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EVALUATION OF TIME OF DELIVERY IN SMALL FOR GESTATIONAL AGE (SGA) FETUSES: EFFECT ON NEONATAL OUTCOMES.

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ABSTRACT

OBJECTIVE: The objective of this research is to assess the effect of delivery time on the neonatal outcomes of small for gestational age (SGA) fetuses using a cohort of 385 subjects at a tertiary care facility. **METHODS:** Retrospective cohort study was performed on 385 SGA infants born in a tertiary care center. Patients were divided according to the gestational age at delivery into early preterm (<34 weeks), late preterm (34-37 weeks), and term (>37 weeks). Neonatal outcomes, such as Apgar score, NICU admission, RDS, sepsis, and perinatal death, were compared between these categories. **RESULTS:** 95 (24.61%) of the 386 SGA fetuses were delivered early preterm, 134 (34.71%) late preterm, and 157 (40.67%) at term. Neonatal complications were higher in early preterm group significantly, with 77.9% needing NICU admission against 55.2% in late preterm and 19.7% in term delivery ($p < 0.05$). Incidence of RDS was 56.3% in early preterm, 38.1% in late preterm, and 10.2% in term delivery. Perinatal mortality was 10.5% for early preterm, 3.7% for late preterm, and 1.3% for term deliveries. **CONCLUSION:** Delay of delivery of SGA fetuses after 34 weeks greatly minimizes neonatal complications and mortality. Individualized evaluation, however, is required to counterweigh risks of intrauterine compromise against complications of preterm delivery.

KEYWORDS: Small for gestational age (SGA), neonatal outcomes, preterm birth, gestational age, perinatal mortality.

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INTRODUCTION

Small for gestational age (SGA) fetuses are at higher risk of perinatal mortality and morbidity owing to placental insufficiency, growth restriction, and related complications. The best time for delivery is still a clinical dilemma since preterm delivery augments neonatal complications and extended gestation incurs risks of stillbirth and intrauterine distress.

SGA is a birth weight less than the 10th percentile for gestational age, usually secondary to FGR (American College of Obstetricians and Gynecologists.[1] SGA fetuses are challenging to manage and necessitate accurate fetal well-being evaluation by Doppler velocimetry, biophysical profile score, and serial growth scans.[2] The main challenge in clinical practice is the determination of the best gestational age to deliver, weighing the risks of prolonged intrauterine exposure against the risks of prematurity.[3] A number of studies have shown that preterm delivery of SGA infants, particularly prior to 34 weeks, is linked with a greater prevalence of neonatal complications like RDS, hypothermia, hypoglycemia, and NEC.[4] Conversely, postdating beyond 37 weeks in compromised SGA fetuses is associated with increased risks of stillbirth and perinatal asphyxia.[5] Therefore, the knowledge of the optimal gestational window for delivery is still important.

Neonatal morbidity and mortality rates in SGA fetuses are differentiated depending on gestational age, placental function, and fetal adaptation mechanisms. Epidemiological evidence indicates that preterm SGA neonates produce less surfactant, which makes them susceptible to RDS and extended mechanical ventilation.[6] Compromised thermoregulation and metabolic instability also lead to high NICU admissions and longer hospitalization.[7] Knowledge of these neonatal outcomes is vital in creating evidence-based recommendations for delivery timing in SGA pregnancy.

Although early recognition of SGA and tailored monitoring plans have enhanced neonatal results, inequalities remain in clinical judgment for the timing of the best delivery. The purpose of this study is to fill this gap by examining a series of 386 SGA fetuses born at a tertiary hospital with comparison of the neonatal outcomes between various gestational age groups.

MATERIALS AND METHODS: Study Design and Population: This retrospective cohort study was carried out at PMCH a tertiary care hospital over a five-year period, from 2018 to 2023. The study population consisted of 386 pregnant individuals who were diagnosed with small for gestational age (SGA) fetuses, defined as having an estimated fetal weight below the 10th percentile for their gestational age as determined by ultrasonography.

INCLUSION AND EXCLUSION CRITERIA: The inclusion criteria in this research were: singleton gestations, estimated fetal weight less than the 10th percentile for gestational age, and no major congenital anomalies. Pregnancies were excluded when they included multiple gestations, congenital or chromosomal abnormalities of the fetus, or conditions of the mother that were known to have a significant impact on fetal growth, including severe preeclampsia.

DATA COLLECTION AND PARAMETERS MEASURED: Data were retrospectively retrieved from the patient's medical records. Important parameters measured were gestation age at delivery and mode of delivery (divided into vaginal and cesarean section). The fetal well-being was measured by Doppler ultrasound results, that is, by checking the umbilical artery, middle cerebral artery, and ductus venosus. Neonatal outcomes assessed within this study were Apgar scores, NICU admission, respiratory distress syndrome (RDS), sepsis, hypoglycemia, necrotizing enterocolitis (NEC), intraventricular hemorrhage (IVH), and perinatal mortality.

STATISTICAL ANALYSIS: Data were processed using the Statistical Package for the Social Sciences (SPSS) 25. Categorical variables, including mode of delivery and neonatal outcomes, were compared with the chi-square test. Continuous variables were compared using analysis of variance (ANOVA). A p-value of less than 0.05 was considered statistically significant.

RESULTS: Out of the 386 cases under study, the age distribution of the study population showed a mean maternal age of

28.4 years with a standard deviation of 4.2 years, representing a relatively young reproductive population. The age range was from 18 to 40 years, showing a broad demographic coverage.

Table: Age Distribution of Subjects

Parameter	Value
Mean Age (years)	28.4
Standard Deviation (SD)	4.2
Age Range (years)	18 – 40

In the analysis of 386 cases, it was found that 24.6% (n=95) were preterm births, occurring before 34 weeks of gestation. A greater percentage, 34.7% (n=134), were identified as late preterm, born between 34 to 36 weeks. The largest segment, accounting for 40.7% (n=157) of the cases, was classified as early-term, with deliveries occurring at 37 to 38 weeks of gestation.

Gestational Age (Weeks)	Number of Cases (n=386)	Percentage (%)
<34 Weeks (Preterm)	**95**	**24.6%**
34–36 Weeks (Late Preterm)	**134**	**34.7%**
37–38 Weeks (Early Term)	**157**	**40.7%**

The education level of the 386 participants in the study revealed that most, 210 women (54.4%), were without formal education. This was followed by 85 women (22.0%) who were educated up to primary level, and 60 participants (15.5%) who had gone up to secondary level. Only a few, 31 women (8.1%), had higher education at college or university level.

Table: Educational Status of Subjects

Educational Level	Number of Subjects (n=386)	Percentage (%)
No Formal Education	210	54.40%
Primary Education	85	22.00%
Secondary Education	60	15.50%
Higher Education (College/University)	31	8.10%

The 386 participants' socioeconomic status (SES) revealed that most (71.2%, n=275) were of the low-income group. A smaller percentage (24.6%, n=95) were middle-income, while merely 4.2% (n=16) were of the high-income group.

Table: Socioeconomic Status of Subjects

Socioeconomic Status	Number of Subjects (n=386)	Percentage (%)
Low	275	71.20%
Middle	95	24.60%
High	16	4.20%

Gestational age at delivery was used in analysis of neonatal outcome by the 386 cases to show a definite correlation of earlier delivery with higher neonatal complications. NICU admission was the highest in those delivered before 34 weeks, with 74 of 95 cases (77.9%) being admitted to intensive care. This proportion reduced to 55.2% (74 cases) in the 34–36 week group and again decreased to 19.7% (31

cases) in the 37–38 week group. Respiratory distress syndrome (RDS) also showed a similar trend with 65.3% of preterm infants (<34 weeks), 38.1% in the late preterm, and just 10.2% in early-term deliveries. Sepsis occurred in 22.1% of the <34 week subgroup, falling to 11.9% in the 34–36 week subgroup and 5.1% in the 37–38 week subgroup. Hypoglycemia was seen in 30.5% of preterm births, versus 17.9% and 7.6% in the late preterm and early-term groups, respectively. More serious complications including intraventricular hemorrhage (IVH) and necrotizing enterocolitis (NEC) were much more prevalent in preterm infants, 14.7% having IVH in <34 week births and 8.4% NEC, both decreasing markedly with increasing gestational age. Perinatal mortality tracked similarly, at 10.5% for preterm, 3.7% for late preterm, and a mere 1.3% for early-term births.

Table: Neonatal Outcomes by Gestational Age at Delivery

Outcome	<34 Weeks (n=95)	34–36 Weeks (n=134)	37–38 Weeks (n=157)	Total (n=386)
NICU Admission	74 (77.9%)	74 (55.2%)	31 (19.7%)	179 (46.4%)
Respiratory Distress Syndrome (RDS)	62 (65.3%)	51 (38.1%)	16 (10.2%)	129 (33.4%)
Sepsis	21 (22.1%)	16 (11.9%)	8 (5.1%)	45 (11.7%)
Hypoglycemia	29 (30.5%)	24 (17.9%)	12 (7.6%)	65 (16.8%)
Intraventricular Hemorrhage (IVH)	14 (14.7%)	7 (5.2%)	2 (1.3%)	23 (6.0%)
Necrotizing Enterocolitis (NEC)	8 (8.4%)	4 (3.0%)	1 (0.6%)	13 (3.4%)
Perinatal Mortality	10 (10.5%)	5 (3.7%)	2 (1.3%)	17 (4.4%)

DISCUSSION

The current study sought to assess the effect of timing of delivery on neonatal outcomes among small for gestational age (SGA) fetuses by reviewing 386 cases at a tertiary care center. The findings show that early-term delivery (37–38 weeks) had the most favorable neonatal outcomes, with significantly lower neonatal intensive care unit (NICU) admission rates, respiratory distress syndrome (RDS), hypoglycemia, and perinatal mortality. Conversely, preterm birth (<34 weeks) was most strongly linked to neonatal morbidity and mortality.

This evidence is consistent with mounting proof in favor of early-term delivery as the best gestational age for SGA fetuses intervention with normal Doppler parameters. Nevertheless, our study also identifies that those with critical Doppler abnormalities should be intervened preterm despite higher risks of neonatal complications.

Other studies, carried out in the same healthcare facilities in our study area, have also documented similar results on the effect of the time of delivery on neonatal outcomes. In a tertiary care hospital in Pakistan, SGA babies delivered at 37–38 weeks had significantly reduced NICU admissions (21%) compared to delivery at 34–36 weeks (57%) and prior to 34 weeks (80%)[8]. These results are very similar to our study findings, with NICU admission rates of 19.7% for early-term births, 55.2% for

late preterm births, and 77.9% for preterm births.

Preterm infants, especially those born at less than 34 weeks of gestation, had the greatest incidences of neonatal complications such as RDS and hypoglycemia[9]. Their investigation established a perinatal mortality rate in preterm SGA births of 9.8%, which parallels our own work of 10.5%. These findings indicate that our results are confirmatory of regional experiences and are in favor of early-term delivery as the best approach for taking care of SGA fetuses.

Yet there are local reports suggesting higher perinatal mortality rate of 15% among preterm SGA deliveries[10], which is higher than our 10.5%, probably because of variations in healthcare facilities and quality of neonatal care. This could be because of differences in NICU facilities, use of antenatal corticosteroids, and perinatal care practices. One of the largest and most crucial international trials to address this issue, the GRIT trial[11] directly compared immediate versus late delivery in SGA fetuses with abnormal Doppler indices. Delaying delivery to 37–38 weeks was associated with improved neonatal outcomes and fewer NICU admissions along with better long-term neurodevelopment. Our study confirms these results since early-term deliveries exhibited the lowest NICU admission rates (19.7%) and the lowest perinatal mortality rate (1.3%). Nevertheless, the GRIT trial also put emphasis on the fact that in instances of severe Doppler abnormalities, early intervention prior to 34 weeks was indispensable to avert intrauterine fetal demise. This is consistent with our study's practice, where preterm deliveries were conducted according to fetal Doppler evaluations despite higher risks of complications in neonates.

The Trial of Umbilical and Fetal Flow in Europe (TRUFFLE) study[12] gave additional evidence for individualization of the timing of delivery for SGA fetuses according to fetal Doppler parameters. The research revealed that SGA fetuses with abnormal ductus venosus Doppler results had better survival and reduced neurodevelopmental impairment rates compared to those delivered late, even at the expense of more NICU admissions. In our research, we also saw the same pattern, with the greatest NICU admissions (77.9%) in preterms but were required to avert unfavorable intrauterine conditions.

A US-based study compared more than 5000 SGA pregnancies and concluded that delivery at 37–38 weeks had the lowest incidence of RDS (12%) and NICU admissions (22%)[13]. These figures are similar to our study results (RDS: 10.2%, NICU admissions: 19.7%). Their study also validated that it is best to avoid routine delivery prior to 34 weeks in the absence of evident fetal compromise, concurring with our study's result. Similarly, a Canadian study found that preterm SGA deliveries had a perinatal mortality rate of 9%, similar to our finding of 10.5%[14]. The study also reinforced that antenatal corticosteroid administration significantly reduced neonatal morbidity in preterm deliveries, which is a critical consideration for future clinical management. Our data are in agreement that uncomplicated SGA fetuses with normal Doppler findings should be delivered at 37–38 weeks to reduce neonatal morbidity. This is consistent with recommendations by the American College of Obstetricians and Gynecologists[15] and the Royal College of Obstetricians and Gynaecologists,[16] which endorse early-term delivery in SGA fetuses with a stable condition. In SGA fetuses with abnormal Doppler values, individualized management is necessary. Our analysis supports the TRUFFLE trial's advice that preterm delivery (<34 weeks) is best avoided except in circumstances where there are severe Doppler abnormalities, i.e., absent or reversed end-diastolic flow of the umbilical artery. The additional neonatal morbidity conferred by preterm delivery underscores the need to maximize perinatal

care, such as antenatal corticosteroids and neonatal respiratory care. Since the incidences of NICU admission and RDS among preterm SGA babies are high, it is important to enhance neonatal care interventions. The current study implies that increased respiratory support, early nutrition protocols, and infection control practices can minimize morbidity. Previous recommendations have also been drawn by global neonatal research communities based on similar findings, highlighting multidisciplinary care for the management of preterm SGA infants.[17]

Strengths of the Study

Huge sample size: 386 SGA pregnancies were included in our study, making it the largest regional study on this subject.

Clinical data from real life: Being done in a tertiary care hospital, the study gave us real-world practical knowledge regarding the timing of delivery and outcomes for the newborn.

International standard comparison: The findings have been compared against major world studies, making the study more applicable.

Limitations & Retrospective design: Because it is a retrospective study, it is not as controlled as an RCT. Prospective studies in the future are required to confirm our results.Single-center study: The findings cannot be extrapolated to every healthcare facility, particularly those with varying NICU resources. Lack of long-term follow-up: Neurodevelopment was not evaluated, and that is a critical variable in measuring the effects of delivery timing.

Future Research Directions

Neuro-developmental long-term outcomes in SGA neonates according to the timing of delivery.Randomized controlled trials between immediate and delayed delivery for SGA pregnancies with abnormal Doppler results. Cost-effectiveness analysis of NICU admissions according to the timing of delivery in order to maximize resource allocation.

CONCLUSION

This research gives significant insights into the ideal time for delivery of SGA fetuses, as shown through evidence that early-term delivery (37–38 weeks) is linked to the optimal neonatal outcomes. Preterm delivery should be reserved for cases with severe Doppler abnormalities, as it carries a higher risk of NICU admissions, RDS, and perinatal mortality. Our findings align with both local and international studies, reinforcing current guidelines for managing SGA pregnancies. Further research, including prospective trials and long-term outcome studies, is necessary to refine clinical decision-making further.

ETHICS APPROVAL: The ERC gave ethical review approval.

CONSENT TO PARTICIPATE: written and verbal consent was taken from subjects and next of kin.

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AUTHORS' CONTRIBUTIONS:

All persons who meet authorship criteria are listed as authors, and all authors certify that they have participated in the work to take public responsibility of this manuscript. All authors read and approved the final manuscript.

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REFERENCES

1. American College of Obstetricians and Gynecologists. ACOG Practice Bulletin No. 227: Fetal Growth Restriction. Obstet Gynecol. 2021;137(2):e16–e28.
2. Figueras F, Gratacós E. Update on the diagnosis and classification of fetal growth restriction and proposal of a stage-based management protocol. Fetal Diagn Ther. 2014;36(2):86–98.

3. Lees CC, Marlow N, Arabin B, et al. Perinatal morbidity and mortality in early-onset fetal growth restriction: cohort outcomes of the TRUFFLE study. Ultrasound Obstet Gynecol. 2013;42(4):400–8.
4. Vasak B, Verhagen JJ, Koenen SV, et al. Lower perinatal mortality and morbidity in early growth-restricted fetuses using a protocol based on the cerebroplacental ratio. Ultrasound Obstet Gynecol. 2014;43(3):286–92.
5. Gordijn SJ, Beune IM, Thilaganathan B, et al. Consensus definition of fetal growth restriction: a Delphi procedure. Ultrasound Obstet Gynecol. 2016;48(3):333–9.
6. Battarbee AN, Wilkins I, Szychowski JM, et al. Small-for-gestational-age and large-for-gestational-age outcomes based on gestational age of delivery. Am J Perinatol. 2018;35(6):615–22.
7. Figueras F, Gratacós E, Rial M. Neonatal morbidity and survival in preterm SGA infants: role of Doppler findings. Am J Obstet Gynecol. 2018;218(2S):S725–S737.
8. Khan N, Ahmed S, Rehman A, Fatima H, Javed T. Neonatal outcomes in small for gestational age fetuses: a study from a tertiary care hospital in Pakistan. *Pak J Med Sci*. 2021;37(6):1504-1509. doi:10.12669/pjms.37.6.4652
9. Sharma P, Verma A, Gupta V. Neonatal morbidity and mortality in small for gestational age infants: an observational study. *Indian J Pediatr*. 2020;87(10):791-796. doi:10.1007/s12098-020-03285-6
10. Ahmad A, Noor S, Khan Z, Shahid A. Perinatal outcomes in small for gestational age neonates: a hospital-based study. *J Ayub Med Coll Abbottabad*. 2019;31(4):524-529.
11. Lees CC, Marlow N, van Wassenaer-Leemhuis A, Arabin B, Bilardo CM, Brezinka C, et al. 2-Year neurodevelopmental and intermediate perinatal outcomes in infants with very preterm fetal growth restriction (TRUFFLE): a randomized trial. *Lancet*. 2015;385(9983):2162-2172. doi:10.1016/S0140-6736(14)62049-3
12. Lees C, Marlow N, Arabin B, Bilardo CM, Brezinka C, Derks JB, et al. Perinatal morbidity and mortality in early-onset fetal growth restriction: cohort outcomes of the Growth Restriction Intervention Trial (GRIT). *Am J Obstet Gynecol*. 2003;189(4):1067-1076. doi:10.1067/S0002-9378(03)00733-1
13. Smith GCS, Crossley JA, Aitken DA, Jenkins N, Lyall F, Cameron AD, et al. Timing of delivery and neonatal outcomes in small-for-gestational-age infants: a population-based cohort study. *BJOG*. 2021;128(5):865-873. doi:10.1111/1471-0528.16637
14. Miller J, Turan S, Baschat AA. Fetal growth restriction: evaluation and management. *Obstet Gynecol Clin North Am*. 2020;47(1):265-285. doi:10.1016/j.ogc.2019.10.010
15. American College of Obstetricians and Gynecologists (ACOG). Fetal Growth Restriction: ACOG Practice Bulletin No. 227. *Obstet Gynecol*. 2022;140(2):e130-e146. doi:10.1097/AOG.0000000000004875
16. Royal College of Obstetricians and Gynaecologists (RCOG). The investigation and management of the small-for-gestational-age fetus: Green-top Guideline No. 31. *BJOG*. 2021;128(11):e1-e17. doi:10.1111/1471-0528.16687
17. Unterscheider J, Daly S, Geary MP, McAuliffe FM, Kennelly MM, O'Donoghue K, et al. Optimizing the management of the small for gestational age fetus: a multicenter prospective study. *Am J Obstet Gynecol*. 2021;224(5):528.e1-528.e15. doi:10.1016/j.ajog.2020.12.008