



Original Research Article

## Morphometric Assessment of the Placenta in Women with Gestational Hypertension: Findings from a Rural Community in Sokoto, Nigeria

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### ABSTRACT

**Background:** A good look at the placenta post-partum, gives valuable information about prenatal life of the fetus. In pre-eclampsia the functional reserve capacity of the placenta is diminished by the utero-placental ischaemia. Under these conditions, a further loss of functional tissue by extensive infarction as a result of a large haematoma may compromise placental function to the extent that it fails to provide the foetus with an adequate supply of oxygen and nutrients.

**Methods:** The placentae were collected immediately after delivery. The umbilical cord was cut to a length of 5 cms from the point of insertion, and then gently dried with filter paper. The weight of the placenta was then obtained on the weighing scale. Detailed gross examination of the placenta was done to note the size, shape, surface area, and the number of cotyledons. The maternal surface was examined for presence of any retro placental hematoma, infarction and calcification. A graduated one-liter beaker was used to obtain the volume of the placenta by water displacement method.

**Results:** Among the hypertensive mothers, 30 (50%) of the women had gestational hypertension without proteinuria and oedema; whereas 20 (33.33%) of the mothers had pre-eclampsia (hypertension was associated with oedema or proteinuria or both) and 10 (16.67%) of the women had eclampsia (with or without oedema and proteinuria).

**Conclusion:** Placental weight and volume were found to be much lower in higher proportion of cases of eclampsia and mild to moderate pre-eclampsia. The three main gross lesions observed were; placental infarcts, retroplacental haematoma and calcification and their incidence in hypertensive pregnancies was higher as compared to placentae from the control group.

**Keywords:** placenta, morphology, pregnancy, hypertension, rural, community.

### INTRODUCTION

The placenta is a dynamic organ which is unique in its development and functions. A careful look and touch by thorough examination of the placenta post-partum, gives valuable information about prenatal life of the fetus. <sup>(1)</sup> Hypertensive disorders are responsible for 5-8 % of all maternal deaths. <sup>(1)</sup>

In pre-eclampsia the functional reserve capacity of the placenta is diminished by the utero-placental ischaemia. <sup>(2)</sup> Under these conditions, a further loss of functional tissue by extensive infarction as a result of a large haematoma may compromise placental function to the extent that it fails to provide the foetus with an adequate supply of oxygen and

nutrients. <sup>(2)</sup> Markedly small placental size and histopathological changes related to confined placental mosaicism may be associated with retroplacental ischaemia. <sup>(3)</sup>

A linear correlation exists between weight of newborn baby and weight of placenta in uncomplicated pregnancies. <sup>(4)</sup> For mild and severe gestational hypertension a linear relationship exists between the weight of newborn baby and the weight of placenta. <sup>(4)</sup>

Rath stated that in hypertension the arrangement of the intracotyledonous vasculature is altered; resulting in low birth weight of the babies. <sup>(5)</sup> About 70% of the foetal deaths in women with hypertension are due to large placental infarcts. <sup>(6)</sup>

Retro placental haemorrhage is due to rupture of maternal decadal arteriole, the wall of which is weakened because of the changes that occur in pre-eclampsia. <sup>(7)</sup>

Extensive placental infarction is associated with a high incidence of foetal hypoxia, intra-uterine growth retardation and death. <sup>(8)</sup> Calcification occurs more commonly in first pregnancies and its incidence is directly related to low maternal age, high maternal socio-economic status and delivery during the summer months. <sup>(9)</sup>

Prenatal death rate in eclamptic women was estimated at 136/1000. <sup>(10)</sup> Whereas Chamberlain et al <sup>(11)</sup> reported a prenatal mortality rate of 33.7/1000 in severe gestational hypertension and eclampsia as compared to the rate of 19.2/100 in normotensive pregnancies. <sup>(11)</sup>

Maternal utero-placental blood flow is decreased in pre-eclampsia because there is maternal vasospasm. <sup>(12-14)</sup> Reduced maternal utero-placental blood flow leading indirectly to constriction of foetal stem arteries has been associated with the changes seen in the placentae of pre-eclamptic women. <sup>(15)</sup> Maternal vasospasm leads to foetal hypoxia. Foetal hypoxia is not uncommon near term and accordingly it may lead to foetal distress and foetal death. <sup>(16)</sup>

## MATERIALS AND METHODS

The present study is based on the observations made on the placentae of patients suspected to be the cases of PIH. Due clearance was taken from the Hospital ethical committee before proceeding with the study. Sixty mothers with uncomplicated pregnancy (control) and sixty mothers with gestational hypertension (study group) were selected from in-patients of Department of Obstetrics and Gynecology General Hospital Tambuwal Sokoto-Nigeria.

The criteria adopted for grouping of these cases were defined according to The International Society for the Study of Hypertension in Pregnancy Classification <sup>(17)</sup> followed by the American College of Obstetrics and Gynecologists. <sup>(18)</sup> The age range of these mothers varies from 18 years to 40 years. The women include primi, multiparae and grand multiparae.

General clinically examination for (pallor, jaundice, oedema etc.) was done for each of the women and relevant obstetrics, surgical and medical history was noted. Urinalysis was done for each patient (for presence or absence of protein) using combi nine stick, Blood pressure was measured using mercury sphygmomanometer; twice at one hour interval for each woman, weight and height were also taken. Mothers with hypertension had their blood pressure ranging from 140/90 mmHg to 190/110 mm of Hg.

The placentae were collected immediately after delivery. The umbilical cord was cut to a length of 5 cms from the point of insertion, and then gently dried with filter paper. The weight of the placenta was then obtained on the weighing scale. Detailed gross examination of the placenta was done to note the size, shape, surface area, and the number of cotyledons. The fetal surface of the placenta was examined; the state of membranes was noted and a search was made for subamniotic hematoma, The mode of insertion of the umbilical cord was noted along with any umbilical cord abnormalities.

The maternal surface was examined for presence of any retro placental hematoma, infarction and calcification. A graduated one-liter beaker was used to obtain the volume of the placenta by water displacement method.

The newborn babies have their birth weight taken (using weighing scale) and the foeto-placental weight ratio calculated for each case.

## RESULTS

**Table 1: Mean values of Measurements of the Placenta and Foetus**

S/N	Parameters	Control Group	Hypertensive Group	Statistical Significance (P < 0.01)
1.	Mean birth wt. of babies in (kg).	2.6 ± 0.31	2.01 ± 0.46	Significant
2.	Mean Placental wt. in (grams)	485.24 ± 47.29	397.08 ± 89.32	Significant
3.	Mean Placental Area in (sq.cm).	245.13 ± 61.21	201.78 ± 58.37	Significant
4.	Mean Placental volume in (cc)	608.98 ± 211.24	369.79 ± 171.41	Significant
5.	Mean Foeto-placental weight ratio	4.79 ± 10.03	5.21 ± 0.85	Significant

**Table 2: Gross Anatomy of the Placentae**

S/N	Parameters	Control Group	Hypertensive Group
1	Mean Number of Cotyledons per Placenta	17 ± 2	16 ± 2
2	Mean Infarcted area in placenta in Number	3.77 ± 1.87	16.5 ± 4.6 *
3	Marginal insertion of umbilical cord (in percentage)	5.2 ± .01	20 ± 3 *
4	Mean calcified areas in placenta in number	4.125 ± 1.15	33.3 ± 3.15 *

\*Statistically Significant (p<0.001).

## DISCUSSION

The study reveals that the foetal weight is significantly less in the hypertensive group than the control group and the morphometry of placenta i.e. weight, surface area and volume show significantly lower values in the study group than the control (normotensive) group. These findings corroborate with the studies of other workers; Fox et al.,<sup>(3)</sup> Damania et al.,<sup>(19)</sup> Kalousek et al.<sup>(20)</sup> and Majumdar *et al.*<sup>(21)</sup> Infarction, retro-placental clot and calcification are significantly fewer in the control (normotensive) group than in study group (PIH). Similar finding were reported by Fox et al among Caucasians<sup>(3)</sup> and Udainia et al<sup>(4)</sup> and Majumdar et al.<sup>(21)</sup> in their study in India. The maternal surface was observed to be made up of a number of cotyledons, the number of which ranged from 13-20 and there was no significant difference between the normotensive and PIH (study) group as

Among the hypertensive mothers, 30 (50%) of the women had gestational hypertension without proteinuria and oedema; whereas 20 (33.33%) of the mothers had pre-eclampsia (hypertension was associated with oedema or proteinuria or both) and 10 (16.67%) of the women had eclampsia (with or without oedema and proteinuria). There was no history of hypertension in the women before pregnancy. All the 60 women in the control group have normal blood pressure.

p>0.001. These corroborate with the findings of Majumdar et al.<sup>(21)</sup>

In this study it was observed that placental weight and size were directly proportional to the birth weight of babies for both the control and the study groups with a significant difference between the two groups as p<0.001. Majumdar et al.,<sup>(21)</sup> Yousonszai and Haworth,<sup>(22)</sup> reported similar findings. In hypertension the arrangement of the intracotyledonous vasculature is altered; resulting in low birth weight of the babies.<sup>(23)</sup>

Placentae infarction in the study group show significant increase in value when compared to that of the control group. Various other workers: Wigglesworth,<sup>(24)</sup> Maqueo et al.<sup>(25)</sup> Kher and Zawar,<sup>(26)</sup> Bhatia et al.<sup>(27)</sup> have reported similar higher incidence of placental infarction in cases of toxemia of pregnancy. Placental calcification was observed more commonly in placenta from hypertensive patients than the normal (control) group in this

study. This corroborate with the finding of Shanklin and Torpin and Swain that reported Placental calcification in 73.34% cases of various grades of hypertensive pregnancies and 10% in the control group. (28,29)

## CONCLUSION

A comparative study between 30 placentae from women with various grades of hypertension during pregnancy and 30 from disease free gestation was conducted. Placental weight and volume were found to be much lower in higher proportion of cases of eclampsia and moderate to mild pre-eclampsia. Lower foeto-placental weight ratio was observed in cases of severe form of the disease than in cases with milder forms of toxæmia. It was thus concluded that lighter placentae usually accompanied a low birth weight of the foetus. The three main gross lesions which were observed are; placental infarcts, retroplacental haematoma and calcification and their incidence in hypertensive pregnancies was higher as compared to normotensive pregnancies (control group).

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### *Authors' contribution:*

**UJD & BA** - Conceived and designed the study, made the first draft of the manuscript; **AA, BSS & AT** - Statistical analysis and interpretation of data; **UJD, MMA & ZAD** – Literature searches and manuscript preparation; All authors reviewed and approved of the final manuscript.

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**Conflict of Interest:** None declared.

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