

A STUDY OF MATERNAL BLOOD SUGAR LEVELS AND NEW BURNS CORD BLOOD SUGAR LEVELS IN RELATION TO BIRTH WEIGHT OF NEWBORNS IN TOXAEMIA OF PREGNANCY

by

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Introduction

Glucose is the principal blood sugar of human foetus, which has been described as a glucose dependent parasite. A close correlation has been observed between fetal glucose uptake, maternal glucose concentration and materno-fetal concentration gradient. Alteration in maternal carbohydrate homeostasis will lead to change in foetal carbohydrate metabolism (Crenshaw, 1970). Toxaemia of pregnancy alters the carbohydrate metabolism similar to that of chemical gestational diabetes and this alteration may be due to maternal beta cell anoxia caused by vascular changes in pre-eclampsia (Singh, 1976).

Present study was undertaken to see the relationship between maternal blood sugar and newborns cord blood sugar levels in toxaemia of pregnancy and its effect on pregnancy outcome.

Material and Methods

The present study was carried out at Associated Group of Hospitals, Bikaner.

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One hundred primigravidae with toxaemia of pregnancy (50 cases of mild, 30 cases of severe pre-eclampsia and 20 cases of eclampsia) and 50 cases of normotensive primigravidae at or near term from all socio-economic stata were included in the present study.

Cases of diabetes, acute or chronic renal diseases and other known clinical disorders were excluded from the study. 2 cc of maternal blood for sugar estimation was taken at or near term (fasting) and also just after delivery was collected in a oxalated vial from antecubital vein. 2 cc mixed blood from cord of baby was also collected.

Blood sugar was estimated by Folin-wu method (Varley, 1969).

Birth weight of the baby was estimated just after delivery.

Observation and Comments

Toxaemia is said to be a disease of primigravidae. On analysing the age, 44% of primi were below the age of 20 years. No statistically significant difference was observed in the age group of mothers in control and toxaemic groups. Minimum

mean birth weight was observed in women below the age of 20 years in control and mild toxæmia, but no such correlation was observed in severe toxæmia.

41.33% of women were illiterate in total group and 48.39% in severe toxæmic group. Mean birth weight of newborn of illiterate mothers were less than of literate mothers in all groups (2.9 Kg to 3 Kg, 2.5 Kg to 2.8 Kg, 2.3 Kg to 2.5 Kg) control, mild toxæmia and severe toxæmia respectively, which is in agreement with Pachuri *et al* (1971).

38.67% of women belonged to socio-economic status III in total group, while 52.93% were of social economic status IV in severe toxæmic group.

Mean birth weight was reduced with lowering of socio-economic class from I to IV in control, and mild toxæmia (3.7 to 2.2 Kg and 2.9 to 2.6 Kg), while in severe toxæmia such relation was not observed. Probably severity of toxæmia affected the continuation of pregnancy irrespective of socio-economic status.

Maternal blood sugar levels were estimated at or near term (fasting) and just after delivery in control and toxæmic group (Table I). A highly significant fall was observed in toxæmia (which was proportional to the severity of disease. $P < .001$). This finding is in agreement with observations of Titus *et al* (1930), Raman (1978). On the contrary, Spellacy (1971) reported hyperglycaemia, while Plummer (1936) found no change in maternal blood sugar level in toxæmia of pregnancy.

During eclampsia Obata (1923) and Widen (1950) observed hyperglycaemia which was explained on the basis of

change in alkali reserve of blood and consequent alteration of hydrogen ions at liver cells resulted in hyperglycaemia. On the other hand, Mukherjee (1952) observed no change in maternal blood sugar. Hypoglycaemia observed in present series which is in agreement with Siegal and Wylie (1933) and Choudhary (1979). Possibly this hypoglycaemia may be due to faulty utilisation of glucose in toxæmia of pregnancy as a result of hormonal imbalance.

There was significant fall in cord blood sugar levels in toxæmia of pregnancy (Table I, $p < .001$). This low cord blood sugar level is due to disturbance of sugar regulatory mechanism reflects either increased demand by fetus or hindrance in the passage, probably liver functions are altered in premature babies (Chaudhary, 1979). When maternal blood sugar levels (after delivery) were compared with cord blood sugar levels, a highly significant positive ($p < .001$) correlation was observed ($MBS > CBS$) (Table II). Maternal hypoglycaemia was associated with fetal hypoglycaemia in toxæmia of pregnancy. Hartman and Jaudon (1937) reported that the cord blood sugar levels are proportional to maternal blood sugar levels.

When mean birth weight was analysed in relation to Maternal blood sugar and cord blood sugar levels (Table III), it was found 3.0, 2.7, 2.4 and 2.3 Kg in control, mild pre-eclampsia, severe pre-eclampsia and eclampsia respectively. There seems to be a direct correlation between maternal blood sugar, cord blood sugar levels and mean birth weight. Maternal hypoglycaemia resulting in foetal hypoglycaemia and low birth weight babies, David *et al* (1976) also reported the same finding.

TABLE I
Maternal Blood Sugar (M B S) and Cord Blood Sugar (C B S) Levels in Control and Toxaemia of Pregnancy

Groups	M B S Mg% at or near term (fasting)			M B S Mg% after delivery			C B S Mg%			P
	Mean	S.D.	S.E.	Mean	S.D.	S.E.	Mean	S.D.	S.E.	
1. Control	89	7.17	1.43	95.24	8.68	1.75	71.76	9.82	1.96	
2. Mild Pre-eclampsia	80	7.44	1.48	86.20	7.61	1.52	62.16	8.60	1.72	<.001
3. Severe Pre-eclampsia	73	10.62	2.74	77.46	12.32	3.18	53.06	11.93	3.08	<.001
4. Eclampsia	70	10.32	3.25	73.4	9.95	3.15	49.50	12.96	4.10	<.001

TABLE II
Relation of Maternal Blood Sugar (MBS) (After Delivery) and Cord Blood Sugar Levels in Control and Toxaemia of Pregnancy

Values	Control		Mild Pre-eclampsia		Severe Pre-eclampsia		Eclampsia	
	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.
M B S (Mg%)	95.24	1.75	86.20	1.52	77.46	3.18	73.4	3.15
C B S (Mg%)	71.76	1.96	62.16	1.72	53.06	3.08	49.5	4.10
Difference	23.48	—	24.04	—	24.40	—	23.9	—
t	8.96	—	8.28	—	5.52	—	4.62	—
p	<.001		<.001		<.001		<.001	

TABLE III

Relation of Mean Maternal and Cord Blood Sugar Levels With Birth Weight of Baby in Control and Toxaemia of Pregnancy

Group	MBS (Fasting) at or near term mg%	MBS after delivery mg%	CBS mg%	MBS-CBS	Mean birth weight (gm%)
Control	89	95.24	71.76	23.48	3000.00
Mild pre-eclampsia	80	86.20	62.16	24.04	2723.20
Severe pre-eclampsia	73.13	77.46	53.06	24.40	2483.33
Eclampsia	69.60	73.40	49.50	23.90	2310.00

Low birth weight babies were 29.33% in total group, while 59.08% in toxaemic group. Low carbohydrate diet, low socio-economic status and faulty utilisation of glucose in toxaemia of pregnancy probably results in low cord blood sugar levels and placental insufficiency leading to I U G R and low birth weight babies.

In present study no relation between mean birth weight and mode of delivery was observed. 54.16% of babies were males and heavier than females in all the groups. 3.0 to 2.9 Kg, 2.7 to 2.6 Kg, 2.7 to 2.2 Kg) in control, mild and severe toxaemic group respectively.

Summary

150 cases of toxaemia of pregnancy and normotensive primigravidae were included in this study. It was observed that toxaemia of pregnancy results in maternal and fetal hypoglycaemia resulting in I U G R and low birth weight babies. The birth weight of baby is directly related to severity of toxaemia, irrespective of age and socio-economic status of mother.

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