

Original Research Article

HISTOPATHOLOGICAL STUDY OF PLACENTAE IN IUGR PREGNANCIES IN COMPARISON TO NORMAL TERM INFANTS IN A TERTIARY CARE HOSPITAL AND CORRELATION WITH PERINATAL OUTCOME AND FOETAL BIRTH WEIGHT

K. Lakshmi¹, K. Padmavathi², D. Priyanka³, Ahalya Prasanthi⁴, K.V. Sudha Madhuri⁵, I. Vijaya Bharathi⁶

¹Assistant Professor, Department of Obstetrics &Gynecology, Government Medical College, Srikakulam, Andhra Pradesh, India.

²Professor, Department of Obstetrics &Gynecology, Rangaraya Medical College, Kakinada, Andhra Pradesh, India.

³Postgraduate, Department of Pathology, Government Medical College, Srikakulam, Andhra Pradesh, India.

⁴Associate Professor, Department of Obstetrics &Gynecology, Government Medical College, Srikakulam, Andhra Pradesh, India.

⁶Professor and HOD Department of Pathology Government Medical College Srikakulam, Andhra Pradesh, India.

Received : 14/11/2023
Received in revised form : 05/02/2024
Accepted : 19/02/2024

Corresponding Author:

Dr. K.V.Sudha Madhuri

Associate Professor, Department of
Obstetrics &Gynecology, Government
Medical College, Srikakulam, Andhra
Pradesh, India..

Email:

kvsmdhuri1975.kk@gmail.com

DOI: 10.5530/ijmedph.2024.1.105

Source of Support: Nil,

Conflict of Interest: None declared

Int J Med Pub Health

2024; 14 (1); 571-574

ABSTRACT

Background: Healthy development of foetus is dependent on normal placental development. Alteration in the placental development is the main etio-pathological factor for Intra Uterine Growth Retardation (IUGR). Hence, the present study aims to compare the histopathological findings of placenta in IUGR and normal term infants.

Materials and Methods: This cross-sectional study was done at a tertiary care hospital for 9 months (June 2023 to February 2024). A total of 100 placentae were included. Fifty normal placentae and Fifty placentae from IUGR pregnancies were included.

Results: Fibrin deposition (34%), Increased Syncytial Knotting (22%), Membrane Hyalinization (20%) and Calcification (12%) were seen along with Chorio-amnionitis (in 3 cases) and haemorrhagic Endo-vasculitis (in 3 cases). These changes were seen less in control group.

Conclusion: The study findings suggest that chronic ischemia and associated secondary changes probably lead to improper perfusion and IUGR. Therefore, a regular antenatal checkup is the key to diagnosis of IUGR.

Keywords: Histopathology, IUGR, Placenta, Foetus, Birth weight.

INTRODUCTION

In the complex interplay of maternal-foetal physiology, the placenta, a highly vascularized organ, plays a crucial role in facilitating foetal growth. It transports nutrients, oxygen, and other essential growth substances from maternal to foetal circulation while simultaneously managing the removal of metabolic waste and carbon dioxide from foetal to maternal circulation. Moreover, the placenta synthesizes hormones that regulates the interaction between the mother and her foetus.^[1]

Within this delicate balance, Intrauterine Growth Restriction (IUGR) emerges as a condition associated with placental insufficiency.^[2] Adaptive changes in IUGR may fail at some point, leading to foetal death.

IUGR, a global phenomenon associated with significant neonatal morbidity and mortality, is characterized by foetal birth weight less than 10th percentile of those born at the same gestational age or two standard deviations below the population mean.^[3] The World Health Organisation (WHO) estimates that over 20 million babies are born with IUGR annually, with a higher prevalence in South Asia and Africa.^[4] The causes of IUGR can be divided into maternal, foetal, placental and unknown causes, but the basic pathophysiology is due to reduced availability of nutrients in mother or its reduced transfer by the placenta to the foetus. It may also be due to reduced utilization by the foetus. Given the multi-faceted nature of IUGR, its diverse etiologic roots, outcomes, and effective treatment strategies remain

insufficiently recognized. Therefore, a more extensive exploration of placental pathology and morphology helps in identifying factors contributing to IUGR and, subsequently, enhancing its treatment and prevention.^[5] Hence this study was conducted with

Objectives

1. To compare the histopathological features of placental tissues in pregnancies with Intrauterine Growth Restriction (IUGR) and those with normal term infants.
2. To assess the correlation between placental histopathological findings with perinatal outcomes and foetal birth weight in both study groups.

MATERIAL AND METHODS

Study design: This Cross-sectional study was carried out in the department of Obstetrics and Gynaecology in a tertiary care hospital, Srikakulam for 9 months from June 2023 to February 2024.

Sampling Technique: Consecutive Convenient Sampling method was used.

Methods of data collection

Hundred placentae (100) were subjected to detailed gross and histopathological examination. Fifty placentae belonged to the IUGR group and other fifty placentae were collected immediately after delivery from women who delivered normal term foetus either vaginally or by caesarean section were included as Control group.

Definition: IUGR was defined on basis of an estimated foetal weight of less than the third percentile for gestational age, reduced amniotic fluid volume or doppler USG of umbilical artery demonstrating absent end diastolic flow velocity and was established by serial ultrasonographic examination.^[6]

Inclusion Criteria

- Maternal age between 20 to 35 years
- Gestational age between 32 to 40 weeks with IUGR (USG confirmed) or normal healthy foetus
- Singleton pregnancies

Exclusion criteria:

- Preterm labor
- Multiple gestation
- Gestational Age <32 weeks
- Gestational Diabetes Mellitus
- Evidence of any congenital anomaly or intrauterine death
- Antepartum haemorrhage

Systemic disorder Clinical parameters

A thorough History, General and Systemic Examination of patient was done. Routine haematological and biochemical investigations were done. The mode of delivery (Vaginal/Caesarean/Forceps) was noted. The weight of the baby was taken within the 1st hour of birth. The neonatal welfare was assessed by APGAR scoring system.

Placenta obtained after delivery was sent immediately in 10% Formalin to the lab for gross and histopathological examination by pathologist. Its dimensions were recorded.

The following parameters were noted

- Placental weight,
- cord insertion – Central or Eccentric
- number of vessels in the cord
- Membrane insertion- Marginal or Circumvallate
- Membrane discolouration-Meconium stained or Yellow
- Foetal surface was examined for colour and health of membranes,
- Maternal surface was examined for loss of cotyledons, haemorrhage, calcification, or necrosis.

Statistical Analysis

The results obtained were analysed to study the correlation between placental findings and the delivery outcomes. Statistical correlation was done using SPSS software version 25. Chi-Square test with or without Yate's correction was used as and when required. P<0.05 was taken as critical level of significance.

Ethical Issues

Ethical clearance from Institutional Ethical Committee was obtained prior to the start of the study. Written informed consent was obtained from all mothers participating in the study.

RESULTS

Total study participants were 100. Age of the study population ranged from 18 to 40 years with Mean age of the mother 24.64 ± 4.10 year. The majority of the study participants with IUGR were in the age group of 18-25 years. [Table 1]

56 of the patients were male and 44 of the patients were female.

From the above table, it was found that the gestational age of the IUGR group was significantly shorter by nearly 1 week than the control group with a P-value <0.05. IUGR neonatal measurement like Birth weight was significantly lower than those in the control group.

The Placental/Neonatal weight ratio was significantly increased in IUGR (18.86) than the control group (18.12) reflecting a significant reduction in IUGR placental efficiency. [Table 2]

From the above table, it was found that several major histologic changes occur in IUGR placentas compared to the normal placentas. These changes include Fibrin deposition seen in 34% of placenta, Increased Syncytial knotting in 22%, Membrane Hyalinization in 20% and calcification in 12% of cases. Eight percent of cases had leucocytic infiltration. No pathology seen in 18% of cases. In addition, Chorioamnionitis (3 cases) and haemorrhagic endo-vasculitis (3 cases) were found more common in IUGR related pregnancies.

In control group, Majority (60%) of the placenta showed no pathology and only 12% and 10% showed

Fibrin deposition and Increased vascularity respectively. [Table 3]

Table 1: Distribution of study population according to their Age

Age in years	IUGR group N (%)	Control group N (%)	Total (N)
18-25	35 (70)	24 (48)	59
26-30	12 (24)	17 (34)	29
31-35	1 (2)	8 (16)	9
36-40	2 (4)	1 (2)	3
Total	50	50	100

Table 2: Maternal, Neonatal and Placental Characteristics

Characteristic	IUGR group (Mean ± SD)	Control group (Mean ± SD)	P-Value
Mothers			
Mean age of mothers (in years)	23.65 ± 2.65	25.42 ± 4.42	0.017
Parity	0.81 ± 1.2	1.1 ± 1.35	0.259 (Not significant)
Neonates			
Gestational age(weeks)	37.8 ± 1.2	38.7 ± 0.9	0.0001
Mean birth weight of fetus (grams)	2253 ± 176	3035 ± 318	0.000
Placental			
Mean placental weight (grams)	425 ± 40.6	550 ± 61.7	0.000

*Unpaired t-test was used to compare the means of two groups

Table 3: The Microscopic findings of Placenta of study group and control group

	IUGR group N (%)	Control group N (%)
Acute Chorio-Aminionitis	3 (6)	0 (0)
Membrane Leucocytic infiltration	4 (8)	0 (0)
Increased Vascularity	2 (4)	5 (10)
Calcification	6 (12)	2 (4)
Fibrin deposition	17 (34)	6 (12)
Hyalinization	10 (20)	4 (8)
Areas of Hemorrhage	2 (4)	0 (0)
Congested blood vessels	4 (8)	2 (4)
Increased Syncytial knots	11 (22)	1(2)
Intervillous Hemorrhage	3 (6)	0 (0)
Peri-villous fibrin deposition and Fibrinoid Necrosis	6 (12)	0 (0)
No pathology	9 (18)	30 (60)

Table 4: Neonatal complications in IUGR and control group

Complications	IUGR group N (%)	Control group N (%)
Birth Asphyxia	4 (8)	0
Meconium Aspiration	2 (4)	0
Hypoglycemia	2 (4)	0
Infections	3 (6)	1 (2)
Normal	39 (78)	49 (98)
Total	50 (100)	50 (100)

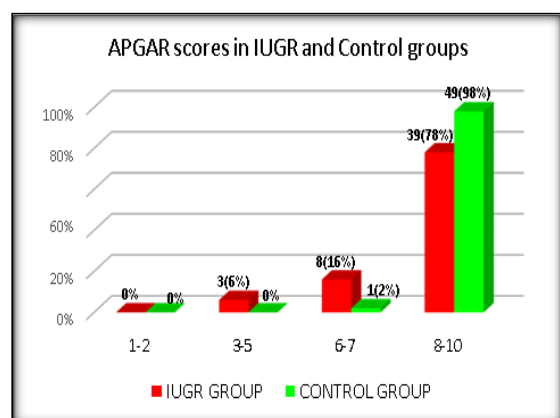


Figure 1: Showing APGAR score in IUGR and control groups

On further analysis, it was found that 6 % of IUGR babies had moderately depressed and 16% had mild depressed APGAR scores.

From the above table it was observed that 8% of infants in the IUGR group were asphyxiated,6% had infections,4% had Meconium aspiration and ,4% had Hypoglycaemia. In the control group only 2 % had infections. The occurrence of complications was found to be increased in IUGR infants and was statistically significant (P<0.05). [Table 4]

DISCUSSION

In the present study, it was found that IUGR was more common in the age group between 18-25 years.

Similar findings were observed in studies done by Zubair DS et al,^[7] Dr Beant Singh et al,^[2] and Sharma et al [8] where the majority of the patients belong to the age group of 19-25 years and <20 years.

In our study Low APGAR scores were found in the IUGR group as compared to the control group (P<0.05). Our study results were in consistent with the studies done by Zubair DS et al,^[7] and Low et al,^[9] with low APGAR scores among IUGR babies.

In the present study, Birth Asphyxia, Meconium aspiration, Hypoglycemia and Infections were more common in the IUGR group than in the control group (P<0.05), these findings were identical with a study done Dr Beant Singh et al,^[2] and Robert et al,^[10] who found these neonatal complications to be more in IUGR infants as compared to normal infants.

Among the various microscopic findings, Fibrin deposition, Increased Syncytial knotting, Membrane Hyalinization and calcification are more common in the study group than the control group. The results of the present study were in parallel to the study done by Nigam et al.^[5] Leucocytic infiltration was seen in 8% in present study whereas Mehendale et al,^[11] and Jain K et al,^[12] observed maximum number of leucocyte infiltration in 27.7% and 30.52% in IUGR placenta respectively.

CONCLUSION

Placental histopathological examination reveals significant differences between pregnancies with Intrauterine Growth Restriction (IUGR) and those with normal term infants. Key findings include increased fibrin deposition, syncytial knotting, membrane hyalinization, and calcification in IUGR placentas compared to normal infants. Maternal age seems to play a role, with a higher prevalence of IUGR observed in younger mothers, particularly those aged 18-25 years. The occurrence of neonatal complications correlates with the severity of placental histopathological changes, emphasizing the importance of placental evaluation in predicting perinatal outcomes. These findings underscore the

necessity of regular antenatal checkups for early detection and management of IUGR, aiming to mitigate adverse neonatal outcomes associated with this condition.

Conflict of Interest: None

Funding Support: Nil.

REFERENCES

1. Mojammamy N, Alayed N, Aljerian K, Aldahmash W, Harrath AH, Alwasel S. Stereological and histopathological assessment of intrauterine growth restriction placenta from Saudi women. *Saudi Journal of Biological Sciences*. 2023 Jan 1;30(1):103482.
2. Kaur G, Singh B, Kaur P, Kaur N, Khan E. Perinatal Outcome and Histopathological Evaluation of Placentas in Intrauterine Growth Restriction (IUGR) Pregnancies. *Parity*. 2017; 4:4-00.
3. Sing S, Pemmaraju A. Comparison of Placental Histopathology in IUG Rand Normal Term Infants: A Cross-Sectional Study. *J. Med. Dent. Sci*. 2017; 16901:36-40.
4. Saleem T, Sajjad N, Fatima S, Habib N, Ali SR, Qadir M. Intrauterine growth retardation-small events, big consequences. *Italian journal of pediatrics*. 2011 Dec;37(1):1-4.
5. Nigam JS, Misra V, Singh P, Singh PA, Chauhan S, Thakur B. Histopathological study of placenta in low birth weight babies in India. *Annals of Medical and Health Sciences Research*. 2014;4(8):79-83.
6. Khajuria R, Sharma M. Histopathology of placenta in intrauterine growth restriction (IUGR).
7. Zubair DS, Gour SS. Comparison of outcome in IUGR and normal pregnancies-A retrospective study. *International Journal of Medical Research and Review*. 2016;4(4):646-9.
8. Sharma M, Bhatia JK, Malik A. A clinicopathologic study of placenta of low birth weight and normal birth weight babies born at a tertiary care center in western India. *Medical Journal of Dr. DY Patil University*. 2021 Mar 1;14(2):166-71.
9. Low JA, Panchar SR, Piercy WN, Worthington D, Karchmar J. Intrapartum fetal asphyxia: clinical characteristics, diagnosis, and significance in relation to pattern of development. *American journal of obstetrics and gynecology*. 1977 Dec 15;129(8):857-72.
10. Richard E, Robert M. Nelson Textbook of Pediatrics:16th Edition
11. Mehendale SS, Lele V, Godbole PV. Placental histopathology with IUGR. *J Obstet Gynaecol India* 1988;33:406-9
12. Jain K, Kavi V, Raghuvver CV, Sinha R. Placental pathology in pregnancy induced hypertension (PIH) with or without intrauterine growth restriction. *Indian J Pathol Microbiol* 2007;50(3):533-537.