



## MORPHOMETRIC STUDY OF HUMAN PLACENTA IN PREECLAMPSIA ASSOCIATED WITH INTRAUTERINE GROWTH RETARDATION

**G.PRIYA\*<sup>1</sup>, K.BHAVINA<sup>2</sup> AND S.SUNDARAPANDIAN<sup>2</sup>**

*1. Department of Anatomy, DD Medical College & Hospital, Tiruvallur District, Chennai, Tamilnadu, India.*

*2. Department of Anatomy, SRM University, Kattankullathur, Tamilnadu, India.*

### ABSTRACT

The placenta is the special pregnancy organ that links a mother to the child for the transport of fetal nutrition through umbilical cord. Preeclampsia is a major disorder of pregnancy which mainly originates in the placenta and is associated with retarded fetal and placental growth. The aim of this study was to compare the morphometric measures of placenta in pregnancies complicated by Preeclampsia (PE) associated with Intrauterine Growth Retardation (IUGR), with that of normal. Totally 180 placentas were studied. Out of which 80 placentas from PE+IUGR and 100 of normal. There was a significant reduction in Placental weight, Diameter, Volume, Thickness, Birth weight of baby, Foeto-placental ratio, Number of cotyledons, Length of the umbilical cord, Gestational week in PE with IUGR compared to normal. These Morphometric changes might cause placental insufficiency in preeclampsia which results in IUGR.

**KEYWORDS:** Placenta ,Preeclampsia (PE), Intrauterine growth retardation(IUGR) and Birth weight of the baby.



**G.PRIYA**

ASSISTANT PROFESSOR

Department of Anatomy, DD Medical College & Hospital, Tiruvallur District, Chennai, Tamilnadu, India

\*Corresponding author

## INTRODUCTION

The human placenta is the functional center of the maternal-fetal system, and is responsible for respiratory, nutritional, excretory, endocrine and immunological functions. The term 'placenta' was first used in the year 1959. The growth and survival of the foetus depend on the formation, full development and functions of the placenta.

Preeclampsia is a condition characterized by maternal hypertension, proteinuria and edema. It may begin suddenly at anytime from about 20 weeks of gestation term and may result in fetal growth retardation, fetal death or death of the mother<sup>1</sup>. Preeclampsia affects as many as 1 in 10 of all pregnancies, making it the commonest antenatal complication. In India 28% of the babies born at term as small for dates. The important maternal cause for this is considered to be under nutrition and toxemia (PE) of pregnancy<sup>2</sup>.

In preeclampsia, the placenta runs shortage of blood, because the arteries in the uterus did not enlarge, as they should have done when the placenta was being formed in the first half of pregnancy. It was recorded that the maternal utero-placental blood flow is decreased in preeclampsia<sup>3</sup> because of maternal vasospasm<sup>4</sup>. Thus the placenta is the main seat of the problem. This study was done to find and correlate the morphological parameters of placenta in preeclampsia associated with the intrauterine growth retardation.

## MATERIALS AND METHODS

The study was carried out on 180 placentae, 100 were from normal pregnant women and 80 from pregnancies complicated by Preeclampsia (PE) associated Intrauterine growth retardation (IUGR). The placentae were collected from Obstetrics and Gynecology department of SRM Medical College and Hospital from 2010-2011, and studied at the anatomy department, after obtaining due consent from the patients. The placental

samples were divided into two groups as Group A (control group) comprises pregnant women without preeclampsia i.e. women who had normal blood pressure, no proteinuria and no edema. Group B (study group) comprises pregnant women with preeclampsia i.e. women of this group had blood pressure at or above 140/90 mmHg after 20 weeks of present pregnancy together with proteinuria and edema. None of these cases had hypertension prior to pregnancy.

All the collected placentas were tagged with code numbers before the commencement of the study, for the purpose of identity. The placentas were weighed by trimming the membranes, cutting the umbilical cord at a distance of 1 cm from the site of insertion, washed in running tap water and dried with blotting paper. The volume of the placenta was determined by water displacement technique. The placental diameter was measured with metallic scale graduated in centimeters (cm). The number of cotyledons counted and the site of insertion of umbilical cord on the fetal surface of placenta were observed. Then the thickness of the placenta was estimated by performing two sections: one in the middle and one cut 2 cm from the margin of the placenta. The birth weights of newborn babies were taken and foeto-placental ratio was calculated in each case.

## STATISTICAL ANALYSIS

The incidence of various gross features was compared with that of normal pregnancies by using the unpaired-type student 't' test.

## RESULTS

The mean placental and fetal weights in PE with IUGR cases were  $283.13 \pm 42.80$  gms and  $1986 \pm 271.32$  gms which were significantly decreased ( $p < 0.0001$ ) as compared to the control group  $451.25 \pm 48.64$  gms and  $3033 \pm 236.05$  gms respectively. The foeto-

placental ratio was  $7.09 \pm 0.85$  which was more than the control group  $6.74 \pm 0.43$ . The mean placental volume and numbers of cotyledons in PE with IUGR were  $245.75 \pm 49.84$  ml and  $11.61 \pm 2.42$  which were significantly decreased as compared to the control group  $386.2 \pm 64.04$  ml and  $15.28 \pm 1.53$  respectively. The mean diameter and thickness

were  $15.04$  cms and  $1.85$  cms (mean value of two measurements) which were decreased as compared to control group  $18.04$  cms and  $2.20$  cms respectively. The mean gestational week is also decreased in study group  $35.86 \pm 2.32$  as compared to the control group  $38.14 \pm 1.58$  (Table 1).

**TABLE I**  
**PLACENTAL MORPHOMETRIC STUDY**

SI.No	Parameters	PE with IUGR study group	Normal group
		Mean $\pm$ S.D	Mean $\pm$ S.D
1	Placental weight	283.13 $\pm$ 42.80	451.25 $\pm$ 48.64
2	Placental diameter	15.04 $\pm$ 2.45	18.05 $\pm$ 1.39
3	Placental volume	245.75 $\pm$ 49.84	386.2 $\pm$ 64.04
4	Placental thickness - Central -Peripheral	2.27 $\pm$ 0.45	2.57 $\pm$ 0.32
		1.43 $\pm$ 0.24	1.84 $\pm$ 0.19
5	Birth weight of baby	1986.75 $\pm$ 271.32	3033.2 $\pm$ 236.05
6	Foeto- placental ratio	7.09 $\pm$ 0.85	6.74 $\pm$ 0.43
7	Number of cotyledons	11.61 $\pm$ 2.42	15.28 $\pm$ 1.53
8	Length of umbilical cord	27.61 $\pm$ 9.26	30.78 $\pm$ 9.23
9	Gestational week	35.86 $\pm$ 2.32	38.14 $\pm$ 1.58

SI no	Parameters	P value	Significance	t	df	SE of D
1	Placental weight	0.0001	Highly significant.	24.29	178	06.921
2	Placental diameter	0.0001	Highly significant	10.37	178	0.29
3	Placental volume	0.0001	Highly significant	16.09	178	08.725
4	Placental thickness central peripheral	0.0001	Highly significant	05.15	178	0.05
		0.0001	Highly significant	12.19	178	0.03
5	Birth weight of baby	0.0001	Highly significant	27.64	178	37.84
6	Foeto placental ratio	0.0006	Highly significant	03.48	178	0.09
7	Number of cotyledons	0.0001	Highly significant	12.32	178	0.29
8	Length of umbilical cord	0.0236	Significant	02.28	178	01.38
9	Gestational week	0.0001	Highly significant	07.82	178	0.29

**'t'-Test**

## DISCUSSION

The Morphometric parameters of placenta like Placental weight, volume, Diameter, Thickness, Number of cotyledons, Gestational week, Length of the umbilical cord and Birth weight of the baby, Foeto-placental ratio were significantly lower in Preeclampsia associated with intrauterine growth retardation group as compared to normal group were statistically significant. This study was similar to the study conducted by Cibils<sup>5</sup> that the placentae from hypertensive patients were significantly smaller than the normal, suggesting that the pathologic process interferes with the normal placental growth. The present study is similar to the observation of Boyd and Scott<sup>6</sup>, Mallik et al<sup>7</sup>, Udainia A and Jain ML<sup>8</sup>, Soma et al<sup>9</sup>, Garg et al<sup>10</sup>, Das et al<sup>11</sup>, Bhatia. A et al<sup>12</sup>.

Similar findings were also described by Aherne and Dunnill<sup>13</sup>, Majumdar. S et al<sup>14</sup> where volume of hypertensive placenta was significantly lower than the normal value at term.

Teasdale<sup>15,16</sup> found significant reduction of transverse diameter in PE group, this reduction seems to be due to the small size of placenta .

Yousonszai and Haworth<sup>17</sup> found that placental weight and size were directly proportional to the birth weight of babies.

Rath<sup>18</sup> stated that in hypertension arrangement of the intracotyledonous vasculature is altered, resulting in low birth weight of the babies.

Chakravorthy<sup>19</sup> reported the reduction in placental and foetal weight in pregnancy induced hypertension. All these statements are confirmed by the present study. The differences in the values may be due to regional variations.

## CONCLUSION

This study reveals that the Preeclamptic placentae has undergone definite morphological changes. These changes seemed to be the result of insufficiency of placenta in Preeclampsia which results in IUGR. Thus preeclampsia have some definite adverse influences on the morphology of the placenta and growth of the fetus. The placental changes are more prominent with severity and duration of the disease.

## REFERENCES

1. Sadler.T.W.Langmann's Medical Embryology.17<sup>th</sup> Ed.Wolters Kluwer(India)Pvt.Ltd.,New Delhi,97(2010)
2. Park.k.Park's Textbook of preventive and social medicine.20<sup>th</sup> Ed .M/S Banarsidas bhanot publishers Jabalpur, India, 460, (2009).
3. Browne JCM, Veall N. The maternal blood flow in normotensive and hypertensive women. J Obst Gynaecol of British Empire, 60:141-147, (1953).
4. Bewly S, Cooper D, Campbell S. Doppler investigation of utero-placental blood flow resistance in the second trimester. A screening study for pre-eclampsia and intrauterine growth retardation. B j Obst and Gynaecol 98:871-879, (1991).
5. Cibils LA. The placenta and newborn infant in hypertension conditions. Am J Obstet Gynecol 118(2):256-70, (1974).
6. Boyd PA, Scott A. Quantitative structural studies on human placentas associated with preeclampsia, essential hypertension and intrauterine growth retardation. Br J Obstet Gynecol 92:714-21, (1985).
7. Mallik GB, Mirchandani JJ, Chitra S. Placenta in intrauterine growth retardation. J Obstet Gynaecol India 29:805-10, (1979).
8. Udainia A, Jain ML. Morphological study of placenta in pregnancy induced hypertension with its clinical relevance. J Anat Soc India. 50(1)24-27, (2001).
9. Soma H, Yoshida K, Mukaida T, Tabuchi Y. Morphological changes in the

- hypertensive placenta .Contrib Gynecol Obstet 9:58-75,(1982).
10. 10. Garg K, Rath .G and Sharma S.Association of birth weight,placental weight and the site of umbilical cord insertion in hypertensive mothers .J.Anat.Soc.India.44-4,(1996).
  11. 11. Das B,Dutta D,Chakraborty S,Nath P.Placental morphology in hypertensive disorders of pregnancy and its co-relation with foetal outcome. J Obstet Gynecol india.40-46,(1996).
  12. 12.Bhatia A, Sharma SD,Jal Nawalla SF,Sagreiya k.A comparative study of placental and fetal outcome. Indian J Pathol Microbiol 24:277-83,(1981).
  13. 13. Aherne W,Dunnill MS.Quantitative aspects of placental structure. J Pathol Bacteriol 91:123-39,(1966).
  14. 14. Majumdar S, Dasgupta H, Bhattacharya K, Bhattacharya A.A study of placenta in normal and hypertensive pregnancies. J Anat Soc India .54(2)34-38, (2005).
  15. 15. Teasdale F.Gestational changes in the functional structure of the human placenta in relation to fetal growth: A morphometric study. Am J Obstet Gynecol, 137:560-3, (1980).
  16. 16. Teasdale F.Histomorphometry of the human placenta in preeclampsia associated with severe intrauterine growth retardation. Placenta 8:119-2, (1987).
  17. 17. Yousonszai and Haworth. Placental dimensions and relations in pre-term and growth retarded infants. Am J Obst Gynaecol 103:265-271, (1969).
  18. 18. Rath G,GargKet al.Vascular pattern of human placenta in complicated pregnancy, A corrosive cast study. Ann Nat Acad Med Sc (Ind) 30:17-22, (1994).
  19. 19. Chakravorty A.P.Foetal and placental weight changes in normal pregnancy and pre-eclampsia.J Obst Gynaecol of British common wealth.74:247-253, (1967).