

## **Use of Antenatal steroids in pre-mature births at tertiary care centre of northern India: A Retrospective Study**

### **Abstract**

Respiratory distress, intraventricular haemorrhage, necrotizing enterocolitis, hypothermia are few of the neonatal threats associated with preterm delivery. Antenatal steroids are given to pregnancy women who are at risk of delivery before 37 weeks to prevent these complications in their babies. Dexamethasone and Betamethasone are the corticosteroids that have proven effective for fetal maturation. The average birth weight of extremely preterm, very preterm, moderate preterm and late preterm babies was 648.75 g, 1573 g, 1828.7 g and 2462.58 g respectively. This is a retrospective study where we have reported the administration of antenatal steroids in mother with impending preterm delivery and have discussed various factors associated with it including average NICU stay of the preterm babies, gender and average weight of the babies, outcome and gravidity of the mother.

**Key word: Neonatology, antenatal, Pregnancy, Newborns, pre-mature births**

### **Introduction**

According to WHO, an approximate estimation of pre-term babies born every year is about 15 million. This corresponds to greater than 1 in 10 babies. The complications associated with pre-term birth kills almost 1 million babies every year especially below the age of 5 years (1, 2). The most common complications leading to death includes resultant respiratory distress syndrome (RDS) and pulmonary immaturity (3). Back in 1972, a preventive approach was identified named as antenatal corticosteroids (ACS), administered to expecting mothers who had a risk of preterm delivery (4). Recently in 2021, in an aim to improve preterm birth outcomes, the Executive Guideline Steering Group (GSG) for the World Health Organization (WHO) maternal and perinatal health have recommended to update the then current recommendations on the use of antenatal corticosteroids as an intervention to improve preterm birth outcomes as published in the WHO recommendations on a priority (5). Stringent maternal care like obstetric care especially in caesarean cases (6) and critical care for the preterm new born is mandatorily required to reduce the burden of preterm deaths (7-9). Administration of ACS has its own importance in this care. A previous large study named as Antenatal Corticosteroids Trial, or ACT including six countries has reported adverse outcomes in maternal infection, stillbirth and neonatal mortality when the responsibility of ACS was given to primary care and community settings with lower level workers. This proves the importance of trained health workers who can efficiently assess the gestational

age, administer ACS with proper medication dose and frequency along with supportive care (10). In present situation, the administration of ACS is strictly based on WHO recommendation. The factors responsible for the efficacy and safety of ACS are proper diagnosis of preterm birth, correct assessment of gestational age and adequate care of mother and newborn. This paper focuses on the administration of ANC steroids to preterm delivered babies.

## Methods

This retrospective study includes the data of 113 babies that were born prematurely before 37 weeks of gestation during the period from January 2021 through December 2022. All antenatal patients who had preterm delivery, their babies were admitted in NICU of SSB Heart and Multispecialty Hospital, Faridabad, Haryana, India, and were enrolled in the study after informed consent and approved from ethics committee SSB hospital, Faridabad . Various data points of the mother and newborn including gestational age, number of ANC steroids given, birth weight and outcome were collected and analysed.

## Result

The total preterm births in two year among the expecting mothers who visited our centre was 113. These included 4 new-borns of extremely preterm births (< 28 weeks) including 1 triplet delivery, 5 new-borns of very preterm birth (28 to 31<sup>+6</sup> weeks), 27 new-borns of moderate preterm births (32w to 33<sup>+6</sup> weeks) which included 4 twin deliveries and 77 new-borns of late preterm births (34w to 36<sup>+6</sup> w) including 2 twin deliveries(Table 1).

Among the extremely preterm births, there were 2 male and 2 female babies. The number of males in very preterm birth, moderate preterm births and late preterm births were 2, 15 and 41 respectively. Similarly, there were 3, 12 and 36 female babies respectively in very preterm birth, moderate preterm births and late preterm birth groups. There seems to be no association of gender predisposition for preterm delivery.

The average birth weight of extremely preterm, very preterm, moderate preterm and late preterm babies was 648.75 g, 1573 g, 1828.7 g and 2462.58 g respectively. Likewise, the average NICU stay of the babies of above groups was 15.76, 10.8, 8.77 and 2.55 days respectively. These are expected results as birth weight increases with gestation as baby grows and hence less complications are expected at higher gestation (between 28-37weeks) leading to overall decrease in NICU stay with increased gestation.

All 4 extremely preterm babies, all 5 very preterm babies, 23 among 27 moderate preterm babies and 25 among 77 late preterm babies showed signs of respiratory distress (Table 2). 3, 1 and 4 extremely preterm, moderate and late preterm babies respectively received no steroid which was due to immediate delivery when they reached our centre. Whereas 1 extremely preterm baby, 1 very preterm baby, 14 moderate preterm babies and 32 late preterm babies received only 1 dose of steroid as they delivered before the time for second dose. Rest received 2 doses of steroids (Figure 1). In total 8 preterm babies born to mothers who were not given any steroid, 6 developed respiratory distress (Figure 2) and the average NICU stay for this group was 9.8 days which was much higher than those who received even one dose. 48 preterm babies were born to women who received single dose of steroid and 57 preterm babies were born to mothers who received complete dose of steroid (Figure 2) with an average NICU stay of 3.9 days and 5.1 days respectively (Table 3). Only 1 death was recorded which occurred in a late preterm birth due to various maternal complications. In extremely preterm birth, parents of all 4 babies left against medical advice (LAMA). Similar cases were recorded with 2 very preterm babies, 6 moderate and 6 late preterm babies. This occurred mainly due to high cost of NICU stay in very and extremely preterm babies, no insurance coverage of new-born, non-affording patients and lack of knowledge. All other babies were discharged in a stable condition. All mothers who gave birth to extremely premature babies were primigravida. 2, 14 and 28 primigravida mothers gave birth to very preterm, moderate preterm and late preterm babies respectively. All rest mothers were multigravida (Table 2).

### **Discussion and Conclusion**

In this retrospective study, we have studied the administration of steroid in pregnant women at high risk of preterm delivery i.e. before 37 weeks. Premature babies often face respiratory distress and various other complications which may lead to poor neurocognitive outcomes (10). Respiratory distress develops due to lack of fetal lung maturity which leads to abnormal lung functioning (11). The corticosteroids administered in these mothers promote surfactant production and thus helping in lung maturation of the fetus (12, 13). In the current study we observed 48 preterm births with single/incomplete steroid dose out of which 29 had respiratory distress. Moreover, 57 premature babies received double/complete dose of ANC steroid out of which 22 had respiratory distress. There seems to be no association of gender predisposition for preterm delivery. An important observation was that patients who had extremely and very preterm births tend to go LAMA due to high cost of NICU, as these

babies require more medications and longer stay. Unable to use the mediclaim policy for pregnancy and new-born was an important reason behind it. Also patients referred from peripheral centres did not receive any antenatal steroids at the centre before referral. Making sure high risk patients are referred timely to higher centres and receive atleast one dose of steroid administration could help avoid these complications((14, 15).

However, effectiveness of ACS in late preterm births is not established in our study and hence more research is required to establish the role of ACS in late preterm births.

#### Ethical Approval:

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

#### Consent

As per international standard, parental written consent has been collected and preserved by the author(s).

**Acknowledgement: we would like to thank SSB heart and multispecialty hospital, Faridabad for their support and co-operation to carry out the research work.**

#### References

1. Perin J, Mulick A, Yeung D, Villavicencio F, Lopez G, Strong KL, et al. Global, regional, and national causes of under-5 mortality in 2000-19: an updated systematic analysis with implications for the Sustainable Development Goals. *Lancet Child Adolesc Health*. 2022;6(2):106-15. doi:10.1016/S2352-4642(21)00311-4
2. UN Inter-agency Group for Child Mortality Estimation: Levels & Trends in Child Mortality. Report 2014. New York; 2014.
3. Vidyasagar D, Velaphi S, Bhat VB: Surfactant replacement therapy in developing countries. *Neonatology* 2011, 99:355-366.
4. Liggins GC, Howie RN: A controlled trial of antepartum glucocorticoid treatment for prevention of RDS in premature infants. *Pediatrics* 1972, 50:515-25.

5. World Health Organization. (2022). WHO recommendations on antenatal corticosteroids for improving preterm birth outcomes. In WHO recommendations on antenatal corticosteroids for improving preterm birth outcomes (pp. 40-40).
6. Sharma Gaurav, Mathai Matthews, Dickson Eva Kim, Weeks Andrew, Hofmeyr Justus G, Lavender Tina, Day Tina Louise, Mathews Elizabeth Jiji, Fawcus Sue, Simen-Kapeu Aline, de Bernis Luc: Quality care during labour and birth: a multi-country analysis of health system bottlenecks and potential solutions. *BMC Pregnancy Childbirth* 2015, 15(Suppl 2):S2
7. Enweronu-Laryea Christabel, Dickson EKim, Moxon GSarah, SimenKapeu Aline, Nyange Christabel, Niermeyer Susan, Bégin France, Sobel LHoward, Lee CCAnne, von Xylander Ritter Severin, Lawn EJoy: Basic newborn care and neonatal resuscitation: a multi-country analysis of health system bottlenecks and potential solutions. *BMC Pregnancy Childbirth* 2015, 15(Suppl 2):S4.
8. Vesel Linda, Bergh Anne-Marie, Kerber Kate, Valsangkar Bina, Mazia Goldy, Moxon GSarah, Blencowe Hannah, Darmstadt LGary, de Graft Johnson Joseph, Dickson EKim, Ruiz Peláez Gabriel Juan, von Xylander Ritter Severin, Lawn EJoy, On behalf of the KMC Research Acceleration Group: Kangaroo mother care: a multi-country analysis of health system bottlenecks and potential solutions. *BMC Pregnancy Childbirth* 2015, 15(Suppl 2):S5
9. Moxon GSarah, Lawn EJoy, Dickson EKim, Simen-Kapeu Aline, Gupta Gagan, Deorari Ashok, Singhal Nalini, New Karen, Kenner Carole, Bhutani Vinod, Kumar Rakesh, Molyneux Elizabeth, Blencowe Hannah: Inpatient care of small and sick newborns: a multi-country analysis of health system bottlenecks and potential solutions. *BMC Pregnancy Childbirth* 2015, 15(Suppl 2):S7
10. Jobe AH. Postnatal corticosteroids for bronchopulmonary dysplasia. *Clin Perinatol.* 2009;36:177–88.
11. Ryan RM, Ahmed Q, Lakshminrusimha S. Inflammatory mediators in the immunobiology of bronchopulmonary dysplasia. *Clin Rev allergy Immunol.* 2008;34:174–90.
12. Williams DM. Clinical pharmacology of corticosteroids. *Respiratory care.* 2018;63:655–70.
13. Htun, Z. T., Schulz, E. V., Desai, R. K., Marasch, J. L., McPherson, C. C., Mastrandrea, L. D., ... & Ryan, R. M. (2021). Postnatal steroid management in preterm infants with evolving bronchopulmonary dysplasia. *Journal of Perinatology*, 41(8), 1783-1796.

14. McElwee, E. R., Wilkinson, K., Crowe, R., Hardy, K. T., Newman, J. C., Chapman, A., ... & Finneran, M. M. (2022). Latency of late preterm steroid administration to delivery and risk of neonatal hypoglycemia. *American Journal of Obstetrics & Gynecology MFM*, 4(5), 100687.
15. Greenough A, Emery EF, Gamsu HR. Dexamethasone and hypertension in preterm infants. *Eur J Pediatr*. 1992;151(2):134-135. doi:10.1007/BF01958959

Table 1: Shows the details of Preterm new-borns delivered in our centre

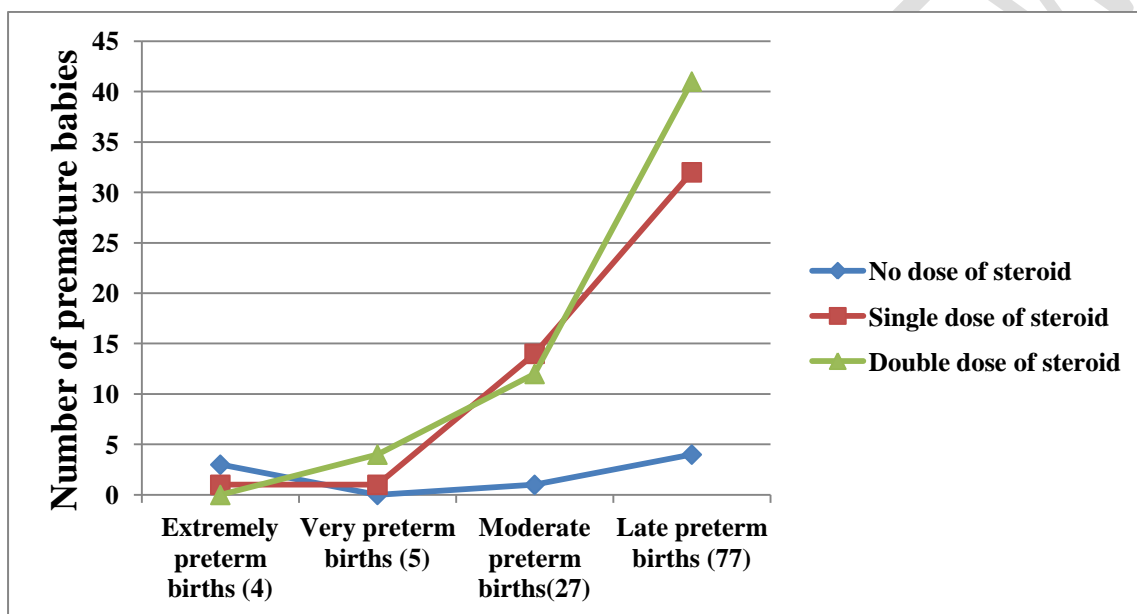
Extremely preterm new-borns (< 28 w)	4
Very preterm new-borns (28 to 31 <sup>+6</sup> w)	5
Moderate preterm new-borns (32w to 33 <sup>+6</sup> w)	27
Late preterm new-borns (34w to 36 <sup>+6</sup> w)	77
Total preterm new-borns in 2 years (2021,2022)	113

Table 2: Shows the details of outcomes of Preterm Birth

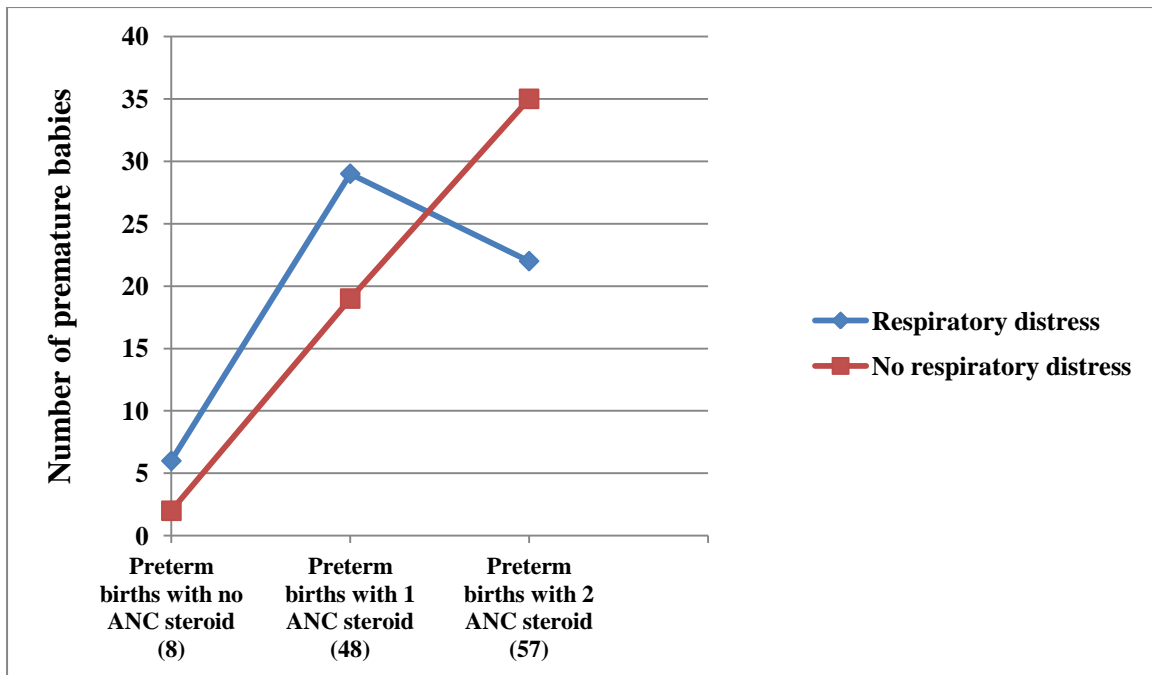
Preterm newborn	Gender		Gravidity		Respiratory distress		Avg Birth weight	Avg NICU stay	Outcome of the newborn		
	M	F	primigravida	multigravida	Yes	No			discharge	LAMA	expired
Extremely preterm (4)	2	2	4	0	4	0	648.75g	15.76 days	0	4	0
Very preterm (5)	2	3	2	3	5	0	1573 g	10.8 days	3	2	0
Moderate preterm (27)	15	12	14	13	23	4	1828.7g	8.77 days	21	6	0
Late preterm (77)	41	36	28	49	25	52	2462.58g	2.55 days	70	6	1
Total preterm (113)	60	53	48	65	57	56	2207.55g	9.47 days	94	18	1

Table 3: Shows the Use of ANC (STEROID) in preterm birth

Use of ANC Steroid	Avg stay in NICU	Outcome		
		Discharge	LAMA	Expired
preterm births with no ANC steroid (8)	9.88 days	4	4	0
preterm births with 1 ANC steroid (48)	3.91 days	38	9	1
preterm births with 2 ANC steroid (57)	5.13 days	52	5	0



**Figure 1:** X axis represents the groups of pre-term births. Y axis represents the number of premature babies receiving no/ single/ double dose of steroid.



**Figure 2:** X axis represents the groups of pre-term births. Y axis represents the number of premature babies based on the respiratory distress.