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The Role of Antenatal Steroids in Decreasing Respiratory Distress Syndrome in Late Preterms

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Abstract

Background: Neonatal Respiratory distress syndrome is a multi-factorial disease in preterm infants, characterized by structural immaturity of the lungs, surfactant deficiency and abnormal surfactant function resulting in deficient gas exchange and respiratory failure. Therapies are developed aiming at treatment of these problems that include antenatal glucocorticoid administration and endotracheal surfactant administration. Corticosteroid treatment given to pregnant women is the only antenatal therapy with significant efficacy in the prevention of RDS.

Objective: To study the role of antenatal steroid in preventing respiratory distress syndrome in late preterm(34-37weeks)

Method: Women with singleton pregnancy with late preterm, who had either received 1 complete course of antenatal corticosteroid or not received antenatal corticosteroid were enrolled and compared. Study done at Hi-Tech Medical College and Hospital from September 2019 to August 2021.

Study Design: Retrospective study Statistical Analysis- Data was analyzed by using appropriate statistical techniques in the form of tables, graphs and diagrams.

Result: In this study, we compared two groups each contains 100 neonates. We found that APGAR score was high in infant who was treated with antenatal corticosteroids and Silverman Anderson score was low. The neonates who were not treated with antenatal corticosteroids- Ph was low in ABG, X-RAY had positive findings, CPAP & ventilation was required more.

Keywords: late preterm, respiratory distress syndrome, antenatal corticosteroi

Introduction

Preterm birth is defined as birth before 37 gestational weeks. Birth in the interval between gestational weeks 34-36 is usually defined as late preterm. Very preterm birth is birth between 28-33 gestational weeks and extremely preterm birth is defined as birth before 28 gestational weeks[1]. Neonatal RDS is a multifactorial disease in preterm infants, characterized by structural immaturity of the lungs, surfactant deficiency and abnormal surfactant function resulting in deficient gas exchange and respiratory failure. The main cause of RDS is a deficiency of pulmonary surfactant, a lipoprotein mixture that is required to reduce surface tension at the air-liquid interface and to prevent generalized atelectasis of the alveolar ducts and alveoli. Respiratory distress syndrome in a newborn develops within the first few hours after preterm birth. It manifests as deficient gas exchange and progressive respiratory failure. Infants with RDS present with clinical signs of respiratory distress that include tachypnoea, grunting, retractions and cyanosis accompanied by increasing oxygen requirements. Physical findings include rhonchi, use of diaphragmatic and other accessory muscles of breathing, nasal flaring, and abnormal patterns of respiration that may be complicated by apnoea. Therapies are developed aiming at treatment of these problems that include antenatal glucocorticoid administration and endotracheal surfactant administration [1-3]. Corticosteroid treatment given to pregnant women is the only antenatal therapy with significant efficacy in the prevention of RDS.

Methodology

This study had done Hi-Tech Medical College and Hospital, Bhubaneswar from September 2019 to August 2021. Women with a singleton gestation resulting in late-preterm birth were identified. Gestational age was determined by best obstetric estimate in the parent study. Neonatal data were collected up to discharge and data on Antenatal Corticosteriod exposure was abstracted from maternal charts. Women were included if they have never received steroids or if they had completed one course. Women who received partial dosing, or those for whom information is incomplete were not included. We compared women exposed to ACS with unexposed parturient, and evaluated neonatal respiratory outcomes such as RDS, ventilator use, and the need for resuscitation in the delivery room. In multivariable analyses we controlled for potential confounders that might influence respiratory outcomes. These include maternal diabetes (gestational and pregestational), race, prenatal care insurance, mode of delivery, presence of labor, gestational age (GA) at delivery, and congenital anomalies. Our primary outcome was RDS. Secondary outcomes included ventilator use, and the need for resuscitation in the delivery room. Additionally, a composite of respiratory morbidities that included RDS and ventilator support in the first 24 hours was analyzed.

Inclusion criteria

1. All late preterm babies born between 34- 37 weeks
2. All late preterm babies whose mother has received antenatal steroid and those babies whose mother have not received steroids.

Exclusion criteria

1. Babies born <34 weeks and > 37weeks
2. Still born & Congenital anomalies
3. Mothers with Diabetes mellitus, pre-eclampsia, gestational diabetes and any contraindications for steroid therapy.
4. Mother who received partial dosing, or those for whom information is incomplete.

Sample design

total population had divided into two groups.

Group-A: Baby of the mother not treated with antenatal steroids.

Group-B: Baby of the mother treated with antenatal steroids

Apgar score at 1min & 5min & Silverman Anderson scoring were recorded of the preterm infants. Chest X-RAY & ABG were send of all the infants.

Data were entered into MS Excel, tabulated and analyzed with appropriate statistical tests. Percentage and Chi-Square test was applied. p-value ≤ 0.05 was considered for statistically significant.

Results

Divided the study population in to two groups. Group-A (Baby of the mother not treated with antenatal steroids) & Group-B(Baby of the mother treated with antenatal steroids). N=200(case- 100 & control- 100). APGAR score at 1min & 5min were showed in the table 1 & 2 respectively.

Table 1: Distribution of MEANS APGAR 1 min in two groups

Group	Number	Mean	SD	Minimum	Maximum	Median	p-value
Group-A	100	5.7500	2.0859	3.0000	9.0000	5.5000	0.0045
Group-B	100	7.3100	1.4613	3.0000	9.0000	8.0000	

In Group-A, the mean APGAR score 1min (mean± s. d.) of patients was 5.7500 ±2.0859 with range 3.0000-9.0000 and the median APGAR score was 5.5000. In Group-B, the mean APGAR score 1min (mean± s. d.) of patients was 7.3100 ±1.4613 with range 3.0000-9.0000 and the median APGAR score was 8.0000. Difference of mean APGAR score 1min in two groups was statistically significant.

Table 2: Distribution of MEANS APGAR 5 min in two groups

Group	Number	Mean	SD	Minimum	Maximum	Median	p-value
Group-A	100	6.3000	2.0326	3.0000	9.0000	7.0000	0.0011
Group-B	100	7.5900	1.3640	3.0000	9.0000	8.0000	

In Group-A, the mean APGAR score 5min (mean± s. d.) of patients was 6.3000 ±2.0326 with range 3.0000-9.0000 and the median APGAR score 5min was 7.5000. In Group-B, the mean APGAR score 5min (mean± s. d.) of patients was 7.5900 ±1.3640 with range 3.0000-9.0000 and the median APGAR score 5min was 8.0000. Difference of mean APGAR score 5min in two groups was statistically significant.

Figure 1: Distribution of silver man Anderson score in two groups

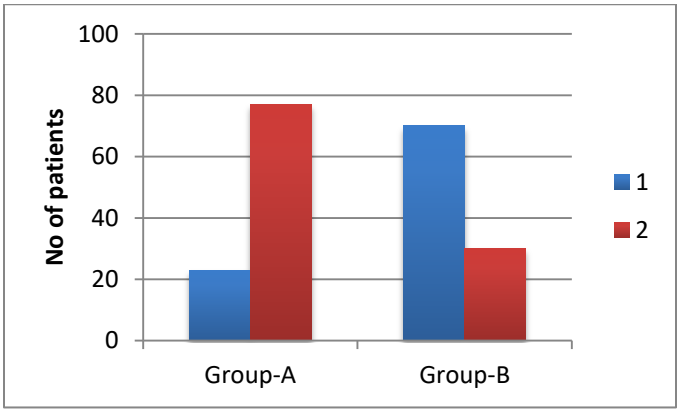
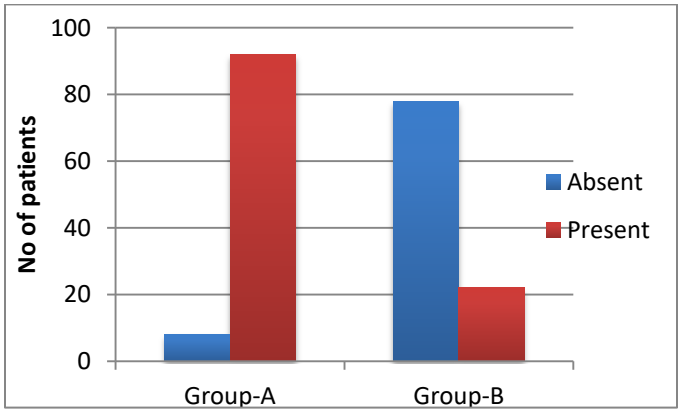


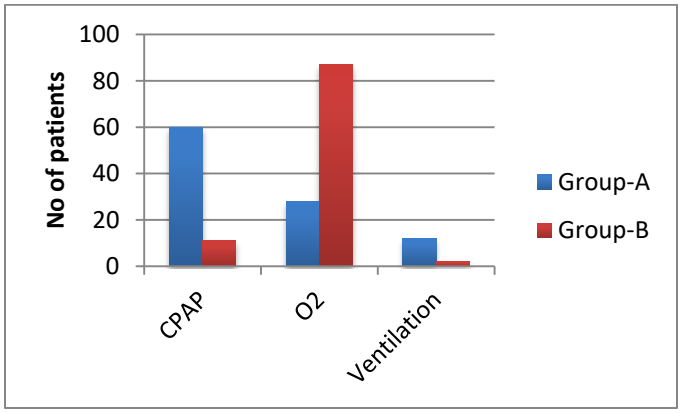
Figure 1 shows the silver man Anderson score were divided into two groups where 1 denotes <5 and 2 denotes >5. It has been concluded that silver man Anderson score is high in the group who were not treated with antenatal steroid. The association between silver man Anderson score in two groups was statistically significant (p=0.0053).

Figure 2: Distribution of ABG in two groups



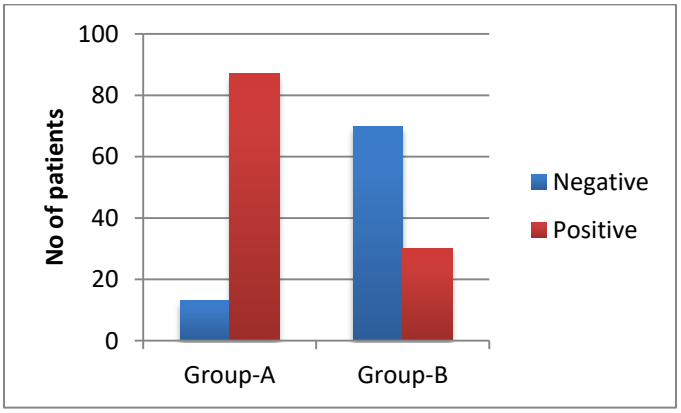
If acidosis is present in Arterial Blood Gas (ABG) it is considered as present, if not considered as absent. In our study incidence of acidosis in ABG is more in the group not treated with antenatal steroid (Group-A). The association between ABG in two groups was statistically significant (p=0.0047)

Figure 3: Distribution of Intervention in two groups



In our study more active intervention such as CPAP &ventilation is required in the group not treated with antenatal steroid (Group-A). The association between intervention in two groups was statistically significant (p=0.00238).

Figure 4: Distribution of Chest X-rayin two groups



The classical chest x ray findings if present were considered as positive(P), if absent considered as negative(N). In this study the incidence of positive chest x ray findings are more in the group not treated with antenatal steroids (Group-A). The association between Chest X-ray in two groups was statistically significant (p=0.0024).

Discussion

Neonatal RDS is a multifactorial disease in preterm infants, characterized by structural immaturity of the lungs, surfactant deficiency and abnormal surfactant function resulting in deficient gas exchange and respiratory failure. The main cause of RDS is a deficiency of pulmonary surfactant, a lipoprotein mixture that is required to reduce surface tension at the air-liquid interface and to prevent generalized atelectasis of the alveolar ducts and alveoli [2].

Respiratory morbidities in LPNs relate to developmental immaturity of the lungs. The mechanisms for benefits of ANC include enhanced alveolar differentiation with the induction of type 2 pneumocytes and activation of endothelial nitric oxide synthase 4[-5].

Experimental studies show that the improvement in lung function after ANC exposure are due to an increase in the absorption of fetal lung fluid, thinning of alveolar

septae, and synthesis of surfactant proteins and phospholipids [6-7].

Uquillas et al. (2020) found that antenatal betamethasone decreased the need for substantial respiratory support during the first 72 h of late preterm newborns after birth ($p = 0.02$) [19]. Uquillas et al.'s study was also a retrospective cohort study, so they could not control for differences in subgroup gestational age (34 weeks, 35 weeks and 36 weeks of gestation) [8].

Balreldin et al. (2020) even concluded that the rate of respiratory distress in the group using ACS was higher than in the group without ACS (6% vs. 4.7%, respectively) [9].

Conclusion

Our systemic review showed that exposure to ANC was beneficial in reducing respiratory distress and need for respiratory support. Also reduced the need for resuscitation at birth.

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