



## PLACENTAL WEIGHT, BIRTH WEIGHT AND FETAL OUTCOME IN PREECLAMPSIA AND NORMOTENSIVE PREGNANCIES

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**ABSTRACT:** Any insult to placenta during the developmental stage affects the placenta weight and birth weight which in turn affects the growth of fetus in-utero. Preeclampsia is the most important underlying maternal condition to complicate pregnancy and probably the main factor in the genesis of IUGR and reduced placental weight. 100 placentae, 25 from normotensive pregnancies (control group) and 75 from pregnancies associated with preeclampsia (study group) were studied for placental weight, birth weight and fetal placental weight ratios. Patients of all ages and parity with period of gestation more than 35 weeks were taken for study. Findings were correlated with fetal outcome. Mean birth weight of newborns and mean placental weight were significantly lower in study group than control group ( $p < 0.001$ ) while fetal-placental ratio were almost constant in both groups and the difference was insignificant ( $p = 0.8598$ ). Fetal outcome was significantly poor in preeclampsia as compared to normotensive pregnancies ( $p < .0001$ ). Impaired placental function in preeclampsia is directly related to low placental and birth weights and poor fetal outcome. This information may be useful in patients counseling and hence a useful guide for managing subsequent pregnancies.

**Key words:** Placenta, Birth weight, Preeclampsia, Normotensive pregnancies

### INTRODUCTION

The growth and development of fetus in utero reflects a balance between fetus, placenta and mother. The placenta is an organ providing nutrition and respiratory support to sustain fetal life. The fetus depends both on an adequate fuel supply and ability of the maternal vascular tree to deliver an adequate fuel supply to the fetal-placental unit. Any impairment in maternal haemostasis may have an adverse effect on fetal growth and development [1]. Preeclampsia is the most important complication of human pregnancy affecting about 5-10% of pregnancies world-wide. It is a major contributor to maternal and fetal morbidity and mortality. The origin of preeclampsia, a disease unique to pregnancy is still matter of debate and numerous theories have been proposed. Preeclampsia develops after a partial disorder in the process of placental formation perhaps due to deficiency of trophoblastic invasion by its spiral arteries and acute atherosclerosis in its myometrial segments [2]. In great majority of cases associated with preeclampsia, the placenta shows the effects of low uteroplacental flow and is smaller on an average than from an uncomplicated pregnancy thus leading to fetal growth retardation. Thus it was assumed that placental study will give information about the maternal diseases which cause IUGR or unsatisfactory outcome. With these aspects in mind, this study was conducted.

### MATERIALS AND METHODS

The present study was conducted in the Department of Anatomy, Government Medical College, Patiala. The placentae were collected from labour room and from gynecological operation theatre, Rajindra Hospital, Patiala. A total of 100 placentae were studied, out of which 75 cases were associated with preeclampsia or pregnancy induced hypertension (study group) and 25 cases were associated with normotensive pregnancy (control group). Patients of all ages and parity with period of gestation more than 35 weeks were taken for study.

The placentae were grouped depending on the degree of hypertension as described by Cunningham et al [3].

1. Normotensive < 140/90 mmHg
2. Mild hypertension  $\geq 140/90$  - <160/110 mmHg
3. Severe hypertension  $\geq 160/110$  mmHg

The placentae with cord and membranes were collected immediately after delivery and examined grossly for any abnormality of cord and membranes. Any gross abnormality in size and shape, gross infarcts, hemorrhages, necrotic areas and calcification was observed. Placentae were given code numbers and preserved in adequate amount of 10% formalin. The placentae were examined grossly and following morphological features were noted.

1. Weight of the placenta
2. Site of insertion of umbilical cord
3. Assuming the placenta to be a perfect circle, the mean diameter was estimated.
4. Volume of placenta was recorded by water displacement technique.
5. Birth weight of the new born was recorded in each case to calculate feto-placental ratio.

Besides gross morphological examination of placenta, clinical evaluation of patients and routine hematological and biochemical tests were also considered.

Data was compiled in a performa. Observations were interpreted and compared with the control.

## RESULTS

**Table 1. Placental weight in study and control group.**

Placental weight (gms)	Study group		Control group	
	No:	%	No:	%
201 – 250	1	1.33	0	0
251 – 300	11	14.67	0	0
301 – 350	15	20	0	0
351 – 400	22	29.33	3	12
401 – 450	16	21.33	5	20
451 – 500	8	10.67	8	32
501 – 550	2	2.67	6	24
551 – 600	0	0	2	8
601 – 650	0	0	1	4
Total	75	100	25	100

**Table 2. Birth weight in study and control group**

Birth weight (gms)	Study group		Control group	
	No:	%	No:	%
501 – 1000	2	2.67	0	0
1001 – 1500	3	4	0	0
1501 – 2000	14	18.67	0	0
2001 – 2500	29	38.67	0	0
2501 – 3000	12	16	11	44
3001 – 3500	12	16	7	28
3501 – 4000	3	4	7	28
Total	75		25	

**Table 3. Feto-placental ratio in study and control group.**

Feto-placental ratio	Study group		Control group	
	No:	%	No:	%
3.6 – 4.0	1	1.33	0	0
4.1 – 4.5	2	2.67	0	0
4.6 – 5.0	7	9.33	1	4
5.1 – 5.5	2	2.67	5	20
5.6 – 6.0	13	17.33	4	16
6.1 – 6.5	16	21.33	10	40
6.6 – 7.0	21	28	4	16
7.1 – 7.5	5	6.67	1	4
7.6 – 8.0	6	8	0	0
8.1 – 8.5	1	1.33	0	0
8.6 – 9.0	1	1.33	0	0
Total	75		25	

**Table 4. Statistical Analysis of Placental weight, Birth weight and Feto-placental ratio in study and control group.**

Variables	Group	Range	Mean	SD	T value	P value	Significance
Placental wt	Study	250-542	375.95	67.195	5.7502	< 0.001	Significant
	Control	385-518	458.28	42.13			
Birth weight	Study	1000-3800	2422	613.27	3.5645	< 0.001	Significant
	Control	2500-3500	2878	305.53			
Feto-placental ratio	Study	3.7-8.6	6.343	0.953	0.1770	=0.8598	Insignificant
	Control	5.7-7.2	6.308	0.364			

**Table 5. Fetal outcome in study and control group.**

Group	Appropriate for Gestational Age (AGA)		Intrauterine Growth Retardation (IUGR)		Intrauterine Death (IUD)		Total	$\chi^2$	P value	Significance
	No:	%	No:	%	No:	%				
Study	32	42.67	33	44	10	13.33	75	25.1	< 0.0001	Highly Significant
Control	25	100	0	0	0	0	25			

The placental weight and birth weight are significantly reduced in study group (preeclampsia) (Table 1&2). The mean weight of placentae in study group (preeclampsia) was  $375.95 \pm 67.195$  gms and in control group (normotensive), the mean placental weight was  $458.28 \pm 42.13$  gms. In study group and control group, mean birth weight was  $2422 \pm 613.27$ gms and  $2878 \pm 305.53$  gms respectively (Table 4). Even though fetal-placental weight ratio showed differences in its values (Table 3), it was not statistically significant. Details of statistical analysis of placental weight, birth weight and fetal-placental weight ratio are shown in Table 4.

In preeclampsia, perinatal outcome was poor when compared with normotensive pregnancies in which all the newborns were appropriate for gestational age (AGA). Intra-uterine growth retardation (44%) and intra-uterine deaths (13.33%) were mostly associated with poorly controlled preeclamptic mothers and the difference between two groups was statistically significant (Table 5).

## DISCUSSION

Pregnancy complicated by preeclampsia not only affects maternal health but also jeopardize fetal normalcy. The placenta being bridge between maternal and fetal activities, this structure is considered as a window through which understanding of maternal dysfunction as well as their impact on fetal well being can be obtained.

The present study reveals that the placental weight is significantly less in study group than the control group. These findings are similar to those reported by Mallik, Mirchandani and Chitra[4], Udania and Jain [5], Majumdar et al [6] and Artico et al [7], who also found significant reduction in placental weight in preeclampsia. In preeclampsia, birth weights were also significantly lower than the birth weights of newborns of normotensive mothers and the findings collaborate with the studies done by Damania [8], Fox [9], Kalousek and Langlois [10] and Majumdar et al [6]. Rath also stated that in hypertensive arrangement of the intercotyledonous vasculature is altered, resulting in low birth weight babies[11]. Placental weight and size are directly proportional to birth weight and thus results in almost constant fetal-placental weight ratio. In present study, the low weight placentae are associated with low birth weight babies and also with intrauterine deaths and the fetal-placental weight ratios in study and control group show insignificant differences. This is in concurrence with the findings of Rath et al who also found almost constant fetal-placental weight ratio in normal and hypertensive pregnancies[12]. Significant relationship between placental and birth weight was also noticed by Sanin et al [13]. In this study, 13.33% cases of preeclampsia were associated with still births and 44% cases had babies having intrauterine growth retardation. Mirchandani, Malik and Chitra [14], Masodkar, Kalamkar and Patke [15] and Avasthi et al [16] observed 12%, 11.9% and 12.5% still births associated with preeclampsia which are almost similar to this study.

## CONCLUSION

It is concluded that placental weight can be “sentinel” indicator of nutritional and/or environmental problems and an important predictor of birth weight. There is a significant relationship between placental weight and birth weight thus resulting in constant fetal-placental weight ratio. However placental weight may vary due to how the placenta gets prepared or due to areas of calcification and any retroplacental hematoma. As preeclampsia is associated with decrease utero-placental flow and placental villous lesions, this will hamper the growth of developing placenta and fetus and results in Intra-uterine growth retardation (IUGR) and intra-uterine deaths (IUDs). This information provides new insight into link between fetus, placenta and preeclampsia thus can be a useful adjunct in planning and management of future pregnancies.

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