*Section: Research Paper*

# Maternal and fetal outcome of administration of corticosteroids in late preterm period

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**Abstract**

**Background:** To analyse maternal and fetal outcome of administration of corticosteroids in late preterm period. **Materials & methods:** A total of 50 subjects were enrolled. Women with a singleton gestation at high risk for late preterm delivery were included. A total of 200 subjects were enrolled. All the subjects were broadly divided into two study groups: Betamethasone group and control group. Outcome of administration of corticosteroids was recorded. The results were analysed using SPSS software. **Results:** There were no significant differences between groups in the incidence of chorioamnionitis or endometritis. The rates of caesarean delivery, and length of stay were also similar between groups. **Conclusion:** Administration of corticosteroids to women at risk for late preterm delivery significantly reduced the rate of neonatal respiratory morbidity.

**Keywords:** Maternal, Fetal, Preterm, Corticosteroid.

## Introduction

For nearly three decades the preterm birth rate has been steadily increasing in the United States, rising by more than 30% during this time period. [1] However, after peaking at 12.8% of all births in 2006, the preterm birth rate has declined for three consecutive years, to 12.18% in 2009. [2] As preterm birth can result in serious long-term medical and developmental problems, with tremendous individual, family and societal cost, this represents a most welcome trend. Meeting the Healthy People 2020 goal of an 11.4% rate of preterm birth may now be possible. Respiratory distress syndrome (RDS), formally known as hyaline membrane disease, is primarily an acute pulmonary process associated with immature lungs that are deficient in surfactant. [3] The absence or insufficient amount of surfactant causes increase surface tension in the alveoli leading to alveolar collapse and atelectasis. This leads to complications such as respiratory distress from increased work of breathing, hypoxia, ventilation-

perfusion mismatch, and eventually respiratory failure. Aside from prematurity, risk factors for RDS include male sex, chorioamnionitis, a caesarean delivery without labor, and maternal diabetes. [4] RDS is inversely related to gestational age; occurring in about 100% of infants born <28 weeks' gestation, about 30% of infants born between 28 and 34 weeks' gestation, and about 1% and 14% of infants born after 34 weeks' gestation. [3,5] Infants born at late-preterm (34 0/7 to 35 6/7 weeks' gestation) are at higher risk for respiratory complications such as RDS than term infants. The Canadian Neonatal Network showed that in a cohort of 6636 infants who were admitted to the Neonatal Intensive Care Unit (NICU) between the gestational ages of 34 to 40 weeks, the incidence of RDS was as high as 14.2% in late-preterm (34 0/7 to 36 6/7 weeks' gestation) infants, 7.2% in early term (37 0/7 to 38 6/7 weeks' gestation) infants, and 4.5% in term (39 0/7 to 40 6/7 weeks' gestation) infants. [6]

However, it is now clear that infants born during the 'late' preterm period (34 weeks 0 days to 36 weeks 6 days) have increased neonatal and childhood complications compared with new-borns born at term (37 weeks or later). [7-9] In that context, a workshop in 2005 recommended redirecting research to infants born between 34 and 36 weeks gestation, particularly to answer the question of whether antenatal corticosteroids are beneficial in this population. [10] Currently 8% of all deliveries occur in the late preterm period; thus the potential public health and economic impact of decreasing respiratory and other morbidities associated with prematurity by administration of antenatal corticosteroids is considerable. [11] Hence, this study was conducted to analyse maternal and fetal outcome of administration of corticosteroids in late preterm period.

**Materials & methods**

A total of 50 subjects were enrolled. Women with a singleton gestation at high risk for late preterm delivery were included. A total of 200 subjects were enrolled. All the subjects were broadly divided into two study groups: Betamethasone group and control group. Participants were given two injections of 12 mg betamethasone or matching placebo 24 hours apart. The primary outcomes were noticed. Maternal and neonatal outcomes were depicted. The data was collected. The results were analysed using SPSS software. The p- value less than 0.05 was considered significant.

**Results**

A total of 200 subjects were enrolled. There were no stillbirths or neonatal deaths within 72 hours. The primary outcome occurred less frequently in the betamethasone group compared with the placebo group. The severe respiratory morbidity composite outcome was also significantly reduced in the betamethasone group compared with placebo. There were no significant differences between groups in the incidence of chorioamnionitis or endometritis. The rates of cesarean delivery, and length of stay were also similar between groups.

Table 1: Neonatal Respiratory Outcomes

| Outcomes | Betamethasone (100) | Placebo (100) | P – value |
|---|---|---|---|
| Primary outcome | 11 (11) | 14 (14) | 0.01 |
| CPAP/HFNC for ≥ 2 continuous hours | 10 (10) | 12 (12) | 0.01 |
| Severe respiratory morbidity | 7 (7) | 12 (12) | 0.001 |
| CPAP/HFNC for ≥ 12 continuous hours | 6 (6) | 10 (10) | 0.001 |
| Transient tachypnea of the newborn | 6 (6) | 9 (9) | 0.01 |
| Need for immediate resuscitation | 15 (15) | 19 (19) | 0.004 |
| Stillbirth or neonatal death < 72 hours | 0 | 0 | |

CPAP – continuous positive airway pressure

HFNC – high flow nasal cannula

Table 2: Maternal Outcomes

| Outcomes | Betamethasone (100) | Placebo (100) | P – value |
|---|---|---|---|
| Chorioamnionitis | 1 (1) | 2 (2) | 0.06 |
| Cesarean delivery | 30 (30) | 28 (28) | 0.5 |
| Length of stay - days | 3 (3-5) | 3 (3-5) | 0.2 |
| Postpartum endometritis | 1 (1) | 1 (1) | 0.8 |

**Discussion**

Antenatal corticosteroid is beneficial in the short-term. The decreased rate of respiratory distress will potentially reduce the use of CPAP and/or admission rates to the special care nursery or NICU. For singleton mothers who are at risk for late-preterm delivery, this can be beneficial for several reasons. First, a reduction in admission can decrease the separation time of the infant from the mother. Reducing mother-infant dyad separation leads to better bonding, breastmilk production, and feeding tolerance, in addition to possibly shortening hospital stay duration. Second, this can be economically favorable by optimizing healthcare costs. A cost-effective analysis was performed assessing total mean woman-infant–pair cost in those who received antenatal betamethasone versus placebo. The maternal costs included the cost of betamethasone treatment if given and outpatient visits or inpatient admissions. The newborn costs included NICU stay with or without the need for respiratory support (e.g., infants who did not have respiratory distress but had hypoglycemia which required NICU stay). This analysis found that treatment with betamethasone was associated with a total cost of $4681 which was significantly less than the mean cost of $5379 in the placebo group (difference of $698; 95% CI, $186–$1257; p = 0.02). [12] Lastly, neonates who develop respiratory distress may need

respiratory support such as CPAP. However, the use of CPAP can increase the risk of developing air-leak syndromes in infants. Rates of pneumothorax ranging from 9 to16% with the use of CPAP in neonates have been reported. [13] Hence, this study was conducted to analyse maternal and fetal outcome of administration of corticosteroids in late preterm period.

In the present study, a total of 200 subjects were enrolled. There were no stillbirths or neonatal deaths within 72 hours. The primary outcome occurred less frequently in the betamethasone group compared with the placebo group. The severe respiratory morbidity composite outcome was also significantly reduced in the betamethasone group compared with placebo. A study by Gyamfi- Bannerman C et al, 2,831 patients were randomized. The primary outcome occurred in 11.6% of the betamethasone group versus 14.4%, in the placebo group (Relative Risk 0.80, 95% confidence interval 0.66-0.97, P=0.02). Severe respiratory morbidity, transient tachypnea of the newborn, surfactant use, and bronchopulmonary dysplasia were also significantly less common in the betamethasone group. There were no significant differences between groups in the incidence of chorioamnionitis or neonatal sepsis. Neonatal hypoglycemia was more common in the betamethasone group. (24.0% versus 14.9%, RR 1.61, 95% CI 1.38-1.88, P<0.001). Administration of betamethasone to women at risk for late preterm delivery significantly reduced the rate of neonatal respiratory morbidity. [14]

In the present study, there were no significant differences between groups in the incidence of chorioamnionitis or endometritis. The rates of cesarean delivery, and length of stay were also similar between groups. Another study by Haviv HR et al, infants born in the late preterm period and via non-labour caesarean section in the early term period are at increased risk of respiratory morbidity when compared to their term-born counterparts. The morbidity in these infants is less frequent and severe than in early preterm infants. Antenatal corticosteroids reduce respiratory morbidity in these populations; however, the magnitude of the reduction appears to be small and predominantly in the self-limiting condition of transient tachypnoea of the neonate. The smaller benefit, along with possible harmful effects of corticosteroids, raises a question about the role of antenatal corticosteroids in this population. Special obstetric populations such as twin pregnancies and pregnancies complicated by diabetes and growth restriction are at increased risk of prematurity and more vulnerable to its complications. Nevertheless, there is limited evidence regarding the benefits of corticosteroids in these populations and potential concern regarding adverse effects. [15] Newborn infants presenting with persistent respiratory distress will require admission to a NICU or a special care newborn nursery. The respiratory symptoms of RDS can vary from mild to severe. Therefore, respiratory support can range from noninvasive support such as nasal cannula (NC) and nasal continuous positive airway pressure (CPAP) for mild to moderate RDS to invasive mechanical ventilation for severe RDS. One study that assessed term infants with RDS had 20% of infants on NC, 56% on nasal CPAP, and 25% on mechanical ventilation. [16] Additionally, admission to the NICU or special care nursery will cause

separation of the mother-infant dyad and increase stress for the parents. The two most common diagnoses for respiratory distress are RDS and transient tachypnea of the newborn (TTN). [17,18]

**Conclusion**

Administration of betamethasone to women at risk for late preterm delivery significantly reduced the rate of neonatal respiratory morbidity.

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