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A STUDY OF MORPHOMETRICAL CHANGES OF PLACENTA IN NORMOTENSIVE AND TOXAEMIA OF PREGNANCY WOMEN.

Anatomy

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ABSTRACT

The placenta is a unique organ where maternal and foetal tissues come in direct contact without rejection, suggesting immunological acceptance of the foetal graft by the mother. The placenta is the most accurate record of infant's prenatal experiences. Structural and functional derangement of placenta evokes a considerable interest, as this may be the only yardsticks to measure adequacy of the foetal environment. Toxaemia of pregnancy is an important reason for large number of maternal deaths and there of foetal deaths. Maternal hypertension (toxaemia of pregnancy) is diagnosed in 6-10% of all deliveries which is associated with 22% of perinatal foetal deaths and 30% of maternal death. The present study was done in 190 pregnant mothers, divided into four groups. 100 cases of Normotensive pregnant woman(control), 30 cases of pregnant woman with mild preeclamptic, 30 cases of pregnant woman with severe preeclampsia, 30 cases of pregnant woman with Eclampsia pregnant women admitted in the department of Obs and Gynae, Rama Medical College, Hospital and Research Centre, Mandhana, Kanpur, U.P(India).Morphometrical parameters placentae such as weight, thickness, radius, diameter, surface area, volume and no cotyledons measured by standard procedures. It was observed morphometrical measurements of placenta were reduced significantly in eclampsia, severe and mild preeclampsia group when compared with control group placenta. Toxaemia of pregnancy affects placenta adversely and leads significant gross changes as compared to control group, it was contributed by the insufficient blood supply to placenta due to preeclampsia. This study results provides useful adjunct in planning and management of future pregnancy in pregnancy induced hypertensive women.

KEYWORDS

Placenta, Morphometrical Measurements, Toxaemia Of Pregnancy, Eclampsia, Severe Preeclampsia, Mild Preeclampsia, Control Group.

Introduction:

The placenta is a unique organ, short lived by design. Its existence is essential for the survival of human embryo/foetus in the intra uterine environment. Human placenta is a discoid, circular, membranous vascular and haemo-chorio-deciduate organ, which connects the foetus with the uterine wall of the mother **Huppertz B et al (2007).** It is a structure where maternal and foetal tissues come in direct contact without rejection, suggesting immunological acceptance of the foetal graft by the mother **Emin m et al., (2010)**. The placenta is the most accurate record of infant's prenatal experiences. Structural and functional derangement of placenta evokes a considerable interest, as this may be the only yardsticks to measure adequacy of the foetal environment **Benrischke k et al., (1990)**.

Hypertensive disorders (Toxaemia of pregnancy) are generating complications during pregnancy which are common and forming fatal characters along with haemorrhage and infection. Pre-eclampsia (PE) is a disease occurs during the pregnancy which is specified by the commencement of hypertension and the presence of protein in the urine in large amount **Costeloe KL et al., (2012) and Moore T et al., (2012).** Pre-eclampsia is considered if one or more of the following criteria are present: Blood pressure140 mm Hg or higher systolic or 90 mm Hg or higher diastolic after 20 weeks of gestation in a woman with previously normal blood pressure. Proteinuria: 0.3g or more of protein in a 24-hours urine collection (usually correspond with 1+ or greater on a urine dipstick test) known as mild preeclampsia **Costeloe KL et al., (2012) and Moore T et al., (2012).** When systolic blood pressure of 160 mm of Hg or higher or 110mm of Hg or higher diastolic on two occasions at least six hours apart in a woman on bed rest, it is associated with proteinuria and oliguria, cerebral or visual disturbances, pulmonary oedema of cyanosis, epigastric pain or right upper quadrant pain, impaired liver function, thrombocytopenia, foetal growth restriction condition is known as severe preeclampsia.
Eclampsia considered by presence of seizures during the pregnancy along with the signs and symptoms of severe preeclampsia **Costeloe KLet al., (2012) and Moore T et al., (2012).**

Toxaemia of pregnancy is an important reason for large number of maternal deaths and there of foetal deaths. Maternal hypertension (toxaemia of pregnancy) is diagnosed in 6-10% of all deliveries which is associated with 22% of perinatal foetal deaths and 30% of maternal death **(Fernando arias et al., 2000).**

MATERIALS AND METHODOLOGY

The present study was done in Dept of Anatomy in collaboration with Department of Obs and Gynae, Rama Medical College, Hospital and Research Centre, Mandhana, Kanpur, U.P(India). The permission has taken from the institution ethical committee prior to conduction of this study. All the cases and controls pregnant women have filled written consent form for willing to give their samples for this study.
The present study was done in 190 pregnant mothers, divided into four groups. 100 cases of Normotensive pregnant woman(control), 30 cases of pregnant woman with mild preeclamptic, 30 cases of pregnant woman with severe preeclampsia, 30 cases of pregnant woman with Eclampsia pregnant women.

Inclusion criteria: Antenatal mothers diagnosed with toxemia of pregnancy with their blood pressure of 140/90 mm of Hg or more in to case group.

Exclusion Criteria: Twin pregnancy, pregnancy with - gestational diabetes, heart diseases, autoimmune disorders, chronic hypertension and placenta previa were excluded. Standard questionnaire was prepared to get the past and present medical/surgical history of cases and controls.

The placentae with cord and membranes were collected and examined immediately after the delivery for abnormality of the umbilical cord and membranes. The amnion and chorion were trimmed from all placenta. The umbilical cord was cut at a distance of 10 centimeters from the site of insertion. Placentae were washed in slow running tap water, dried with the help of blotting paper. The placentae along with the umbilical cord were given code numbers and were preserved in 10% formalin solution.

Placental morphometrical parameters:

Placental Weight: Placental weight was measured by directly placing the placenta over standardized weighing scale.

Placental Diameter: The placenta was placed on a flat surface after trimming and mopping. At first the maximum diameter was measured with a metallic scale graduated in centimeters. Then second maximum diameter was recorded at right angles to the first one. The mean of two diameters was considered as the diameter of placenta.

Placental Thickness: Placenta was placed on a flat surface. Two circles were drawn from the center of the placenta. Thick point needle was inserted to the full thickness of placenta at five points. Centre of the inner circle, two different points between inner and outer circle and two different points outside the outer circle. Mean of all five points was taken as the thickness of placenta.

Number of cotyledons: Gentle pressure was applied on center of the fetal surface of placenta. As a result, the cotyledons on the maternal surface became prominent. The placenta was then placed on a flat surface with maternal side facing upwards and total number of cotyledons was recorded.

Placenta surface area was calculated by πr^2 and placenta volume calculated by $\pi r^2 h$ formula. R means radius of placenta and h means thickness of placenta. The data were statistically analyzed.

Results:

The study sample was 190, Distributed in to 30 samples of mild preeclampsia, 30 samples of severe preeclampsia, 30 samples of eclampsia and 100 cases of normotensives mothers. For comparing the morphometrical parameters of placentae to determine its increasing or decreasing trends, the mean value for each group was determined.

Table 1: Mean Placenta weight in control and study groups.

GROUP	NO OF SUBJECTS	Mean +/- S. D(cms)	P value compared with control group
Control	100	443±101	-------
Mild preeclampsia	30	386±98.8	<0.0022
Severe preeclampsia	30	296±68.3	<0.0001
Eclampsia	30	232±45.2	<0.0001

In present study the mean placental weight was reduced in study group sub groups when compared with control group. And also noticed placental weight reduced significantly as the severity of the disease increases. Differences between control, preeclampsia **(<0.0022)**, severe preeclampsia **(<0.0001)** and eclampsia **(<0.0001)** groups were statistically significant (Table.1).

Table 2: Mean Placenta thickness in control and study groups.

GROUP	NO OF SUBJECTS	Mean +/- S. D(cms)	P value compared with control group
Control	100	2.545±0.176	-------
Mild preeclampsia	30	2.448±0.235	<0.0067
Severe preeclampsia	30	2.423±0.152	=0.0001
Eclampsia	30	2.391±0.146	<0.0001

It was observed the mean thickness of the placenta in control group was (2.545cm), Eclampsia group(2.391cm), severe and mild preeclampsia group was (2.423cm and 2.448cm) respectively. Placental thickness also decreased in study groups when compared with control group. The difference between the groups was statistically significant (Table.2).

Table 3: Mean Placenta diameter in control and study groups.

GROUP	NO OF SUBJECTS	Mean +/- S. D	P value compared with control group
Control	100	16.438±0.558	-------
Mild preeclampsia	30	16.120±0.790	<0.0058
Severe preeclampsia	30	15.815±0.652	<0.0001
Eclampsia	30	15.542±0.56	<0.0001

In present study found placental diameter and radius in control group 16.438±0.558 and 8.219±0.279 and in mild preeclampsia groups as 16.120±0.790 and 8.060±0. 395. In severe preeclampsia group 15.815±0.652 and 7.9075±0.326. in eclampsia group 15.542±0.56 and 7.772±0.293 as follows. The differences between the groups was statistically significant with descending trend (Table.3& 4).

Table 4: Mean Placenta Radius in control and study groups.

GROUP	NO OF SUBJECTS	Mean +/- S. D	P value compared with control group
Control	100	8.219±0.279	-------
Mild preeclampsia	30	8.060±0.395	<0.0058
Severe preeclampsia	30	7.9075±0.326	<0.0001
Eclampsia	30	7.772±0.293	<0.0001

Table 5: Mean Placenta Surface Area in control and study groups.

GROUP	NO OF SUBJECTS	Mean +/- S. D	P value compared with control group
Control	100	214.432±14.7	-------
Mild preeclampsia	30	204.528±19.9	<0.0080
Severe preeclampsia	30	196.727±416.1	<0.0001
Eclampsia	30	189.955±14.2	<0.0001

The mean and SD of placenta surface area and placental volume in control group was 214.432±14.7 and 540.25±55.1. In preeclampsia group was 204.528±19.9 and 502.54±81.7. In severe preeclampsia groups was 196.727±416.1 and 476.330±46.5.imn eclampsia group was 189.955±14.2 and 454.553±47.5. The differences between the groups and subgroups was statistically significant shown in (Table no 5 & 6). And also found the surface area and volume decreases as the severity of the diseases increases (Table.5&6).

Table 6: Mean Placenta Volume in control and study groups.

GROUP	NO OF SUBJECTS	Mean +/- S. D	P value compared with control group
Control	100	540.25±55.1	-------
Mild preeclampsia	30	502.54±81.7	<0.0056
Severe preeclampsia	30	476.330±46.5	<0.0001
Eclampsia	30	454.553±47.5	<0.0001

Table 7: Mean No of cotyledons in control and study groups.

GROUP	NO OF SUBJECTS	Mean +/- S. D	P value compared with control group
Control	100	26.23±6.03	-------
Mild preeclampsia	30	25.00±3.94	<0.0066
Severe preeclampsia	30	20.20±4.29	<0.0001
Eclampsia	30	19.30±3.05	<0.0001

No of cotyledons in control group was 26.23, in eclampsia, severe and mild preeclampsia groups was 25.00, 20.20 and 19.30 respectively. Above results shown no of cotyledons reduced significantly in study groups when compared with the control group. The differences between groups found significant statistically (Table.7).

Discussion:

Placenta is a vital organ maintaining pregnancy and promoting fetal development, which functions as fount upon which developing foetus derives its nutritional substance and obtains its metabolic and immunological requirements. Gross placental measures can best assess the time of onset and cumulative placental effects of a suboptimal intrauterine environment. In present study found placental morphometrical parameters like placental weight, Thickness, Diameter, Radius, Surface area, Volume and No of cotyledons significantly reduced in mild, severe preeclampsia and eclampsia when compared with the normotensive (control) pregnant women placenta.

Normally placental weight ranges from 400gms to 600gms. Placental weight was reduced significantly as the severity of the disease increased. Similar results are reported by **Udaina et al and Mujumdar et al** who found reduced placental weight in preeclamptic cases as compared to normotensive pregnancies. The reduced placental weight in hypertensive group may be attributed to reduced blood flow due to ischaemic changes in the vessels.

Other morphometrical parameters like Placental Thickness, Diameter, Radius, No of Cotyledons, Surface Area and Volume were significantly reduced in present study. **Sengupta Kishwara et al., (2009)** in their study mentioned morphometrical measurements such as weight, thickness, radius, diameters, volume and no of cotyledons reduced significantly preeclampsia and eclampsia groups when compared with control group placenta and the difference found significant statistically.

Our study results similar with **Udainia et al., and Majumdar et al.,** study results.

Conclusion:

This study concludes that placenta and preeclampsia, eclampsia interlinked. Toxaemia of pregnancy affects placenta adversely and leads significant gross changes as compared to control group, it was contributed by the insufficient blood supply to placenta due to

preeclampsia. This study results provides useful adjunct in planning and management of future pregnancy in pregnancy induced hypertensive women.

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