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Effectiveness of Less Invasive Surfactant Administration in Preterm with Respiratory Distress Syndrome

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ABSTRACT

Background: Neonatal respiratory distress syndrome due to surfactant deficiency is associated with high morbidity and mortality in preterm infants. While studies have should that early treatment with surfactant therapy has markedly reduced mortality. There are certain methods by which surfactant can be given, the most common initially used was intubation and mechanical ventilation which itself is also associated with many complications. LISA i.e. less invasive surfactant administration is an emerging technique in which surfactant is given via soft tube without intubation and oxygen support given with nasal CPAP, which has been internationally studied and preferred with significantly reduced need of mechanical ventilation. **Objective:** To determine the effectiveness of Less Invasive Surfactant Administration (LISA) in preterm neonates with respiratory distress syndrome. **Study Design:** Descriptive, case series. **Settings:** Department of neonatology of children hospital, PIMS Hospital, Islamabad Pakistan. **Duration:** Total 6 months duration from 31st August 2019 to 28th February 2020. **Methods:** A total of 85 preterm babies with respiratory distress 2 syndrome fulfilling the following criteria were selected. Extremely and very low birth weight i.e. <1.5kg and extremely sick were excluded. Patients were given surfactant through the soft nasotracheal tube and put on CPAP and the children's condition was assessed during 72 hours of procedure for improvement and related complications like pneumothorax, need of mechanical ventilation and mortality. Neonates having earlier clinical improvement with no prolonged need of mechanical ventilation and having fewer complications were considered effective. **Results:** Mean gestational age was 33.08 ± 1.35 weeks. Out of the 85 patients, 46 (54.12%) were male and 39 (45.88%) were females with male to female ratio of 1.2:1. Mean birth weight was 2.50 ± 0.73 kg. The effectiveness of LISA in preterm neonates with respiratory distress syndrome was found in 63 (74.12%) patients. **Conclusion:** This study concluded that the effectiveness of LISA in preterm neonates with respiratory distress syndrome is quite high.

Keywords: *Preterm birth, Respiratory distress syndrome, LISA.*

INTRODUCTION

Prematurity is defined as a birth that occurs before 37 completed weeks (fewer than 259 days) of gestation. Worldwide, the estimated rates of the preterm birth is about 11. [1] Nearly 70 to 80 percent of preterm births happen without apparent external influence and are related to preterm labor (40- 50%) or preterm rupture of membranes (20-30%). The rest of preterm births (i.e. 0-30%) are due to medical reasons related to maternal or fetal problems. The mortality risk from prematurity is greater in low- and moderate-income countries.[2,3]

Respiratory distress is one of the most common reasons a neonate is admitted to the neonatal intensive care unit, 15% of term infants and 29% of late preterm infants admitted to the neonatal intensive care unit develop significant respiratory morbidity, this is even higher for

infants born before 34 weeks' gestation.[4] Neonatal respiratory distress syndrome due to surfactant deficiency is associated with high morbidity and mortality in preterm infants. While studies has should that early treatment with surfactant therapy has markedly reduced the mortality. There are certain methods by which surfactant can be given, most common initially used was intubation and mechanical ventilation which itself is also associated with many complications.[5] Second is LISA i.e. less invasive surfactant administration which is emerging technique in which surfactant is given via soft tube through trachea without intubation and oxygen support given with nasal CPAP, which has being internationally studied and preferred with significantly reduced need of mechanical ventilation.[6]

LISA has being associated with less complication even in susceptible preterm. Recently meta-analysis has being done which adds that less invasive surfactant administration is safe, easy to administer and reduces composite outcome of mortality.[7,8] Difficulties associated with LISA were surfactant reflux, desaturation and Bradycardia but non-significant and observer dependent. The effectiveness of LISA studied keeping in view the outcomes as need for mechanical ventilation, occurrence of a pneumothorax requiring chest tube insertion in the first 3 days, duration of non-invasive ventilation (NIV) has being studied which are significantly lower in LISA.[9,10]

The rationale of my study was to consider the importance of LISA and its efficacy in our population as very limited studies has done on effectiveness of LISA in our population and no data is available. The objective of the study was to determine the effectiveness of LISA in preterm neonates with respiratory distress syndrome.

METHODS

A Descriptive case series was conducted at the Department of neonatology children hospital, PIMS, Islamabad. After taking the approval from ethical committee and research department was taken,

Inform consent was taken. selected. The total duration of 6 months from 31st August 2019 to 28th February 2020. The sample size was calculated by W.H.O calculator taking a confidence interval at 95%, absolute precision period as 10% and anticipated population as 32.3%[11] our sample size was i.e. n= 85. The non-probability, consecutive sampling technique was used. All preterm with respiratory distress syndrome fulfilling the inclusion criteria i.e. Neonates > 30 weeks and < 36+6 weeks, breathing spontaneously, no anomalous baby, and no underlying congenital heart disease were enrolled.

Children's name, gestational age, sex, clinical condition at presentation was recorded by on duty doctor. Patients were given surfactant through soft nasotracheal tube and put on CPAP and children condition was assessed during 72 hours of procedure for improvement and related complications like, pneumothorax, need of mechanical ventilation and mortality. Neonates having earlier clinical improvement with no prolong need of mechanical ventilation and having less complications were considered effective. Data was collected through a structured proforma. Data was analyzed using statistical program by latest version of IBMSPSS. The quantitative variable like age, weight and height were presented by calculating mean and standard deviation. The qualitative variable like sex and effectiveness were presented by calculating frequency and percentages. Effect modifiers like age, gender and grades of RDS were controlled by stratification. Post stratification chi-square test was applied; p value < 0.05 was significant

RESULTS

Mean gestational age was 33.08 ± 1.35 weeks (Table VII). Out of the 85 patients, 46 (54.12%) were male and 39 (45.88%) were females with male to female ratio of 1.2:1. Mean birth weight was 2.50 ± 0.73 kg. Majority of the patients have grade 2 RDS, 35(41.18%), followed by grade-3 21(24.71%), Grade-2 20(22.53%) and Grade 1 (9(10.58%). The effectiveness of LISA in preterm neonates with respiratory distress syndrome was found in 63 (74.12%) patients. Table 1

Table 1: Baseline characteristics of patients according to gestational age (n=85)

Variables		Number (n)	Percentage (%)
Gender	Male	46	54.12
	Female	39	45.88
Gestational age (weeks)	31-33	48	56.47
	34-35	37	45.53
Grades of RDS	1	20	22.53
	2	35	41.18
	3	21	24.71
	4	9	10.58
Effectiveness	Yes	63	74.12
	No	22	25.88

Table 2 shows the effectiveness of LISA with respect to grade of RDS and Gender. The results revealed that there was statistical difference in the effectiveness with respect to age and grade (P-value > 0.05)

Table 1: Stratification of effectiveness with respect to grades and gender

Grades	Effectiveness		P-value
	Yes	No	
1	16	4	0.849
2	25	10	
3	16	5	
4	6	3	
Gender			
Male	35	11	0.653
Female	28	11	

DISCUSSION

Non-invasive strategies in neonatal care of preterm infants are becoming increasingly important. However, a significant proportion of preterm infants with respiratory distress syndrome (RDS) fails non-invasive respiratory support alone and need exogenous surfactant (SF) replacement therapy.[12] Recent studies show that LISA might be associated with higher survival rates without bronchopulmonary dysplasia (BPD) and might lead to fewer other complications of preterm birth, such as severe IVH and pneumothorax when compared to endotracheal SF administration after intubation.[9,13]

This study at neonatology department of PIMS, to determine the effectiveness of LISA in preterm neonates with respiratory distress syndrome. The mean gestational age was 33.08 ± 1.35 weeks (Table VII). Out of the 85 patients, 46 (54.12%) were male and 39 71 (45.88%) were females with male to female ratio of 1.2:1. Mean birth weight was 2.50 ± 0.73 kg. Distribution of patients according to grade of RDS.

Effectiveness of LISA in preterm neonates with respiratory distress syndrome was found in 63 (74.12%) preterm babies as shown in figure VII. There was lesser need for mechanical ventilation by 32.3% within 72 hours (RR=0.71 (95% CI 0.53 to 0.96), p=0.02), and complications like pneumothorax 7.5%. Similarly a meta-analysis done by Aldana-Aguire and Lau CSM also showed that the LISA technique resulted in a significant reduction in the composite outcome of death at 36 weeks (RR=0.75 (95% CI 0.59 to 0.94), p=0.01, there is 86.4% successful first attempt and very less chance of pneumothorax.[11,13]

LISA is effective in reducing mechanical ventilation, it has shown reduced need for mechanical ventilation in randomized controlled trials (RCTs).[14,15] an observational study using a matched-pairs design in more than 1000 infants demonstrated that this effect is robust in clinical practice also outside the specific setting of trials.[16] Effectiveness of LISA in extremely low gestation babies is still questionable, as respiratory drive is strongly associated with gestational age of babies, theoretically LISA is more beneficial in babies with advanced gestational age. In our study we compared the effectiveness of LISA among different gestational age but only in moderate to late preterm babies which shows P value of 0.773 i.e. less than 0.5 which is non-significant, but our data is insufficient considering early and very preterm babies. Use of LISA in infants with a gestational age (GA) of 26–28 weeks avoids mechanical ventilation in the first 72 hours, which also means that the majority of infants will not need endotracheal intubation and

ventilation throughout their hospital stay. In smaller infants with a GA of 25 weeks or less, the rate of mechanical ventilation is also reduced in the first 72 hours, but quite a few of these infants still need intubation later on mainly for severe apnoea.90 Ramos-Navarro *et al*. observed significantly lower need of mechanical ventilation in LISA group (43.3%), while it was 73% in control group and less need for O2 supplementation at 28 days, 30% vs. 45% with p=0.031.[17]

CONCLUSION

This study concluded that effectiveness of LISA in preterm neonates with respiratory distress syndrome is quite high in a sense that it's associated with less complications such as lesser need of ventilation, pneumothorax and have greater chance of first successful attempt.

LIMITATIONS

The limitation of study was a single centered study and smaller sample size.

SUGGESTIONS / RECOMMENDATIONS

It is recommended that less invasive surfactant administration should be used routinely in our practice in preterm neonates with respiratory distress syndrome in order to improve the survival rate of preterm neonates.

CONFLICT OF INTEREST / DISCLOSURE

Authors declare no conflict of interest.

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