

Evaluation of Relationship between Placental Morphology and Adverse Perinatal Outcome in Different Conditions Affecting Pregnancy

Shilpi Singh¹, Anjani Kumari², Deepshikha Singh³, Seema⁴

¹Senior Resident, Department of Obstetrics and Gynaecology, Darbhanga Medical College and Hospital, Laheriasarai, Bihar

²Senior Resident, Department of Obstetrics and Gynaecology, Darbhanga Medical College and Hospital, Laheriasarai, Bihar

³Tutor, Department of Anatomy, All India Institute of Medical Sciences, Patna, Bihar

⁴Professor and Head of Department, Department of Obstetrics and Gynaecology, Darbhanga Medical College and Hospital, Laheriasarai, Bihar

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Corresponding Author: Dr. Anjani Kumari

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Abstract:

Background: The placenta serves as a mirror reflecting the fetus's intrauterine condition. The placenta is thought to be a major contributor to neonatal and maternal mortality as well as a significant influence influencing fetal growth, which is typically linked to placental insufficiency. The placenta reflects pregnancy issues both macroscopically and microscopically, such as hypertension or gestational diabetes.

Methods: Four kinds of placentas were used in the study: normal, pregnancy-induced hypertension, anemia, and diabetes mellitus. A total of 129 placentas were examined. Placental weight, placental surface area, fetal birth weight, placental coefficient, fetoplacental weight ratio, and the result of the foetus, stillbirth or alive were among the many factors that were examined.

Results: It was noted that the PIH group's placental weight was noticeably lower than average. On the other hand, it was higher in the group with diabetes and anemia. The birth weight of the newborns in the PIH and anemia groups is significantly lower than that of the diabetes group. A stillbirth was noted in 3.33% of the deliveries in the usual group. Pregnancy complications are associated with a somewhat increased percentage of stillbirths.

Conclusion: The perinatal outcome is also impacted by these diseases. Along with fetal characteristics like foetal weight, placental properties are also changed. Therefore, diagnosing these risk factors in pregnancies during the antenatal stage will enhance the result.

Keywords: Insufficiency, Macroscopically, Perinatal, Coefficient.

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Introduction

Due to the placenta's unparalleled significance in a person's intrauterine development, many anatomists, embryologists, and obstetricians have long been fascinated by and curious about it. The placenta serves as a mirror reflecting the fetus's intrauterine condition. Since the placenta and umbilical cord are the most precise records of an infant's prenatal experiences, their examination can provide important insights when a fetal outcome is poor. [1]

The placenta is thought to be a major contributor to neonatal and mother mortality and a crucial element influencing fetal growth, which is typically linked to placental insufficiency. [2] The placenta reflects pregnancy issues both macroscopically and microscopically, such as hypertension or gestational diabetes. [4] When one or more disorders complicate a pregnancy, adverse perinatal outcomes are

seen. Complications include diabetes, twins, and hypertensive diseases are frequently seen. The placenta serves as a mirror reflecting the fetus's intrauterine condition. Because the placenta is the most reliable record of an infant's prenatal experiences, research on it can provide important insights when a fetal result is poor. [1]

In this study, we attempted to compare the variables that influence the foetus's condition and are thought to change the placenta's form.

Material and Methods

From February 2023 to January 2024, 129 placentas from the obstetrics and gynecology department of Darbhanga Medical College and Hospital in Laheriasarai, Bihar's labor rooms and operating rooms were used in this study. Placentas were sent to the

Anatomy department's Research Laboratory as soon as they were delivered, and details were recorded. Gross anomalies in the membranes and cords, if any, were observed. By removing all membranes and chopping the umbilical cord 5 cm from the placenta's implantation, an exact weighing was performed. The remaining blood was drained from the superficial vessels. Blood clots that had adhered were removed, and the placenta was cleaned with running water, dried with blotting paper, and weighed using a scale. The weight was expressed in grams.

Using a measuring scale, the placenta's diameter was determined in order to calculate its surface area. A metallic scale with a centimeter (cm) graduation was initially used to measure the maximum diameter. After that, a second maximum diameter was measured perpendicular to the first. The placenta's diameter, measured in centimeters, was determined by taking the mean of the two measurements. The diameter is used to compute the radius. [3]

Formula for Surface area of the placenta = πr^2 , where π - 3.14

By setting the placenta in a white enamel tray, the maternal surface of the placenta was seen. The number of cotyledons was counted, and any anomalies, such as calcification and infarction, were studied under a magnifying glass on both surfaces of the placenta. The weight of the newborn infant was measured and the foeto-placental weight ratio was computed following the examination of the placenta and umbilical cord. The placental weight was divided by the baby's birth weight to determine the placental coefficient. We separated the 129 placentae that were examined into four

groups based on the clinical diagnostic and risk factors of the expectant mothers. The diagnosis was made using laboratory tests and the clinical examination performed by senior department faculty members, who are associate professors or professors. Patients with pregnancy-induced hypertension (PIH), patients with anemia, patients with diabetes mellitus, and normal patients with no problems were the four groups.

The presentation of continuous variables was given as mean±standard deviation. Percentages were used to express categorical variables. Statistics were defined as significant when $P < 0.05$. Graph Pad Prism 5.01, a statistical program, was used to examine the data.

Results

In the normal group, the mean placental weight was 486 ± 124 gm, in the PIH group, 398 ± 98 gm, in the anemia group, 504 ± 133 gm, and in the diabetic group, 547 ± 138 gm. It was noted that the PIH group's placental weight was noticeably lower than average. On the other hand, it was higher in the group with diabetes and anemia.

Table 1 also displays placental surface area as observed in various groups. In the groups with diabetes and anemia, there were noticeable increases. The birth weight of the newborns in the PIH and anemia groups is significantly lower than that of the diabetes group.

In our study, the most significant parameter was the babies' birth weight. When compared to the normal group, we found that the PIH and anemia groups had considerably lower fetal birth weights. However, it was significantly higher in the group with diabetes (Table 1).

Table 1: Parameters observed in different groups

	Normal Group n = 30	PIH Group n = 33	Anaemia Group n = 38	Diabetes Group n = 28
Placental weight (Gm)	486 ± 124	398 ± 98	504 ± 133	547 ± 138
Placental surface area (Sq. cm)	223.6 ± 108.5	188.4 ± 89.6	256.9 ± 154.8	286.4 ± 156.9
Birth weight of babies (Gm)	2865 ± 170	2267 ± 168	2262 ± 157	3208 ± 189
Placental coefficient	0.17	0.18	0.22	0.17
Feto-placental weight ratio	5.90	5.70	4.49	5.86

Table 2 shows the fetal outcome for each category, whether the baby is born alive or stillborn. A stillbirth was noted in 3.33% of the deliveries in the usual group. Pregnancy complications are associated with a somewhat increased percentage of stillbirths.

Table 2: Foetal outcome in different groups

	Normal Group n = 30	PIH Group n = 33	Anaemia Group n = 38	Diabetes Group n = 28
Alive	29 (96.67%)	28 (84.85%)	34 (89.47%)	24 (85.71%)
Still birth	01 (3.33%)	05 (15.15%)	04 (10.53%)	04 (14.29%)

Discussion

The placenta, which joins the developing foetus to the uterine wall to enable food intake, waste removal, and gas exchange through the mother's blood supply, is thought to be a distinctive property of eutherian or "placental" mammals [3]. Numerous investigations into the morphology of the placenta have been carried out in the past. In this work, we compared the morphological characteristics of the placenta in several pregnancy-complicating circumstances, such as anemia, gestational diabetes mellitus, and pregnancy-induced hypertension. Additionally, we contrasted the perinatal outcome (stillbirth or alive) under these circumstances.

We observed that the PIH group had a lower placental weight (398 ± 98 gm), while the anemia and diabetes groups had higher placental weights. Hypoxia brought on by anemia and the compensatory rise in blood flow that results in an increase in placental weight in anemia could be the cause. The weight gain observed in the placentas of diabetes women could be explained by compensatory hyperplasia and macrosomia [3].

Similar results in diabetic placentae were noted by Ashfaq et al. (2005) [8], Pankaj Saini et al. (2015) [6], Saha et al. (2014) [7]. Because of ischemic alterations in the arteries, the reduced placental weight in the hypertension group may be explained by decreased blood flow [1]. Anjankar et al. also noted the same results (2014) [1].

In our study, the birth weight of newborns increased in the diabetes group and decreased in the PIH and anemia groups. The weight gain observed in the placentae of diabetes moms could be explained by compensatory hyperplasia and macrosomia. Fetal hyper-insulenemia in reaction to hyperglycemia in fetuses of diabetic moms may be the cause of this macrosomia (Queenan JT) [9]. Majumdar et al. (2005) [10], Udania & Jain (2001) [11], Anjankar et al. (2014) [1], reported reduced birth weight in the PIH group.

According to Thomson et al. (1969) [12], the foeto-placental ratio is more significant in evaluating the foetus than the placenta's weight alone. Previous research by Thomson et al. (1969) [12], Saigal et al. (1969) [13], Gunapriya Raghunath et al. (2011) [14], and Anjankar et al [1] showed an increased foeto-placental ratio in hypertensive pregnancies. Rath et al. [15] found a decreased foeto-placental weight ratio. Table II illustrates that stillbirth rates are higher in the groups with perinatal illnesses known to impact perinatal outcomes: diabetes (14.29%), anemia (10.53%), and PIH (15.15%) than in normal pregnancies (3.33%).

Conclusion

Every couple values pregnancy much, but risk factors such as diabetes, anemia, or pregnancy-induced hypertension make pregnancy more difficult. The perinatal outcome is also impacted by these diseases. Along with fetal characteristics like foetal weight, placental properties are also changed. Therefore, diagnosing these risk factors in pregnancies during the antenatal stage will enhance the result.

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