FOETAL AND PLACENTAL WEIGHT CHANGES IN NORMAL PREGNANCY AND PRE-ECLAMPSIA

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It is an established fact that pre-eclampsia, eclampsia and essential hypertension are associated with the depression of foetal growth, presumably as a result of placental insufficiency. A knowledge of the placental coefficient (placental weight foetal weight) may give an indication of the prenatal adversities and of the abnormally small or large placenta.

Most of the workers have observed that the placental weight varies with the foetal weight, but otherwise they have noted no correlation between the two variables. Adair and Thelander (1925) and Calkins (1937) observed a relationship between foetal weight and placental weight. However, the literature contains contradictory data regarding the numerical value of placental coefficient.

Considering the contradictory reports regarding the numerical value and also the clinical significance of the placental coefficient in the literature, it was thought fruitful to undertake the study of placental weight, foetal weight and placental coefficient in normal and in abnormal pregnancies. It was also thought worthwhile to study the relation between gestation period, maternal age, socio-economic status and the parity on the one hand and placental weight, foetal weight and placental coefficient on the other.

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Material and Methods

The patients with ages between 18-40 years, of average height and weight including both primigravida and multigravida, all free from any evidence of other systemic diseases—were taken. Only patients with pregnancy between 36-40 weeks' and livebirths were included. The cases were grouped into two main groups.

Group I—30 normal healthy pregnant women (36-40 weeks) who had no signs of toxaemia and were apparently free from any general disease.

Group II—30 pre-eclamptic women (36-40 weeks) including both mild and severe.

After the delivery of the placenta, a ligature was applied to the cord near its insertion into the placenta, and both membranes and cord were cut away within 1 cm. of placenta which was then gently washed to remove excess blood and liquor. The placenta was then wiped and weighed on an accurate commercial scale. The baby weight was also recorded on the same scale. Placenta was carefully watched for any evidence of placental insufficiency in the form of areas of infarction. Placental and foetal weight ratio was calculated in every case.

Results and Discussion

Foetal Weight in Normal Pregnancy

The foetal weight studies have shown that there is a tendency for the mean foetal weight to rise from 36 weeks upto 40 weeks. (Table III). It was also observed that the foetal weights of the male infants were higher as compared to those of female infants. This confirms the results of the earlier workers who have reported that the sex of the child affects the foetal weight and that the male infants weigh more at birth as compared to female infants (Hendricks 1964).

The results of the present study show that there was no relation between the maternal age and the foetal weight at all the periods of gestation. In addition, the results of present study indicate that at all the periods of gestation the foetal weight decreased with the lowering of socio-economic status of the mother.

Moreover, it was observed that multigravidae gave birth to foetuses with higher weight as compared to those of primigravidae at all the periods of gestation. These observations are quite in agreement with the observations of earlier workers.

In Pre-Eclampsia

The results of the present study indicate that in mild pre-eclampsia, the foetal weight increases with the increase in the period of amenorrhoea, while in severe pre-eclampsia the foetal weight show a trend of decrease. These results are quite in agreement with the observations of Chakarvarty (1967), Morris *et al* (1955) who claimed that foetal growth was retarded in severe pre-eclampsia. The observations of the present study confirm the results reported by Morris *et al* (1955). It seems that the lower values of foetal weights as observed in severe pre-eclampsia may be due to heavy proteinuria (Table I).

TABLE I

Showing Relation Between Foetal Weight and Different Degrees of Albuminuria in Pre-eclampsia

Period of amenorrhoea in weeks	Foetal weight in gms.			
	Alb—Nil or trace	+	++	+++ & ++++
36	2488.3	2900	2335	2333.5
37	2494.5	3405	2724	2191
38	2822.5	—	2500	2497
39	—	—	—	1930
40	2400.0	—	—	—

It has been found that the foetal weight decreases both in mild and severe pre-eclampsia, with the decrease in the socio-economic status of mother at all the periods of gestation. Further in mild pre-eclampsia, the average weight of male infants at birth was higher as compared to that of female infants. Similar observations were made in severe pre-eclampsia (Table II).

In mild and severe pre-eclampsia in multiparas, the infants weighed more at birth as compared to primigravidas.

TABLE II

Showing Relation Between Period of Amenorrhoea, Sex of Child in Mild Pre-eclampsia

Period of amenorrhoea in weeks	Placental weight in gms.		Foetal weight in gms.		Placental co-efficient	
	Male	Female	Male	Female	Male	Female
36	450.8	283.3	2736.0	2183.3	.1594	.1494
37	441.7	602.7	2834	2309	.1577	.1904
38	433.5	400.0	3122.5	1900	0.1383	.2105
39	227	—	1930	—	.1171	—
40	—	300	—	2400	—	.1250

Placental Weight in Normal Pregnancy

Chakarvarty (1967) has observed that the mean placental weight in normal cases tends to increase as pregnancy advances from 36 weeks onwards, but the difference was not statistically significant. The results of the present study show that the mean placental weight in normal cases tends to decrease as the pregnancy advances from 36 weeks onwards (Table III).

TABLE III

Showing Period of Gestation and Mean Values of Placental Weight, Foetal Weight and Placental Coefficient in Normal Pregnancy

Period of amenorrhoea in weeks	Placental weight in gms.	Foetal weight in gms.	Placental coefficient
36	446.6 (14)	2630.1 (14)	.1702 (4)
37	391.7 (9)	2708.5 (9)	.1670 (9)
38	372.5 (4)	2999.2 (4)	.1492 (4)
39	330 (2)	3054 (2)	.1328 (2)
40	—	—	—

As indicated by the present study there is no direct relation between the sex and the size of the child and the placental weight. Gruenwald and Minh (1961) have also observed that the placental weight alone did not determine the size of the baby. However, other workers have agreed that small undernourished full term infants have usually small sized placentae. Rumbolz and his collaboraters (1953 & 1961), Warkany *et al* (1961), Morris *et al* (1955) and Klooster-man (1956) support this viewpoint. The results of the present study confirm the observations of Gruenwald & Minh (1961).

It has been observed that there is no direct relation between age of the mother and placental weight at different periods of gestation. Further, at all periods of gestation, the placental weight decreases with the decrease in socio-economic status of the mother. (Table IV)

In addition, there is no direct relation between the degree of parity and placen-

TABLE IV

Relation Between Socio-economic Status of Mother and Foetal Weight, Placental Weight and Placental Coefficient

Period of gestation	Socio-economic status	Placental weight	Foetal weight	Placental coefficient
36	H	595 (1)	3405 (1)	.1747
	M	440 (5)	2820	.1561
	P	438.1 (8)	2414	.1758
37	H	500 (1)	2900	.1724
	M	403 (5)	2586	.1555
	P	402.6 (3)	2213	.1809
38	H	400 (1)	2700	.1589
	M	363.5 (3)	2432.3	.1496
39	H	360 (1)	2700	.1407
	M	300 (1)	2400	.1250
	P	—	—	—

H—high; M—middle; P—poor.

tal weight. It may also be noted that both in mild and severe pre-eclampsia, there is no relation between the degree of albuminuria and the placental weight (Table V).

TABLE V

Showing Relation Between Placental Weight and Different Degrees of Albuminuria in Pre-eclampsia

Amenorrhoea in weeks	Placental weight in gms.			
	Nil or trace	+	++	+++ & ++++
36	409	500	352	442.3
37	463.1	454	283.7	477.9
38	483.5	—	300	297
39	—	—	—	227
40	300	—	—	—

Placental Coefficient

The placental, foetal weight ratios are termed as placental coefficient (Little 1960). In normal cases, the placental coefficient varied from 0.129 to 0.200 with the average value of 0.1555. The results of the present study confirm the observations of Little (1960).

In male infants the value of placental coefficient has been found to be higher as compared to that of female infants (Table II). However, no direct relation between the maternal age and the placental coefficient was observed. Further, the present study shows that placental coefficient is in no way related with socio-economic status of the mother (Table IV).

It was found during the observations that the placental coefficient varied from 0.1239 to 0.2777. This shows that the values of placental coefficient are higher in pre-eclamptic cases as compared to normal cases. A higher value of placental coefficient in pre-eclamptic cases has been reported by Chakravorty (1967) and by Little (1960).

The study shows that the placental coefficient decreases with the increase of period of gestation (Table VI). However, the sex of child does not have a definite relation with placental coefficient (Table II).

In the present study, the degree of albuminuria was found not to affect the placental coefficient, both in mild and severe pre-eclampsia (Table I). However, both in mild and severe pre-eclampsia the parity of the mother was not found to have any definite bearing on the placental coefficient.

TABLE VI

Relation of Period of Gestation with Placental Weight, Foetal Weight and Placental Coefficient

Duration of amenorrhoea in weeks	Placental weight	Foetal weight	Placental coefficient
36	400.5 (8)	2023	.1555
37	479 (8)	2637	.1701
38	422.2 (3)	2715	.1624
39	—	—	—
40	300 (2)	2400	.1250

Summary

In the study under discussion sixty patients who had been admitted in State Zenana Hospital, Jaipur were studied.

In Normal Pregnancy

(1) Relation of increase in period of gestation. Foetal weight—increase. Placental weight—no significant change. Placental coefficient—decrease. Age of mother. No relation of all three.

(2) Socio-economic status of mother —with its increase. Foetal weight—increase. Placental weight—increase. Placental coefficient—no relation.

(3) Sex of child. Foetal weight—higher in male. Placental weight—no direct relation. Placental coefficient—No definite relation.

(4) Age of mother—Foetal weight, Placental Weight, Placental coefficient. No relation.

(5) Parity—Foetal weight, Placental weight, Placental coefficient. Higher in multigravida. No effect.

In Pre-eclampsia

(1) Period of amenorrhoea—Mild-foetal weight. Increase Placental weight, Severe—foetal weight-Decrease—Placental-weight—No direct relation. Placental coefficient—No direct relation.

(2) Age of mother—No direct relation of all in both mild and severe pre-eclampsia.

(3) Socioeconomic status—with its decrease—Foetal weight decreases, Placental weight, Placental coefficient—No relation.

(4) Sex of child—Foetal weight, more in male, Placental weight, Placental coefficient—No direct relation.

(5) Degree of albuminuria—Foetal weight, Placental weight, Placental co-efficient—No direct relation.

(6) Parity—Foetal weight, Placental weight—higher in multigravida, Placental coefficient—No effect.

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