

FACTORS AFFECTING BIRTH WEIGHT WITH SPECIAL REFERENCE TO TOXEMIA OF PREGNANCY

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SUMMARY

Birth weight of the babies of 50 patients of toxemia of pregnancy was compared with that of 50 newborns of healthy mothers. A difference, statistically highly significant, was observed with a mean birth weight of 2.19 ± 0.08 kg in the former group and 2.76 ± 0.07 kg in the latter group. The weight of the placenta also showed a significant difference. It was 448.2 ± 14.04 G in normal pregnancy. When compared in mild and severe toxemia it was found to be 410.0 ± 16.58 G and 396.0 ± 19.82 respectively. These values were statistically insignificant.

Introduction

Birth weight varies from child to child, 2.5-3.5 kg. being considered to be normal. A large number of physiological and pathological conditions are responsible for a change from the normal. Parity, weight of the mother and socio-economic status reflecting nutritional standards are few of the very commonly encountered factors. Toxemia of pregnancy is a pathological condition which is responsible to quite some extent for prematurity and low birth weight. An attempt has been made in the present study to evaluate these factors and to discuss the possible reasons of low birth weight in toxemia.

Material and Methods

The present study was conducted on 100 pregnant females admitted in the

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P.B.M. Hospital attached to S.P. Medical College, Bikaner. Fifty of them were suffering from toxemia of pregnancy and the other 50 had normal pregnancy. Their age ranged from 15-35 years.

A detailed case report including the obstetrical history, drug intake, radiation encounter, previous infections and other chronic diseases was taken. Stress was laid upon eliciting their socio-economic status, dietary habits and literacy. On the basis of per capita income the subjects were divided into 5 groups as described by Prasad, 1970 (Table I).

TABLE I
B. G. Prasad Classification for Socio-Economic Group
(Per Capita Income)

Group I	Rs. 300/- and above
Group II	Rs. 150/- to Rs. 299/-
Group III	Rs. 70/- to Rs. 149/-
Group IV	Rs. 30/- to Rs. 69/-
Group V	Rs. 30/-

Detailed physical examination including that of the heart and lungs was performed. A fresh sample of urine was examined especially for the presence of albumin.

After ligation of the cord and proper cleaning the exact weight of the newborn and the placenta was taken. The child and the placenta were examined for evidence of abnormalities, if any.

Results

In the present study the mean birth weight of the newborn in the normal pregnancy group was 2.762 Kg, which is statistically significantly higher than 2.199 Kg, the mean birth weight found in the toxemia group ($p < .001$). Besides, a comparison on the placental weight has shown a significant difference in normal and toxemia groups but the difference in placental weight in mild and severe toxemia has not been found to be statistically significant as depicted in Tables II and III.

A study of the birth weight in the various socio-economic groups, divided according to the per-capita income reveals

that a reduction in the birth weight is statistically highly significant ($p < .001$) in toxemic patients of group II. The results are significant in group V. No patient in the present study fell in group I of the classification. However, it is clearly evident that the birth weight has regularly fallen with the decrease in the socio-economic status (Table IV).

A highly significant fall in the birth weight has been found in primigravidas suffering from toxemia although the results are also significant in 2nd, 3rd, and 4th para (Table V). Maternal age has not been found to have any statistically significant effect.

The effect of maternal weight on the birth weight of the child has been studied in the present series. It has been found that the birth weight has fallen with the increase in the weight in toxemia group but has on the contrary, increased in the normal pregnancy group.

Considering the effect of literacy of the mother it has been found that the birth weight in toxemia group is significantly low in patients having primary school education, it is highly significant in those

TABLE II
Birth Weight in Normal Pregnancy and Toxemia

S.N.	Group	Mean	S.E.	P Value
1.	Normal Pregnancy	2.76	0.07	
2.	Toxemia	2.19	0.08	<.001

TABLE III

Placental Weight in Grams in Normal Pregnancy and Toxemia and Various Groups of Toxemia

S.N.	Study group	Mean placental weight	S.E.	P value
1.	Normal pregnancy	448.2	14.04	
	Toxemia	403.0	12.82	<.05
2.	Mild Toxemia	410.0	16.58	
	Severe toxemia	396.0	19.82	<.7

TABLE IV
Mean Birth Weight in Kg. in Relation to Socio-Economic Status

S.N.	Study group	Socio-economic group	Mean birth weight	S.E.	P value
1.	Normal pregnancy	II	3.14	0.08	
	Toxemia		2.50	0.13	<.001
2.	Normal pregnancy	III	2.61	0.08	
	Toxemia		2.17	0.09	<.01
3.	Normal pregnancy	IV	2.15	0.21	
	Toxemia		1.7	0.10	<.1
4.	Normal pregnancy	V	1.75	—	
	Toxemia		1.75	—	

TABLE V
Birth Weight in Kg. in Relation to the Parity of the Mother

S.N.	Parity	Study group	Mean with weight	S.E.	P value
1.	Primipara	Normal pregnancy	2.67	0.10	
		Toxemia	2.09	0.82	<.001
2.	Para 1-3	Normal pregnancy	2.80	0.11	
		Toxemia	2.33	0.14	<.02
3.	Para 4	Normal pregnancy	2.67	0.21	
		Toxemia	2.45	0.37	<.01

having secondary school education. The effect is insignificant in illiterate patients and those having middle school education (Table VI).

Discussion

In the present study the birth weight of newborn of toxemic mothers has been

found to be less than that in normal pregnant mothers. Hendricks and Brenner (1971) found that at an equivalent week of gestation the fetus and placenta of toxemic women weigh less than that found in normal pregnant women. The toxemic patients tend to deliver earlier and, therefore, the perinatal mortality is

TABLE VI
Birth Weight in Kg. in Relation to the Literacy of the Mother

S.N.	Literacy	Study Group	Meant birth weight	S.E.	P value
1.	Illiterate	Normal pregnancy	2.3	0.17	
		Toxemia	1.9	0.11	<.1
2.	Primary	Normal pregnancy	2.59	0.08	
		Toxemia	2.17	0.11	<.01
3.	Middle	Normal pregnancy	2.9	0.16	
		Toxemia	3.17	0.11	<.4
4.	Secondary	Normal pregnancy	3.14	0.11	
		Toxemia	2.33	0.11	<.001

twice as compared to infants of non-toxemic mothers.

The fetus and placenta are significantly lighter in hypertensive mothers. The placental villi in such patients have an abnormally high number of syncytial buds which are proportional to the intensity and particularly to the duration of hypertension. The neonatal weight curve of intrauterine growth is markedly different from the average standard of true premature babies (Cibils, 1974). Long *et al* (1980) have suggested that fetal growth retardation usually precedes the manifest disease in early onset pre-eclampsia. They ascribe hypoglycemia to be the cause of perinatal mortality. Foetal growth retardation has been seen to be more frequent in early onset toxemia reflecting its close association with proteinuric disease. These findings suggest that placental insufficiency, the cause of fetal growth retardation, may predispose to toxemia or an unrecognised disease state resulting in fetal malnutrition, if it is present for a longer period than the clinically apparent toxemia.

In an attempt to correlate the degree of intra-uterine growth retardation and the severity of toxemia, Das *et al* (1963) noted reduction in birth weight only in severe toxemia when systolic blood pressure was over 200 mm of Hg, diastolic blood pressure over 110 mm of Hg, and albuminuria over 5 gm/24 hours. They found it to be less in survivals and more in still births. In comparison to this a fall in the birth weight has been found uniformly in all patients of toxemia in the present study with one common point that the fall is higher in severe toxemia as compared to the mild disease.

Jarvinen *et al* (1958) noted an inverse relationship between the duration of

toxemia and birth weight. Conversely, Gruenwald (1965) found a high incidence of toxemia in the mothers of autopsied small for date infants. Corroboratory findings have been put forth by North (1966), suggesting the fetal growth retardation to be due to abnormalities in the vasculature of the uterus and placenta causing placental insufficiency.

The ultimate effect in both, toxemia and malnutrition, is a reduction in birth weight. An effort has therefore been made to establish an etiologic correlation between the two. According to Choudhuri (1971) during pregnancy the whole maternal organism is under stress and all the systems have to adapt themselves to the new situation. Under stress the adrenal cortical activity is found to be affected which is thought to be one of the factors responsible for toxemia. Low serum albumin and beta globulin levels alongwith a rise in 1, 2 and gamma globulins are similar in both Selye's adaptation syndrome of stress and in toxemia. Further he found toxemia to be more common among people of low socio-economic groups in whom nutritional deficiencies were more common. He stressed upon the deficiency of iron, calcium and thiamine and propounded that toxemia probably resulted due to failure of adaptation of the body to the stress of pregnancy. The present study also confirms the incidence of low birth weight with the decline in the socio-economic status.

Besides other socio-economic factors cigarette smoking has been found to have consistent effect on the birth weight. Comstock *et al* (1971) and Murphy and Muleahy (1971) have hypothesised that hypoxia resulting from increased maternal and fetal carboxy-haemoglobin levels is the causative factor for low birth

weight in mothers who smoke. This factor has not been found to operate in the patients included in the present study.

Bhargava *et al* (1973) considered maternal age below 20 years and primiparity to contribute to low birth weight in conjunction with other factors like previous fetal loss, toxemia and antepartum haemorrhage. Similarly, Kaltreider and Johnson (1976) also found that patients under 19 years of age had a highly significant tendency for low birth weight deliveries. No substantial proof as to the reason of such an occurrence has been put forth.

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