIVE STUDY OF UREA CONTENT IN MATERNAL BLOOD, CORD BLOOD, AND AMNIOTIC FLUID IN NORMAL AND TOXAEMIC PREGNANCIES AND ITS SIGNIFICANCE IN RELATION TO FOETAL OUTCOME

by

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Toxaemia of pregnancy is one of the most formidable risks of child bearing. In addition to increasing maternal morbidity and mortality, toxaemia of pregnancy is a major factor responsible for foetal loss. The severity of disease directly affects the perinatal mortality. In this study we have tried to correlate maternal blood urea, cord blood urea and amniotic fluid urea with the severity of the disease. Our aim is to study its prognostic value and to forecast foetal well being.

Material and Methods

In this study we have estimated blood urea level in 25 non-pregnant healthy females. Maternal blood urea, cord blood urea and amniotic fluid urea levels were estimated in 25 pregnant healthy females. We have also investigated maternal blood urea, cord blood urea and amniotic fluid urea in 40 patients of toxaemia of pregnancy out of these 30 patients were having pre-eclampsia and 10 eclampsia. The cases of toxaemia were divided into three groups as follows.

Mild & Moderate Pre-eclampsia: This group included cases with blood pressure upto 160/100 mm Hg with detectable oedema and proteinuria.

Severe Pre-eclampsia: This group included cases with blood pressure more than 160/100 mm of Hg with oedema and proteinuria.

Eclampsia: These cases had varying degree of hypertension, oedema and proteinuria with convulsions.

Birth weight and length of the newborns were also recorded at the time of birth.

Investigations

1. Albumin was tested in urine by boiling test.
2. Blood pressure was recorded.
3. Estimation of urea level in maternal blood cord blood and amniotic fluid was done by Nesslerisation method as described by King and Wooton, 1959.

Collection of Sample

1. *Maternal blood*: 2 ml. of blood was taken from antecubital vein of mother and collected in oxalate vial.

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2. *Cord blood*: 2 ml of cord blood was taken at the time of delivery and collected in oxalate vial.

3. *Amniotic fluid*: 20 cc. amniotic fluid was collected by a syringe with wide bore needle by direct puncture of membranes at the end of first stage of labour and collected in a dry plain vial.

Observations

Blood in normal healthy non-pregnant females ranged from 18-30 mg% with a mean value of 23.52 mg%.

TABLE I

Comparison of Maternal Blood Urea Between Normal Pregnancy and Different Degrees of Toxaemia

Group of cases	No. of cases	Mean	S.D.	t. value	df.	p. value
1. Normal pregnancy	25	19	2.62	6.113	43	.001
Mild & Moderate P.E.T.	20	25.7	4.31	—	—	highly significant
2. Normal pregnancy	25	19	2.62	6.55	33	.001
Severe P.E.T.	10	30.7	5.31			highly significant
3. Normal pregnancy	25	19	2.62	8.254	33	.001
Eclampsia	10	36.5	6.50			highly significant
4. Mild & moderate P.E.T.	20	25.7	4.31	2.58	28	.02 significant
Severe P.E.T.	10	30.7	5.31			
5. Severe P.E.T.	10	30.7	5.31	3.47	18	.001 highly significant
Eclampsia	10	36.7	6.50			

Maternal blood urea level showed an increase with the severity of disease.

TABLE II

Comparison of Amniotic Fluid Urea Between Normal Pregnancy and Different Degrees of Toxaemia

Group of cases	No. of cases	Mean	S.D.	t. value	df.	p. value
1. Normal pregnancy	25	21.44	2.583	5.597	43	.001
Mild & Moderate P.E.T.	20	27.95	4.66			highly significant
2. Normal pregnancy	25	21.44	2.583	6.368	33	.001
Severe P.E.T.	10	33.4	5.71			highly significant
3. Normal pregnancy	25	21.44	2.583	9.549	33	.001
Eclampsia	10	40.3	6.03			highly significant
4. Mild & moderate P.E.T.	20	27.95	4.66	4.05	28	.001
Severe P.E.T.	10	33.4	5.71			highly significant
5. Severe P.E.T.	10	33.4	5.71	2.627	18	about .02
Eclampsia	10	40.3	6.03			significant

Amniotic fluid urea level showed an increase with the severiy of toxaemia.

TABLE III

Urea Level in Maternal Blood and Amniotic Fluid in 2 of Maternal Deaths in Eclamptic Cases

Variable	Maternal blood urea mg/100 ml		Amniotic fluid mg/100 ml.	
	Range	Mean	Range	Mean
1	40	43	44	46
2	46		48	

Cord blood urea level increased with increase in the degree of toxaemia and mean birth weight decreased with increase in mean cord blood urea level.

Discussio

Blood urea level during normal pregnancy was found to range between 15-24 mg% with a mean value of 19 mg% (Table I). No significant differnce was

TABLE IV

Comparison of Cord Blood Urea in Normal Pregnancy and Different Degrees of Toxaemia

Group of cases	No. of cases	Mean	S.D.	t. value	df.	p. value
1. Normal pregnancy	25	19.84	2.608	5.48	43	.001
Mild & Moderate P.E.T.	20	26.4	4.82			highly significant
2. Normal pregnancy	25	19.84	2.608	6.53	33	.001
Severe P.E.T.	10	31.9	5.60			highly significant
3. Normal pregnancy	25	19.84	2.608	8.544	33	.001
Eclampsia	10	37.8	6.44			highly significant
4. Mild & moderate P.E.T.	20	26.4	4.82	2.653	28	0.01 significant
Severe P.E.T.	10	31.9	5.60			
5. Severe P.E.T.	10	31.9	5.60	2.18	18	0.05
Eclampsia	10	37.8	6.44			significant

Mean cord blood urea level showed an in crease with the severity of toxaemia.

TABLE VI

Relationship Between Period of Gestation, Mean Birth Weight, Mean Birth Length and Mean Umbilical Cord Blood Urea in Cases of Normal Weight Infants Born to Normal Pregnant Females

Period of gestation	No. of cases	Mean birth Wt. (gms)		Mean birth length (cms)		Mean cord blood urea mg/100 ml.	
		Mean	S.D.	Mean	S.D.	Mean	S.D.
37	10	2780	139.8	48.1	.875	19.9	3.10
38	6	2983	518.3	49.4	.970	19.66	2.58
39	2	3125	671.7	50.5	.707	19.55	.707
40	4	3200	437.7	50.75	.5	20.0	2.82
41	3	3466	493.2	57	1	20.0	3.0

Birth weight and length increased with period of gestation, whereas cord blood urea level had no relation with period of gestation or birth weight in babies of normal women.

TABLE V

Cord Blood Urea Values in Relationship to Infant Mortality

Variable	No. of cases	Cord blood urea (mg/100 ml)	
		Range	Mean
Babies died after birth	16	25-45	33.875
Still birth	3	30-46	36.66
Alive birth	21	18-38	27.285

Babies who died after birth had much higher levels of cord blood urea than the babies who survived.

were made by Sinha and Mukherjee (1973), who found mean maternal and cord blood urea value of 13.80 mg/100 ml and 14.35 mg/100 ml respectively.

Sharma *et al* (1976) also had similar findings as they reported mean maternal and cord blood urea of 19.75 mg/100 ml and 19.98 mg/100 ml respectively. All these observations suggest that urea is found in almost equal concentration in the blood of mother and foetus.

We did not find any effect of period of gestation and parity on umbilical cord

TABLE VII

Birth Weight, Period of Gestation and Cord Blood Urea in Different Degrees of Toxaemia

Severity of toxaemia	No. of cases	Birth weight (gms.)		Period of gestation (weeks)		Cord blood urea mg/100 ml	
		Range	Mean	Range	Mean	Range	Mean
1. Mild and moderate pre-eclampsia	20	1700-2850	2270	36-40	37.7	18-35	26.4
2. Severe P.E.T.	10	1700-2200	1865	36-40	37.5	25-41	31.9
3. Eclampsia	10	1500-2100	1800	36-38	36.9	26-46	37.8

found in blood urea levels in patients of different parity and gestation period. The average maternal blood urea level of 19 mg/100 ml during normal pregnancy was found to be significantly lower than the average value of 23.52 mg% in healthy non-pregnant females of control group. Our findings in this regard were lower than Gupta *et al* (1963). 22 mg% and a little higher than Cadden and Farris (1936), 15.19 mg% and Purandare and Agashe (1959), 16.1 mg%.

Our findings resemble closely with Kishore and Tandon (1965), 18.75 mg%.

We found that mean maternal blood urea level 19 mg% and cord blood urea level 19.84 mg% during normal pregnancy resembled each other closely (Tables I & IV). Similar observations

blood urea level. We found mean amniotic fluid urea level (21.44 mg%) to be significantly higher than mean maternal blood urea level 19.84 mg% (Tables I & II). Similar observations have been made by Zangesmeister and Meissl (1903), William and Bargen (1924), Makepeace *et al* (1931), and Shrewsburg (1933). We did not find any significant difference in mean amniotic fluid urea levels in women of different gestation period and parity.

We found that mean birth weight and birth length increases with period of gestation in normal pregnancy group (Table VI). Mean cord blood urea level however showed no corelation with increase in birth weight and gestation period. An insignificant rise or fall in an irregular manner was found in mean cord

blood urea level with increase in period of gestation. Our observations of mean cord blood urea levels of 19.84 mg/100 ml in normal weight babies born to normal healthy pregnant females resemble those of Kilpatrich and Mackay (1965) who have observed a mean cord blood urea of 18.7 gm/100 ml in 82 normotensive pregnancies.

We found that urea levels in maternal blood, amniotic fluid and cord blood of women having mild and moderate toxaemia were significantly higher than the same levels in normal pregnancy group (Tables I, II & IV). Mean value of maternal blood urea level in toxaemia (Mild & Moderate) cases was 25.7 mg/100 ml, this resembled closely with the findings of Kishore and Tandon (1965) whose mean value was 24.6 mg/100 ml. Comparatively higher values have been reported by Dieckmann and Pottinger (1952) i.e. 28 mg/100 ml and Gupta *et al* (1963) e.i. 29.3 mg/100 ml.

Our mean cord blood urea value (26.4 mg/100 ml.) in mild and moderate pre-eclampsia cases is slightly higher than those observed by Sinha and Mukerjee (1973) and Sharma *et al* (1976) whose values were 18.20 mg% and 22.28 mg% respectively.

The amniotic fluid urea level (27.95 mg/100 ml) observed in the present series is slightly lower than those of Saxena and Kharduval (1971) and higher than those of Sinha and Mukerjee (1973) whose values were 38.21 mg/100 ml., 23.70 mg/100 ml. respectively in mild and moderate pre-eclampsia.

In the 10 cases of severe pre-eclampsia in the presen series mean maternal blood urea level was 30.7 mg/100 ml. mean cord blood urea level was 31.9 mg/100 ml and mean amniotic fluid urea level was 33.4 mg/100 ml. These values are significantly higher than the same values in normal pregnancy group. Our mean maternal blood urea values in severe P.E.T. group resembled with the findings of Kishore and Tandon (1965) and Saxena *et al* (1971) whose values were 30.25 mg/100 ml. and 30.78 mg/100 ml. respectively.

The values of maternal blood and cord blood urea in severe P.E.T. group were significantly higher than the mild and moderate P.E.T. groups, whereas amniotic fluid urea level in severe P.E.T. group showed highly significant rise above mild group.

In 10 cases of eclampsia mean maternal blood urea level was 36.5 mg/100 ml, mean cord blood urea level was 37.7 mg/100 ml. and amniotic fluid urea level was 40.3 mg/100 ml. These values are significantly higher than the same values found in normal pregnancy group. Our findings in eclampsia group resemble with observations of Prabhawati (1957), Sinha *et al* (1973).

In our study urea levels in maternal blood, cord blood and amniotic fluid in eclampsia group showed significant rise above the same levels in severe pre-eclampsia group.

From this study we conclude that urea levels show a rise with increasing severity of toxaemia in maternal blood, cord blood and amniotic fluid. The rise in amniotic fluid urea level was more than that in maternal blood urea. Therefore, estimation of maternal blood urea concentration may serve as a guide to severity of disease. In this study, maternal death rate in eclampsia was 20%. These 2 women had mean blood urea and amniotic fluid urea level of 40 mg/100 ml and 46 mg/100 ml, and 4 mg/100 ml and 48 mg/100 ml respectively.

Infant mortality was 30% in mild pre-eclampsia 60% in severe pre-eclampsia

and 70% in eclampsia. In 16 new born infants who died after birth, mean umbilical cord urea level was 33.87 mg%, in 3 still born infants mean cord blood urea was 36.66 mg%. A highly significant corelation existed between the cord blood urea levels and mortality of new born infants. Infant mortality rate in our study was higher than that reported by Chesley and Somers (1941) and Prabhavati (1957). We found that birth weight of infants born to toxaemic mothers falls with increase in the cord blood urea levels. Our findings of inverse relationship between birth weight and cord blood urea level are in agreement with those of Sjostedt (1958), Kilpatrick and Mackay (1965), Sinha and Mukerjee (1973), and Ojha and Sarin (1979) who have corelated high cord blood urea with low birth weight in toxaemia of pregnancy.

Summary

The present study was carried out to estimate maternal blood urea, cord blood urea and amniotic fluid urea in normal pregnant females and toxaemic women and these levels were corelated with birth weight, birth length and gestation period of infants. We found inverse relationship between the birth weight of infants and the umbilical cord blood urea levels at the same gestation period.

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