Original Research Article

A Comparative Study of Non Surfactant Therapy Versus Surfactant theraphy among Preterm with Respiratory Distress Syndrome : A Prospective Study

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Abstract

Background: Premature birth affects 10–12 percent of newly born newborns in our country, compared to 5–7% in Western countries. The WHO classifies a live-born newborn as "premature" if it is delivered before 37 weeks from the first day of the last menstrual cycle. Prematurity, intrauterine growth retardation, or both can cause low birth weight (LBW, birth weight of 2500 g or below). Around 57 percent of deaths in children under the age of five occur during the neonatal period, with preterm accounting for 36 percent of these cases. The presence of one or more indicators of increased labour of breathing, such as tachypnea, nasal flaring, or grunting, is a clinical condition known as respiratory distress.**Objective:** The study's goal was to see how surfactant therapy worked in preterm babies with respiratory distress syndrome (RDS). **Materials and Procedures**: Over the course of three years, a prospective comparative study was undertaken in a tertiary care hospital's newborn intensive care unit. After comparing general features, parents of the newborns who gave their approval for surfactant (who could afford it) were assigned to the surfactant group, while those who could not afford it were assigned to the nonsurfactant group. **Results:** The nonsurfactant group had a higher rate of neonatal fatalities (30.04 percent vs. 52.27 percent), which was statistically significant (p 0.05). Because of less death from the principal issue, i.e., RDS and its complications, early newborn fatalities were higher in the non surfactant group (38.47 percent vs 53.62) than in the surfactant group (38.47 percent vs 53.62). The surfactant group had higher late neonatal mortality (63.63 percent vs 50.51 percent) than the nonsurfactant group, but the difference was not statistically significant (p 0.05). The most common cause of death in both groups was sepsis, which accounted for 60% of both groups' deaths.**Conclusion:** It was concluded from our study that the duration of mechanical breathing, ICU stay, hospital stay, morbidity, and death were all reduced in established RDS when a single dosage of surfactant was given late at night. Sepsis was the leading cause of death and morbidity, highlighting the importance of aseptic delivery and newborn care.

Keywords: Neonatal death, Preterm, Respiratory distress syndrome, Sepsis, Surfactant

Introduction

Every newborn has the potential to develop into a fully functioning human being capable of meeting the demands of the future. Premature birth occurs in 10–12 percent of newly born newborns in our country, compared to 5–7% in Western countries[1]. The WHO defines a live-born newborn as "premature" if it is delivered before 37 weeks from the first day of the last menstrual cycle[2]. Prematurity, intrauterine growth retardation, or both can cause low birth weight (LBW, birth weight of 2500 g or below). Around 57 percent of deaths in children under the age of five occur during the neonatal period, with preterm accounting for 36 percent[2,3].The intact neurobehavioral development survival of these newborn newborns has increased to >90 percent [1] with the advent of neonatology, better understanding of neonatal physiology, and sophisticated care. The most prevalent reason for a premature baby's admission to a neonatal intensive care unit is respiratory issues (NICU). Respiratory distress syndrome (RDS) or hyaline membrane disease (HMD) is a common respiratory condition that occurs more frequently as newborns are delivered prematurely[4-7].10% of babies born between 33 and 34 weeks, 15–30% of babies born between 32 and 36 weeks, 50% of newborns born between 28 and 32 weeks and 60–80% of kids born before 28 weeks are affected. RDS is a preterm infant's acute sickness that usually manifests within 6 hours and is characterised clinically by at least two of the three fundamental features: (1) tachypnea (respiratory rate [RR] >60/min), (2) retractions (Intercostals and Subcostals), and (3) expiratory grunt (NNF India)[8].The severity of RDS was determined using the Downes score (term newborns) and Silverman-Andersons score (preterm babies).Prematurity is the most common cause of RDS, and it is caused mostly by a lack of pulmonary surfactants.Early diagnosis to detect at-risk infants, prenatal steroids to prevent illness, enhanced neonatal care, innovations in respiratory support, and surfactant replacement therapy (SRT) have all contributed to a significant decrease in RDS mortality. SRT lowers initial inspired oxygen and ventilation requirements, as well as the incidence of severe RDS, mortality, pneumothorax, and other preterm morbidity according to systematic reviews of RCT. In immature newborns, however, RDS remains a significant source of morbidity and mortality[9-14].The goal of this research was to see how preterm neonates responded to surfactant therapy for RDS.

Materials and methods

From March 2018 to March 2021, the study was done in the NICU of a tertiary care unit in the Paediatric department. Both groups used the same case selection criteria, which included a premature baby (34 weeks) brought to the NICU with clinical signs and symptoms of RDS and X-ray findings suggestive of RDS after ruling out other probable respiratory distress differential diagnoses. Situations have been defined as shortness of breath in a newborn child with any 2 of 3 key features, i.e., tachypnea (RR >60/min), retractions (intercostals

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and subcostal), and expiratory grunt. Newborns >34 weeks of gestation or birth weight ≥2000 g, or newborns having respiratory distress due to other causes such as surgical, metabolic causes, congenital respiratory tract anomaly, birth asphyxia, heart defects, cytokine release syndrome, and infections such as congenital pneumonia were excluded from the analysis. In both groups, parents who departed against medical advice were excluded from surveillance.In addition to other supportive management, parents were counselled on the role of SRT. The presence of Fio2 >0.35 percent to keep Pao2 normal (60–80 mm-Hg) or Sp02 (88–93 percent) or having arterial/alveolar oxygen tension ratio (PaO2/ PAO2 or a/A ratio 0.22) necessitated SRT and mechanical ventilation. After matching the general features, babies whose parents gave authorization for the surfactant (and who could afford it) were assigned to the surfactant group, whereas those who could not afford it were assigned to the nonsurfactant group. After describing the SRT to the parents or legal guardians, written consent was obtained. A sufficient amount of surfactant was administered.A predesigned pro forma was used to record antenatal history, which included the history of premature rupture of membranes, previous pregnancies, antenatal corticosteroid doses, and causes of premature birth. Significant postnatal occurrences and clinical examination findings were also recorded, along with gestational age estimation using New Ballard score. Fluids were given to all newborns in either group according to their weight and day of birth, as well as broad-spectrum antibiotics (ampicillin and gentamycin) and additional supportive care as needed. On an individual clinical basis, routine and special investigations were sent.After intubating and clinically validating the site of the ET tube, surfactant was supplied, and airway secretion was cleared. With a baby in the supine position, surfactant was given in 2–3 aliquots. After each aliquot, the patients were manually ventilated while being assessed for adequate airway, breathing, auscultation, Spo2, chest rise, heart rate, RR, blood pressure, pulse, and air entry. They were then placed back on bubble-CPAP or mechanical ventilator, depending on their clinical condition. Suctioning was only done when absolutely necessary and for at least 1 hour.At 30 minutes, 1, 6, 12, 24, 36 hours, 48 hours, and 72 hours, vital signs, oxygen requirements, and ventilation settings were all monitored on a regular basis. After 30 minutes of SRT, blood gas analysis was performed as needed. To rule out air leaks, pneumonia, and ventilator-associated pneumonia, have a chest X-ray 6 hours, 24 hours, or whenever needed. Between 3 and 5 days after admission, a bedside cranial ultrasonography was performed, as well as at discharge. Weaned from ventilator assistance and placed on oxygen inhalation were those newborns who improved progressively without the complications of disease or intervention. Those that worsened were given proper care and vital signs were closely monitored.Complications emerged in both groups, and the length of ventilator support, NICU stay, and hospital stay were all recorded and reported. Because the trial was conducted in a government facility with modest expenses for NICU stay and ventilation, neither group's treatment costs were analysed.

Results

The total number of preterm newborns in this study was found out to be 123. Among these 47 of them met the SRT criteria and were given surfactant. The remaining 76 newborns who met the SRT requirements but whose parents couldn't afford the surfactant were placed in the non-surfactant group. Table 1 shows that the general features of both groups were similar. There was a delay in surfactant administration because it was a tertiary referral centre serving babies from all over the state with poor health transportation. The nonsurfactant group had a higher rate of neonatal fatalities (30.04 percent vs. 52.27 percent), which was statistically significant (p 0.05).Because of less death from the principal issue, i.e., RDS and its complications, early newborn fatalities were higher in the non surfactant group (38.47 percent vs 53.62) than in the surfactant group (38.47 percent vs 53.62). The surfactant group had higher late neonatal mortality (63.63 percent vs 50.51 percent) than the nonsurfactant group, but the difference was not statistically significant (p 0.05). Overall, the surfactant group had a higher total survival rate than the non-surfactant group, although the difference in comparative survival by gestational age was statistically insignificant. The duration of ventilation and NICU stay was considerably longer in the nonsurfactant group than in the surfactant group. (Table 1 to 4).

Discussion

In our country, HMD is the most common reason for neonatal ventilation[9]. In our nation, the reported survival of babies ventilated for HMD ranged from 25% to 64%[10,11].The babies who did not get surfactant had a considerably lower chance of surviving till discharge (49.23 percent), which was consistent to other Indian research. In an Indian study, Narang et al. discovered that early neonatal mortality was significantly lower in the surfactant group (25%) than in the nonsurfactant group (38.7%), and overall survival until discharge was significantly higher in the surfactant group (62.5%) than in the nonsurfactant group (38.7%). (43.7 percent)[12].In their study, Femitha et al. discovered that those who got SRT had a survival rate of 71.3 percent.13 Neonatal fatality was found to be 40% in Bae et al.15 According to Cummings et al., the SRT reduced infant mortality by up to 40%[16]. This difference was attributable to the surfactant group having fewer RDS complications, a shorter period of ventilator support and ICU stay, fewer odds of sepsis, and other supportive therapy complications than the nonsurfactant group.In a research by Narang et al., sepsis was the leading cause of newborn death, accounting for 49 percent of all neonatal deaths.12 The most common consequence of ventilated newborns, according to Bhakoo, was sepsis (67 percent)[17]. Early newborn mortality was much lower in the surfactant group (25 percent) than in the nonsurfactant group (38.7%) in a research by Narang et al., and septicemia was the most common cause of death in both groups[12]. It's possible that the surfactant group's higher survival rate is attributable to fewer complications like RDS, prolonged ventilation, sepsis, and other interventions.Overall, sepsis was the most common cause of late neonatal death, which was higher than other research' findings. In a research conducted in Korea in 1996, Bae et al. found sepsis to be the leading cause of death (42.6%), while Narang et al. identified sepsis to be the cause of death in 49 percent of neonatal deaths[12,15]. The duration of ventilation and hospital stay are closely associated to the occurrence of infection, and the lower incidence of sepsis in the surfactant group could be due to the shorter period of ventilation, ICU stay, less need for intervention, and fewer complications of the illness process. Survival was higher in the steroid plus surfactant group than in the steroid only group in our study. Jobe et al.found that antenatal corticosteroid medication in threatening premature labour combined with the use of postnatal rescue surfactant is related with a lower incidence of RDS and may be useful for lowering the severity of RDS and improving the long-term outcome of VLBW infants[18].

Table 1: General characteristics of patients

Characteristics	Surfactant (47)	No surfactant (76)
Antenatal booked pregnancy (%)	81.05	76.41
Antenatal steroid (%) (Last dose 24 h before delivery)	44.21	40.57
PROM >18 h (%)	29.05	28.70
Cesarean delivery (%)	18.89	26.72

Duration of hospitalization (Mean±SD)	12.26±3.94	12.69±3.04
Gestational age in weeks (Mean±SD)	33.24±2.89	33.27±2.93
Birth weight in grams (Mean±SD)	1338.7±344.23	1404±372.85
Male babies (%)	72.16	63.64
Average age at which SRT given	15.26±3.04	

Table 2: Early neonatal death

Causes of deaths	Early neonatal deaths		
	Surfactant group	Non surfactant	p value
Sepsis	52	60.93	1.1
Others (NEC, PPHN, PDA)	27	6.99	0.4
Pneumonia	-	-	-
RDS	01	12.87	1.2
Air leak	27	12.87	0.3
IVH	01	12.87	1.1
Total	38.47	53.62	0.4

Table 3 : Late neonatal death

Causes of deaths	Late neonatal deaths		
	Surfactant group	Non surfactant	p value
RDS	-	-	--
Air leak	1	7.37	1.1
IVH	-	-	--
Sepsis	59.25	65.61	1.1
Others (NEC, PPHN, PDA)	0	14.6	1.1
Pneumonia	44.94	26	0.7
Total	63.63	50.51	0.4

Table 4: Overall morbidity among survivors

Overall morbidity in survivors	Surfactant group	Non surfactant	*p* value
IVH	4.81	10.48	0.7
NEC	12.22	23.96	0.4
CLD	4.91	10.44	0.7
Others (ROP, PPHN, etc.)	12.22	22.98	0.4
Sepsis	53.95	80.23	0.04
Pneumonia	42.85	65.61	0.12
PDA	12.22	19.86	0.3

Conclusion

It was concluded from our study that the duration of mechanical breathing, ICU stay, hospital stay, morbidity, and death were all reduced in established RDS when a single dosage of surfactant was given late at night. Sepsis was the leading cause of death and morbidity, highlighting the importance of aseptic delivery and newborn care.

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