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

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.

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 1: Distribution of Babies according to Gestational Age

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

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.

Regarding 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.

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 that 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 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).

Accordingly, steroids have been used widely for obstetric 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.

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**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.