Research Paper Medical Science

Role Of Betamethasone to Prevent Respiratory Distress Syndrome in the New Born-A Retrospective Study

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Introduction

Respiratory problems are the commonest cause of neonatal illness and death, and account for a major proportion of admission to the nurseries. Respiratory distress syndrome (RDS) or hyaline membrane disease almost always occurs in preterm babies and is the commonest cause of respiratory distress in this population.

The overall incidence of RDS is 10-15%, but can be as high as 80% in neonates those are <28 weeks. At 29-30 weeks of gestation, the incidence of RDS in vaginal births is 64%, which decreases as age increases in 2-weekly increments to 35%, 20%, 5% down to 0.8% at 37 weeks or more. In addition to prematurity, asphyxia, acidosis, maternal diabetes and cesarean section can increase the risk of RDS.

The state of maturation of the fetal lung is the major determinant of whether the preterm infant will survive or succumb to RDS Fetal lung development involves growth, maturation of lung structure and lung function. The regulation of lung development is under multi-hormonal control and is influenced by glucocorticoids, insulin, androgens, estrogens, catecholamines, epidermal growth factor, transforming growth factor, prolactin, thyroid hormones and other factors'. In RDS, the basic abnormality is surfactant deficiency due to immaturity of lung structure.

The role of prophylactic corticosteroid administration in antenatal women for prevention of RDS has been studied for several years now. Antenatal steroids influence the synthesis of fetal proteins and peptides. In general, glucocorticoids act to enhance cell differentiation and maturation rather than cell growth. In the fetal lung, steroids induce several changes that favorably affect neonatal pulmonary performance. Production of surfactant is enhanced by the effect of glucocorticoids on enzymes important in the synthesis of phosphatidylcholine, a major component of surfactant; neonatal lung compliance is increased; production of proteins that enhance surfactant activity is increased; and alveolar protein leakage is decreased. Steroids also affect other organ systems, inducing maturation in the fetal brain, skin, and gastrointestinal tract'.

Aim

The aim of the study is to retrospectively determine the incidence of severe RDS (requiring ventilatory support) and mortality in infants born between 27 and 40 weeks gestation among high risk antenatal population following prophylactic antenatal corticosteroid therapy.

A retrospective study was done on 1,775 babies born between 27 and 40 weeks gestational age, among 1,580 antenatal women at Dept.of Obs & Gynec,B.J.Medical College & Civil Hospita,Ahmedabad,Gujarat between January 2011 and December 2013. Antenatal risk factors such as diabetes mellitus, essential and pregnancy induced hypertension, as well as previous bad obstetric history (BOH) (fetal losses) was noted. All these women received antenatal steroids in the form of betamethasone 12 mg administered intramuscularly, once weekly covering the period of gestation from 28 to 36 weeks.

The only population that received steroids earlier commencing from 26 weeks were those with previous history of preterm labor/fetal loss due to RDS, prophylactic cervical cerclage owing to risk of cervical incompetence and multiple gestation. The incidence of RDS among different groups such as gestational age, birth weight, gender survival, maternal age, medical disorders complicating pregnancy and previous BOH has been studied with illustration in the form of tables. We studied the incidence of RDS in infants, including those that required assisted ventilation. The number of infants who succumbed to RDS despite ventilation and supportive therapy were also noted.

Table:1 Distribution of Babies according to Gestational Age

Gestational Age(Weeks)	No. of Babies	RDS
27-28	18	14 (77.77%)
28-30	35	30(85.71%)
30-32	68	57(83.82%)
32-34	172	82(47.67%)
34-36	1015	98(9.65%)
36-38	341	16(4.69%)
38-40	126	

Results & Discussions

As illustrated above, the incidence of RDS according to gestational age, birth weight, gender, maternal risk factors and the use of ventilatory support have been noted in this study. It can be seen that the maximum incidence of RDS occurred between gestational ages of 27-34 weeks (Table 1) suggesting that this period of fetal growth requires additional therapy to augment lung maturity in the event of emergency delivery.

Table 2:Birth Weight, gender & Incidence of RDS			
		Gender	Incidence of RDS
Birth Weight	No.of Babies	Male Female	Male Female
<1 Kg	31	11 20	1(9.09%) 7(35%)
1-2 Kg	404	184 220	77(41.8%) 75(34%)
2-3 kg	1162	586 576	72(12.2%) 53(9.2%)
>3 Kg	178	104 74	8(7.6%) 4(5.4%)
Total	1775	885 890	158(8.9%) 139(7.8%)

According to the birth weight (Table 2), the highest incidence of RDS occurred in babies weighing <1 kg to 1-2 kg, the contributing factors being, prematurity, maternal or fetal condition necessitating delivery and also to a certain extent, the insufficient coverage with steroid therapy.

Multiple gestation is also one of the major contributing factors to RDS because of the higher incidence of preterm labors and hence a shorter course of steroid therapy. As shown in (Table 3) the incidence of RDS is higher in twins (47.08%) and triplets (33.3%) when compared to singleton (8.35%).

Table 3:Multiple Gestation and RDS		
Gestation	Babies Delivered	RDS
Singleton	1388	116(8.35%)
Twins	378(189 Sets)	178(89 Sets) (47.08%)
Triplets	9(3 sets)	3(1 Set) 33.3 %

About 42% (663 of 1,580) of the antenatal population had medical disorders and BOH complicating their pregnancy. Among these, babies born to mothers with diabetes mellitus had the highest incidence of RDS. This is due to the fact that diabetes increases the risk of RDS, even in near term babies due to the inhibitory effect of insulin on surfactant synthesis and lung maturation. Among the remaining 58% (917 of 1,580) who had no risk C.11 factors, the incidence of RDS was 17.12% (157 of 917) (Table 5). In this group however there were no mortalities due to RDS.

Relating to gender and severity of RDS, we had 32 babies that required ventilatory support. Of these 81.25% (26 of 32) survived. There was an 18.75% (6 of 32) mortality rate with 5 of the deceased babies falling between the crucial gestational ages of 27-34 weeks. Generally male neonates have a greater incidence and severity of RDS when compared to female neonates. This is attributed to the inhibitory effect of androgens on lung maturity and surfactant synthesis.

Table 4 :Distribution of maternal risk factors according to gestational weeks & RDS		
Maternal Risk Factors	Babies delivered	RDS
BOH	112	17(15.7%)
Diabetes Mellitus	302	46(15.23%)
Hypertension	95	33(34.7%)
Combined (>2 risk factors)	154	44(28.5%)
No maternal risk factors	917	157(17.12%)

However in our study the gender related susceptibility was not statistically significant. Similarly elective LSCS prior to onset of labor is also associated with risk of RDS. Many of the women in our study especially in the high risk group were delivered by LSCS due to various indications including increasing severity of diabetes and hypertension despite therapy and fetal distress owing to growth restriction or maternal events such as preterm labor and preterm premature rupture of membranes itself. However cases of chorioamnionitis were excluded from this study.

In our Indian scenario there is a risk of at least 36% of RDS infants requiring ventilatory support. The National Neonatal Perinatal Database (NNPD) estimates at least 1.9% of all live births are complicated by RDS and 14.3% of mortality among these. About 50% of babies born between 28-32 weeks suffer from RDS. Although other factors such as good quality of neonatal intensive care, affordability of surfactant and low rates of nosocomial sepsis would have contributed to lower incidence of mortality in this study, the most significant factor appears to be the prophylactic steroid therapy. In our study there is also a higher incidence of preterm deliveries owing to the already mentioned risk factors. Despite this, there is comparatively a lower incidence of babies with RDS that required assisted ventilation and supportive surfactant therapy, about 1 .8% with a mortality of 0.33%. This can be attributed to the timely intervention with antenatal corticosteroids covering the crucial weeks in pregnancy.

In the early 1970s, Liggins and Howie, studied' the effects of steroids on preterm labor in lambs and simultaneously noticed the lack of RDS and increased survival in preterm animals exposed to antenatal steroids. Subsequently, multiple controlled trials have demonstrated their unequivocal benefit. Antenatal steroids not only decrease the incidence and severity of RDS, but also the overall neonatal mortality, intraventricular hemorrhage (IVH) and necrotizing enterocolitis (NEC). Long-term follow-up of children exposed to one course of antenatal steroids have not shown any adverse effects. It was only after 1994, when the National Institute of Health (NIH) published the consensus report on steroids, did its use become widespread. Though a cheap and very effective intervention, its potential is grossly under utilized even today. Initial reports comparing the effects of single course of antenatal steroids and placebo showed loss of apparent beneficial effects beyond 7 days from the first dose of steroid. Therefore it became common practice to prescribe multiple courses of steroids on a weekly or rescue basis. Since concerns have risen regarding the effect of repeated courses of steroids on mothers such as propensity to develop gestational diabetes or PIH and long-term developmental outcome of children, the NIH at present has concluded that there is not enough data regarding benefits of repeated steroid therapy'. However, there has been no data to document the benefit of repeated courses of antenatal steroids. Our data and experience can be considered as the first of its kind to study the benefit of antenatal steroid therapy.

Conclusion

Antenatal steroids will significantly improve the outcome of preterm infants, especially when resources are limited to manage sick preterm infants requiring intensive care. In the given dosage, the therapy as such did not evoke any complications in both mother and neonate and can be considered for routine administration in high risk groups.

Implementation of antenatal steroids, availability of a good NICU set up with facilities for mechanical ventilation and exogenous surfactant are the main factors which will certainly improve outcome in the management of RDS.

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