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Study of Histopathological findings of Placenta in Cases of Deliveries at Tertiary Health Care Institute

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Abstract

Placentae from 67 mothers were studied, of which 28 were from mothers with uncomplicated pregnancies, and the remaining were associated with various maternal and fetal disorders. The purpose of this study was to describe the various gross and microscopic findings in the placentae, and to correlate them with various clinical and radiological abnormalities. Gross and microscopic examination of all the placentae was carried out. Formalin-fixed, paraffin-embedded tissue sections were used which were stained with hematoxylin and eosin. This study found a significant increase in neonatal weight, placental weight and placental diameter in cases of Gestational Diabetes Mellitus (GDM) as compared to cases of Normal Gestation (NG); while neonatal weight, placental weight and placental diameter were significantly lower in cases of maternal anemia, Pregnancy Induced Hypertension (PIH) and Intrauterine Growth Retardation (IUGR) as compared to cases of NG. This study found a significantly increased prevalence of calcifications, syncytial knots, infarcts and fibrinoid necrosis in cases of PIH as compared to cases of NG. Also, the prevalence of sclerotic villi, syncytial knots and chorangiosis was significantly more in cases of GDM than in cases of NG. In addition, the prevalence of sclerotic villi, syncytial knots, infarcts and fibrinoid necrosis was significantly more in cases of maternal anemia than in cases of NG. Overall, the study showed several significant findings, both gross and microscopic, in placentae from mothers and/or foetuses affected by various pathological processes. It was seen that conditions such as GDM, anemia, PIH etc. have a profound effect upon both the foetus and the placenta. Placental examination thus gives an idea of the type and severity of the condition complicating the pregnancy.

Keywords: Anemia, Histopathology, Placenta, GDM, IUGR, PIH

1. Introduction

The placenta forms a functional unit between the mother and the fetus and any pathological event that concerns the mother or the fetus will influence the normal function of the placenta[1,2], resulting in morphological and histopathological changes. Initial observations on placenta were based on macroscopic examination but currently attention is focused on microscopic abnormalities as they may provide crucial information. The placenta has been under appreciated and under studied by the scientific community. Improper function of this critical organ causes fetal abnormalities, preterm labor, preeclampsia and IUGR[3]. This study attempts to describe the changes occurring in the placenta in these pathological processes and to correlate them with the clinical/radiological diagnoses.

2. Materials and Methods

A prospective study of 68 placentae (as one case was of dichorionic-diamniotic twins) over a period of 2 years and 4 months from August 2014 to December 2016 was carried out in the Department of Pathology of MVP's Dr. V. P. Medical college, a tertiary care hospital in Nashik, Maharashtra, with the consent of all of the mothers. The study was a descriptive study. Placentae were included irrespective of age of the mother, parity, birth order, and weeks of gestation, mode of delivery and birth weight

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of the baby. Placentae delivered in cases of medical termination of pregnancy were excluded from the study.

Each case was studied in account of clinical presentation, ANC records, radiological investigations and other relevant investigations. The gross placental examination, histopathological reports and slides were studied in detail.

The placentae collected soon after delivery, rinsed with running tap water, the membranes and cord were trimmed off from the placenta in all cases and weighed on weighing machine graduated in grams (gms) and then preserved in 10% formalin for next 24 hours.

2.1 Gross Examination of Placentae

The diameter was measured using measuring tape in centimetres. Placental shape, color, thickness at centre, condition of membranes, presence of infarction, calcification, site of umbilical cord insertion were all noted down.

Tissues were taken from following placental sites for histopathological studies;

- Cross section of umbilical cord- Cross section just proximal to and just distal to any apparent cord constriction or cord stricture.
- Membranes.
- Fetal side placenta.
- Basal placenta(maternal side).
- Sampling of any apparent abnormalities.

3. Results

The mean maternal age in the study was 25.99 +/- 4.07 years. 40.3% of the mothers were primiparae. The mean gestational age at delivery was 34.73 +/- 6.05 weeks. 41.79% of the mothers had uncomplicated pregnancies; the remainder had a variety of clinically and/or radiologically diagnosed disorders complicating pregnancy, such as anemia, PIH, GDM, IUGR, oligohydramnios etc.

Table 1. Distribution of neonatal weight in the study

Neonatal Weight	Frequency	Percent
Unknown	1	1.45
Normal >= 2500 gms	36	52.17
Low Birth Weight (LBW) >=1500 and <2500	20	28.99
Very Low Birth Weight (VLBW) >=1000 and < 1500	7	10.14
Extremely Low Birth Weight (ELBW) <1000	5	7.25
Total	**69**	**100.00**

Categories of low birth weight are given according to textbook definition[4].

Table 2. Morphometry of all the placentae in the study

	Mean	SD
Placental Weight	405.59	158.19
Placental: Neonatal Weight Ratio	0.19	0.08
Placental Diameter (Cms)	16.75	3.94
Placental Thickness at Centre (cms)	2.01	0.69

The morphometric measurements of the placentae in the study were as follows:

2.69% of the placentae were round, while 35.82% were oval in shape. One (1.49%) was received in fragments.

55.07% of the placentae had central umbilical cord insertion; 42.03% had eccentric umbilical cord insertion. Eccentric cord insertion was not significantly more common in either PIH (p = 0.18) or IUGR (p = 0.6)

Table 3. Distribution of microscopic findings in all the placentae in the study

Microscopic Findings	Frequency	Percent
Intervillous hemorrhage	23	34.33
Villitis	4	5.97
Calcifications	33	47.83
Sclerosis of Villi	17	25.37
Syncytial Knots	22	32.84
Infarction/Infarcts	24	35.82
Fibrinoid Necrosis	13	19.40
Chorioamnionitis	18	26.87
Cord Vasculitis	12	17.91
Funisitis	0	0.00
Chorangiosis	6	8.96
Hyaline Thrombi in Placental Blood vessels	2	2.99

Table 4. Chi square test between cases of NG and PIH with respect to microscopic findings. (* - Significant)

Microscopic Findings	NG (28)	PIH (13)	Chi sq statistic	p value
Intervillous hemorrhage	9	7	1.76	0.3
Villitis	1	1	0.33	0.54
Calcifications	12	11	6.29	0.01*
Sclerosis of Villi	3	5	4.35	0.08
Syncytial Knots	2	10	20.88	0.00*
Infarction/Infarcts	2	12	28.64	0.00*
Fibrinoid Necrosis	0	12	36.54	0.00*
Chorioamnionitis	6	4	0.42	0.69
Cord Vasculitis	4	3	0.49	0.66
Chorangiosis	2	0	0.98	1
Hyaline Thrombi in Placenta Blood vessels	0	1	2.21	0.32

Table 5. Chi square test between cases of NG and GDM with respect to microscopic findings (* - Significant)

Microscopic Findings	NG (28)	GDM (3)	Chi sq statistic	p value
Intervillous hemorrhage	9	1	0.002	1
Villitis	1	0	0.11	1
Calcifications	12	3	3.54	0.1
Sclerosis of Villi	3	3	13.84	0.004*
Syncytial Knots	2	2	8.54	0.03*
Infarction/Infarcts	2	0	0.23	1
Fibrinoid Necrosis	0	1	9.64	0.09
Chorioamnionitis	6	0	0.79	1
Cord Vasculitis	4	2	4.76	0.08
Chorangiosis	2	2	8.54	0.03*

Table 6. Chi square test between cases of NG and anemia with respect to microscopic findings (* - Significant)

Microscopic Findings	NG (28)	Anemia(6)	Chi sq statistic	p value
Intervillous hemorrhage	9	5	5.35	0.06
Villitis	1	1	1.53	0.33
Calcifications	12	2	0.19	1
Sclerosis of Villi	3	3	5.25	0.05*
Syncytial Knots	2	6	23.68	0.00*
Infarction/Infarcts	2	6	23.68	0.00*
Fibrinoid Necrosis	0	3	15.36	0.003*
Chorioamnionitis	6	3	2.07	0.31
Cord Vasculitis	4	2	1.23	0.28
Chorangiosis	2	0	0.45	1
Hyaline Thrombi in Placenta Blood vessels	0	1	4.81	0.18

Table 7. ANOVA (Analysis of Variance) between NG, PIH, GDM, Anemia, IUGR, IUFD and Oligohydramnios with respect to placental:neonatal weight ratio

Placental :Neonatal Weight Ratio	Minimum	Maximum	Mean	SD	F statistic	p value
NG	0.12	0.27	0.17	0.03	1.16	0.34
PIH	0.14	0.60	0.23	0.12		
Anemia	0.13	0.60	0.24	0.18		
GDM	0.18	0.21	0.19	0.01		
IUFD	0.11	0.60	0.23	0.15		
IUGR	0.13	0.17	0.15	0.02		
Oligohydramnios	0.14	0.21	0.17	0.03		

Table 8. ANOVA between various clinical and radiological diagnoses with respect to neonatal weight

Neonatal Weight	Minimum	Maximum	Mean	SD	F statistic	p value
NG	0.7	3.6	2.72	0.59	7.71	<0.0001*
PIH	0.3	2.8	1.86	0.86		
Anemia	0.3	2.8	1.78	0.92		
GDM	3.4	3.4	3.40	0.00		
IUFD	0.2	2.75	1.54	0.75		
IUGR	1.7	2	1.90	0.17		
Oligohydramnios	1	2.5	1.63	0.56		
Fetal anomalies	0.63	1.4	0.99	0.39		

Table 9. ANOVA between cases of NG, PIH and GDM and Anemia with respect to placental weight (* - Significant)

Placental Weight(g)	Minimum	Maximum	Mean	SD	F statistic	p value
NG	140	700	456	108.69	6.44	0.001*
PIH	110	620	354	159.70		
GDM	620	700	658	40.41		
Anemia	180	550	338.75	155.95		

Table 10. ANOVA between cases of NG, PIH, GDM and Anemia with respect to placental diameter. (* - significant)

Placental Diameter	Minimum	Maximum	Mean	SD	F statistic	p value
NG	11.5	24	18.07	3.06	16.08	<0.0001*
PIH	10.5	19	14.57	2.04		
GDM	23	27	24.8	2.08		
Anemia	10.5	15.5	13.63	2.07		

Table 11. ANOVA between cases of full term, preterm and postdated gestation with respect to placental weight (* - Significant)

Placental Weight(g)	Minimum	Maximum	Mean	SD	F statistic	p value
Full term	220	700	493.21	117.79	16.37	<0.0001*
Pre term	110	600	324.10	125.57		
Post dated	340	570	466.67	96.39		

Table 12. ANOVA between cases of full term, preterm and postdated gestation with respect to placental diameter (* - Significant)

Placental Diameter	Minimum	Maximum	Mean	SD	F statistic	p value
Full term	14	27	19.07	3.51	9.11	0.0003*
Pre term	10.5	30	15.36	3.64		
Post dated	15	22	18.08	3.28		

4. Discussion

Dhabhai P et al.,[5] found increased syncytial knots, hyalinized villi, stromal fibrosis and fibrinoid necrosis in cases of PIH as compared to controls.

Treesh SA et al.,[6] studied placentae from women affected by GDM and found an increase in mean placental weight (compared to controls), increased number of fetal capillaries in the villi, stromal villous fibrosis, villous edema, thickness of basement membrane of syncytiotrophoblast, glycogen deposits and strong positive reaction for CD34 in the wall of blood vessels in stem villus. Khaskhelli LB et al.,[7] also found significantly increased placental weight, thickness and diameter in cases of GDM as compared to controls as well as areas of necrosis and degeneration.

A study by Kotgirwar S et al.,[8] on placentae from cases of IUGR found increased fibrinoid necrosis, increased perivillous fibrinoid deposition, increased syncytial knots and increased placental infarction in placentae in IUGR cases as compared to controls.

Soni RB[9] found a higher prevalence of villous fibrosis, sclerotic villi, cytotrophoblastic proliferation and increased villous capillaries in the placentae of anemic mothers as compared to controls. Adil SAK[10] found an increased prevalence of syncytial knots, vasculo-syncytial membranes, fibrinoid necrosis and stromal fibrosis in the placenta of anemic mothers as compared to controls. However, the effect of anemia on placental size and weight is controversial; Begum M et al.,[11] found a significant increase in placental weight in anemic mothers as compared to controls, while Lelic M et al.,[12] found a small decrease in the placental weight of anemic mothers as compared to controls.

4.1 Neonatal Weight

This study found the neonatal weight to be significantly increased in cases of GDM and significantly reduced in cases of PIH, maternal anemia and IUGR as compared to cases of NG. These findings concurred with those of other studies, such as Sankar KD et al.,[13] Keche HA[14], Elshennawy TMA et al.,[15], Lelic M et al.,[11] and Kotgirwar S et al[8].

4.2 Gross Placental Parameters

This study found mean placental weight and diameter to be significantly increased in cases of GDM as compared to cases of NG. Elshennawy TMA et al[15] found only a mild increase in these variables in cases of GDM as compared to controls, but Saini P et al[16] found a significant increase in placental weight, diameter and thickness as compared to controls.

This study found that mean placental weight and placental diameter were significantly reduced in cases of PIH as compared to cases of NG.

Goswami PR et al.,[17] found significant reduction in placental weight, diameter and thickness in cases of PIH as compared to controls. Similar findings were reported by Keche HA et al[14].

This study found that mean placental weight and diameter were significantly reduced in cases of anemia as compared to cases of NG. However, other studies show conflicting data regarding placental measurements in anemic mothers; Soni R et al.,[18] found a significant reduction in placental weight as compared to controls only in severe anemia (<7 g/dl) but not in mild-to-moderate anemia, while Lelic M et al.,[11] found an insignificant decrease in placental weight in anemic mothers as compared to controls, while Begum M et al.,[10] actually found an increase in mean placental diameter and surface area in placentae from anemic mothers.

This study found mean placental weight and diameter to be significantly reduced in cases of preterm birth as compared to full term births, but no significant difference was observed between full term and post term births.

Sherin F et al.,[19] and RL Balihallimath et al.,[20] also found a significant reduction in placental weight and thickness in preterm births as compared to full term births.

This study found a significant reduction in placental weight and diameter in cases of IUGR as compared to cases of NG, supported by Kotgirwar S et al[7].

In this study, the mean placental:neonatal weight ratio was higher but not significantly higher in cases of PIH and anemia as compared to cases of NG. It was slightly but not significantly lower in cases of IUGR as compared to cases of NG.

Kambale T et al.,[21] Majumdar S[22], Kurdukar MD et al.,[23] however, all found an increased placental:neonatal weight ratio in cases of PIH as compared to controls, while Ghomian N[24] and Marconi AM et al.,[25] found an increased placental:neonatal weight ratio in cases of IUGR as compared to controls.

In this study, eccentric insertion of the cord was not significantly more prevalent in either PIH or IUGR as compared to cases of NG.

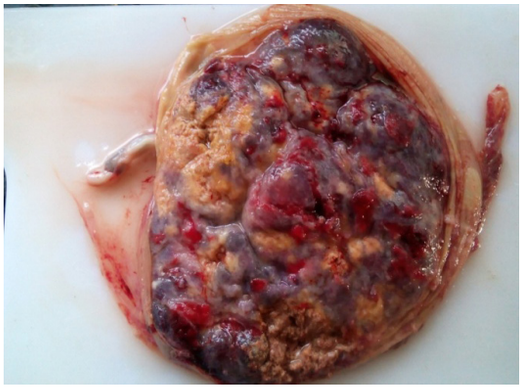

Figure 1. Maternal surface of placenta. White areas indicate infarcts.

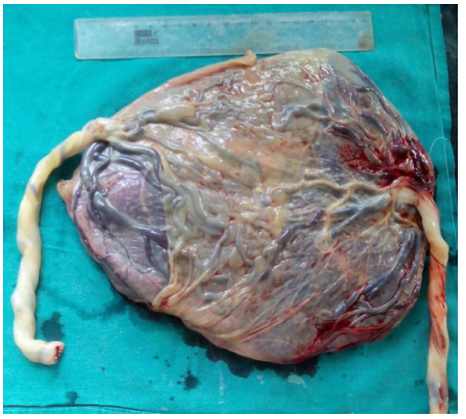

Figure 2. Twin placenta (Fetal surface)- Monochorionic - Diamniotic.

4.3 Microscopic Placental Findings

This study found a significantly increased prevalence of calcifications, syncytial knots, infarcts and fibrinoid necrosis in cases of PIH as compared to cases of NG. Similar findings were reported by Dhabhai P et al.,[4] Goswami P et al.,[26] and Goswami PR and Shah SN[17].

In this study, it was found that the prevalence of sclerotic villi, syncytial knots and chorangiosis was significantly more in cases of GDM than in cases of NG. Similar findings were reported by Verma R et al.,[27] Edu A et al.,[28] and Hyunh J et al[29].

In this study it was found that the prevalence of sclerotic villi, syncytial knots, infarcts and fibrinoid necrosis was significantly more in cases of maternal anemia than in cases of NG. Similar findings were reported by Soni RB et al.,[8] and Adil SAK et al[9].

This study did not find any significantly increased microscopic finding in cases of IUGR as compared to cases of NG. This contrasts with the findings by other workers, such as Kotgirwar S et al.,[7] Mardi K et al.,[30] and Bal K et al.,[31] who found an increased prevalence of fibrinoid necrosis, perivillous fibrin deposition and syncytial knots and infarcts in placentae from cases of IUGR as compared to controls. Bal K et al.,[31] also noted cytotrophoblastic hyperplasia in cases of IUGR.

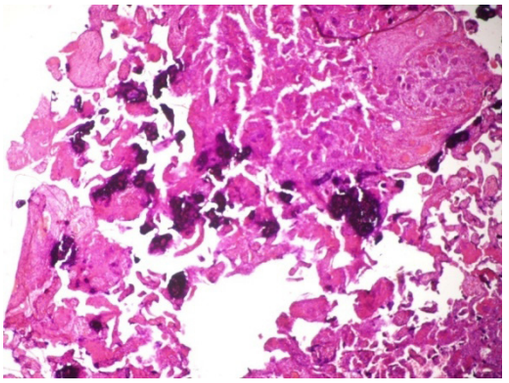

Figure 3. Calcifications in placenta (100X, H&E).

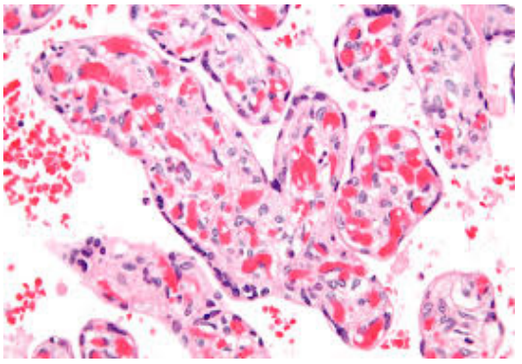

Figure 4. Chorangiosis (400X, H&E).

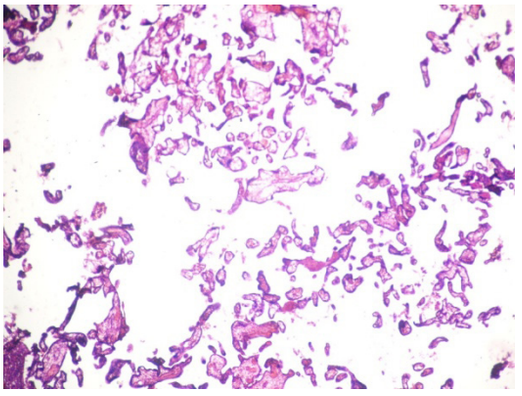

Figure 5. Sclerosis of villi in case of GDM (100X, H&E).

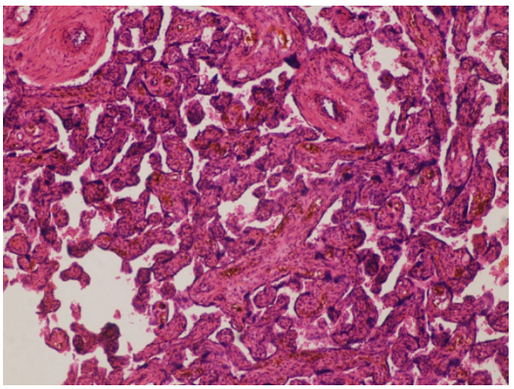

Figure 6. Syncytial knots (100XH&E).

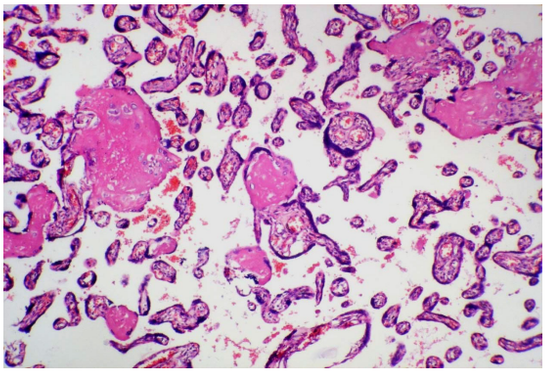

Figure 7. Fibrinoid necrosis in case of GDM (H&E, 100X).

5. Conclusion

This study shows several significant findings, both gross and microscopic, in placentae from mothers and/or foetuses affected by various pathological processes.

This shows anatomopathological study of the placenta is fundamental for the comprehension and integration of poor obstetric outcomes, thereby playing an important role in litigation processes as well as timely management of the mother and fetus which can improve outcome of further pregnancies.

Therefore, this study highlights the importance of placental examination suggesting that it should be a routine component of both obstetric and neonatal care.

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