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Original Research Article

# A prospective observational study on pattern of early term neonatal morbidities

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## Abstract

**Aim:** The aim of this study to evaluate the early neonatal morbidities in early term neonates.

**Materials and Methods:** This prospective, observational study was done the Department of Paediatrics, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India. For 16 months. consecutive 320 intramural newborns were examined and all the early term (37 $^{[0/7]}$ to 38$^{[6/7]}$ weeks) and the full-term (39$^{[0/7]}$ to 41$^{[6/7]}$ weeks) babies were include for the study. Morbidities of the early term and full-term babies within the first seven days of life were observed. All the babies included in the study were examined at birth, after 24 hours, after 48 hours and daily up to seven days.

**Results:** Consecutive 320 live births were included in the study during the study period. Out of the total 320 population included in the study, 120 were early term (37.5%) and 200 were full terms (62.5%). Among the study population most of the babies were 39 weeks of gestational age and the least being 37 weeks. The mean gestational age of the population was 39.44 ± 1.42 weeks. Among the total population 95 were delivered by cesarean section (29.69%) and 225 had vaginal (70.31%) birth (table 3). Among the early term deliveries 39 were delivered by cesarean section (32.5%) and 81 by vaginal delivery (67.5%). Out of total full tem deliveries 56 were by cesarean section (28%) and 144 by vaginal delivery (72%). P-value is 0.784. NICU/SNCU admission rates were higher for babies born at an earlier gestational age (14.67% v/s 9%) than babies born later. Incidence of morbidities like jaundice requiring phototherapy (5% v/s 2%), need for resuscitation (6.67% v/s4 %), hypoglycemia on admission (5% v/s 2%), respiratory morbidities (3.33% v/s 2%), need for mechanical ventilation (1.67% v/s 0.5%),clinical sepsis (6.67% v/s 3.5%), confirmed sepsis (5% v/s 1.5%), need for intravenous antibiotics (10.83% v/s 6.5%), need for intravenous fluid (12.5% v/s 7%) were significantly higher in early terms than full terms during the first one week of life. Significantly higher number of babies delivered by cesarean section needed intervention and NICU admission (15.79% v/s 8.44%) than vaginally born babies. Moreover, among the cesarean deliveries the early term babies had significantly more morbidities or NICU/SNCU admission than their counterparts.

**Conclusion:** Neonatal morbidity decreases with delivery at later gestational ages and that infants delivered at 37 and 38 weeks' gestation, are at increased risk for morbidity compared to infants delivered at 39 weeks or later. So, to reduce early term deliveries and its influence on health care system we should carefully consider the optimal timing and route of delivery.

## Introduction

A term baby has been defined as one born after 37 weeks gestation and preterm baby, defined as one born on or before the end of 37 week of pregnancy. Although preterm babies are a category known for its high mortality and diverse morbidities, the overall incidence of prematurity related complications decreases significantly with increasing gestational age.

However, more recent evidence indicates that, though the adverse neonatal outcome decreases with increasing gestational age, babies delivered at 37 and 38 weeks are at increased risk for morbidity as compared to babies delivered at 39 weeks of gestation.[1-4] The increased risk of neonatal morbidity for babies born at 37 and 38 weeks compared to 39 weeks gestation led Fleischman et al to suggest adoption of an "Early term" delivery category.[5] Subsequently a work group which included ACOG convened in late 2012, which recommended that the label 'term' be replaced with designation early term (37 0/7 weeks of gestation through 38 6/7 weeks of gestation), full term (39 0/7 week of gestation through 40 6/7 weeks of gestation) late term (41 0/7 weeks of gestation) and post term (42 0/7 week of gestation and beyond) to more accurately describe deliveries occurring at or beyond 37 weeks of gestations.[6] From the recent studies in the outcome for babies born early term, it is becoming clear that gestational age represents a continuum from the last to the most mature rather than a dichotomy of term and preterm. As mentioned above, pretem and early term babies are physiologically and metabolically immature and are at increased risk of adverse neonatal outcomes compared with full term babies. Early term babies have a higher incidence of neonatal problems such as respiratory distress, hypoglycemia, temperature instability, neonatal jaundice, infection and feeding difficulties.[7] The immature lung structure present before full term may be associated functionally with delayed intrapulmonary fluid absorption, surfactant insufficiency and inefficient gas exchange leading to transient tachypnea of newborn and respiratory distress syndrome.[8,9] Early term babies are generally considered to be low risk groups for immediate neurologic problems. The frequency of GMH – IVH is very low in late preterm and early term babies as there is involution of germinal matrix by 34 weeks of gestation.[10,11] The most commonly seen clinical problem in early term babies is feeding and was the most common short-term morbidity.[11] Feeding issues of these babies are extension of maturational development of feeding ability of the moderately preterm baby.[12] Early term babies are also prone for metabolic complications like hypoglycemia, hypothermia, and increased susceptibility to infection.[13] Late preterm and early term babies have decreased capacity to handle unconjugated bilirubin. They have decreased hepatic uptake, decreased uridinediphosphoglucoronate glucuronyl transferase activity (UGT) and increased enterohepatic circulation, delayed postnatal maturation of hepatic bilirubin uptake and conjugation. This hepatic immaturity is added by delayed lactogenesis seen in the mother of these babies.[14] All these factors leads to high chance of neonatal jaundice and is the most common cause of readmission in these babies. Many deliveries before 39 weeks gestation follow spontaneous onset of labour but others result from induction of labour or elective caesarean section that may or may not be medically indicated. As early term babies are more prone for neonatal morbidities it is better to discourage non-indicated delivery before 39 weeks of gestation.[15]

## Materials and Methods

This prospective, observational study was done the Department of Paediatrics Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India for 16 months.

## Methodology

A consecutive 320 intramural newborns were examined and all the early term ($37^{[0/7]}$ to $38^{[6/7]}$ weeks) and the full-term ($39^{[0/7]}$ to $41^{[6/7]}$ weeks) babies were include for the study. Morbidities of the early term and full-term babies within the first seven days of life were observed. All the babies included in the study were examined at birth, after 24 hours, after 48 hours and daily up to seven days. For babies who were discharged early, the parents were advised to attend Sick Newborn Care Unit if any form of illness develops within seven days.

Exclusion criteria were multiple birth, congenital malformations, genetic disorders inborn metabolic disorders, pre terms & post terms.

**Results**

Consecutive 320 live births were included in the study during the study period. Out of the total 320 population included in the study, 120 were early term (37.5%) and 200 were full terms (62.5%). The distribution of study population according to gestational age is shown in table 1. Among the study population most of the babies were 39 weeks of gestational age and the least being 37 weeks. The mean gestational age of the population was 39.44 ± 1.42 weeks.

**Table 1: Distribution of study population according to gestational age**

| Gestational age | Frequency | Percent |
|---|---|---|
| 37 weeks | 48 | 15% |
| 38 weeks | 72 | 22.5% |
| 39 weeks | 88 | 27.5% |
| 40 weeks | 52 | 16.25% |
| 41 weeks | 60 | 18.75% |

Among the population 170 were boys (53.12%) and 150 were girls (46.88%). Among the early term babies 58 were boys (48.33%) and 62 are girls (51.67%). Among full term babies 108 were boys (54%) and 92 were girls (46%).

**Table 2: Distribution of weight for gestation among study population**

| Weight for gestation | Frequency | Percent |
|---|---|---|
| AGA | 260 | 81.25% |
| LGA | 15 | 4.69% |
| SGA | 45 | 14.06% |
| Total | 320 | 100.0% |

Among the total population 95 were delivered by cesarean section (29.69%) and 225 had vaginal (70.31%) birth (table 3). Among the early term deliveries 39 were delivered by cesarean section (32.5%) and 81 by vaginal delivery (67.5%). Out of total full tem deliveries 56 were by cesarean section (28%) and 144 by vaginal delivery (72%). P-value is 0.784

**Table 3: Difference in mode of delivery between early and full term babies**

| Mode of delivery | TERM | | Total | P value (Chi square test) | OR (95%CI) |
|---|---|---|---|---|---|
| | Early Term | Full Term | | | |
| CEASEREAN | 39 | 56 | 95 | | |
| VAGINAL | 81 | 144 | 225 | 0.777 | 1.049 |
| Total | 120 | 200 | 320 | | (0.747 – 1.487) |

Out of 95 cesarean newborn 15 (15.79%) needed NICU admission. Out of 225 vaginally born babies 19 (8.44%) needed NICU admission. P value is <0.05.

Table 4 is showing the incidence of different types of morbidities in early term and full term neonates and their NICU/SNCU admission rates. NICU/SNCU admission rates were higher for babies born at an earlier gestational age (14.67% v/s 9%) than babies born later. Incidence

of morbidities like jaundice requiring phototherapy (5% v/s 2%), need for resuscitation (6.67% v/s4 %), hypoglycemia on admission (5% v/s 2%), respiratory morbidities (3.33% v/s 2%), need for mechanical ventilation (1.67% v/s 0.5%),clinical sepsis (6.67% v/s 3.5%), confirmed sepsis (5% v/s 1.5%), need for intravenous antibiotics (10.83% v/s 6.5%), need for intravenous fluid (12.5% v/s 7%) were significantly higher in early terms than full terms during the first one week of life. Significantly higher number of babies delivered by cesarean section needed intervention and NICU admission (15.79% v/s 8.44%) than vaginally born babies. Moreover, among the cesarean deliveries the early term babies had significantly more morbidities or NICU/SNCU admission than their counterparts

**Table 4: Comparison of morbidities between early & full term babies**

| **Morbidities** | **Early term (n=120)** | **Full term (n=200)** | **P value (Chi square test)** |
|---|---|---|---|
| NICU/SNCU admission | 17(14.67)% | 18(9%) | 0.01 |
| Phototherapy for jaundice | 6(5%) | 4(2%) | 0.006 |
| Need for resuscitation | 8(6.67%) | 8(4%) | 0.024 |
| Hypoglycemia | 6(5%) | 4(2%) | 0.006 |
| Respiratory morbidities | 4(3.33%) | 4(2%) | 0.232 |
| Ventilation support | 2(1.67%) | 1(0.5%) | 0.326 |
| Clinical sepsis | 8(6.67%) | 7(3.5%) | 0.037 |
| Confirmed sepsis | 5% | 3(1.5%) | 0.024 |
| Need for antibiotics | 13(10.83%) | 13(6.5%) | 0.021 |
| Need for IV fluid therapy | 15(12.5%) | 14(7%) | 0.006 |

## Discussion

Some research suggesting that the short-term outcomes of children born between 37-38 weeks are worse than those born after 39 weeks, including a greater risk of not surviving infanthood. In our study 37.5% early term and 62.5% full term with highest cluster in 39 week age and lowest in 37 weeks with mean gestational age of 39.44 ± 1.42 weeks. It is in line with the study of Parikh LI et al.[16] and Sengupta S et al.[17] where the full term population is twice the early term, whereas the study conducted by Ramprakash MA et al.[18] has nearly equal distribution of early and full term population. In contrast to the previous studies our study shows 32.5% cesarean section in early term and 28% in full term population. Thus rate of cesarean section is almost equal in both the population and there is no statistically significant difference between them. The information reported here demonstrates that early term infants make up a significant proportion of NICU admissions and supports previous research that shows that this group of infants is at some increased health risks when compared to full term infants. Our findings illustrate that 14.17% of early term infants needed NICU/SNCU admission compared to 8 % of their full term (P value < 0.01) counterparts signifying that babies born during term gestation are not a homogenous risk group and early term infants may look as healthy as full-term babies, but are physiologically and metabolically less mature than full term babies. Our study is supported by Fang et al.[19] as they found increased neonatal morbidities requiring NICU admission for early term (8.4 %) compared to full term (3.3%) despite fetal pulmonary maturity. In their study Tita et al.[20] reported that 12.8% of 37-week

and 8.1% of 38- week infants were admitted to the NICU, compared to 5.9% and 4.8% of 39-week and 40-week infants, respectively. After adjusting for potential confounders, infants born at 37 weeks had a 2.3 times higher risk of an NICU admission, compared to infants born at 39 weeks.

NICU admission decreases as gestational age increases from 37 to 39 weeks as reported by Ghartey et al.[21] Ramprakash MA et al.[18] also found that odds of NICU admission were 2.61 times in early term pregnancies, compared to full term pregnancies. Poets CF et al.[22] found singletons born by elective cesarean section at 37 (i.e. $37^{[0/7]}$ to $37^{[6/7]}$) weeks' gestation showed twice the risk of dying or becoming acutely ill after birth compared to children born at $39^{[0/7]}$ to $39^{[6/7]}$ weeks' gestation. Sengupta S et al.[17] also found that even among vaginal deliveries, early-term neonates (6.8%) had a significantly higher rate of NICU or neonatology service admissioncompared with full term neonates (4.4%). There is also an additive effect of cesarean section delivery on the need for admission to NICU/SNCU which was highest at a younger gestational age. Fang et al.[19]and Bates et al.[23]conducted the study on population with documented fetal pulmonary maturity and found that despite lung maturity, delivery before 39 weeks is associated with significantly increased neonatal morbidity when compared to scheduled deliveries at 39 weeks or greater and significant increases in neonatal morbidity were noted prior to 39 weeks regardless of the mode of delivery.

We found in our study that infants admitted in NICU/SNCU with neonatal hyperbilirubinemia requiring phototherapy are significantly higher in early term (5 %) than full term (2 %) population. Our study is analogous with the findings of Ramprakash MA et al.[18] that the odds of neonatal jaundice were 3.59 times in early term pregnancies, compared to full term pregnancies. Jensen, JR et al.[24] (9.2% v/s 1.2%), and Ruth CA et al.[25]also found similar observations in their study between early and full term. Jaundice and hyperbilirubinemia occur more commonly in early term infants than in full term because of developmental immaturity in the liver i.e. decreased capacity to handle unconjugated bilirubin, decreased hepatic uptake, decreased Uridinediphosphoglucuronate Glucuro- nosyl Transferase (UGT) activity, and increased enterohepatic circulation, delayed postnatal maturation of hepatic bilirubin uptake and bilirubin conjugation and feeding difficulties.[26] The life span of red blood cells are also shortened in early term and enterohepatic circulation is specially increased in sick early term babies due to some other comorbid conditions which common in this group. Bilirubin neurotoxicity may also occur at an earlier postnatal age and the margin of safety may be narrower.

In our study, among the early term 6.67% babies required resuscitation of some sort, as compared to only 4% of full term babies. The need for resuscitation including Initial steps of resuscitation positive pressure ventilation at birth and intubation were significantly higher in early term when compared to full term born[P value <0.05]. None of the babies in the study period required medications for resuscitation. Parikh et al.[16]found rates of HIE, asphyxia, or seizures tended to be lowest at 38 and 39 weeks of gestation, but were not significantly different between early and full term birth for any precursor. Study conducted by Heimstad R et al.[27] shows there is a U shaped distribution, of need for resuscitation with lowest rates at 39 weeks of gestation. However, that study lacked information on the specific indications for induction.[27]

Hypoglycemia (Symptomatic or Asymptomatic) defined as blood sugar below 40mg/dl was seen in 5% babies in the early term group as compared to 2% in full term babies (P value <0.05) in our study population. Only sick term babies had glucose estimation during admission in NICU/SNCU. Our findings are also similar to the study done by Ramprakash MA et al.[18] where odds of hypoglycemia were 3.42 times more in early term pregnancies, compared to full term. Sengupta S et al.[17] also found incidence of hypoglycemia twice more in early term (4.9%) than full term (2.5%). The risk of hypoglycemia is also increased when

there are increased energy demands (eg, sepsis, hypoxia, and cold stress) and when enteral intake is inadequate (eg, abnormal suck and swallow or feeding intolerance). So screening for asymptomatic hypoglycemia is recommended in this group of newborns after an initial feeding.

In our study the babies admitted with any sort of respiratory morbidities are significantly higher in early term (3.33%) than full term (2%) population. Among the respiratory morbidities transient tachypnea of newborn (TTN) was most common. Need for neonatal ventilation either in form of CPAP or Mechanical ventilation was also higher in early (1.67%) than full (0.5%) term. Our study is supported by the findings of Madar et al.[28] that ventilation for severe RDS was significantly higher for infants born at 37 weeks (18.0 per 10,000births) and 38 weeks (5.9 per 10,000 live births), versus 39-41 weeks, in which only 1 of 133,277 had RDS. Morrison et al[29]also found rate of respiratory morbidities are 14 and 8 times higher respectively in 37 and 38 weeks than their full terms counterparts. A smaller study conducted by Ghartey et al.[27] shows a 2-fold increased risk of RDS, oxygen use, continuous positive airway pressure (CPAP) in early term than full term babies. Eagle WA et al.[30] found that infants born at 37 weeks' gestation have a 3-fold greater rate of respiratory distress syndrome that those born at 38 weeks' gestation, who in turn, have a 7.5-fold greater rate than infants born at 39 to 41 weeks'gestation.[30] Thus pulmonary disorders such as transient tachypnea of the newborn (TTN), respiratory distress syndrome (RDS), pneumonia are more common, and incur a greater risk of respiratory failure, in early term than in full-term infants.[31]

More babies were evaluated for sepsis and received empirical antibiotics in early term (6.67 %) as compared to full term (3.5%)[P value <0.05]. We also found that 5% of early term babies had blood culture positive sepsis compared to 1.5% of full term. Bates et al.[23] found a nearly two-fold higher risk ofsuspected/proven sepsis in early term population compared to full term. Parikh LI et al.[16]said there is decrease in sepsis morbidity occurred between 37 and 38 weeks with the nadir between 38 and 39 weeks for spontaneous labor and indicated deliveries as compared to full term. The findings of Jensen JR et al.[24] (5.3% v/s 3.5% after 39 weeks) and Sengupta S et al.[17]are also in line with us. Apart from immature defense mechanism of infants born at an earlier gestational age leading to an increased susceptibility to infectious agents, early term infants are also at an increased risk because of invasive monitoring required for them due to some other morbidities are much more than full term infants.

In our study between early and full term infants we found that the need for intravenous antibiotics (10.83% v/s 6.5%; P value <0.05) and need for intravenous fluid (12.5% v/s 7%; P value <0.05) was significantly higher in the former group. Our findings are analogous with the findings of Sengupta S et al.[17] intravenous fluid (7.5% v/s 4.4%), antibiotics (2.6% v/s 1.6%)] proving that early term infants are relatively immature and more prone to infections.

## Conclusion

Neonatal morbidity decreases with delivery at later gestational ages and that infants delivered at 37 and 38 weeks' gestation, are at increased risk for morbidity compared to infants delivered at 39 weeks or later. So, to reduce early term deliveries and its influence on health care system we should carefully consider the optimal timing and route of delivery.

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