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# THE PHARMACOTHERAPY OF NEONATAL RESPIRATORY DISTRESS SYNDROME (NRDS): A REVIEW

**Raafia Yousuf and Atta Abbas***

Department of Pharmacy, Health and Well Being, University of Sunderland, England, United Kingdom.

**ABSTRACT**

Respiratory distress syndrome RDS is a serious condition where the lungs cannot provide sufficient oxygen. Neonatal RDS affects newborn babies who are born before their lungs are fully developed, a serious medical condition where a newborn baby's lungs cannot provide their body with enough oxygen.Pulmonary immaturity such as incomplete structural and functionally developed lung, high compliance of chest wall and deficiency of lung surfactant are common pathophysiological reasons of NRDS. The prevalence of NRDS in Pakistan is similar to the Western countries i.e. 1% but in India it raises to almost 12%. The pharmacotherapy of NRDS is mainly focused towards the goal of preventing oxygen deprivation and lung collapse. A number of clinical guidelines suggest different types of treatment approaches. A review of different approaches to treat the disease is the objective of the article.

**Key words:** RDS, Neonatal Respiratory Distress Syndrome NRDS, Pharmacotherapy.

## INTRODUCTION

Respiratory distress syndrome RDS is a serious condition where the lungs cannot provide sufficient oxygen. It is a breathing disorder which affects the newborns and rarely full term infants, the disease is more common in neonates born before their due date or proposed date of birth and are also called as preterms [1]. Respiratory distress syndrome is further classified into a variety of sub types but here the discussion will focus on the RDS that affects the neonates i.e. neonatal respiratory distress syndrome NRDS. It affects newborn babies who are born before their lungs are fully developed, a serious medical condition where a newborn baby's lungs cannot provide their body with enough oxygen, also known as Hyaline Membrane disease[2].The disease is more prevalent in those neonates who are born 6 weeks or earlier before their proposed date of birth. As a result of premature birth, the lung function in such individuals is not fully developed [1].

Pulmonary immaturity such as incomplete structural and functionally developed lung, high compliance of chest wall and deficiency of lung surfactant are common pathophysiological reasons of development of NRDS [3]. In normal circumstances, babies begin to produce surfactant by the week 24 or 28 during pregnancy and by week 34, enough surfactant is produced by them to breathe freely [2].

In England, it was observed that babies who were born before 28 weeks of pregnancy half of them have chances to develop NRDS [2]. In US, evidence records 50% neonates born between 26 – 28 weeks of gestation develop RDS. Furthermore, 30% of premature neonates born between 30-31 weeks of gestation develop RDS [4]. In case of South Asia, the prevalence of NRDS in Pakistan is similar to the Western countries however, morbidity and mortality in preterm infants is very high, it was observed in Pakistan that the disorder may be less common than the overall 1% incidence reported from developed countries. In a prospective study of the prevalence of RDS in 10,134 births at a tertiary care hospital, Bhutta ZA and Yousuf K documented the disorder in 127 (1.2% births), with a prevalence of 12.8% among low birth weight infants. The overall mortality for this group was 39%, with the highest

Corresponding Author:-**Atta Abbas** Email: bg33bd@student.sunderland.ac.uk

mortality rate (68%) among newborn infants < or = 1kg birth weight. The study concluded that RDS is a significant cause of morbidity and mortality in preterm infants with a similar prevalence rate to western countries figures [5]. The story of India wears a different look as the incidence of NRDS was topping up to 12% among preterms[6].

The prematurity of pulmonary functions, although a major risk factor [1-2]. is not only the sole reason behind the disease, it can also develop due to genetic predisposition and/or when mother is diabetic, delivery is cesarean, multiple pregnancies and rapid labor. The risk of NRDS might decrease if mother has chronic pregnancy induced blood pressure this situation stresses the infant's lungs to develop sooner [7].

NRDS symptoms appeared rapidly after birth. Symptoms include bluish colored skin and mucus membranes, apnea, decreasing in urine output, grunting, nasal flaring, rapid or shallow breathing [7]. The diagnostic criteria for RDS include several tests which confirm and give a clear picture of infant's breathing problems. The tests include chest x-ray which provides a radiographic picture of lungs and heart and demonstrate any sign of NRDS. Blood tests are more likely important to know that infant have sufficient amount of oxygen present in blood. Or might be some infection in blood causes breathing problems. Echocardiography is also used to go through the heart movement by using sound waves to construct a moving heart and figure out any complications of heart causing any breathing problem [1].
The pharmacotherapy of NRDS is mainly focused towards the goal of preventing oxygen deprivation and lung collapse. The Clinical Guideline of State of Queensland, Australia points out the prime focus to ensure adequate oxygen saturation and monitoring of breathing rate and heart rate. The second goal is to treat the cause which in this case is usually the deficiency of lung surfactant [8]. As NRDS is more common in premature infants, therefore treatment starts as soon as the baby is born. However surfactant replacement therapy decreased the mortality rate up to 50%. In surfactant therapy is done early in neonates, it decreases the pulmonary air leakage and 28 day mortality as compared with selective surfactant therapy. Neonates should receive assisted ventilation with $FIO_2$ of more than 0.40 should receive intratracheal surfactant within 2 hours after birth. However surfactant is a prophylactic treatment but if surfactant is present is sufficient form nasal bubble continuous positive air way pressure (CPAP) mainly used to treat RDS. The doses of clinically available surfactant preparations are 50-200mg/kg. Rapid bolus administration of surfactant after adequate lung recruitment with 3-4cm of positive end-expiratory pressure (PEEP) and adequate positive pressure may improve its homogeneous distribution. An ideal surfactant was not identified but a new surfactant which shows better performance as compare to Beractant is Lucinatant (Surfaxin®), a KL4 polypeptide exogenous surfactant was approved by US FDA in March 2012 [9][4].

Moreover, it was reported in India that the survival of those babies who were given SRT improved with increasing gestational maturity and birth weight [6]. According to European consensus guidelines on the management of neonatal respiratory distress syndrome they reported this after a critical examination on most up to date evidence of 2007. Antenatal steroids use is strongly recommended but if its courses are repeated they are not safe. As far as surfactant replacement therapy SRT is concerned, optimum dose and timing of administration in different gestations are not clear. Mechanical ventilation can provide support but leads to lung injury [10]. Additional supportive treatment includes antibiotic treatment and nutritional support. The following table demonstrates the treatment strategies at a glance.

**Table 1. Treatment Strategies for NRDS**

| S.No | Treatment Strategy/Goal | Action |
|---|---|---|
| 1 | Ensure $O_2$ support | Oxygenation Therapy |
| 2 | Prevent lung collapse | Surfactant therapy SRT |
| 3 | Continuous Positive Airway Pressure CPAP | |
| 4 | Supportive treatment | Antibiotic Therapy |
| | | Nutritional Support TPN |

## CONCLUSION

For neonates with RDS, the best plan is that they have proper oxygenation and maintenance of lung functions and supportive care including monitoring their body temperature, fluid management, circulatory support and nutritional support to have the best outcomes of all the therapies stated above.

## CONFLICT OF INTEREST

The authors declare no conflict of interest exists.

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