Surfactant therapy In Albatool teaching hospital

Under supervision of :

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Research Presented By

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Abstract：

Background: The use of clinical pulmonary surfactant began three decades ago. Since then, surfactant replacement therapy has become the standard therapeutic intervention to RDS in preterm infants

Methods: Data for 52 infant with RDS include Before & After administration of SRT , following clinical outcomes .

Results: Male (n = 35; 67.308%) ,while 17 were female (32.692%). Most of then has admitted in day 1 of life with common gestational age 37w or 37+(1→6) days ,48.077% Pulmonary opacities ,35% is the most common radiological findings. Decreass in respiratory rate, raising Spo2 and relieving of cyanosis after surfactant administration can demonstrate the therapeutic response.

Conclusion: Surfactant replacement therapy has been shown to be effective in improving outcomes for premature infants with RDS. It can reduce the need for mechanical ventilation, decrease the risk of complications associated with RDS, and improve survival rates.

1.Introduction

Pulmonary surfactant is a critical component of lung, dysfunction of it has been implicated in a variety of respiratory diseases [1,2], including respiratory distress syndrome (RDS) in newborns, acute respiratory distress syndrome (ARDS), and chronic obstructive pulmonary disease (COPD) [2,3].The main function of pulmonary surfactant is to reduce the surface tension of the water in the airspace between the alveoli, allowing the alveoli to expand and contract more easily [3,4]. This is accomplished by the lipids in the surfactant, which form a monolayer on the surface of the water, reducing the surface tension and allowing the water to spread out more evenly [5]. In addition to its role in maintaining the structural integrity of the alveoli, pulmonary surfactant also plays a role in host defense, modulating inflammation, and enhance immune response [2,3]. These lipids are arranged in a specific ratio and are accompanied by proteins such as surfactant protein A (SP-A), surfactant protein B (SP-B), and surfactant protein C (SP-C). The three most important biophysical properties of functional PSurf films are rapid adsorption to the air–water interface, efficient compression during exhalation, and efficient re-extension upon expansion during inhalation [1,5,6,7]. Surfactant replacement therapy is a medical intervention used primarily in the treatment of RDS in premature infants. Surfactant replacement therapy involves administering exogenous surfactant directly into the lungs of affected infants to

compensate for the deficiency [8,9]. The surfactant can be derived from animal sources or produced synthetically [10]. The procedure typically involves introducing the surfactant through an endotracheal tube placed into the infant's airway [11,12,13] usually while they are on a mechanical ventilator [8,14,15]. The surfactant is delivered in small aliquots, and care is taken to ensure proper distribution throughout the lungs. This procedure helps to improve lung function, reduce respiratory distress, and enhance oxygenation [8,12,13]. Respiratory Distress Syndrome (RDS), also known as hyaline membrane disease, is a common respiratory condition that primarily affects premature infants. It occurs due to a deficiency or inadequate production of surfactant, a substance that helps the lungs expand and keeps the air sacs (alveoli) from collapsing [16,17]. In premature infants, RDS may present with Cyanosis, Fine inspiratory crackles, Labored breathing, Oxygen requirement, In severe cases, diminished or decreased breath sounds may be heard upon auscultation of the chest [18,19,20]. A chest X-ray is often performed to confirm the diagnosis of RDS. The X-ray may reveal a ground-glass appearance, indicating areas of lung consolidation and a lack of air-filled spaces. The lungs may appear hazy or opaque due to the absence of sufficient surfactant [21].

2 objective

To assess the effect of intratracheal administration of synthetic surfactant in premature newborns with established RDS.

3 Patients and methods

Cross sectional study conducted in 52 infant with RDS the NICU of, Albatool teaching hospital recording age, in the period from December 2023 to February 2024 . Gender, Numbers of surfactant, Time of administration , & Mode of surfactant administration also Mode of ventilation, Respiratory rate , SpO2, Chest x-ray after administration, Complications of SRT And number of Days of stay in the NCU Before & After administration of SRT

The criteria for patient selection:

1. Neonates in their first week of life
2. Neonates with clinical and radiologic evidence of respiratory distress syndrome requiring assisted ventilation
3. Neonates treated by synthetic surfactant

The criteria for patients Exclusion

1. Babies aged more than one month
2. Neonates without clinical or radiologic evidence of respiratory distress syndrome

3. Neonates with confirmed diagnosis of respiratory distress syndrome but haven’t treated by synthetic surfactant

Statistical analysis:

The data was collected in a Proforma and analyzed manualy. Mean, median, standard deviation, minimum , maximum values , percentage comparisms , p , r and interquartile range were done in summarizing numerical parameters. Chi square analysis was done for statistical confirmation of the data.

4 Results

52 infant with RDS were included. Most of them were male (n = 35; 67.308%) ,while 17 were female (32.692%).

Gestational age	36w or 36+(1→6) days	37w or 37+(1→6) days	38w or 38+(1→6) days	Full term baby
Number of children	18	25	15	4
Percentage	34.615%	48.077%	28.846%	7.692%

Table 1 : Number of children according to their gestational age

Figure 1:Time of admissions

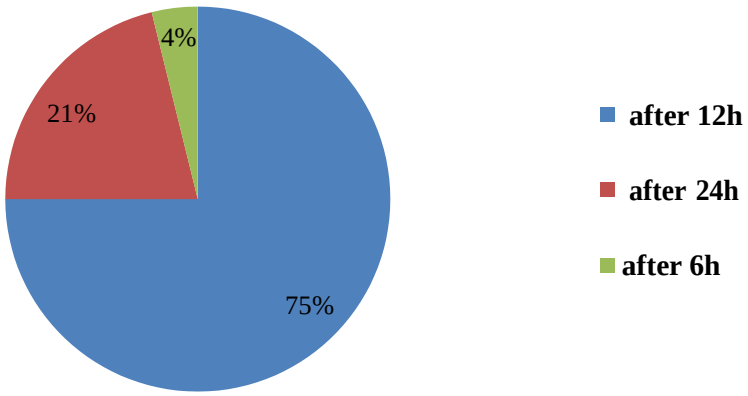
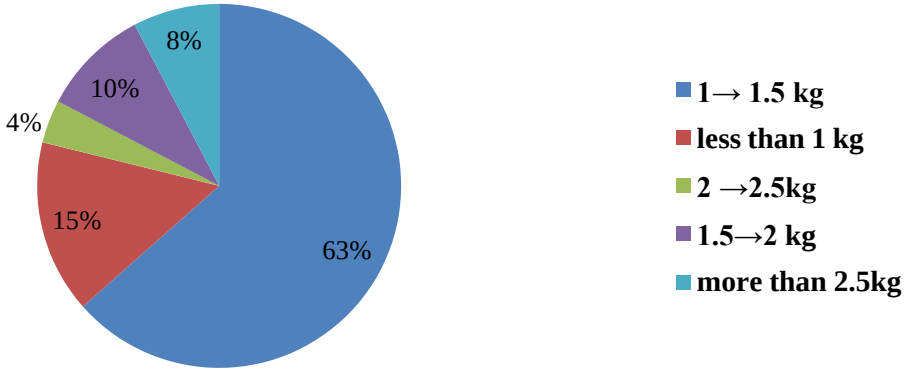


Figure 2: Body weight at birth



n=39 of 52 (75%)followed by on day 2 : n=11 (21.154%), on day 3:n= 2 (3.846%),

	Before administration	After administration	p	r
Respiratory rate	Mean =71 SD=1.4	Mean =63 SD=2.1	o.o1	
Mode of ventilation	Nasal cannula	Nasal cannula		
SpO2	Mean =89 SD=3.2	Mean =93 SD=2.8		

Table 3: Respiratory rate , Mode of ventilation SpO2 and Chest x-ray comparisons between before and after administration SRT

Figure 3: The average of SPO2, Respiratory rate before and after administration of SRT

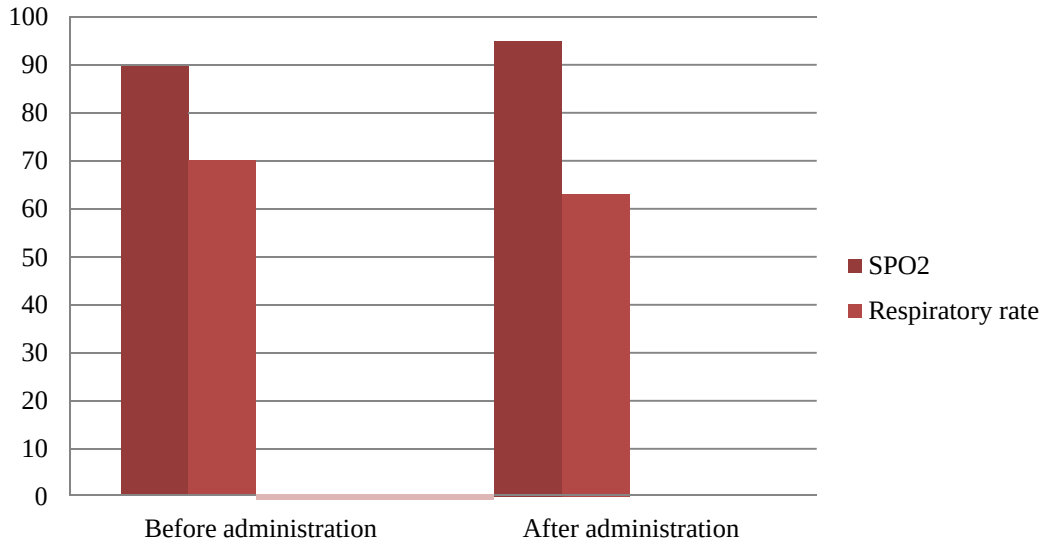


Figure 4 :Days of stay in the NCU

G P A	G_2 P_1 A1	G_1 P_1 A0	G_5 P_5 A1	G_2 P_0 A1	G_4 P_3 A2	G_3 P_3 A1	G_3 P_3 A0
Percentage	35%(18)	15%(8)	10%(5)	8%(4)	18%(9)	4% (2)	10%(5)

Chest x-ray findings	Number	Percentage	
Pulmonary opacities	**18**	**35%**	
Hyperinflation		**4**	**8%**
Consolidation		**8**	**15%**
Ground glass opacities		**5**	**10%**
Normal		**17**	**32%**
Collapse		**0**	**0**

Table 4: X-ray findings in neonates admitted with respiratory distress

Disscussion

The study included fifty two infant with RDS, the majority them were male (n = 35; 67.308%) ,while 17 were female (32.692%). Gender may have some impact on the incidence and severity of certain respiratory conditions, although it does not directly affect surfactant therapy. The age of the newborn is crucial as it helps determine the timing of surfactant administration and the potential impact of surfactant therapy on respiratory distress [22,23]. Gestational age about 37w or 37+(1....→6) days representing for the most of cases (48 %) , then 36w or 36+(1....→6) days (35%) , RDS especially affects those born before 37 weeks of gestation due to impairment of surfactant and risk for RDS decreases with increasing gestational age [24,25]. then 38w or 38+(1....→6) days (29%), Full term baby was only 8%. Because even RDS primarily affects premature infants due to , it can also occur in full-term infants who have insufficient surfactant production due to certain medical conditions or complications during pregnancy [26,27,28]. Respiratory rate reflects the newborn's breathing pattern and respiratory rate greater than 60 breaths per minute is indicative of respiratory distress [29] as in all cases included (66_ 78) . SpO2 was ranged from 81%to97% collected cases with avarager of 89 which is very alarming .Oxygen saturation levels indicate the amount of oxygen carried by the blood. Since underuse and overuse of supplemental

oxygen can harm premature infants, The effects of adopting a restricted or low oxygen range In the very early neonatal period (<48 hours age) increases mortality and spastic diplegia and age more than 48 hours had no difference in early or late mortality, but increase the risk of blindness , apnea, cyanosis and asphyxia also oxygen saturation levels must be monitored and kept at less than 95% to prevent reactive oxygen species-related diseases, such as retinopathy of prematurity and bronchopulmonary dysplasia. Changes in respiratory rate and Spo2 after surfactant administration can demonstrate the therapeutic response [9]. Birth weight ranged 1.5 and 2kg was the most common range of weight. LBW is one of risk factor for RDS. Birth weight provides insights into the newborn's overall growth and development. Most of them had SRT 12 hours after birth. The timing of surfactant administration plays a crucial role in optimizing its therapeutic effects. It determined whether immediately after birth or at later intervals, so should be based on the clinical condition of the newborn. But it had been lated in majority of cases due to low educational and socioeconomic state. The dose and number of surfactant administrations are essential in determining the adequacy of surfactant replacement therapy and its effectiveness in improving lung function also. The mode of surfactant administration refers to the method used to deliver the surfactant into the newborn's airways. Different modes have varying levels of efficacy, risks, and indications, influencing the choice of administration. A small volume of poractant alfa (1.25

mL/kg) was given as a single bolus using a closed technique during ventilation (ventilation not interrupted during administration). Ventilator parameters were recorded before, during and after administration. A complete cessation (ie, obstruction) of flow down the endotracheal tube (ETT) was observed in 50 of 52 (96%) of infants. Following surfactant administration. Most of them stayed in the Neonatal Care Unit for 2 Days (69%), 26% stayed for 3 Days only 5% styed for 4 Days. The length of stay in INCU reflects the overall progress and recovery of the newborn. It can be influenced by the response to surfactant therapy and the resolution of respiratory distress.

Gravidity refers to the total number of pregnancies, P represents the number of full-term pregnancies, and A represents the number of abortions or miscarriages [30,31]. Frerquency of GPA was 35% for G_2 P_1 A_1 , 15% for G_1 P_1 A0, 10% for G_5 P_5 A_1, 8%for G_2 P_0 A_1 , 18% for G_4 P_3 A_2 , 4% for G_3 P_3 A_1, 10% for G_3 P_3 A_0 . This information helps in understanding the mother's obstetric history, which can influence the newborn's health. while being ventilated in assist control volume guarantee mode The mode of ventilation provides information about the respiratory support required by the newborn before and after surfactant therapy [12,13]. It assess the effectiveness of surfactant in reducing the need for mechanical ventilation.

Conclusion

Pulmonary surfactant is a material produced by the lung that helps to prevent alveolar collapse at low transpulmonary pressures. Surfactant is chemically heterogeneous, meaning it is made up of different components. Both the lipid and protein are important for establishing and maintaining a low surface tension. Intratracheal administration of synthetic surfactant to infants with established respiratory distress syndrome has been demonstrated to improve clinical outcome. Infants who are treated with synthetic surfactant have a decreased risk of pneumothorax, a decreased risk of pulmonary interstitial emphysema, a decreased risk of intraventricular hemorrhage, a decreased risk of bronchopulmonary dysplasia, a decreased risk of neonatal mortality, a decreased risk of mortality prior to hospital discharge and at 1 year of age. Infants who receive synthetic surfactant treatment for established RDS have an increased risk of apnea of prematurity.