ORIGINAL RESEARCH PAPER

Anatomy

KEY WORDS:

# A COMPARATIVE STUDY ON MORPHOMETRIC ANALYSIS OF PLACENTA FROM NORMOTENSIVE AND HYPERTENSIVE MOTHERS

**Panigrahi I** Department of Anatomy S.C.B Medical College Cuttack

**Ray S** Department of Anatomy S.C.B Medical College Cuttack

## INTRODUCTION

Placenta is an anatomical and functional unit between the mother and the foetus. Human placenta is **discoid, deciduate, hemochorial, chorioalla ntoic labyrinthine gland** which connects developing embryo by umbilical cord to the endometrium of mother's uterus.[1]

The fetal surface is smooth,covered by amnion and presents the attachment of the umbilical cord close to its centre.

The maternal surface is rough,irregular and is mapped out into 15-20 convex polygonal areas known as cotyledons which are limited by fissures.[2]

**Contd...**

- Hypertension is a sign of an underlying pathology that may be preexisting or appears for the first time during pregnancy, which is called Pregnancy induced hypertension (PIH).[3]
- It has been recorded that the maternal utero placental blood flow decreases in PIH because of maternal vasospasm.
- Reduced maternal uteroplacental blood flow leading indirectly to constriction of foetal stem arteries has been associated with the changes seen in the placentas of women with PIH.Maternal vasospasm leads to foetal hypoxia.[4]
- PIH is one of the foremost aetiologies of intrauterine growth retardation,foetal distress and infant mortality.As placenta is the foetal organ for gaseous exchange, nutrition and excretion, the survival, development and growth of the foetus are solely dependent on the proper functioning and development of the placenta.. Hence it is responsible for bringing about all the physiological changes and maintenance of the pregnancy to term.[5]
- A thorough evaluation of placenta provides an accurate record of any complications which can occur during the prenatal life of the foetus and its consequences in future.

**Contd...**

- The anatomical placental assessment becomes more precise through morphometric analysis which is a non-invasive, indirect method of study in physiology or pathology of human gestation.[6]
- Placental examination in such cases gives valuable information and answers to the questions concerning pregnancy management.This helps to plan a safe pregnancy and a healthy baby outcome at its end.[7]

## AIM AND OBJECTIVE

The aim of this study is to analyze and compare the morphometric differences in weight,diameter,no of cotyledons,thickness and fetoplacental ratio among the placenta in normal pregnancy and pregnancy-induced hypertension. **Ethical Issues**

Ethical clearance was given by the Instituitional Ethics Committee of SCB medical college and hospital, Cuttack, 753007 (IEC Appln No- 761)

## MATERIAL AND METHODS

This observational comparative study was conducted in the Department of Anatomy S.C.B. medical college and Hospital , Cuttack in collaboration with Department of Obstetrics and Gynaecology , S.C.B. medical college and Hospital , Cuttack.

- In the present study ,25 placentae with attached umbilical cords were obtained soon after delivery from mothers, who were diagnosed with hypertension.
- Then the specimens were preserved in air tight plastic containers containing 10% formalin.
- Hypertension is diagnosed empirically when appropriately taken blood pressure exceeds 140 mm Hg systolic or 90 mm Hg diastolic on 2 readings recorded at an interval of 4 hrs.[8]
- The mothers included in the present study were within the reproductive age group i.e;15-49 yrs as per the WHO. [9]
- A control group labelled as Group A were 25 placentae with attached umbilical cords were obtained soon after delivery and preserved in the same manner, from normotensive mothers of similar age group as certified by an obstetrician from the Dept of Obstetrics and
- Gynaecology, S.C.B. medical college and hospital, Cuttack, which was used to compare the relevant data obtained from the study group.

**Contd...**

- The placentae delivered at the O & G Dept of SCB medical college were collected soon after delivery and washed under running tap water to wash off blood smear and clots.The amnion and chorion were trimmed from placenta.
- All the specimens were tagged with numbers that corresponded with the numbers indicated in the register for neonatal indices.
- The specimens were then placed in plastic containers filled with formalin(10%) with an airtight lid and kept at room temperature before transporting to the Dept of Anatomy,SCB medical college,cuttack for detailed examination and measurements.

**Inclusion Criteria:**

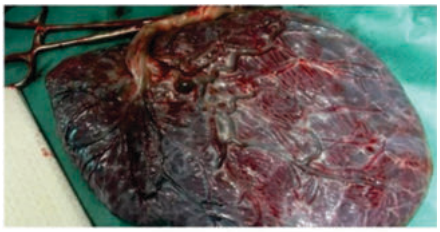
Placenta delivered from mothers undergoing institutional deliveries were included in the study from different age groups starting from 15-49 years with more than 20 weeks of gestation with or without oedema and proteinuria 1+ or above.

**Exclusion Criteria**:

Placenta delivered from mothers undergoing home deliveries,mothers below 15 years of age,damaged placenta. Patients suffering from any other medical disorders like anaemia, renal disease, cardiovascular disease, diabetes, hypothyroidism, Rh isoimmunisation, mothers with primary or secondary hypertension before the onset of pregnancy were excluded from the study.

**1) Weight OfThe Placenta**

- The weight of the placenta is weighed on an electronic weighing scale (METIS, MODEL :- TES.BEN.85871605, MAX weight 15 kgs, accuracy ± 1 gram) .
- The weight is rounded up to the next higher integer and expressed in grams.
- The weight of the placenta is then recorded in the data sheet.



Weight of placenta by foetal weighing scale

**2) Diameter Of Placenta :**

- The diameter of the placenta was measured using a non malleable metallic scale upto the accuracy of 1mm.
- The placenta was placed in a flat tray.At first,the maximum diameter was measured with a metallic scale graduated in centimeters.
- Then the second maximum diameter was taken at right angles to the first one.
- The mean of the two measurements was considered to be the diameter of placenta.

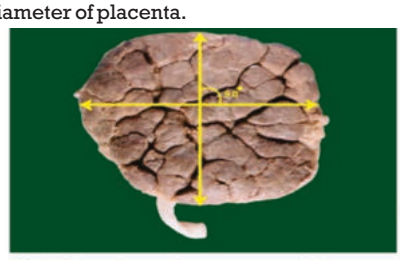
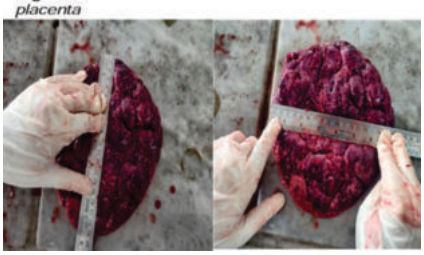


**Fig.-2:** *Procedure of measurement of diameter of placenta*



**Data Analysis**

All data obtained from measurements taken were entered into excel sheet and analysed using the SPSS software version 25.0 To find out the statistical differences between the means, student t test was conducted.Statistical significance was accepted when P value was less than 0.05.

**Observation**

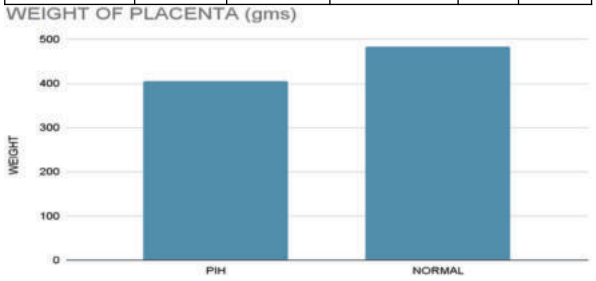
From the collected data, the mean values and standard deviation (SD) were calculated for placental weight and diameter.The summary of the results of these parameters are presented in (Table 1).

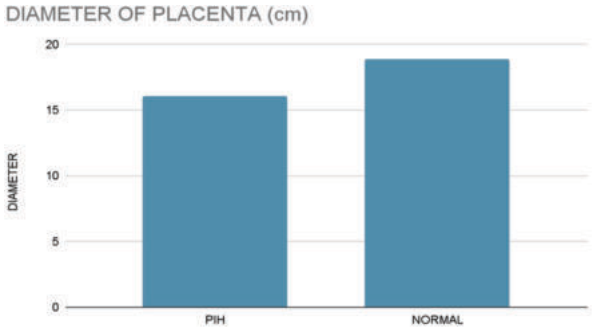
**Table 1 :- Mean values and standard deviation (SD) of PIH and normal placental morphometry .**

| SERIAL NO | STUDY GROUP | WEIGHT (gms) | DIAMETER(cms) |
|---|---|---|---|
| 1 | PIH | 406.80 + 30.45 | 16.04 + 1.92 |
| 2 | NORMAL | 483.28 + 31.06 | 18.88 + 2.58 |

**Table 2**

| Variable S | Group | Mean | Standard Deviation | T Value | P Value |
|---|---|---|---|---|---|
| Pl Wt | HTN | 406.80 | 30.448 | -8.79 | <0.001 |
| | N | 483.28 | 31.006 | | |
| Pl Diameter | HTN | 16.04 | 1.925 | -4.4 | <0.001 |
| | N | 18.88 | | | |




**Contd**

- The mean placental weight from PIH and normotensive mothers is 406.80 ± 30.44 and 483.28 ± 31.06 respectively
- The mean placental diameter from PIH and normotensive mothers is 16.04 ± 1.92 and 18.88 ± 2.58 respectively.
- The difference between the mean placenta weight and diameter of both the groups is found to be significant ($p < 0.001$).
- The placental parameters are **significantly lower** in PIH mothers as compared to that of normotensive mothers.

**Table 3**

| Socioeconomic Status | PIH | | Normal | |
|---|---|---|---|---|
| | N | % | N | % |
| High | 2 | 8 | 5 | 20 |
| Low | 16 | 64 | 7 | 28 |
| Middle | 7 | 28 | 13 | 52 |

**Contd...**

**Table 3** shows that the maximum number of mothers having PIH (study group ) are from low socioeconomic status (16/25) 64% followed by medium socioeconomic status (7/25) 28% followed by high socioeconomic (2/25) 8% .But in control group, the maximum number of mothers are from medium socioeconomic status (13/25) 52% followed by low socioeconomic status (7/25) 28% followed by high socioeconomic status (5/25) 20%.

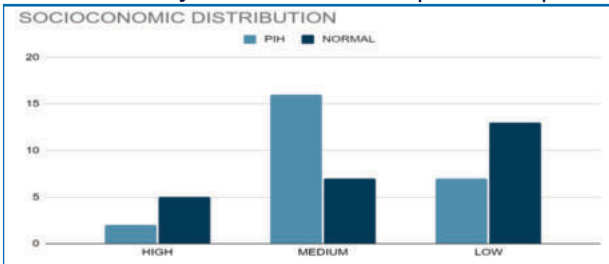


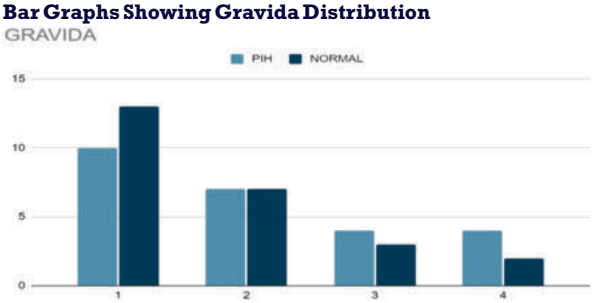

**Table 4**

| GRAVIDA | PIH | | NORMAL | |
|---|---|---|---|---|
| | N | % | N | % |
| 1 | 10 | 40 | 13 | 52 |
| 2 | 7 | 28 | 7 | 28 |
| 3 | 4 | 16 | 3 | 12 |
| 4 | 4 | 16 | 2 | 8 |

**Contd...**

Table 4 depicts that in the study group there were (10/25) 40% of cases belonged to primigravida , 28% (7/25) cases were second gravida, 16% (4/25) cases belonged to both third and fourth gravida .

**Bar Graphs Showing Gravida Distribution**




**Contd...**

Table 3 and Table 4 shows the percentage distribution of socioeconomic status and gravida among the normotensive mothers and mothers having PIH separately.It can be observed that placental parameters (weight and diameter ) show **statistically significant values** in normotensive mothers when compared to that of mothers having PIH.

## DISCUSSION

In the present study,placental morphometry like weight and diameter are found to be **significantly lower** in all the placentae obtained from mothers having PIH when compared to that of placentae obtained from normotensive mothers.

Mothers from Low Socioeconomic status are found to be predominant 64% followed by Medium Socioeconomic status 28% in Study group which is similar to the observations done by **Kalra et al 1985**.[10]

While in the control group, Medium Socioeconomic status mothers are found to be more predominant 52% followed by low socioeconomic status mothers 28%. High incidence in low socioeconomic status due to lack of antenatal check up leading to late diagnosis and poor control of disease process.

**Contd...**

- The gravida distribution analysis in this study depicted that the maximum number of PIH cases belonged to the category of primigravida i.e 40% in study group and 52% in control group, which is corroborative to the study done by **Page et al 1972; Kher et al 1981**[11].
- Primigravida have unyielding abdominal wall leading to higher intra abdominal pressure that could lead to decreased uterine blood flow by external compression of myometrium as uteroplacental blood flow in part is controlled by tone of myometrium through which all blood vessels must pass to reach the intervillous space **Page et al 1972** [11]
- The second hypothesis is immunological where effective immunization by previous pregnancy is lacking in primigravida.
- The placental weight is significantly less 406 gm in study group as compared to control group i.e 483.28 gm.The decrease in weight in PIH is possibly due to secondary changes in placenta like infarction and necrosis which is similar to the findings by **Pradeep S Londhe et al oct 2011**.[12]

## CONCLUSION

- PIH was predominantly seen in mothers of Low Socioeconomic group where as normotensives belonged to Medium Socioeconomic group.
- On the basis of placental morphometry obtained in this study made it possible to conclude that mothers having PIH have a recognisable morphometric difference with statistical significance from the control group.
- Majority of patients of PIH belonged to primigravida and mostly coming from low socioeconomic status. Thus we conclude that this particular group is vulnerable to the development of PIH.
- So it is essential for regular antenatal check up followed by early and effective control of hypertension so as to reduce the complications related to hypertensive pregnancies.

## REFERENCES

1) Gray's Anatomy.The Anatomical Basis Of Clinical Practice, 42nd International edition.London:2021.p.179
2) Divya Shanthi D'Sa,Sangeetha V. MORPHOMETRIC STUDY OF PLACENTA IN RELATION TO BIRTH WEIGHT OF FULL TERM IN NEWBORNS.Int J Anat Res 2018;6(1.2):4924-4927.
3) Dutta D.C. The placenta and fetal membranes. Textbook of obstetrics, 7th edition. Kolkata: Central;2011.p.28-40.
4) Salmani D, Purushothaman S, Somashekara SC, Gnanagurudasan E, Sumangaladevi K, Harikishan R, et al. Study of structural changes in placenta in pregnancy-induced hypertension. J Nat Sc Biol Med 2014;5:352-5.
5) Dutta A.K.The placenta. Essentials of human embryology, 5th edition. Kolkata: Current books international; p.58-68.
6) Rupa L Balihallimath et al.,Placental morphometry Determines the Birth Weight.Journal of Clinical and Diagnostic Research.2013;7(11):2428-2431.
7) Londhe PS, Mane AB. Morphometric study of placenta and its correlation in normal and hypertensive pregnancies. Int J Pharm Bio Sci 2011;2:229-37
8) Williams Obstetrics 25th Edition p.1754.

**Contd...**

9) WHO,United Nations,Department of Economic and Social Affairs,Population Division(2019).World Population Prospects 2019,Online Edition.Rev.1.
10) Kalra VB.,Agrawal A., Sareen PM. and Kaira R.Histopathological changes in toxaemia of pregnancy. India. 3. Obstet.Gynaec. 35 : 85, 1985 (Q : ind. 3. Patho. Micro.331,1990)
11) Page E.W.: On the pathogenesis of Pre-eclampsia and eclampsia. J Obstet. Gynaec. Brit ,With .79 : PP 883 - 894, Oct 1972
12) Londhe PS, Mane AB. Morphometric study of placenta and its correlation in normal and hypertensive pregnancies. Int J Pharm Bio Sci 2011;2:229-37
13) Stock MK, Anderson DF, Phernetton TM, McLaughlin MK, Rankin JH. Vascular response of the maternal placental vasculature. *J Dev Physiol.* 1980;2:239–46.
15) Narasimha A, Vasudeva DS. Spectrum of changes in placenta in toxemia of pregnancy. Indian J Pathol Microbiol 2011;54:15-20.
16) Bazaz G, Mirchandani JJ, Chitra S. Placenta in intrauterine growth retardation. *J Obstet Gynecol India.* 1979;29:805–10.
17) Nobis P, Das U. Placental morphology in hypertensive pregnancy. *J Obstet Gynecol.* 1991;41:166–9.