

Frequency of Abnormal Placental Histopathology and their Association with Adverse Perinatal Outcomes

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ABSTRACT

Objective: To determine the frequency and pattern of abnormal placental histopathology and its impact on adverse fetal outcomes.

Study Design: Cross-sectional/Observational

Place and Duration: This study was conducted at department of Obstetrics and Gynaecology, Jinnah Medical and Dental College Hospital Korangi, Karachi for duration of six months from 1st June 2019 to 30th November 2019.

Methodology: One hundred and fifty five women with normal or C-section deliveries were enrolled. After taking informed written consent, detailed demographics including age, gestational age, body mass index, mode of delivery and co-morbidities were recorded. Placenta of each patient was examined macroscopically and sent to laboratory for histopathological examination. Frequency of abnormal placenta was recorded. Association between abnormal placenta and poor neonatal outcomes were examined. Data was analyzed by SPSS 27.0.

Results: Mean age of patients was 28.75±5.34 years. Mean gestational age was 38.24±2.16 weeks. Abnormal placenta was found in 45 (29.03%) patients while 70.97% had normal placenta on histopathology. Out of 45 abnormal placenta, vessel wall thickness was found in 31 (68.89%), infarction found in 8 (17.77%), chorioangiomas found in 4 (8.89%), and villitis in 2 (6.67 %). A significant association was observed between abnormal placenta and adverse fetal outcomes with p-value <0.05.

Conclusion: Abnormal placental histopathology was found in 29.03% and significantly associated with adverse fetal outcomes.

Keywords: Placental Histopathology, Neonatal Outcomes, Neonatal death, Low-birth weight, NICU Admission, Apgar Score.

INTRODUCTION

During pregnancy the placenta is the organ that binds the mother and foetus. The exchange of nutrients and oxygen from the mother to the foetus and the removal of foetal waste products¹ play a key role in the growth and development of foetuses. Placenta contains a pregnancy journal. Pathological placenta screening may contribute to the clinical understanding of premature birth, restricted foetal growth and neonatal morbidity².

In the past few years, placental lesion results have helped to better understand how the placenta works. Less than optimum placental performance can cause both mother and foetus morbidity or even mortality. In fact, placental lesions are indicated as the main cause of foetal death³. It is also increasingly evident that impaired placental functioning may have a significant effect on the live child⁴.

There is growing evidence that placental pathology can lead to singleton mortality in pregnant women when they are 24 weeks or older^{5,6}. The placenta sits at the interface between mother and foetus and offers a record of foetal and maternal intrauterine events. A variety of disorders are known to involve stillbirth, including anomalies on the cord (insertion site, coiling index, etc.)⁷, abnormalities of the site of implementation (placenta previa, placenta accrete, increta and percreta), processes of infectious disease (maternal or foetal), and circulation compromise (maternal or foetal)⁸.

Many pregnancy complications associated with high foetal morbidity and death have been shown to be very different from typical placental morphology and anatomy⁹. With placenta as a picture for the mother's and the foetus' health, complications like hypertension during pregnancy have been significantly reflected microscopically or macroscopically in placenta¹⁰. We conducted present study with aimed to determine the frequency and pattern of abnormal placental histology and its association with adverse fetal outcomes.

METHODOLOGY

This cross-sectional/observational study was conducted at department of Obstetrics and Gynaecology, Jinnah Medical and Dental College Hospital Korangi, Karachi for duration of six months from 1st June 2019 to 30th November 2019. Total 155 women with normal or C-section deliveries were enrolled. After taking informed written consent, detailed demographics including complete blood picture, age, gestational age, body mass index, parity, mode of delivery and co-morbidities were recorded. Women with ischemic heart disease, renal failure patients, ages <18 years and those with no consent were excluded from this study.

Placenta of each patient was examined macroscopically and sent to laboratory for histopathological examination. Frequency of abnormal placenta was recorded. Association between abnormal placenta and

poor neonatal outcomes such as Apgar score, still birth, mortality, NICU admission, low birth weight and IUGR were examined. All the data was analyzed by SPSS 24.0. Mean±SD was obtained. Frequencies and percentages were recorded in tabulation form. Chi-square test was applied to examine the association between abnormal placental histology and adverse fetal outcomes. P-value <0.05 was taken as significant.

RESULTS

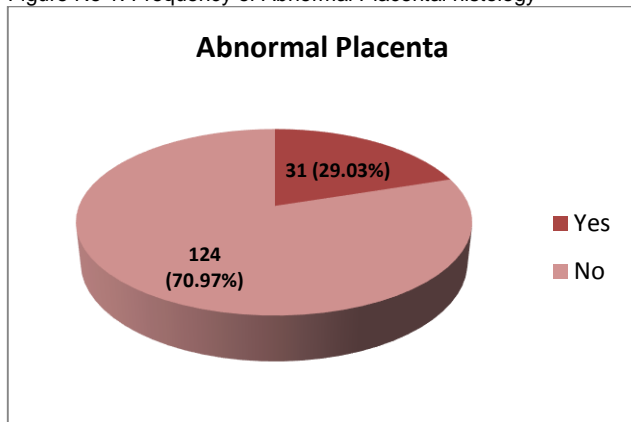
Mean age of patients was 28.75±5.34 years. Mean gestational age was 38.24±2.16 weeks. Mean BMI was 25.74±2.44 kg/m². 90 (58.06%) patients were primigravida while 65 (41.94%) were multigravida. 94 (60.65%) patients had normal deliveries while 61 (39.35%) had cesarean section mode of delivery. 40 (25.81%) patients had hypertension, 26 (16.77%) had diabetes mellitus, 15 (9.68%) had anemia, chronic liver disease found in 4 (2.58%) patients. (Table 1)

Table No 1: Demographic detail of all the included patients

Characteristics	Frequency No.	%age
Mean age (years)	28.75±5.34	-
Mean Gestational Age	38.24±2.16	-
Mean BMI (kg/m)	25.74±2.44	-
Mean Placenta Weight (gms)	402.36±18.74	-
Gravidity		
Primigravida	90	58.06%
Multigravida	65	41.94%
Mode of delivery		
Normal Vaginal	94	60.65%
C-section	61	39.35%
Co-morbidities		
Hypertension	40	25.81%
DM	26	16.77%
Anemia	15	9.68%
CLD	4	2.58%

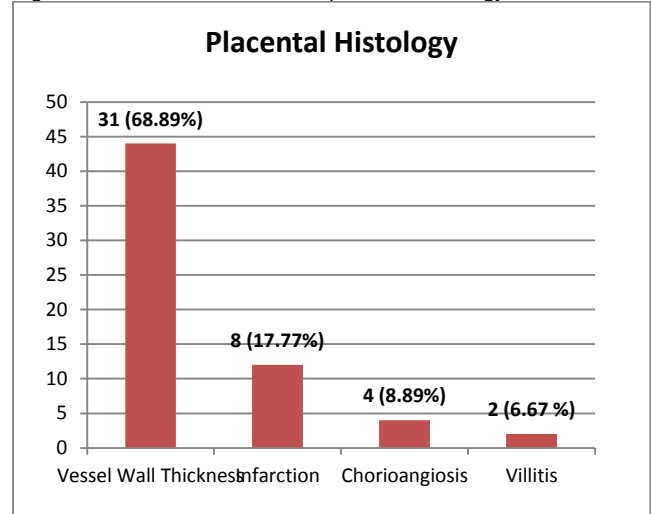
Abnormal placenta was found in 31 (29.03%) patients while 124 (70.97%) had normal placenta on histopathology. (Figure 1)

Figure No 1: Frequency of Abnormal Placental histology



According to the histology of 45 abnormal placenta, vessel wall thickness was found in 31 (68.89%), infarction found in 8 (17.77%), chorioangiomas found in 4 (8.89%), and villitis in 2 (6.67%). (Figure 2)

Figure No 2: Pattern of abnormal placental histology



According to the neonatal outcomes, 22 (14.19%) had low birth weight, 12 (7.74%) had apgar score <5 at 1 minute, 3 (1.94%) had still birth, mortality in 6 (3.87%), and 11 (7.10%) neonates had need for NICU admission. We found a significant association between abnormal placental histology and adverse neonatal outcomes with p-value <0.05. (Table 2)

Table No 2: Adverse Neonatal outcomes and association with abnormal placenta histology

Variables	Abnormal Placenta (n=31)	Normal Placenta (n=124)	P-value
LBW	15 (38.71)	7 (5.65)	0.024
Apgar Score <5 at 1 Min	8 (25.80)	4 (3.23)	0.038
Still birth	3 (9.68)	0 (0)	0.002
NICU Admission	8 (25.80)	3 (2.42)	0.029
Death	5 (16.13)	1 (0.81)	0.022

DISCUSSION

Adverse pregnancy outcomes (PPOs) are both health and political issues on the agenda. Low birth weight and premature birth are the most common PPOs. These issues have put an economic burden on high healthcare rates, educational costs and service costs. Successful measures aimed at maximised pregnancy would also have a significant economic effect on society. We conducted present study with aimed to determine the frequency of abnormal placenta histology and its association with adverse neonatal outcomes. In this regard 155 patients were analyzed. The mean age of patients in our study was 28.75±5.34 years. Mean gestational age was 38.24±2.16 weeks. Mean BMI was 25.74±2.44 kg/m². 90 (58.06%) patients were primigravida while 65 (41.94%) were multigravida. 94 (60.65%) patients had normal deliveries while 61 (39.35%) had cesarean section mode of delivery. Many of previous studies demonstrated that majority of women 60% were in the age group 25 to 30 years¹¹⁻¹². A study by Ramachandran A et al [13] reported that out of 120 patients whom were analyzed for placental histology 53.33% were primigravida while 46.67% were multigravida.

In our study we found that placental weight was 402.36±18.74gms. Studies have shown typical placenta at

term to be 185 mm in diameter and 23 mm in thickness on average with a volume of 497 ml and 508 gms in weight¹⁴⁻¹⁵.

In present study abnormal placenta was found in 31 (29.03%) patients while 70.97% had normal placenta on histopathology. According to the histology of 45 abnormal placenta, vessel wall thickness was found in 31 (68.89%), infarction found in 8 (17.77%), chorioangiomas found in 4 (8.89%), and villitis in 2 (6.67%). A study by Auwah SP et al¹⁶ reported that frequency of placental haematoma, placental infarction, and placental calcification in the hypertensives were significantly ($p = 0.001$). Another study reported that vessel wall thickening was demonstrated in 54/120 patients (45%). 7 out of 54 (12.96%) fetuses were still born in this group compared to 2/30 (6.67%) with normal histology (p value <0.05)¹⁷.

In this study according to the adverse neonatal outcomes, we found that 22 (14.19%) had low birth weight, 12 (7.74%) had apgar score <5 at 1 minute, 3 (1.94%) had still birth, mortality in 6 (3.87%), and 11 (7.10%) neonates had need for NICU admission. We found a significant association between abnormal placental histology and adverse neonatal outcomes with p -value <0.05 . Zia S et al found that anterior placental implantation raises the risk of high blood pressure, gestational diabetes mellitus, placental abruption, delayed intrauterine growth and intrauterine pregnancy-inducing foetal death. Posterior placenta has a strong preterm labour association¹⁸. The occurrence of neonates in this category also was substantially high with 1 minute Apgar $<5/10$ premature birth and IUD. This supports the hypothesis that the adverse neonatal outcome was possibly due to uteroplacental flow ischemia¹⁹.

The primary contributor to foetal deaths is placental pathology associated with maternal vascular underperfusion, ranging from 34 to 38 percent²⁰⁻²¹. This is most pronounced during the early stages, complicated by hypertensive conditions in pregnancies and then strongly decreased. Fetal death during the term is primarily caused by placental parenchyma pathology²².

CONCLUSION

We can conclude that abnormal placental histopathology was found in 40% and significantly associated with adverse fetal outcomes. Moreover, pathological examination of the placenta is essential for clarifying causes of adverse neonatal outcomes.

REFERENCES

- Larsen W (2001) Human embryology. Philadelphia: Churchill livingstone.
- Bonnin A, Levitt P (2011) Fetal, maternal, and placental sources of serotonin and new implications for developmental programming of the brain. *Neuroscience* 197: 1–7.
- Ogunyemi D, Murillo M, Jackson U et al. The relationship between placental histopathology findings and perinatal outcome in preterm infants. *J Matern Fetal Neonatal Med* 2003 Feb;13:102-9
- Robbins JR, Bakardjiev AI (2012) Pathogens and the placental fortress. *Curr Opin Microbiol* 15: 36–43.
- Korteweg FJ, Erwich JJ, Holm JP, Ravise JM, van der Meer J, et al. (2009) Diverse placental pathologies as the main causes of fetal death. *Obstet Gynecol* 114: 809–817.
- Benirschke K, Kaufmann P, Baergen R. Pathology of the Human Placenta. 5th ed. New York, Springer Verlag; 2012.
- Pásztor N, Keresztúri A, Kozinszky Z, Pál A. Identification of causes of stillbirth through autopsy and placental examination reports. *Fetal Pediatr Pathol.* 2014;33:49–54.
- Redline RW. Placental pathology: a systematic approach with clinical correlations. *Placenta.* 2008;29:S86–91.
- Pinar H, Goldenberg RL, Koch MA, et al. Placental findings in singleton stillbirths. *Obstet Gynecol.* 2014;123:325–36.
- Tachibana M, Nakayama M, Miyoshi Y. Placental examination: prognosis after delivery of the growthrestricted fetus. *Curr Opin Obstet Gynecol.* 2016 Apr 1;28(2):95-100.
- Guttmacher AE, Maddox YT, Spong CY. The Human Placenta Project: placental structure, development, and function in real time. *Placenta.* 2014 May;35(5):303-4.
- Armstrong DL, McGowen MR, Weckle A, Pantham P, Caravas J, Agnew D et al. The core transcriptome of mammalian placentas and the divergence of expression with placental shape. *Placenta.* 2017 Sep;57:71-8.
- Ramachandran A. Analysis of placental pathology and fetal outcome. *Int J Reprod Contracept Obstet Gynecol* 2018;7:1322-9.
- Stanek J. Placental hypoxic overlap lesions: a clinicoplacental correlation. *J Obstet Gynaecol Res.* 2015;41(3):358–69.
- Binbir B, Yeniel AO, Ergenoglu AM, Kazandi M, Akercan F, Sagol S. The role of umbilical cord thickness and HbA1c levels for the prediction of fetal macrosomia in patients with gestational diabetes mellitus. *Arch Gynecol Obstet.* 2012;285:635–9.
- Auwah SP, Okai I, Ntim EA, Bedu-Addo K (2020) Prevalence, placenta development, and perinatal outcomes of women with hypertensive disorders of pregnancy at Komfo Anokye Teaching Hospital. *PLoS ONE* 15(10): e0233817.
- Sato Y, Benirschke K, Marutsuka K, Yano Y, Hatakeyama K, Iwakiri T et al. Associations of intrauterine growth restriction with placental pathological factors, maternal factors and fetal factors; clinicopathological findings of 257 Japanese cases. *Histol Histopathol.* 2013 Jan;28(1):127-32
- Zia S. Placental location and pregnancy outcome. *J Turk Ger Gynecol Assoc* 2013;14:190-193.
- Vafaei, H., Karimi, Z., Akbarzadeh-Jahromi, M. et al. Association of placental chorangiomas with pregnancy complication and prenatal outcome: a case-control study. *BMC Pregnancy Childbirth* 21, 99 (2021).
- Katz N, Schreiber L, Oron A, Halachmi S, Kohelet D. Inflammatory response in preterm newborns born after prolonged premature rupture of membranes: is there a correlation with placental histological findings?. *IMAJ.* 2017 Oct;19(10):610-3.
- Goldenberg RL, Culhane JF, Johnson DC. Maternal infection and adverse fetal and neonatal outcomes. *Clin Perinatol* 2005;32:523-59.
- Kulkarni, A.D., Palaniappan, N. & Evans, M.J. Placental Pathology and Stillbirth: A Review of the Literature and Guidelines for the Less Experienced. *J. Fetal Med.* 4, 177–185 (2017).