



STUDY OF EFFECT OF ANTENATAL STEROIDS ON MECHANICALLY VENTILATED LOW BIRTH WEIGHT NEONATES WITH RESPIRATORY DISTRESS ADMITTED TO NEONATAL INTENSIVE CARE UNIT(NICU)

Paediatrics

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ABSTRACT

Background: Low birth weight (LBW) is defined as a birth weight of less than 2.5kg as per World Health Organization (WHO)¹. Low birth weight (LBW) is a major public health problem in developing countries including India. In India, 30-35% of babies are LBW and more than half of them are full term babies². Reduction of low birth weight forms an important contribution to the Millennium Development Goal (MDG) for reducing child mortality³. Corticosteroids administration before anticipated preterm births is one of the most important antenatal therapies available to improve neonatal outcomes. Corticosteroids alter the structural and biochemical physiology of neonates, like surfactant production and lung maturation and thus reduces the requirement and duration of mechanical ventilation. **Aims And Objectives:** 1. To know the effect of antenatal steroids in minimizing the duration of ventilation in LBW neonates 2. To know the effect of antenatal steroids on assisting in early extubation of LBW neonates. **Inclusion Criteria:** All Low birth weight neonates <2.5 kg who were intubated and on ventilator support. **Exclusion Criteria:** 1. Major congenital anomalies 2. Extubated as a part of withdrawal of care. **Materials And Methods:** This study was a Prospective Observational Study and was conducted in Rajarajeswari Medical College and Hospital, Bangalore for a duration of 18 months between January 2021 and June 2022. **SAMPLE SIZE:** n=54, Sample size calculated using considering 95% confidence interval and 10% precision. **Results:** All the parameters i.e., birth weight, gestational age, gender, presence of maternal comorbidities, surfactant and antenatal steroids showed significant association with number of days of mechanical ventilation in the study. **Conclusion:** This study was conducted to study the effect of antenatal steroids on mechanical ventilation in low-birth-weight neonates admitted to neonatal intensive care unit and it was found that antenatal steroids had significant effect on duration of mechanical ventilation; this study has also recognized the factors involved in prolonging the days of mechanical ventilation such as prematurity, doses of antenatal steroids received, low birth weight, lower gestational age. Recognising such factors can help in preventing complications among the newborns thereby reducing the number of days of mechanical ventilation.

KEYWORDS

INTRODUCTION:

Low birth weight (LBW) is defined as a birth weight of less than 2.5kg as per World Health Organization (WHO)¹. Low birth weight (LBW) is a major public health problem in developing countries including India. In India, 30-35% of babies are LBW and more than half of them are full term babies². Reduction of low birth weight forms an important contribution to the Millennium Development Goal (MDG) for reducing child mortality³. Globally, neonatal mortality is 20 times more likely for LBW neonates when compared to normal weight neonates and it increases sharply as birth weight decreases⁴. Low birth weight leads to impaired growth of the infant resulting in higher mortality and increased morbidity and it is an important indicator of maternal and child health⁵. LBW neonates usually need extra hospital care where there is a constant concern and uncertainty over future health outcomes⁶. Recently, the field of neonatology and newborn care have advanced and as a result there is decrease in the mortality with respect to LBW neonates⁷. Mechanical ventilation is one of the life-saving intervention in these babies⁸. If ventilation gets prolonged, they can be associated with complications and sequelae like Bronchopulmonary Dysplasia (BPD), Subglottic stenosis, Retinopathy of Prematurity (ROP), bronchial hyper-reactivity, abnormal hearing and also atelectasis, barotrauma and volutrauma⁸⁻¹⁰.

Corticosteroids administration before anticipated preterm births is one of the most important antenatal therapies available to improve neonatal outcomes. Single course of corticosteroids is recommended for pregnant women between 24- 34 weeks of gestation who are at risk of preterm delivery within 7 days including for those with ruptured membranes and multiple gestation¹¹. Women who are at risk of preterm delivery within 7 days between 24-34 weeks of gestation are the candidates for the antenatal corticosteroids and not only decrease the incidence of RDS but also risk of IVH and neonatal mortality¹². Betamethasone is superior to Dexamethasone in preventing RDS and periventricular leucomalacia¹³. Recommended regimen Betamethasone 12mg IM 24 hours apart two doses and four doses dexamethasone 6mg IM 12 hours apart¹⁴. ACOG 2012 recommends a single rescue course of antenatal corticosteroids should be considered in women before 34 weeks whose prior course administered atleast 7 days previously¹⁵. Corticosteroids acts on target tissues on specific proteins receptors. They alter gene expression in those target organs thus resulting in alteration in protein synthesis and deposition¹⁶. This

leads to accelerated maturation of lungs, thereby reducing the severity and incidence of RDS^{17,18,19,20}.

Corticosteroids alter the structural and biochemical physiology of neonates, like surfactant production and lung maturation and thus reduces the requirement and duration of mechanical ventilation^{21,22,23}. It is also noted that in developed countries there is reduction in deaths from respiratory causes with use of corticosteroids²⁴. In addition, corticosteroids also provide stability to cardiovascular system and cause modification in renal functioning which are essential for survival of extremely preterm neonates²⁵.

Objectives Of The Study:

1. To know the effect of antenatal steroids in minimizing the duration of ventilation in LBW neonates
2. To know the effect of antenatal steroids on assisting in early extubation of LBW neonates.

MATERIALS AND METHODS:

This study was a Prospective Observational Study and was conducted in Rajarajeswari Medical College and Hospital, Bangalore for a duration of 18 months between January 2021 and June 2022.

SAMPLE SIZE:

n=54, Sample size calculated using considering 95% confidence interval and 10% precision.

Inclusion Criteria:

1. All Low birth weight neonates <2.5 kg who were intubated and on ventilator support.

Exclusion Criteria:

1. Major congenital anomalies
2. Extubated as a part of withdrawal of care

METHODS:

Low birth weight neonates who were intubated and who were on mechanical ventilator support were included and using case records demographic details like Birth weight(BW), Gestational age (GA), gender. Prenatal characteristics like antenatal steroids (number of doses), duration of Mechanical ventilation and extubation were

studied and their correlation with their antenatal corticosteroids was done in this study.

Statistical Analysis:

Descriptive statistics was used for statistical analysis. Fisher exact test was used to test significance of differences in proportion of two or more groups. The p value of <0.05 was considered as significant.

RESULTS:

Table 1: Distribution Of Subjects According To Birth Weight

BIRTH WEIGHT	NUMBER	PERCENTAGE
< 1 kg	13	14.3
1kg-1.49 kg	28	30.7
1.5 kg-2.49kg	50	55
Total	91	100

Among 91 Low birth weight neonates admitted to NICU with Respiratory distress, the birth weight of 13(14.3%) was <1 kg, for 28(30.7%) it was between 1-1.49kg and for 50(55%) it was 1.5-2.49 kg(TABLE 1).

Table 2: Distribution Of Mechanical Ventilation According To Birth Weight

BIRTH WEIGHT	MV
< 1000gm	13
1001-1499gm	23
1500-2499gm	18

Among 13 neonates with birth weight <1kg, all 13 cases needed mechanical ventilation, among 28 neonates with birth weight between 1-1.49kg, 23 needed mechanical ventilation and in neonates with birth weight between 1.5-2.49 kg, 18 were mechanically Ventilated (TABLE 2).

Table 3: Association Between Prenatal Steroids And Extubation

Prenatal steroids	Extubated successfully
0 dose	02
1 dose	10
2 doses	28

Among LBW neonates who received 1 dose of antenatal steroids, 10 cases were extubated successfully. Among those who received 2 doses of antenatal steroids, 28 cases were extubated only 2 cases extubated successfully among neonates who did not receive antenatal steroids.

Table 4: Comparing Various Complications With Duration Of Mechanical Ventilation

FACTORS		< 3 DAYS	4-7 DAYS	7-14 DAYS	>14 DAYS	P VALUE
BIRTH WEIGHT	< 1000 gm	0	7	3	3	0.00082660*
	1000-1499gm	15	6	2	0	
	1500-2499gm	13	4	1	0	
GESTATIONAL AGE	< 29+6 weeks	12	5	4	3	0.0058*
	30-37+6 weeks	16	10	2	0	
	>38 weeks	0	2	0	0	
GENDER	MALE	21	12	4	2	0.02015210*
	FEMALE	7	5	2	1	
ANTENATAL STEROIDS	YES	20	12	5	3	0.0007620*
	NO	8	5	1	0	
SURFACTANT	YES	10	3	0	3	0.00928*
	NO	18	14	6	0	

Among LBW neonates whose birthweight <1kg, 7 cases needed MV for 4-7 days, 3 cases for 7-14 days and 3 case for more than 14 days. Among those with birth weight between 1-1.49kg, 15 needed <3 days of mechanical ventilation, 6 cases for 4-7 days, 2 cases needed 7-14 days and none more than 7 days. Among 18 neonates with birth weight between 1.49-2.49 kg neonates, 13 needed for <3 days, 4 for 4-7 days and 1 case for 7-14 days of MV.

Among neonates with Gestational age < 29 weeks, 12 cases needed MV for <3 days, 5 for 4-7 days, 4 needed for 7-14 days and 3 needed

MV for more than 14 days. Out of 32 LBW neonates with Gestational age between 30-37 weeks, 16 neonates needed <3 days, 10 needed for 4-7 days and 2 cases needed 7-14 days of MV. Among neonates whose Gestational age was above 38 weeks, all the 2 needed MV for 4-7 days of MV. Among 40 LBW neonates who received Antenatal steroids, majority around 20 cases had MV for only <3 days, 12 cases needed 4-7 days, 5 cases for 7-14 days and 3 beyond 14 days of MV. Requirement of surfactant among LBW neonates admitted to NICU was found in 16, out of which 10 had < 3 days of Mechanical ventilation, 3 cases for 4-7 days and 3 cases for more than 14 days of MV.

All the parameters i.e., birth weight, gestational age, gender, presence of maternal comorbidities, surfactant and antenatal steroids showed significant association with number of days of mechanical ventilation in the study (TABLE 4)

DISCUSSION:

This study was conducted to study the effect of antenatal steroids on mechanical ventilation in low-birth-weight neonates admitted to neonatal intensive care unit. Corticosteroids work by maturing the baby's lungs before birth. There are different types of corticosteroid and they can be given in different ways and in different doses.^{26,27} There are only few studies in the literature which have shown the effect of antenatal steroids on the fetal outcome specifically their effect on mechanical ventilation. In this study, it was observed that birth weight, gestational age, gender, presence of maternal comorbidities, surfactant and antenatal steroids showed significant association with number of days of mechanical ventilation. Among LBW neonates who received 1 dose of antenatal steroids, 10 cases were extubated successfully. Among those who received 2 doses of antenatal steroids, 28 cases were extubated only 2 cases extubated successfully among neonates who did not receive antenatal steroids.

In a study conducted by Brazilain network research²⁸, after multiple logistic regression, the use of antenatal corticosteroid independently improved birth conditions and decreased ventilation time. In a meta-analysis by Deshmukh et al.²⁹ need for any respiratory support was significantly less in the ANC vs. control group neonates [ANC: 11% vs. Control: 16%] which supports the findings of the present study. Gabr et al.³⁰ reported that antenatal steroids have effective role in decreasing incidence and severity of RDS. But the findings of this study were contrary to a study by Madhu et al.³¹ in which no significant difference was noted in number of days of ventilation with respect to factors like birth weight, gestational age, gender, presence of maternal comorbidities, surfactant and antenatal steroids and number of doses of antenatal steroids were not significantly associated with successful extubation.

CONCLUSION:

This study was conducted to study the effect of antenatal steroids on mechanical ventilation in low-birth-weight neonates admitted to neonatal intensive care unit and it was found that antenatal steroids had significant effect on duration of mechanical ventilation; this study has also recognized the factors involved in prolonging the days of mechanical ventilation such as prematurity, doses of antenatal steroids received, low birth weight, lower gestational age. Recognising such factors can help in preventing complications among the new-borns thereby reducing the number of days of mechanical ventilation.

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