

# The Study of the Effect of Antenatal Corticosteroids on Requirement of Surfactant and Ventilator in Preterm Neonates

Dr. Smitha .K<sup>1</sup>, Dr. G. Nita<sup>2</sup>

<sup>1</sup>Associate Professor, Kempegowda Institute of Medical Science and Research Hospital, V. V. Puram, Bangalore, Karnataka, India

<sup>2</sup>Junior Resident

**Abstract:** Background: Preterm birth is defined as live births occurring before 37 completed weeks of gestation.<sup>1</sup> Preterm birth is a significant cause of perinatal morbidity and mortality. Nearly one half of all cases of congenital neurological disability, including cerebral palsy are a consequence of prematurity. Aim: a) To study the effect of antenatal corticosteroids on preterm neonates, b) Need for surfactant, c) Need for ventilator. Materials and methods: It's a prospective study conducted in the Department of OBG, KIMS Hospital and Research Center, Bangalore, Karnataka. 200 patients with preterm labour were selected for the study. 136 patients had received antenatal corticosteroids. 64 patients couldn't receive antenatal corticosteroids as the patients had presented with active labour from September 2018 to August 2019. Group 1 – did not receive antenatal corticosteroids. Group 2 – received antenatal corticosteroids. Results: In group 1 requirement of surfactant and ventilator was 40.6% and 71.9% respectively whereas in group 2 requirement of surfactant and ventilator was 22.1% and 41.2% respectively. All these observations were statistically significant. Conclusion: Antenatal corticosteroid administration significantly reduces the requirement of surfactant and ventilator in preterm neonates. Every effort should be made to initiate antenatal corticosteroid therapy in women between 28 and 36 weeks+6 days as soon as preterm delivery appears likely.

**Keywords:** antenatal corticosteroids, Preterm neonates, Surfactant

## 1. Introduction

Prematurity is still a major problem for the health centers throughout the world. Preterm birth is a significant cause of perinatal morbidity and mortality. Nearly one half of all cases of congenital neurological disability, including cerebral palsy are a consequence of prematurity.

Respiratory distress syndrome (RDS), also known as hyaline membrane disease was the primary cause of morbidity and mortality in preterm newborns before 1980's. Respiratory distress syndrome (RDS) is a serious complication of preterm birth and the primary cause of early neonatal mortality and disability. RDS develops as a consequence of surfactant deficiency and immature lung development. Maturation of foetal lungs is dependent on surfactant, which is a complex molecule.

Liggins and Howie first introduced steroid therapy in 1972<sup>2</sup>. After the first consensus conference of National Institutes of Health (NIH) in 1994, it was proved that antenatal corticosteroids decrease the incidence of RDS in preterm infants<sup>3</sup>. They recommended giving a single course of corticosteroids to every pregnant woman between 24 and 34 weeks gestation who is at risk of preterm delivery within next seven days<sup>4</sup>. Dexamethasone and betamethasone are the corticosteroids recommended for antenatal therapy<sup>5,6</sup>.

Pulmonary surfactant, which is produced by type II pneumocytes, is composed of about 90% lipids mainly phospholipids and 5-10% surfactant proteins. The phospholipids have surface tension reducing properties, while the surfactant proteins are important in regulating surfactant function and metabolism, and may also have an immunomodulatory role. As antenatal corticosteroids accelerate maturation of type II pneumocytes,

enhancement of the pulmonary surfactant system is expected. Glucocorticoids increase mRNA of surfactant proteins. Recommended regimens include two doses of 12 mg of betamethasone given intramuscularly 24 hours apart or four doses of 6 mg of betamethasone given intramuscularly 12 hours apart<sup>7</sup>.

Since the introduction of steroid therapy in clinical practice, many randomized controlled studies have concluded the positive maturational effects of antenatal corticosteroids on foetal lungs, which decrease incidence and severity of hyaline membrane disease, reduce incidence of intra-ventricular haemorrhage, and overall reduce neonatal mortality<sup>8</sup>.

## 2. Aim and Objectives

- To study the effect of antenatal corticosteroids on preterm neonates
- Need for surfactant
- Need for ventilator

## 3. Materials and Methods

This is a prospective study conducted in the Department of OBG, KIMS Hospital and Research Center, Bangalore, Karnataka from September 2018 to August 2019. 200 patients with preterm labour were selected for the study (gestational age between 28 weeks to 36 weeks+6 days). 136 patients had received antenatal corticosteroids. 64 patients couldn't receive antenatal corticosteroids as the patients had presented in active labour. Comparisons were made between infants treated antenatally with antenatal corticosteroids hours and infants with no antenatal corticosteroid treatment. Surfactant was given to infants with radiological and clinical signs of RDS.

Volume 8 Issue 9, September 2019

[www.ijsr.net](http://www.ijsr.net)

Licensed Under Creative Commons Attribution CC BY

Group 1- did not receive antenatal corticosteroids

Group 2- received antenatal corticosteroids

#### 4. Results

Among our study group 38% were primigravida, 62% were multigravida.

41% delivered vaginally, 59% delivered by caesarean section

#### Age Distribution

Age	Group 1	Group 2	Percentage
< 20 years	4	0	2 %
20 – 25 years	26	54	40 %
26 – 30 years	26	60	43 %
>30 years	8	22	15 %
<b>Total</b>	<b>64</b>	<b>136</b>	<b>100 %</b>

#### Severity of Preterm

	Group 1	Group	Percentage
28 to 31+6 weeks	18	30	24 %
32 to 33+6 weeks	4	18	11 %
34 to 36+6 weeks	42	88	65 %
Total	<b>64</b>	<b>136</b>	<b>100 %</b>

#### Birth Weight

	Controls	Cases	Percentage
< 1000 grams	2	10	6 %
1000-1999 grams	20	34	37 %
2000-2999 grams	40	62	51 %
>/= 3000 grams	2	10	6 %
Total	<b>64</b>	<b>136</b>	<b>100 %</b>

#### Requirement of Surfactant & Ventilator among Group 1

	Group 1	Surfactant	Percentage	Ventilator	Percentage
28 to 31+6 weeks	18	16	88.9 %	18	100 %
32 to 33+6 weeks	4	4	100 %	4	100 %
34 to 36+6 weeks	42	6	14.3 %	24	57.1 %
Total	<b>64</b>	<b>26</b>	<b>40.6 %</b>	<b>46</b>	<b>71.9 %</b>

- Among 16 neonates who received surfactant between gestation age of (28-31+6 weeks): 8 received 2 doses of surfactant, 8 received 1 dose of surfactant
- Among 4 neonates who received surfactant between gestation age of 32-33+6 weeks: all 4 received 2 doses of surfactant.
- Among 6 neonates who received surfactant between gestation age of 34 to 36+6 weeks: 2 received 2 doses surfactant, 4 received 1 dose of surfactant
- Among 24 neonates who required ventilator between 34 to 36+6 weeks: 6 were on SIMV mode, other 18 were on CPAP mode
- All neonates of less than 34 weeks who required ventilator were on SIMV mode

#### Requirement of Surfactant & Ventilator among Group 2

	Cases	Surfactant	Percentage	Ventilator	Percentage
28 to 31+6 weeks	30(6)*	22	91.7%(P-0.76)	24	100 %
32 to 33+6 weeks	18	6	33%(P-0.01)	14	77.8%(P-0.3)
34 to 36+6 weeks	88	2	2.3%(P-0.008)	18	20.5% (P-0.0001)
Total	<b>136</b>	<b>30</b>	<b>22.1% (P-0.006)</b>	<b>56</b>	<b>41.2 % (P-0.0001)</b>

\*among 30 preterm neonates, 6 preterm neonates died within 2 hours of NICU admission

- Among 22 neonates who received surfactant between gestation age of (28-31+6): 12 received 2 doses of surfactant, 10 received 1 dose of surfactant
- Among 6 neonates who received surfactant between gestation age of 32-33+6 weeks: 4 received 2 doses of surfactant, 2 received 1 dose of surfactant
- Among 2 neonates who received surfactant between gestation age of 34 to 36+6 weeks: 2 received 2 doses surfactant.
- Among 24 neonates who required ventilator between 28 to 31+6 weeks: 2 were on SIMV mode, other 2 were on CPAP mode

- Among 14 neonates who required ventilator between 32 to 33+6 weeks: 10 were on SIMV mode, other 4 were on CPAP mode
- Among 18 neonates who required ventilator between 34 to 36+6 weeks: 2 were on SIMV mode, other 16 were on CPAP mode.

## 5. Discussion

With this study we intend to evaluate the efficacy of antenatal corticosteroids among preterm neonates by assessing the requirement of surfactant and ventilator. In clinical practice antenatal corticosteroids are used to reduce neonatal morbidity and mortality<sup>9</sup>.

The rate of surfactant requirement was reduced by 18% in group 2 (who received antenatal corticosteroids) (P-0.006). Requirement of surfactant was significantly reduced in neonates of mother treated with antenatal corticosteroids between 32 to 33+6 weeks and 34 to 36+6 weeks (P-0.01 and P-0.008 respectively). This data is consistent with the Cochrane review of randomized controlled trials of administration of antenatal corticosteroids found a decreased rate of respiratory distress syndrome in neonates born before 34 weeks gestation (relative risk 0.58, 0.47 to 0.72; five studies, 1177 infants)<sup>10</sup>. Antenatal corticosteroids were not shown to reduce surfactant requirement when analyzed for all neonates born between 28 to 31+6 weeks (P-0.76).

Our study analyzed data on whether neonates were ventilated, as a surrogate marker for severe respiratory distress syndrome, as neonates with less severe respiratory distress syndrome may be more likely to be managed with less invasive respiratory support<sup>11,12</sup>.

The rate of ventilator requirement was reduced by 30% in group 2 (P-0.0001). But there was no obvious benefit on preterm neonates who received antenatal corticosteroids less than 34 weeks on requirement of ventilator.

## 6. Conclusion

Evidence from this study supports the use of antenatal corticosteroids to accelerate fetal lung maturation in women at risk of preterm birth. Such steroid treatment has also been recommended by groups including WHO, the Royal College of Obstetricians and Gynaecologists, the Society of Obstetricians and Gynaecologists of Canada, the American Congress of Obstetrics and Gynaecology, and the American Academy of Paediatrics<sup>13</sup>.

Antenatal corticosteroid administration significantly reduces the requirement of surfactant and ventilator in preterm neonates. Every effort should be made to initiate antenatal corticosteroid therapy in women between 28 and 36 weeks+6 days as soon as preterm delivery appears likely.

## References

- [1] WHO: recommended definitions, terminology and format for statistical tables related to the perinatal period and use of a new certificate for cause of perinatal deaths. Modifications recommended by FIGO as amended. *Acta Obstet Gynecol Scand* 1976;56:247-53.
- [2] Bonanno C, Wapner RJ. Antenatal corticosteroid treatment: What's happened since Drs Liggins and Howie? *Am J Obstet Gynecol* 2009;200(4):448-57.
- [3] NIH Consensus development panel on the effects of corticosteroids for fetal maturation on perinatal outcomes. *JAMA* 1995; 273: 413-18.
- [4] Goldenberg RL, Culhane JF, Iams JD, Romero R. Epidemiology and causes of preterm birth. *Lancet* 2008;371(9606):75-84
- [5] Klinger G, Koren G. Controversies in antenatal corticosteroid treatment. *Can Fam Physician* 2000;46:1571-3.
- [6] Effect of corticosteroids for foetal maturation on perinatal outcomes. NIH Consensus Statement 1994;12(2):1-24
- [7] Kliegman, R., Stanton, B., St. Geme, J. W., Schor, N. F., & Behrman, R. E. (2016). *Nelson textbook of pediatrics* (Edition 20.). Philadelphia, PA: Elsevier.
- [8] Baud O, Foix-L'Heliès L, Kaminski M, Audibert F, Jarreau PH, Papiernik E et al. Antenatal glucocorticoid treatment and cystic periventricular leukomalacia in very premature infants. *N Engl J Med* 1999 Oct 14; 341(16): 1190-96.
- [9] BMC Pregnancy and Childbirth volume 19, Article number: 114 (2019)
- [10] Roberts D, Dalziel S. Antenatal corticosteroids for accelerating fetal lung maturation for women at risk of preterm birth. *Cochrane Database Syst Rev* 2006;356:CD004454.pmid:16856047.
- [11] Fischer HS, Bühner C. Avoiding endotracheal ventilation to prevent bronchopulmonary dysplasia: a meta-analysis. *Pediatrics* 2013;356:e1351-60.doi:10.1542/peds.2013-1880 pmid:24144716.
- [12] Finer NN, Carlo WA, Walsh MC, et al. SUPPORT Study Group of the Eunice Kennedy Shriver NICHD Neonatal Research Network. Early CPAP versus surfactant in extremely preterm infants. *N Engl J Med* 2010;356:1970-9.doi:10.1056/NEJMoa0911783 pmid:20472939.
- [13] International Journal of Gynecology & Obstetrics Volume 144, Issue 3 FIGO COMMITTEE REPORT the American Academy of Paediatrics