Association of neonatal respiratory morbidity with timing of elective cesarean delivery

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ABSTRACT

Background: Elective Cesarean Delivery (ECD) rate has increased in both developed and developing countries due to obstetric indications and cesarean section on request. Neonatal respiratory morbidity is one of the complications of elective cesarean delivery performed before 39 weeks gestation. The aim of this study was to compare the risk of neonatal respiratory morbidity of elective caesarean section performed at 37⁰⁰ to 38⁰⁶ weeks with those delivered at 39⁰⁰ to 41⁰⁶ weeks gestation.

Methods: A retrospective study was conducted on all pregnant women who were delivered by elective caesarean at a gestational age of 37⁰⁰ to 38⁰⁶ weeks and were compared with those delivered at 39⁰⁰ to 41⁰⁶ weeks. Maternal and neonatal characteristics, neonatal respiratory morbidity including: respiratory distress syndrome, transient tachypnea of the newborn, persistent pulmonary hypertension of newborn and serious respiratory morbidity were analyzed.

Results: Incidence of neonatal respiratory morbidity was 15.8% and 6.3% in neonates delivered at 37⁰⁰ to 38⁰⁶ weeks and ≥39 weeks gestation respectively. Combined respiratory morbidity risk (Odds ratio: OR 2.82; 95% Confidence interval CI: 1.34-5.94; P value <0.05) was significantly higher in the neonates delivered at 37⁰⁰ to 38⁰⁶ weeks compared with those delivered ≥39 weeks. Risk of TTN (OR 2.6; 95% CI: 0.95-7.45; P value 0.08) and RDS (OR 2.42; 95%CI: 0.48-12.15; P value 0.45) increased by two fold in neonates delivered before 39 weeks.

Conclusions: Neonates delivered by elective cesarean at 37⁰⁰ to 38⁰⁶ weeks gestations are at increased risk of developing respiratory morbidity compared with infants delivered beyond 39 weeks. Respiratory morbidity can be reduced by delaying the ECD until 39 weeks of gestation.

Keywords: Elective cesarean delivery, Neonatal respiratory morbidity, Transient tachypnea of newborn, Gestational age

INTRODUCTION

Elective cesarean section at term, in an obstetric population without prenatally identified risk factors, remains associated with increased resuscitation risk with related implications for the neonate compared with vaginal delivery.¹

M. Hourani and co-workers studied a total of 134 neonates delivered by elective cesarean at or beyond 37 weeks, found a significant risk for the development of respiratory complications (P = 0.0001) in the neonates delivered before 39 weeks.²

Hansen and colleagues reported that the infants delivered by elective cesarean at 37 weeks had a 10% incidence of
respiratory morbidity (defined as transient tachypnea of newborn, respiratory distress syndrome or persistent pulmonary hypertension of newborn) compared with 2.8% among infants delivered vaginally (OR 3.7; 95% CI, 2.2-6.1). The relative risk increased with decreasing gestational age. 

Proposed mechanisms for the association between ECD and respiratory morbidity include iatrogenic prematurity with surfactant deficiency and attenuation of the fetal catecholamine surge during labor. 

A significant reduction in neonatal RDS would be obtained if elective caesarean delivery were performed after 39<sup>th</sup> gestational weeks of pregnancy.

**METHODS**

- Hospital based retrospective study

**Inclusion criteria**

- Pregnant women with gestation between 37<sup>th</sup>-38<sup>th</sup> and 41<sup>st</sup>-46<sup>th</sup> weeks who underwent elective cesarean section
- Singleton pregnancies
- No maternal and fetal complications

**Exclusion criteria**

Pregnancies complicated by:

- Intrauterine fetal deaths,
- Emergency caesarean sections,
- Multiple pregnancies and
- Associated maternal and/or fetal complications

Case sheets were reviewed to obtain data regarding the demographic details like maternal age and parity. Neonatal outcome analyzed included birth weight, sex of the baby, APGAR score at 1 and 5 minutes, NICU admission (admission more than 3 days), neonatal respiratory morbidity like transient tachypnea of newborn, respiratory distress syndrome and persistent pulmonary hypertension and serious respiratory morbidity (oxygen therapy for more than two days, nasal continuous positive airway pressure, or need for mechanical ventilation).

**Objectives**

- To determine the incidence of neonatal respiratory morbidity in elective caesarean section performed at 37<sup>th</sup>-38<sup>th</sup> weeks of gestation and those delivered ≥39 weeks.

- To compare the risk of neonatal respiratory morbidity after elective cesarean delivery at 37<sup>th</sup>-38<sup>th</sup> weeks of gestation with those delivered ≥39 weeks of gestation.

**Statistical analysis**

Patients’ data were analyzed using SPSS 17.0. Chi-square test and unpaired t-student test used wherever appropriate. P value, odds ratio and 95% Confidence Interval were calculated. A value of P <0.05 was considered significant.

**RESULTS**

During the study period of six months, there were 2890 deliveries. Of these, 1739 (60.2%) neonates were delivered vaginally and 1151 (39.8%) by cesarean section. Of 1151 cesarean sections, 202 (17.5%) elective cesarean delivery (ECD) performed between 37<sup>th</sup>-38<sup>th</sup> and 38<sup>th</sup>-46<sup>th</sup> weeks and 160 (13.9%) between 39<sup>th</sup>-41<sup>st</sup> weeks (Figure 1). Maternal and neonatal characteristics are shown in (Table 1). Mean maternal age ± SD (years) was 27.3 ± 4.9 and 26.2 ± 4.6 years respectively in both the groups found to be statistically significant (P value <0.05). There were no significant differences in both groups in relation to parity of the mothers and birth weight of neonates (P = 0.76; 0.6 respectively). We found that 20 (9.95%) neonates delivered before 39 weeks and 6 (3.75%) neonates born after 39 weeks gestation by ECD were admitted in NICU for more than 3 days (statistically significant differences found between two groups i.e. P value <0.05).

**Figure 1**: Number of elective cesarean delivery.

Indications of elective caesarean section shown in (Figure 2) shows that previous LSCS was the commonest indication for elective cesarean delivery in both the groups i.e.,150 (74.3%) between 37<sup>th</sup>-38<sup>th</sup> weeks and 128 (80%) between 39<sup>th</sup>-41<sup>st</sup> weeks.
The number of infants who developed respiratory morbidity after elective cesarean between 37th and 41st weeks are shown in (Table 2). The incidence of combined respiratory morbidity was 15.8% and 6.3% after elective cesarean delivery at 37th to 38th weeks and 39th to 41st weeks respectively (Figure 3).

The neonatal respiratory morbidity risk (OR 2.82;95% CI:1.34-5.94; P value <0.05) was significantly higher in the neonatal group delivered by ECD at 37th weeks to 38th weeks compared with those delivered at 39th to 41st weeks. Risk of TTN (OR 2.6; 95% CI: 0.95-7.45; P value 0.08) and RDS (OR 2.42; 95%CI: 0.48-12.15; P value 0.45) increased by two fold at 37th and 38th weeks. Serious respiratory morbidity included oxygen therapy for more than two days, nasal continuous positive airway pressure, or need for mechanical ventilation. (OR 2.15; 95% CI: 0.56-8.27; P value-0.40) was found in 3.8% and 1.9% neonates delivered before and after 39 weeks respectively (Table 2).

Table 1: Maternal and neonatal characteristics.

<table>
<thead>
<tr>
<th>Maternal &amp; neonatal characteristics</th>
<th>Gestational age (week)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>37th to 38th weeks (N (%)</td>
<td>39th to 41st weeks (N (%))</td>
</tr>
<tr>
<td>Maternal characteristics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal age (years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;35</td>
<td>179 (88.6)</td>
<td>146 (91.3)</td>
</tr>
<tr>
<td>≥35</td>
<td>23 (11.4)</td>
<td>14 (8.7)</td>
</tr>
<tr>
<td>Mean age ± SD (years)</td>
<td>27.3 ± 4.9</td>
<td>26.2 ± 4.6</td>
</tr>
<tr>
<td>Parity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>39 (19.3)</td>
<td>28 (17.5)</td>
</tr>
<tr>
<td>≥1</td>
<td>163 (80.6)</td>
<td>132 (82.5)</td>
</tr>
<tr>
<td>Neonatal characteristics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neonatal age (years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>90 (44.5)</td>
<td>95 (59.4)</td>
</tr>
<tr>
<td>Female</td>
<td>112 (55.4)</td>
<td>65 (40.6)</td>
</tr>
<tr>
<td>Mean birth wt. (kg)</td>
<td>3.02 ± 0.55</td>
<td>2.99 ± 0.54</td>
</tr>
<tr>
<td>Birth weight (kilograms)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;2.5</td>
<td>29 (14.4)</td>
<td>17 (10.6)</td>
</tr>
<tr>
<td>2.5-4</td>
<td>160 (79.2)</td>
<td>128 (80)</td>
</tr>
<tr>
<td>&gt;4</td>
<td>13 (6.4)</td>
<td>15 (9.4)</td>
</tr>
<tr>
<td>NICU admission</td>
<td>20 (9.9)</td>
<td>6 (3.75)</td>
</tr>
</tbody>
</table>

*Statistically significant P value 
**Admission >3 days

The number of infants who developed respiratory morbidity after elective cesarean between 37th and 41st weeks are shown in (Table 2). The incidence of combined respiratory morbidity was 15.8% and 6.3% after elective cesarean delivery at 37th to 38th weeks and 39th to 41st weeks respectively (Figure 3).

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Table 2: Neonatal respiratory morbidity following elective cesarean delivery.

<table>
<thead>
<tr>
<th>Neonatal respiratory morbidity</th>
<th>ECD b/w 37th &amp; 38th weeks (n=202) N (%)</th>
<th>ECD b/w 39th &amp; 41st weeks (n=160) N (%)</th>
<th>OR (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total no. of infants with combined respiratory morbidity</td>
<td>32 (15.8)</td>
<td>10 (6.3)</td>
<td>2.82 (1.34-5.94)</td>
<td>0.007*</td>
</tr>
<tr>
<td>Transient tachypnea of new-born</td>
<td>16 (7.9)</td>
<td>5 (3.1)</td>
<td>2.6 (0.95-7.45)</td>
<td>0.08</td>
</tr>
<tr>
<td>Respiratory distress syndrome</td>
<td>6 (2.9)</td>
<td>2 (1.25)</td>
<td>2.42 (0.48-12.15)</td>
<td>0.45</td>
</tr>
<tr>
<td>Persistent pulmonary hypertension</td>
<td>2 (0.9)</td>
<td>0</td>
<td>-</td>
<td>0.58</td>
</tr>
<tr>
<td>Serious respiratory morbidity **</td>
<td>8 (3.9)</td>
<td>3 (1.8)</td>
<td>2.15 (0.56-8.27)</td>
<td>0.40</td>
</tr>
</tbody>
</table>

*Statistically significant p value (<0.05)
**Oxygen therapy for more than 2 days; Nasal continuous positive airway pressure; Need for mechanical ventilation

OR: Odds ratio; CI: Confidence interval; ECD: Elective cesarean delivery
DISCUSSION

In our study, we analyzed 202 neonates delivered by elective cesarean section before 39 weeks and 160 neonates delivered beyond 39 weeks of gestation. The incidence of neonatal respiratory morbidity was 15.8% in elective cesarean section performed between 37th and 38th weeks and 6.3% between 39th and 41st weeks while TTN and RDS was observed in 7.9% and 2.9% compared to 3.1% and 0.9% respectively. The incidence of respiratory morbidity after elective cesarean delivery was 25% at 38 weeks compared to 11% in elective cesarean delivery beyond 39 weeks while TTN was observed in 10% compared to 7% of newborns respectively in a study conducted by S. Hefny and colleagues. We found that neonatal respiratory morbidity risk (OR 2.82; 95% CI: 1.34-5.94; P value <0.05) was significantly higher in elective cesarean section performed before 39 weeks of gestation, similar results were observed in Zanardo V et al. study.

In the present study, TTN (OR 2.6; 95% CI: 0.95-7.45; P value 0.08) and RDS (OR 2.42; 95% CI: 0.48-12.15; P value 0.45) risk is increased by two fold in elective cesarean delivery performed before 39 weeks. Hansen and co-workers reported that there was a fivefold increased risk of respiratory morbidity in infants delivered by ECD at 37 weeks (OR 5.0; 95% CI: 1.6-16.0).

Hamida Ben and colleagues observed that there was a significant reduction in the incidence of respiratory distress from elective caesarean performed after 39 weeks gestation. In the present study, 3.8% neonates delivered by Elective cesarean delivery before 39 weeks developed serious respiratory morbidity while in the Hansen study, 1.9% of infants delivered by ECD at 37 weeks experienced serious respiratory morbidity.

CONCLUSIONS

Neonatal respiratory morbidity risk is significantly increased in neonates delivered by elective cesarean section before 39 weeks gestation. Our results suggest that reduction in the neonatal respiratory morbidity would be achieved by delaying the elective cesarean delivery until 39 weeks.

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Ethical approval: Not required

REFERENCES


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