

Placenta in Eclampsia and PRE-Eclampsia

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Abstract: The placenta has been described as the mirror of the prenatal mortality. A glance of the literature reveals that eclampsia; pre-eclampsia syndrome exerts its deleterious effect on the placenta. So, the present study was undertaken to analyse and assess the morphological variations of placenta like size, shape, weight, attachment of umbilical cord and number of cotyledons and its correlations to the neonatal weight changes in normal pregnancy, eclampsia and pre-eclampsia. A comparative morphological study of placenta between normal pregnancies complicated by toxemia was carried out. 150 placenta from uncomplicated full term deliveries were considered as "control group" and 150 placentas from pre-ECLAMPSIA and ECLAMPSIA were considered as "study group". The weight of the placenta was less when compared to normal placenta in pre ECLAMPSIA and ECLAMPSIA. The majority of the placentas were round (158 cases) followed by oval placenta (142 cases) with none case showing placenta succenturiate (bilobed placenta). The average dimension of the placenta was 18.38x1.95cms in the control group and 15.48x1.62cms in the study group. The insertion of the cord was central in 282 cases followed by eccentric in 14 cases and battledore insertion was observed in 2 cases. The average number of cotyledons varies from 18 to 23 in all groups and mean of the same was observed in 18.38 in normal control group, 13.85 to 15.48 in study groups. The neonatal weight in disease condition observed reduction in mean birth weight, the weight being more observed in normal pregnancy. There was no post partum mortality in the study.

Keywords: Placenta , ECLAMPSIA, preECLAMPSIA.

I. Introduction

Placenta is a unique organ that arises denovo, directly related to the growth and development of foetus in utero, being an organ of vital importance for continuation of pregnancy and foetal nutrition. It has evoked great interest among the pathologists and the obstetricians as well, and much work has been done to understand the 'Unique biological status of this complex organ.¹ The human placenta is discoid because of its shape. At term four fifth of placenta is of foetal origin and one fifth is of maternal origin. It has foetal and maternal surfaces and peripheral margins. The foetal surface is covered by smooth and glistening amnion with the umbilical cord attached at the centre. Branches of the umbilical vessels are visible beneath the amnion as they radiate from the insertion of the cord.² The placenta is developed from two sources, the principal component is foetal which develops from chorion frondosum and the maternal component consists of decidua basalis.²

The placenta at term is a circular disc with a diameter of 185mm and thickness of about 2.5cm at its centre. It feels spongy in texture and weight about 500gms. The proportion of the weight of foetus is roughly 1:6 at term and occupies about 30% of uterine wall.² The maternal surface is finely granular, mapped into 15-30 convex polygonal areas called lobes or grooves, by a series of fissures called cotyledons. The maternal blood gives a dull red colour to it and numerous small greyish spots are seen due to depositions of calcium in the degenerated area but they are of no clinical significance.³ In recent years placenta has drawn attention as a valuable indicator for maternal and foetal diseases. Many of the disorders of pregnancy which are associated with high prenatal morbidity and mortality are accompanied by gross pathological changes in placenta.⁴

Placenta is a complex multifunctional organ of mainly foetal origin with pleiotropic roles during foetal growth. It has a portion derived from the developing embryo and a maternal portion formed by the modification of the uterine lining of the mother (Yetter 1998)⁵

The present study was undertaken to analyze the morphological variations in placenta in preECLAMPSIA and ECLAMPSIA.

II. MATERIAL AND METHODS

The material for the present study comprised by 300 placenta for both study and control group. 150 placenta from uncomplicated full term deliveries were consider as a "control group" and 150 placenta from preECLAMPSIA toxemia and ECLAMPSIA were considered as a "study group". The present study included

women in the age group of 20-35 years. The gestational age and foetal weight were taken from the clinical case-sheet. The placenta was submitted to the laboratory along with contained the information about previous obstetric history, obstetric estimate of gestational age, route of delivery, birth weight, sex, maternal and foetal complications of pregnancy, labor, and delivery, total length of umbilical cord and indication for placental examination. The placenta was placed in 10% formalin prior to transport and an adequate volume of fixative was used. The placenta was transported in a large, flat container containing 0.5% formaldehyde in saline so that placental shape was not deformed. Fixative volume was sufficient to completely surround and immerse the placenta in the laboratory⁶:

Method of examination and sampling:

The gross examination of the placenta entails careful review of the umbilical cord, placental membranes, foetal and maternal surfaces, and villous tissue.

Examination of the umbilical cord;

Measurements of cord length, greatest and least diameters, number of vessels, colour and insertion site were noted.

Examination of the extra placental membranes:

The extra placental membranes were inspected for unusual coloration, haemorrhagic regions, extra lobes, membranes vessels and other abnormal alterations.

Examination of the placental disc:

According to ACOG⁷: (American congress of obstetricians and gynecologist)

Hypertension is defined as a blood pressure of 140/90 mm of Hg on at least two different occasions six hours apart with the patient at rest in bed. Proteinuria is defined as 300mg or more of urinary protein per 24 hours or 100 mg/l or more in at least two random urine specimens collected six or more hours apart.

The cases were divided into three groups ECLAMPSIA (group I) and pre-ECLAMPSIA (group II) and control (group III). Criteria laid down for each group are as follows:

Group I. Eclampsia includes cases with higher blood pressure over 200 mm of Hg systolic with proteinuria of > 5gms/24hrs, oedema and associated symptoms like headache, dizziness, disturbance of vision, epigastric pain and convulsions.

Group II. Preeclampsia includes cases with sustained rise of blood pressure of 160 systolic or 110 diastolic or more with proteinuria more than 1.0gm/l and marked oedema with possibility to go in for convulsions if there are associated symptoms like severe headache, vomiting and epigastric pain.

Group III. Control group from uncomplicated full term deliveries . The present study requires detections for morphological variations of placenta like size, shape, weight, attachment of umbilical cord and number of cotyledons and its correlations to the neonatal weight changes in normal pregnancy and various clinical conditions associated with pregnancy.

Methods

In the present study ‘Z’ test was used to measure difference between two mean. ‘Tukey’ test was also used to measure the difference between two mean.

III. OBSERVATION AND RESULTS

The present study included 300 placenta of both control and study group obtained from the department of obstetrics and gynecology between December 2011 and December 2012. The cases were divided into three groups. Viz; ECLAMPSIA (group I), pre -ECLAMPSIA (group-II), and control (group- III)

Table1. Showing Total Number Of Placenta In Each Group.

GROUPS	TOTAL NUMBER OF PLACENTA
ECLAMPSIA GROUP	8(2.6%)
PRE ECLAMPSIA	142 (47.3%)
NORMAL	150(50%)
TOTAL	300

The study included women with an age group ranging from 20 to 35 years.

Table2. Showing Age-Wise Distribution Of Placenta Age Groups

GROUPS	AGE 20-24	AGE 25-30	AGE31-35
ECLAMPSIA	6	2	2
PRE -ECLAMPSIA	88	48	4
NORMAL	106	36	8
TOTAL	200	86	14

The weight of the placenta in various groups is shown in table:

Table 3. Showing Weight-Wise Distribution Of Placenta Weight In Grams

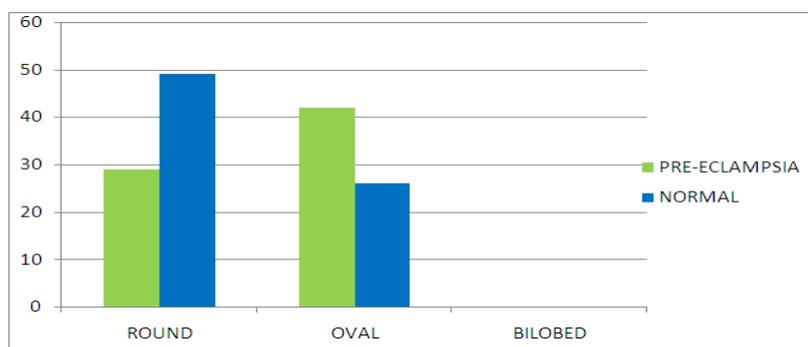
GROUPS	<500	500	>500
ECLAMPSIA	8(100%)	00	00
PRE-ECLAMPSIA	134 (94.3%)	8 (5.6%)	00
NORMAL	108 (72%)	26(17.3%)	16 (10.6%)
TOTAL	250	34	16

It is seen from the above table that the placenta from ECLAMPSIA group showed weight less than 500gms in 100% cases. Whereas placenta from pre-ECLAMPSIA group showed weight less than 500gms in 94.3% cases. The placenta from normal pregnancies with weight less than 500gms is 72%. The overall incidence of various shapes of placenta encountered in the study is shown in table 4.

Table4. Showing Various Shape Of Placenta Shape Of Placenta

GROUPS	ROUND	OVAL	BILOBED
ECLAMPSIA	2	6	0
PRE-ECLAMPSIA	58	84	0
NORMAL	98	52	0
TOTAL	158	142	00

The above table shows that the majority of placenta are round in shape 52.66%, Incidence of bilobed placenta (placenta succenturiate) being 0% while in the present study 47.33% placenta were oval in shape.

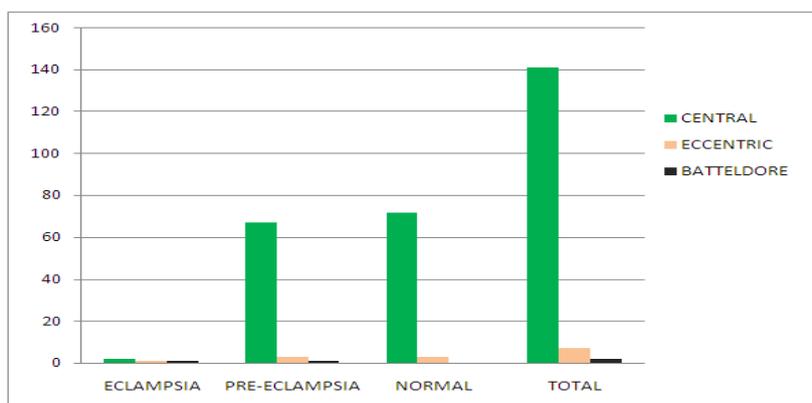


Graph-1

In both table.4 and graph.1, the distributions of the shape of the placenta shown are same. The average dimension of placenta in cms (length x thickness at the center) in various groups are shown in the table below.

Table 5. Showing average dimension of placenta

GROUP	AVEREGE DIMENSION IN (CMS)
ECLAMPSIA	13.85X1.37
PRE-ECLAMPSIA	15.48X1.98
NORMAL	18.38X1.99



Graph-2

In both table.5 and graph.2, the distributions of modes of cord insertions shown are same.

Table No 6. Showing Number Of Cotyledons On Maternal Surface

GROUPS	AVERAGE NUMBER OF COTYLEDONS
ECLAMPSIA	15.89
PRE-ECLAMPSIA	16.82
NORMAL	18.82

The average number of cotyledons range from 18 to 23 in all 3 groups and mean of the same is shown in the table above.

Table 7. Showing Average Neonatal Weight In The Three Groups In Grams

GROUPS	AVERAGES NEONATAL WEIGHT
ECLAMPSIA	1700
PRE-ECLAMPSIA	2475
NORMAL	2800

The present study showed that the neonatal weight decreases with disease of the pregnancy (preeclampsia and eclampsia) the weight being more than 2800gms in normal pregnancy as compared to 1700 to 2475 gms in eclampsia and pre-ECLAMPSIA respectively.

Placental Study

**1. Size of the placenta (Dimension)
(Diameter in cms)**

GROUPS	CONTROL	ECLAMPSIA	STATISTICAL TEST
Mean placental diameter	N=150 17.79±3.30	N=8 14.85±2.16	p>0.005 Not significant

GROUPS	CONTROL	PRE-ECLAMPSIA	STATISTICAL TEST
Mean placental diameter	N=150 18.79±3.30	N=142 15.47±3.07	P<0.001 Significant

2. Placental thickness at center in cms

GROUPS	CONTROL	ECLAMPSIA	STATISTICAL TEST
Mean placental thickness at center	N=150 1.95±2.33	N=8 1.325±0.805	P>0.05 NOT Significant

GROUPS	CONTROL	PRE-ECLAMPSIA	STATISTICAL TEST
Mean placental thickness at center	N=150 1.95±2.33	N=142 1.9253±3.02	P>0.05 NOT Significant

3. Weight of placenta in grams

GROUPS	CONTROL	ECLAMPSIA	STATISTICAL TEST
Mean placental wt. In grams	N=150 456.8±50.914	N=8 373.25±38.32	P<0.02 Significant

GROUPS	CONTROL	PRE-ECLAMPSIA	STATISTICAL TEST
Mean placental wt. In grams	N=150 456.8±50.914	N=142 414.47±63.18	P<0.03 Significant

4. Numbers Of Cotyledons

GROUPS	CONTROL	ECLAMPSIA	STATISTICAL TEST
Mean number of cotyledons per placenta	N=150 17.24±1.70	N=8 16.24±5.73	P>0.05 NOT Significant

GROUPS	CONTROL	PRE-ECLAMPSIA	STATISTICAL TEST
Mean number of cotyledons per placenta	N=150 15.24±1.70	N=142 15.88±2.37	P>0.05 NOT Significant

5. Neonatal Weight In Grams

GROUPS	CONTROL	ECLAMPSIA	STATISTICAL TEST
Mean birth wt. of neonates in grams	N=150 2780.33±339.53	N=8 1850±812.43	P<0.01 Significant

GROUPS	CONTROL	PRE-ECLAMPSIA	STATISTICAL TEST
Mean birth wt. of neonates in grams	N=150 2742.33±339.53	N=142 2373.53±392.68	P<0.001 Significant

IV. Discussion

The placenta has been described as the mirror of the prenatal mortality. A glance of the literature reveals that ECLAMPSIA; pre-ECLAMPSIA syndrome exerts its deleterious effect on the placenta. So, the present study was undertaken to analyse and assess the morphological variations of placenta like size, shape, weight, attachment of umbilical cord and number of cotyledons and its correlations to the neonatal weight changes in normal pregnancy, ECLAMPSIA and pre-ECLAMPSIA. A total of 150 placentas were studied, which included 75 placenta from uncomplicated full term deliveries, considered as a "control group" and 75 placenta from ECLAMPSIA and pre-ECLAMPSIA, considered as "study group".

a. Weight Of The Placenta

The average weight of the normal placenta is 653gms with water content of 84.15% (cibis luis⁸).

Mallik et al⁹, have reported five cases of toxemia with placental weight less than 300gms. Nobis and Das (1980)¹ in their study have shown that the placental weight in toxemic cases varies from 279-407gms.

Arati et al¹⁰ in their study have shown reduced placental weight in severe toxemia, the lowest recorded was 280gms.

In the present study, 100% of the ECLAMPSIA placenta weighted less than 500gms and the least weight recorded being 350gms. It was further observed that 94.3% placenta from pre-ECLAMPSIA weighted less than 500gms, here the least placental weight being 200gms. Placenta from normal pregnancies weighted less than 500gms in 72%, least weight being 300gms in present study.

Present study showed that mean placental weight (in gms) of ECLAMPSIA with a p value less than 0.02 (P<0.02) is statistically significant. Similarly mean placental weight of pre-ECLAMPSIA with p value less than 0.03 (p< 0.03) is significant.

2. Shape Of The Placenta

	NOBIS AND P.DAS	PRESENT STUDY
ROUND	46%	52.66%
OVAL	17%	77.33%
BILOBED	5%	0%

The present study shows that the majority of placentas are round in shape. Incidence of bilobed placenta was 0% in the present study.

3. Dimension Of Placenta

Mallik et al⁹ reported the mean diameter of normal placenta to be 17.54cms. In the study done by Dr.H.T.Jayaprakash in 1988, the mean diameter was 17.31cms. In the present study the average dimension in normal placenta is 17x1.95cms and 14.85x1.32cms in ECLAMPSIA and 16.47x1.92cms in pre-ECLAMPSIA which does not show statistically significant variation.

4. Insertion Of Cord

In the present study, the majority of cases showed central insertion, 94% in both control and study group, eccentric in 4.6% and battledore in 1.3%.

Nobis and Das¹ in their study have shown that it is central in 44.19%, eccentric in 42.17% and battledore in 1.26%.

5. Number Of Cotyledons

The average no. of cotyledons range from 18 to 23 in all three groups and mean of the same is 15.82 in normal control group and 15.24 to 15.82 in study groups. Another Study by Majumdar S , Dugupta H, Bhattacharya K and Bhattacharya A.¹¹, show decreased no. of cotyledons in study group. Control group 17+2, study group 16+2. The present study did not show any statistically significant variation.

6. Neonatal Weight

The present study showed that the neonatal weight decrease with disease of pregnancy (preeclampsia and ECLAMPSIA). The weight being more than 2700gms in normal pregnancy as compared to 1900 to 2375gms in ECLAMPSIA and preeclampsia.

Palaskar et al 2001¹² in comparative study of foetoplacental weight relationship in normal pregnancy and disease conditions showed reduction in mean birth weight, placental weight and foetoplacental ratio.

According to Rath in 1994¹¹, in hypertension the arrangement of the intracotyledons vasculature is altered resulting in low birth weight of the babies.

Baird Have stated that heavy proteinuria have increased the incidence of low birth weight babies in preeclampsia.

Fox¹³ also stated that reduction in the villous population will interfere with foetal nutrition and growth, hence leading to decrease in their neonatal weight.

The neonatal weight in ECLAMPSIA and preeclampsia with p-values less than 0.001 ($p < 0.001$) is statistically highly significant in present study.

V. Summary

1. A comparative morphological study of placenta between normal pregnancies complicated by toxemia was carried out.
2. 150 placenta from uncomplicated full term deliveries were considered as "control group" and 150 placentas from pre-ECLAMPSIA and ECLAMPSIA were considered as "study group".
3. The weight of the placenta was less when compared to normal placenta in pre ECLAMPSIA and ECLAMPSIA.
4. The majority of the placentas were round (158 cases) followed by oval placenta (142cases) with none case showing placenta succenturiate (bilobed placenta).
5. The average dimension of the placenta was 18.38x1.95cms in the control group and 15.48x1.62cms in the study group.
6. The insertion of the cord was central in 282 cases followed by eccentric in 14 cases and battledore insertion was observed in 4 cases.
7. The average number of cotyledons varies from 18 to 23 in all groups and mean of the same was observed in 18.38 in normal control group, 13.85 to 15.48 in study groups.
8. The neonatal weight in disease condition observed reduction in mean birth weight, the weight being more observed in normal pregnancy.
9. There was no post partum mortality in the study.

VI. Conclusions

- The morphometry of placental weight showed significantly lower values in the study group than the control normotensive group.
- The shape, dimension, cord insertion and number of cotyledons did not show significant variation
- The study reveals that the placental weight and neonatal weight are significantly less in hypertensive group than in the control group.
- The present study showed that incidence of preeclampsia and eclampsia is more commonly seen in the age group of 20-30 years.

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