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Original Research Article

Antenatal injection betamethasone- A fetal lung warrior

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ABSTRACT

Background: One of the most frequent causes of neonatal mortality or NICU admission of neonates especially in premature infants is Neonatal Respiratory Distress Syndrome (NRDS). Antenatal steroids are the most important and widely utilized interventions for improvement of neonatal outcomes like reducing incidence of respiratory distress syndrome (RDS), reducing neonatal NICU (neonatal intensive care unit) admission rates and also improve outcomes of pre-term infants. Antenatal steroids (ANS) like betamethasone 12 mg are given at 24 hourly IM at 28-34 weeks of gestation to mother. For administration of corticosteroids at less than 24 weeks of gestational age decision should be made at a senior level by taking all clinical aspects into consideration.

Objective: To observe the effect of Betamethasone administration IM in pregnant women at risk of pre-term delivery and fetal outcomes in terms of development of Respiratory Distress Syndrome (RDS) and Neonatal Intensive Care Unit (NICU) admission rate by giving it between 28 to 34 weeks of gestation.

Introduction: Antenatal corticosteroids (betamethasone) play an important role for prevention of respiratory distress syndrome and reducing NICU admission rate of new borns and also reduce neonatal mortality and morbidity but benefits related to the time between administration of corticosteroid and delivery needed to be explored. Benefits of the injection betamethasone administration IM 12 mg between 24 hours and seven days on pre-term delivery has been established. [1,2]

Methods: This was prospective study conducted in private setup from November 2020 to March 2021 in Scientific Research Institute, Surendranagar, Gujarat, India. Study comprised of 100 women with single tone pregnancies (28 – 36 weeks gestational age) in age group of 19 – 33 years not in labour, but at risk for pre-term delivery based on fetal or maternal indications. These pregnant women were treated with two doses of 12 mg Betamethasone Intramuscularly apart of 24 hourly for maturation of fetal lungs.

Conclusion: Antenatal corticosteroids like betamethasone have a significant benefit on neonatal outcome even if used after 34 weeks of pregnancy. This was given prophylactically to those who are known to have increased risk of pre-term labour. Antenatal steroid like betamethasone 12 mg IM is also of benefit to reduce neonatal respiratory distress syndrome (NRDS) and NICU admission rates by giving it at 28-34 weeks of gestational age.

1. Introduction

Antenatal corticosteroids (ANS) are recommended in pregnant women between 24-34 weeks of gestation deemed at risk for preterm delivery for reducing the incidence rates of RDS in neonates. [3,4]

Betamethasone enhances lung surfactant production and increasing lung maturity in newborns. [5–7] Betamethasone is commonly administered as a combined preparation of betamethasone phosphate and betamethasone acetate, 2 injections are given of 12 mg (2*12 mg) intramuscularly spaced by 24 hourly. [8]

A significant decrease in the rate of the respiratory distress syndrome (RDS) by 50% after administration of

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corticosteroids to mothers was shown first by Leggins and Haowie.[5,9]

Prophylactic corticosteroid (betamethasone) in single tone pregnancies accelerates the fetal lung maturity, thereby reducing respiratory complications.[10] Maternal administration of betamethasone is used for acceleration of the maturity of fetal lungs, reducing neonatal mortality, respiratory distress syndrome, intraventricular haemorrhage and necrotizing enterocolitis in pre-term infant and thereby reducing NICU admission rates of neonate.[11] In comparision of vaginal delivery, babies born at or after 37 weeks (at term) by planned or elective caesarean section and before onset of labour are more likely to develop respiratory complications. Betamethasone injections given to mother have been shown to reduce the risk of new born babies having breathing difficulties in babies born before 34 weeks.[12] They concluded that antenatal corticosteroid (betamethasone) and delaying delivery till 39 weeks, both reduce the rate of admissions to special care baby units with respiratory distress after elective caesarean section at term or prophylactic steroid administration to those who are at increased risk of pre-term labour.[13]

In severely growth- restricted fetuses the benefits of betamethasone treatment have been questioned.[14] With betamethasone administration, some side effects like reduction in fetal body movements, fetal breathing movements and heart rate variation have been reported.[15,16] These changes are returned to normal values within 4 days following betamethasone treatment and these changes are transient. After repeated courses of steroids there might be increased risk of fetal growth restriction observed.[17]

The significant number of the women delivers outside of the putative one to seven days therapeutic window after betamethasone or antenatal corticosteroid treatment, and this delay may be associated with an increased risk of maternal and neonatal adverse outcomes.[18]

2. Materials and Methods

This is a prospective study of pregnant women from November 2020 to March 2021. Pregnant women in age group of 19- 33 years visiting obstetrics and gynaecology Department of scientific research institute, Surendranagar, Gujarat, India. In this study 28-36 weeks of pregnant women are included. They were administered injection of 12 mg Betamethasone 24 hourly or a single dose of 24 mg IM as per obstetrician's decision. Mothers with diabetes mellitus, other maternal medical illness (e.g. serious systemic infections, renal disease, trauma, SLE etc.,), those on prolonged steroid therapy were excluded.

Baseline demographic data of pregnant women included in this study like age of mothers, gestational age at time of presentation, gravid status, betamethasone administration, etc, were recorded from patient's case file. Then up till delivery, they were followed.

New born babies of the enrolled mothers were observed for respiratory distress, diagnosis, need of ventilation, oxygen therapy, NICU admission and outcome at the time of discharge, etc. all things are noted.

2.1. Inclusion criteria

All pregnant women.

2.2. Exclusion criteria

1. Fetal distress
2. Emergency lscs
3. Pre-term labour
4. Mothers with diabetes mellitus
5. Other maternal medical illness
6. Other maternal medical illness
7. Mothers on prolonged steroid therapy

3. Results

Table 1: Demographic details of antenatal women

	Characteristics	Group (n=100)
1	Maternal age, years	19-33 years
2	Gestational Age in weeks	28 – 36 weeks
3	Gravid status (enrolled patients)	
	Primi	66(66%)
	Multi	34(34%)
4	Pre- eclampsia	10 (10%)

Table 1 shows the demographic variables of the study group with regards to maternal age and parity. Among 100 pregnant women of age between 19-33 years, 66 women are primi and 34 are multiparae. In this study group involved pregnant women are of 28-36 weeks of gestational age. Among 100 pregnant women, 10 women are associated with pre-eclampsia.

Table 2: Primary outcome variables

Mode of delivery	
Vaginal delivery	58 (40+18)
Lscs	42
Instrumental delivery (vaccum/ outlet forceps)	18

Table 2 shows comparison of primary outcomes, among 100 antenatal women spontaneous vaginal delivery is 58% among which instrumental vaginal delivery is 18% and caesarean section 42%.

Table 3 shows the diagnosis in babies born within (18 women) and after (82 women) 24 hours of betamethasone administration, among which total 16 NICU admission done. Among 16 NICU admissions, total 13 babies are affected with respiratory distress syndrome (RDS).

Table 3: Diagnosis in babies born within (n=18) and after (n=82) 24 hours of betamethasone administration

Diagnosis	<24 hours N(%)	>24 hours N(%)
Normal	08	76
RDS	08	05
NICU admission	10	06

Table 4: Neonatal characteristics

Female gender	54 (54%)
Male gender	46 (46%)
Birth weight (gm)	1100 to 3900 gm

Table 4 shows characteristics neonates, among 100 babies, 54 were female and 46 were male. Birth weight of those ranges from 1100-3900 grams.

NICU admission: 16 (16%)

Need for ventilation: 1 (1%)

Need for oxygen therapy: 9 (9%)

Table 5: Neonatal outcome

Indications for NICU admission	
Delayed cry	3
Fetal ss	13
Total	16

Table 5 shows neonatal outcome. Total 16 NICU admissions are done, among which 9 babies needed oxygen therapy and only 1 baby (1%) need ventilation. Various causes are also depicted for NICU admission like delayed cry, respiratory distress.

Table 6: Correlation of neonatal respiratory outcomes with maternal diagnosis.

Neonatal diagnosis(n)	Injection-delivery interval(n)	Maternal diagnosis
RDS	<24 hours (8)	Oligohydroamnios
		Idiopathic pre-term pain followed by PIH
		Anaemia
		Premature rupture of membranes
		Idiopathic
	>24 hours (5)	Meconium stained liquor
		Delayed progression of labour
		Birth asphyxia
		Idiopathic

Table 6 shows the correlation of neonatal respiratory outcomes with the maternal diagnosis in which causes according to injection – time delivery intervals are mentioned.

4. Discussion

In our private hospital, Scientific Research Institute, Surendranagar, Gujarat we did the study of 100 pregnant women by giving Betamethasone injection IM 24 hourly at 28-34 weeks of gestation of 19-33 age range to see the maternal and neonatal outcome after giving the injection.

Mean weeks of gestation in our study is 33.4. This is corresponding with the range of gestational age in weeks when Betamethasone corticosteroid administration is recommended to mothers in order to impart the maximum benefits to the neonates born.[6,17] Most common recorded diagnosis in our study was oligohydroamnios, idiopathic pre-term pain followed by PIH, anaemia, premature ruptures of membranes. In our study 18 patients delivered within 24 hours of drug administration. Majority of the neonates (8 out of 13) diagnosed with RDS were born in less than 24 hours. However, due to small number of subjects significance of this finding cannot be established.

According to Roberts D and Dalziel SR report, incidence of RDS was significantly reduced in babies born before 48 hours and between one and seven days of treatment of mothers with corticosteroid, but not in those born before 24 hours in corticosteroid treated mothers.[6]

In spite of this, we have tried in 18 antenatal women came to hospital with complain of labour pain in which injection-delivery time interval was less than 24 hours, result shows that 10 neonates which did not need any NICU admission (Antenatal injection betamethasone- a fetal lung warrior).

A study by Haowei G et al., preterm respiratory failure in advance can be predicted by the Silverman Anderson Score, as it will due to advance prediction of pre-term respiratory failure further aid clinicians in rapid assessment of severity and extent of the respiratory failure in such preterm babies.[9]

5. Conclusion

In our study we administered betamethasone corticosteroid in 100 antenatal women of age ranges between 19-33 years of age of gestation age ranges between 28-36 weeks. Our study showed that there was improvement in neonatal outcome and reduced incidence of neonatal respiratory distress syndrome (NRDS) and NICU admission rates in new-born babies. Betamethasone increases surfactant production and increases fetal lung maturity and thereby reducing RDS incidence.

6. Source of Funding

None.

7. Conflict of Interest

None.

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