

COMPARATIVE STUDY OF THE NEONATAL OUTCOME OF SPONTANEOUS AND INDICATED PRETERM BIRTH

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Received : 04/02/2023
 Received in revised form : 10/03/2023
 Accepted : 27/03/2023

Keywords:
 Spontaneous, late-preterm,
 hyperbilirubinemia, hypoglycemia.

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DOI: 10.47009/jamp.2023.5.2.287

Source of Support: Nil,
 Conflict of Interest: None declared

Int J Acad Med Pharm
 2023; 5 (2); 1365-1370



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Abstract

Background: The goal of this research is to compare the neonatal outcomes of spontaneous vs recommended preterm deliveries that occur before 37 weeks of gestation. The purpose of this research was to compare the rates of respiratory morbidity between infants born prematurely (at less than 37 weeks of gestation) due to natural causes and those born prematurely (for medical reasons). Our study's objective was to assess the prevalence of hyperbilirubinemia, hypoglycemia, sepsis, and necrotizing enterocolitis among hospitalised preterm neonates born at a gestational age of less than 37 weeks.

Materials and Methods: At Department of Paediatrics, Siddhartha Medical College, Vijayawada, Andhra Pradesh, India between October 2021 and September 2022, researchers looked back at data from two groups of premature babies. Group 1 consisted of babies born prematurely for no apparent reason, while Group 2 consisted of babies born prematurely due to medical complications. Live births that occurred before 37 weeks of pregnancy but were still considered preterm. **Result:** Hyperbilirubinemia occurs in 73.8% of spontaneous preterm infants and 67.9% of suggested preterm infants, however this difference is not statistically significant. Hypoglycemia is more common in late preterm infants than in early preterm infants, with 16.3% of spontaneous preterm newborns experiencing it compared to 28.6% of indicated preterm infants ($p=0.1257$). The rate of sepsis in preterm newborns is 20% for those born prematurely due to no apparent cause, but only 19.6% among those born prematurely due to a medical condition. There is no statistically significant difference between the prevalence of necrotizing enterocolitis in spontaneous vs suggested preterm infants (16.3% vs 8.9%). **Conclusion:** Late preterm babies who are born naturally as well as those who are induced for medical reasons run the risk of developing perinatal morbidity. Clarification is needed about the obstetric management of pregnancies that are at risk for late-preterm prematurity, and specialised caregiving practises for newborns in this situation need to be enhanced.

INTRODUCTION

Research on neonatal morbidity caused by physiologic immaturity has focused mostly on premature infants born earlier than 37 weeks of gestation.^[1,2] However, more recent research suggests that neonatal morbidity reduces with delivery at later gestational ages, and that children delivered at 37- and 38-weeks' gestation are at a higher risk for morbidity compared to infants delivered at 39 weeks.^[3,4] When compared to infants delivered after 38 weeks, infants born between 37 and 38 weeks have a higher risk of developing

respiratory distress syndrome, transitory tachypnea of the newborn, pneumonia, hypothermia, and difficulty with feeding.^[5,6]

The neonatal outcomes of late-preterm newborns are significantly worse than those of mature neonates. Several studies have already shown that a late-preterm birth is associated with much increased rates of respiratory morbidity, infant jaundice, and feeding difficulties, in addition to additional serious morbidities such as intraventricular haemorrhage or sepsis.^[7-9] [Note: Long-term neurodevelopmental outcomes and death rates are also worse in this group of newborns.^[10,11] [Show citation] There have

been several obstetric morbidities that have been linked to lower perinatal outcomes. Both short-term and long-term morbidities have been linked to the conditions of intrauterine growth restriction (IUGR) and preeclampsia.^[12] As a result of these discoveries, the obstetric community has been motivated to lower the rates of late-preterm prematurity, and most of the preventative interventions have concentrated on elective deliveries. On the other hand, late preterm births are difficult to forestall.^[13]

MATERIALS AND METHODS

Department of Paediatrics, Siddhartha Medical College, Vijayawada, Andhra Pradesh, India conducted a retrospective study comparing preterm babies born early due to unforeseen circumstances (Group 1) and those born early due to medical necessity (Group 2) between April 2016 and April

2018. Singleton preterm live births defined as those occurring before 37 weeks of gestation.

Inclusion Criteria

- Newborns who were admitted to the hospital within their first 24 hours of life during the period of the study.
- Live births of a single embryo.
- A gestational age of less than 37 weeks at the time of delivery.

Exclusion Criteria

- Significant congenital abnormalities.
- Deaths of newborns that occur while they are in the hospital.
- Variations in the chromosomes

RESULTS

There were 136 preterm neonates that were included in the study; 80 of them were spontaneous preterm, which accounts for 59%, and the remaining 56 were indicated preterm, which accounts for 41%.

Table 1: Distribution of Spontaneous and Indicated Preterm Infants

	Spontaneous Preterm	Indicated Preterm	Total
Count	80	56	136
Percentage	59%	41%	100%

Table 2: Distribution of Late and Early Preterm Infants

	Late Preterm	Early Preterm	Total
Count	98	38	136
Percentage	72%	28%	100%

There were 130 premature babies born, 98 of them were born late (or 72%) and 38 who were born early (or 28%).

Table 3: Distribution of Spontaneous & Indicated Preterm Infants among Late Preterm Group

	Spontaneous Late Preterm	Indicated Late Preterm	Total Late Preterm
Count	53	45	98
Percentage	54%	46%	100%

There were 98 Late Preterm babies born, 53 of them were premature due to no apparent cause (54%), and 45 who were premature due to an underlying cause (46%).

Table 4: Distribution of Spontaneous & Indicated Preterm Infants among Early Preterm Group

	Spontaneous Late Preterm	Indicated Late Preterm	Total Late Preterm
Count	27	11	38
Percentage	71%	29%	100%

There were 38 preterm births, with 11 being indicated and 27 being spontaneous.

Table 5: Distribution of Birth weight among Preterm Group

	AGA	SGA	LGA
Count	84	51	1
Percentage	62%	38%	1%

According to Fenton's chart, preterm infants' birth weights are used to categorise them as either "Appropriate" (for their gestational age), "Big" (for their gestational age), or "Little" (for their gestational age). Out of the total of 136 premature babies, 84 are considered to be "Appropriate for Gestational Age" (62%), 1 is "Big for Gestational Age" (1%), and 51 are "Little for Gestational Age" (38%). In other words, the vast majority (62%) of preterm infants were healthy.

Table 6: Distribution of Spontaneous and Indicated Preterm based on Birth Weight

	AGA	SGA	LGA
Spontaneous Preterm	57	23	0
Indicated Preterm	27	28	1
Total	84	51	1

Only 23 of the 84 children born prematurely due to a spontaneous cause were considered undersized for their gestational age.

Only 23 of the 51 children in the tiny for gestational age category were born at or before their due date.

Hence, most preterm babies (57 out of a total of 59) born naturally were full-term, while most preterm babies (28 out of a total of 39) born due to medical intervention were premature but small.

Table 7: Comparison of Respiratory Morbidity among Spontaneous and Indicated Preterm Infants

Respiratory Morbidity	Normal	Not Normal	Total
Spontaneous Preterm	46	34	80
Indicated Preterm	32	24	56
Total	78	58	136
Respiratory Morbidity	Normal	N Not Normal	Normal
Spontaneous Preterm	57.5%		42.5%
Indicated Preterm	57.1%		42.9%

There is no statistically significant difference between the rates of respiratory morbidity in spontaneous and suggested preterm newborns (57.5% and 57.1%, respectively).

Table 8: Comparison of Respiratory Morbidity among Spontaneous and Indicated Late Preterm Infants

Respiratory Morbidity	Normal	Not Normal	Total
Spontaneous Late Preterm	39	14	53
Indicated Late Preterm	30	15	45
Total	69	29	98
Respiratory Morbidity	Normal		Not Normal
Spontaneous Late Preterm	73.6%		26.4%
Indicated Late Preterm	66.7%		33.3%
Respiratory Morbidity	Not Normal	Expected	Chi square p-value
Spontaneous Late Preterm	14	16	
Indicated Late Preterm	15	13	0.530
Total	29	29	0.530

It is not statistically significant that 73.6% of late preterm infants born to mothers who did not have pregnancy complications suffer respiratory morbidity, compared to 66.7% of late preterm infants born to mothers who did experience pregnancy complications.

Table 9: Comparison of Respiratory Morbidity among Spontaneous and Indicated Early Preterm Infants

Respiratory Morbidity	Normal	Not Normal	Total
Spontaneous Early Preterm	7	20	27
Indicated Early Preterm	2	9	11
Total	9	29	38
Respiratory Morbidity	Normal		Not Normal
Spontaneous Early Preterm	25.9%		74.1%
Indicated Early Preterm	18.2%		81.8%

There is no statistically significant difference between the rates of respiratory morbidity in spontaneously preterm and suggested preterm newborns.

Table 10: Comparison of Hyperbilirubinaemia among Spontaneous and Indicated Preterm Infants

Hyperbilirubinaemia	NO	PT	Total
Spontaneous Preterm	21	59	80
Indicated Preterm	18	38	56
Total	39	97	136
Hyperbilirubinaemia	NO	PT	
Spontaneous Preterm	26.3%		73.8%
Indicated Preterm	32.1%		67.9%
Hyperbilirubinaemia	PT	Expected	Total
Spontaneous Preterm	59	57	
Indicated Preterm	38	40	
Total	97	97	0.689

Preterm newborns are more likely to develop hyperbilirubinaemia if they were born prematurely due to unknown causes (73.8% vs 67.9%), but this difference is not statistically significant.

Table 11: Comparison of Hypoglycaemia among Spontaneous and Indicated Preterm Infants

Hypoglycaemia	NO	D1/D2/D3/D4/D5	Total
Spontaneous Preterm	67	13	80
Indicated Preterm	40	16	56
Total	107	29	136
Hypoglycaemia	NO	D1/D2/D3/D4/D5	
Spontaneous Preterm	83.8%	16.3%	
Indicated Preterm	71.4%	28.6%	
Hypoglycaemia	D1/D2/D3/D4/D5	Expected	Chi square p-value
Spontaneous Preterm	13	17	
Indicated Preterm	16	12	
Total	29	29	0.1257

At a p-value of 0.1257, there is no statistically significant difference in the prevalence of hypoglycemia in spontaneously preterm and suggested preterm newborns.

Table 12: Comparison of Sepsis among Spontaneous and Indicated Preterm Infants

With Sepsis	Proven	Probable	No Sepsis
Spontaneous Preterm	16	4	60
Indicated Preterm	11	4	41
Total	27	8	35
Sepsis	No Sepsis	Sepsis	Total
Spontaneous Preterm	60	20	80
Indicated Preterm	41	15	56
Total	101	35	136
Sepsis	Proven Sepsis	Probable	No Sepsis
Spontaneous Preterm	20.0%	5.0%	75.0%
Indicated Preterm	19.6%	7.1%	73.2%

While there is no statistically significant difference between the prevalence of sepsis in spontaneously preterm and suggested preterm infants, the former accounts for 20% of all preterm infant deaths.

Table 13: Comparison of Necrotizing Enterocolitis among Spontaneous and Indicated Preterm Infants

Necrotizing Enterocolitis	NO NEC	NEC	Total
Spontaneous Preterm	67	13	80
Indicated Preterm	51	5	56
Total	118	18	136
Necrotizing Enterocolitis	NO NEC	NEC	
Spontaneous Preterm	83.8%	16.3%	
Indicated Preterm	91.1%	8.9%	
Necrotizing Enterocolitis	NEC	Expected	Chi square p-value
Spontaneous Preterm	13	11	
Indicated Preterm	5	7	
Total	18	18	0.248

There is no statistically significant difference between the prevalence of necrotizing enterocolitis in spontaneous versus suggested preterm births (16.3% vs 8.9%).

DISCUSSION

There were 150 preterm births out of a total of 457 admissions to the hospital. Six sets of twin births and two babies born with birth defects were taken out of the original 150 preterm births, leaving 136 preterm neonates for the study.

Eighty (59%) of the 136 participants were preterm babies born early due to no apparent cause, while 56 (41%) were born early due to an indicator.

Nkyekyer et al.^[14] found that the overall rate of premature birth was 9.3 percent, with 61.1 percent of premature births being the result of a mother's own actions and 39.1 percent being medically necessary.

With a 6.2% rate of preterm birth, Auger et al.^[15] found that 28.7% of babies were born too soon. PPROM was associated with 30.7% of premature births, while preterm labour was associated with 40.6%.

Forty percent of premature newborns were deemed to be "indicated" by the researchers Ananth CV et al.^[16] Out of 765 women with hypertension, 32.2% gave birth prematurely, with 10.5% of these pregnancies being spontaneous and 21.6% being indicated.

Sixty-eight percent of the infants born prematurely due to unavoidable causes were born at a healthy weight for their gestational age, while the majority of the preterm infants born due to medical causes (55% of the total) were born undersized for their age. Normal et al. found that a high percentage of premature babies were small for their gestational age, which they believe may be due to intrauterine compromise. According to research conducted by Villar et al., the percentage of premature babies born

too small for their gestational age is highest in the group of babies born because of medical need. According to research conducted by Lee JH et al., women who gave birth prematurely had a considerably higher mean gestational age at birth and a significantly lower mean birth weight. According to research conducted by Kase BA et al,^[17] SGA pregnancies were responsible for the majority of Indicated preterm births occurring before 30 weeks.

This study found that whereas 42.9% of indicated preterm children also experienced respiratory morbidity, 42.5% of spontaneous preterm infants did so. There is no statistically significant increase in the risk of respiratory morbidity for preterm neonates born with induction of labour compared to the spontaneous group. It was shown that there was no statistically significant difference between spontaneous and suggested preterm infants in the late preterm and early preterm sub groups in terms of unfavourable respiratory outcome.

The frequency of respiratory distress was 47% in a study conducted by Lee JH et al,^[18] on 243 preterm infants between 24-32 weeks of gestational age. Indicated preterm births made up 58.1% of the total, whereas spontaneous preterm births accounted for 38.4%. Research by Riity MK et al,^[19] on singleton births between 24 and 33 weeks of gestation found a statistically significant difference between the incidence of respiratory distress syndrome in the medically suggested group (73%) and the spontaneous preterm group (53%).

Researchers Yang LC et al,^[20] found that of the 73 babies born prematurely (16–26 weeks), due to PPRM, 38 survived. The incidence of respiratory discomfort among the surviving was therefore 100%. 59.9% of the spontaneous preterm births compared to 9.3% of the recommended preterm births exhibited histological chorioamnionitis (p.001).^[21] This is because chorioamnionitis increases foetal lung maturation, which in turn reduces the incidence of RDS. Feldman K, et al,^[22] found that children born late preterm through caesarean section without labour had a higher probability of requiring resuscitation (OR 2.43), as well as experiencing transient tachypnea of the newborn (OR 1.43). Analyzing RDS and apneic episodes in relation to spontaneous preterm birth yields odds ratios of 2.33 and 1.29, respectively.

This study found that hyperbilirubinemia was present in 73.8% of the infants born prematurely due to uncontrollable factors, while it was present in 67.9% of the infants born prematurely due to medical intervention. There was no significant difference between late and early preterm infants who were either born prematurely or whose prematurity was indicated by their mother's health history.

Uma S. et al,^[23] found that 50% of infants born prematurely, regardless of gestational age, have jaundice. According a research by Melamed et al,^[24] roughly 18% of spontaneously late preterm neonates

required phototherapy for jaundice. Hyperbilirubinemia was seen in 78% of neonates with a low birth weight, according to a study by Sehgal et al.^[25]

Odds Ratio 1.14; 95% CI 1.03 to 1.27 for hyperbilirubinemia was found for late preterm infants born after induced labour, compared to spontaneous preterm births.

When comparing the prevalence of hypoglycemia between indicated and spontaneous preterm births, the study found no statistically significant difference (16.3% vs 28.6%). For the subset of late preterm newborns, the rate of hypoglycemia is significantly lower in the spontaneous late preterm infant group (11.5%) than in the suggested preterm infant group (30.4%; p 0.01). There was no significant difference found in the early preterm subgroup (p value 0.75). Indicated preterm neonates had a significantly higher incidence of hypoglycemia than spontaneous preterm neonates, 79% versus 49%, according to a study of singleton births between 24 and 33 weeks of gestational age by Riity MK et al.^[19]

According to a study by Melamed et al,^[24] there was a statistically significant difference between the prevalence of hypoglycemia in term newborns (0.4%) and that in spontaneously late preterm neonates (6.8%). Feldman K. et al,^[22] found that compared to babies born during spontaneous labour, those born via Caesarean section at a late gestational age were more likely to experience hypoglycemia (Odds Ratio 1.97; 95% CI 1.63 to 2.39) after birth.

There was no statistically significant difference between the prevalence of sepsis in spontaneous and suggested preterm newborns (25% vs 26.7%). There was no statistically significant difference between late and early preterm infants that were born prematurely due to either spontaneous or specified causes.

In late preterm newborns, the frequency of sepsis was found to be 70% by Natale et al.^[26] Mc Intire et al,^[27] found that the risk of culture-proven sepsis in late preterm infants is two to five times higher than in term infants, and that 80% of late preterm deliveries were due to preterm labour and preterm premature rupture of membranes. Consequently, the majority of spontaneous preterm births are at risk for EOS and should be evaluated for sepsis and antimicrobial therapy.

Indicated preterm individuals at increased risk for Group B streptococcal sepsis, according to research by Robert JS et al.^[28] Uma S et al,^[23] found that of the babies born prematurely due to spontaneous preterm labour, 16.8% had septicaemia. This was in babies whose gestational ages were fewer than 34 weeks.

This study found that necrotizing enterocolitis occurred in 16.3% of spontaneous preterm newborns and in 8.9% of suggested preterm children; however, the difference between these two groups was not statistically significant. There was no statistically significant difference between late and early preterm infants that were born prematurely due

to either spontaneous or specified causes. About 25% of infants with NEC require surgical intervention, and the mortality rate is 10%, according to research by Bhoomika et al.^[29] This condition affects about 10% of extremely preterm (28 weeks) or extremely low birth weight (1000 g) infants and 5% of very preterm (28-31 weeks) or very low birth weight (1500 g) infants. In their study on the causes of NEC, Nanthakumar et al,^[30] found that the concentration of inflammatory mediators was higher in preterm newborns than in term infants.

Antenatal corticosteroid therapy has been linked to a lower incidence of RDS, and hence a lower risk of NEC, as described by Crowley P et colleagues.^[31]

According to Wo'jkowska-Mach et al,^[32] the incidence of NEC was 8.7% among premature newborns, with a case fatality rate of 22.8%. Retrospective research by Yang LC et al,^[20] found that 38 out of 73 children born prematurely (16–26 weeks) due to PPROM survived. The frequency of NEC was 5.3% among the survivors, while the prevalence of respiratory distress was 100%.

Feldman K. et al,^[22] found that compared to infants born at term, those born late preterm through caesarean section without labour had a higher incidence of NEC (Odds Ratio 3.20; 95% CI 1.07 to 9.53).

CONCLUSION

Late-preterm infants who are born naturally or who are brought into the world for medical reasons are both at risk for perinatal morbidity. Clarification is needed about the obstetric management of pregnancies that are at risk for late-preterm prematurity, and specialised caregiving practises for newborns in this situation need to be enhanced.

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