

# A Comparative Study to Evaluate The Morphometry of Placenta and Foetus in Different Grades of Toxemia of Pregnancy and Normotensive Pregnant Women

T Praveen<sup>1</sup>, N Swetha Vinela<sup>2</sup>

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**Author's Affiliation:** <sup>1</sup>Assistant Professor, Department of Anatomy, Shadan Institute of Medical Sciences, Peeranchuruvu, Hyderabad, <sup>2</sup>Assistant Professor, Department of Biochemistry, Ayaan Institute of Medical Sciences, Kanakamamidi, RR(Dist.), Telangana (India).

**Corresponding Author:** N Swetha Vinela, Assistant Professor, Department of Biochemistry, Ayaan Institute of Medical Sciences, Kanakamamidi, R.R.(Dist.), Telangana (India).

E-mail: [nvinela0@gmail.com](mailto:nvinela0@gmail.com)

## Abstract

The placenta is a unique organ, short lived by design. Its existence is vital for the persistence of human embryo/foetus in the intra uterine environment. Structural and functional derangement of placenta arouses a considerable interest, as this may be the only index to measure adequacy of the foetal environment. Hypertensive disorders generating complications during pregnancy (Toxaemia of pregnancy) which are common and forming deadly characters along with haemorrhage and infection. Maternal hypertension (toxaemia of pregnancy) is diagnosed in 6-10% of all deliveries which is related with 22% of perinatal foetal deaths and 30% of maternal death. The present study has done in 240 pregnant mothers, divided into four groups 40 cases of mild preeclampsia, 40 cases of severe preeclampsia, 40 cases of Eclampsia, 120 cases of control (Normotensive) pregnant women admitted in Department of Obs and gynaecology, Rama medical college, Hospital and research centre, Mandana, Kanpur (Up) and Shadan institute of medical sciences, Peeranchuruvu, Hyderabad, Telangana (India). The placentae were weighed with a standard weighing machine. The fetal weight was noted from the case records provided. In this present study the mean placental, birth weights were low in different grades of toxemia of pregnancy when compared with control group. The fetoplacental weight ratio was higher in cases of eclampsia, severe and mild preeclampsia when compared with control group.

**Keywords:** Preeclampsia; Eclampsia; Placenta weight; Foetal weight; fetoplacental weight ratio.

## Introduction

The placenta is a unique organ, short lived by design. Its presence is vital for the survival of human embryo/foetus in the intra uterine environment. The placenta performs variety of functions, extending from anchoring the fertilized ovum, preventing its rejection by the maternal immune system to permit the transport of nutrients and wastes between the mother and the embryo/foetus. (Emin m et al.,2010). Structural and functional instability of placenta arouses a considerable interest, as this may be the only yardsticks to measure adequacy of the foetal environment (Benriscske k and Kauffmann p 1990). As the placenta is the direct connection between mother and foetus, the investigation of placenta gives a clear idea of what had happened with it, when it was in the mother's womb and what is going to happen with the foetus in future (Burke CJ and Tannenberg AE 1995).

Hypertensive disorders (Toxaemia of pregnancy) are generating complications during pregnancy which are common and forming fatal characters along with haemorrhage and infection (ACOG 2002). 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 (Eiland, Elosha, Nzerue, et al., 2012). Pre-eclampsia is considered if one or more of the following criteria are present: Blood pressure 140 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 (ACOG 2002). When systolic blood pressure of 160 mm of Hg or higher or 110 mm 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 or cyanosis, epigastric pain or right upper quadrant pain, impaired liver function, thrombocytopenia, foetal growth restriction condition is known as severe preeclampsia. Eclampsia is considered by presence of seizures during the pregnancy along with the signs and symptoms of severe preeclampsia (ACOG 2002).

Toxaemia of pregnancy is an important reason for large number of maternal deaths and therefore 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 2000).

Perinatal outcome is powerfully influenced by gestational age and the severity of hypertension as expressed by the need for antihypertensive treatment, irrespective if the underlying syndrome preeclampsia and eclampsia is associated with degree of fetal injury. The main impact on the fetus is under nutrition as a result of utero-placental vascular insufficiency, which leads to growth retardation and low birth weight. Long term follow-up studies have demonstrated that babies who suffered intra uterine growth retardation are more likely to develop diabetes mellitus, hypertension, coronary artery disease in adult life due to catecholamine released from the mother at the time gestational period (Alicia M and Lapidus MD 2011, Perloff D 1998).

## Materials and Methodology

The present study has been done in 240 pregnant mothers, divided into four groups 40 cases of mild preeclampsia, 40 cases of severe preeclampsia,

40 cases of Eclampsia, 120 cases of control (Normotensive) pregnant women admitted in Department of Obs and Gynae, Rama Medical College, hospital and research Centre, Mandhana, Kanpur, U.P (India) and Shadan institute of medical sciences, Peeranchuruvu, Hyderabad, Telangana (India). All the cases and controls pregnant women have filled written consent form for willing to give their samples for this study. 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. Standard questionnaire was prepared to get the past and present medical/surgical history of cases and controls. In questionnaires, several parameters were taken such as history of renal, liver failure, seizures, mother who has the hypertensive disorder before the pregnancy and other medical problems. The permission has been taken from the institution ethical committee prior to conduction of this study. 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. The placentae were weighed with a standard weighing machine. The fetal weight was noted from the case records provided by the department of obstetrics and gynecology.

## Statistical Analysis

The data were statistically analyzed. The student t-test was used to compare the mean values of placental and fetal weight and fetoplacental weight ratio among case and controls.

## Results

The study sample was 240, Distributed in to 40 samples of mild preeclampsia, 40 samples of severe preeclampsia, 40 samples of eclampsia and 120 cases of normotensives mothers. For comparing the placentae, fetal weight and fetoplacental weight ratio to determine its increasing or decreasing trends, the mean value for each group was determined.

**Table 1:** Comparison of placentae, fetal weight and fetoplacental weight ratio in between control and case with sub groups.

Groups	No of samples	Placental weight Mean±S.dev (Grams)	Foetal weight Mean±S.dev (Grams)	Fetoplacental weight ratio Mean±S.dev
I. Control	120	444.16±100.77	2804.62±405.4	6.54±1.27
II. Mild PET	40	386.02±98.75	2548.75±582.66	6.84±1.45
II. Severe PET	40	295.62±68.25	2057.50±567.88	7.34±2.21
IV. Eclampsia	40	231.98±45.20	1855.00±744.8	7.90±2.27

**Table 2:** Comparison of placentae weight in between control and case with sub groups.

Groups	No of samples	Mean±S.dev (Grams)	P value compared with control group
I. Control	120	444.16±100.77	-
II. Mild PET	40	386.02±98.75	<0.002
II. Severe PET	40	295.62±68.25	<0.0001
IV. Eclampsia	40	231.98±45.20	<0.0001

**Table 3:** Comparison of fetal weight in between control and case with sub groups.

Groups	No of samples	Mean±S.dev (Grams)	P value compared with control group
I. Control	120	2804.62±405.4	-
II. Mild PET	40	2548.75±582.66	= 0.045
II. Severe PET	40	2057.50±567.88	<0.0001
IV. Eclampsia	40	1855.00±744.8	<0.0001

**Table 4:** Comparison of fetoplacental weight ratio in between control and case with sub groups.

Groups	No of samples	Mean± S. Dev	P value compared with control group
I. Control	120	6.54±1.27	-
II. Mild PET	40	6.84±1.45	=0.760
II. Severe PET	40	7.34±2.21	=0.047
IV. Eclampsia	40	7.90±2.27	<0.0001

## Discussion

Mohan et al (1989) reported in that mean placental and foetal weight were less in preeclampsia and eclampsia groups when compared with control group and also noticed placental and fetal weight reduced significantly as the severity of the disease increases (Table 5) .

Das et al (1996) reports also suggested that placental and fetal weight reduces significantly as the severity of the disease increases (Table 5). In their study mentioned majority of birth weights in severe PET

and eclampsia groups were <2.5kg due to the very low placental weight leads to intra uterine growth retardation (IUGR).

Summit Gupta et al (2013) study also revealed that placental, birth weights were significantly reducing in mild, severe preeclampsia groups when compared with control group.

Raghavendra et al (2014) also in their study noticed mean placental and birth weights were reduced significantly with different grades of PIH. They have also noticed significant correlation between

**Table 5:** Comparison of the mean placental, fetal weight and fetoplacental weight ratio between present and previous studies.

Study	Groups	No of cases	Plcaenta Weight in grams	Foetal weight Mean±S.dev (Grams)	Feto-placental weight ratio
Mohan et al	Control	20	476	2.8	6.08:1
	Mild PET	10	477	2.86	6.00:1
	Severe PET	20	440	2.3	5.28:1
	Eclampsia	4	381.70	1.6	5.18:1
Das et al	I	20	442	2.9	6.56:1
	II	20	422	2.6	6.15:1
	III	20	377	2.05	5.43:1

Study	Groups	No of cases	Placenta Weight in grams	Foetal weight Mean±S.dev (Grams)	Feto-placental weight ratio
Raghavendra et al	IV	20	355	1.84	5.21:1
	Control	50	488.42	3.01	6.17:1
	Mild PET	29	406.69	2.54	6.26:1
	Severe PET	16	374.68	2.67	7.13:1
	Eclampsia	05	390.00	2.1	5.38:1
Present study	I	120	444.16±100.77	2804.62±405.4	6.54±1.27
	II	40	386.02±98.75	2548.75±582.66	6.84±1.45
	III	40	295.62±68.25	2057.50±567.88	7.34±2.21
	IV	40	231.98±45.20	1855.00±744.8	7.90±2.27

fetoplacental weight ratio and severity of the disease.

Conflicting results were found about foetaplacental weight ratio and severity of the disease in Mohan et al (1989) and Das et al (1996) studies. They mentioned foetaplacental weight ratio was reduced as the severity of the disease increases. Their study results show foetus weight reduced significantly when compared with placental weight as the severity of the disease increases.

In this present study the mean placental, birth weights were low in different grades of toxemia of pregnancy when compared with control group. The fetoplacental weight ratio was higher in cases of mild, severe preeclampsia and eclampsia when compared with control group. Present study results correlated with study results of Raghavendra et al (2014). It shows placental weight reduced significantly when compared with foetus weight as the severity of the disease increases. Severity of the toxemia of pregnancy significantly influences the morphometry of the placenta then foetus.

## Conclusion

According to the results generated by the present study, the mean weight of placenta in sub groups of Toxaemia of pregnancy group was low compared to control group. In present study, the birth weight was low with increasing grades of hypertension compared to control groups. The fetoplacental weight ratio was higher in case eclampsia, severe and mild preeclampsia when compared with control group. From the present study, it can be concluded that, the toxemia of pregnancy adversely influences the weight of the placenta and foetal outcome. Thus, placenta acts as an effective index by examination of which we can predict the status of foetus in neonatal life as it can act as an indicator to the overall development of the foetus.

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