



## OUTCOME OF SURFACTANT THERAPY IN PRETERM BABIES WITH HYALINE MEMBRANE DISEASE AT NEONATAL INTENSIVE CARE UNIT OF A TERTIARY HOSPITAL

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### ABSTRACT

**INTRODUCTION:** Hyaline membrane disease (HMD) is a disease of preterm infants that is caused by insufficient pulmonary surfactant in alveoli. Pulmonary surfactant is a complex mixture of phospholipids and surfactant-specific proteins that is synthesized, packaged, and secreted from alveolar type II cells of the lung. Absent or insufficient surfactant due to developmental immaturity of alveolar type II cells or spontaneous or inherited mutations of surfactant-related genes, or inactivation of surfactant due to inflammation, chemical modification, or lung injury, result in high surface tension and atelectasis.

**Objective:** The objective of this study was to analyze the outcome of surfactant replacement therapy in preterm babies with hyaline membrane disease.

**Methodology:** This will be a retrospective observational study conducted at neonatal unit of Pediatric Department, SMIMER, Surat.

Study duration will be of one-year (1<sup>st</sup> June 2018 – 31<sup>st</sup> May 2019). Preterm babies from 26wks–36wks of gestation with Hyaline Membrane Disease will be included in this study whereas babies with congenital malformations and meconium stained liquor will be excluded. All preterm babies who had clinical and radiological features of HMD will be considered for Surfactant Therapy.

**Results:** In this study of 70 preterm babies with HMD received ST, 54% (38) were male and 46% (32) were female. The mean birth weight of preterm babies with HMD was 1293.02 ± 324gms and mean gestational age was 31.33 ± 2.8weeks. Among 70 preterm babies with HMD receiving ST, 71% (50 babies) discharged from the hospital and 29% (20 babies) expired. Among 20 expired babies, five due to pulmonary hemorrhage, seven due to septicemia, four due to NEC, four due to IVH.

**Conclusion:** The use of surfactant therapy has improved the survival outcome and decreased the associated morbidities in babies with HMD. The maximum impact of survival was seen among the preterm babies of 32- 36 weeks with birth weight of 1200 -2000 grams.

**KEYWORDS :** preterm babies, hyaline membrane disease, surfactant therapy, outcome of surfactant therapy, antenatal steroids

### INTRODUCTION

Hyaline membrane disease (HMD) is a disease of preterm infants that is caused by insufficient pulmonary surfactant in alveoli. Pulmonary surfactant is a complex mixture of phospholipids, natural lipids and surfactant-specific proteins that is synthesized, packaged, and secreted from alveolar type II cells of the lung. In the alveolar spaces and small respiratory bronchioles that have poor structural support, surfactant sits at the air-liquid interface over the residual and protective liquid layer overlying the epithelium and disrupts the surface tension generated by the lung liquid. This surface tension is forceful enough to promote alveolar collapse at low lung volumes and to oppose reinflation of atelectatic airspaces. Absent or insufficient surfactant due to developmental immaturity of alveolar type II cells or spontaneous or inherited mutations of surfactant-related genes. Inactivation of surfactant due to inflammation, chemical modification, or lung injury, result in high surface tension and atelectasis. Preterm infants are particularly prone to HMD because alveolar type II cells not develop until early in the third trimester, and their number and capacity to produce surfactant, increases throughout the third trimester. These above causes lead to surfactant deficiency. The basis for prevention of HMD is the observation that maternal hormones, specifically glucocorticoids, enhance surfactant maturation. Numerous trials have shown that administration of antenatal corticosteroids in anticipation of preterm birth is effective preventive HMD. ANC modifies surfactant readiness as well as lung structure, including thinning of alveolar walls. Target population is pregnant women 24 to 34 weeks of gestation with PTL. A complete course of ANC is considered to be either betamethasone at 12 mg intramuscular q24h \* 2 doses OR dexamethasone 6 mg intramuscular q12h \* 4 doses. (1,2,3)

### OBJECTIVE

The Objective of this study was to analyze the outcome of surfactant therapy in preterm babies with hyaline membrane disease (HMD) born to mothers who did not receive antenatal steroids as well as mothers who adequately received antenatal steroids.

### METHODOLOGY

This was a retrospective observational study conducted at neonatal unit of Pediatric Department, SMIMER, Surat. Study duration was of one-year (1<sup>st</sup> June 2018 – 31<sup>st</sup> May 2019). Preterm babies from 26 weeks – 36 weeks of gestation with Hyaline Membrane Disease were included in this study whereas babies with congenital malformations and meconium stained liquor were excluded. All preterm babies who had clinical and radiological features of HMD were considered for Surfactant Therapy (ST).

The surfactant (Survanta; Abbott Laboratories, USA; Dose: 4 ml/kg) was administered intra-tracheally according to standard procedures in four divided aliquots applying INSURE (intubation, surfactant administration and extubation to Bubble CPAP) Technique. (1,2)

### RESULTS

In this study of 70 preterm babies with HMD who received ST, 38 (54%) were male and 32(46%) were female. The mean birth weight of preterm babies with HMD was 1293.02 ± 324 grams and mean gestational age was 31.33 ± 2.8 weeks. Among 70 preterm babies with HMD receiving ST, 50 (71%) babies discharged from the hospital and 20 (29%) babies expired. Among 20 expired babies, 5 were due to pulmonary hemorrhage, 7 due to septicemia, 4 due to NEC, 4 due to IVH. In all these babies average Apgar score at 1min and 5 min was 6.03 ± 1.15 and 7.53 ± 0.77 respectively. Also, Silverman's score at 1 hr. of birth was 6.07 ± 1.2. Average age of the

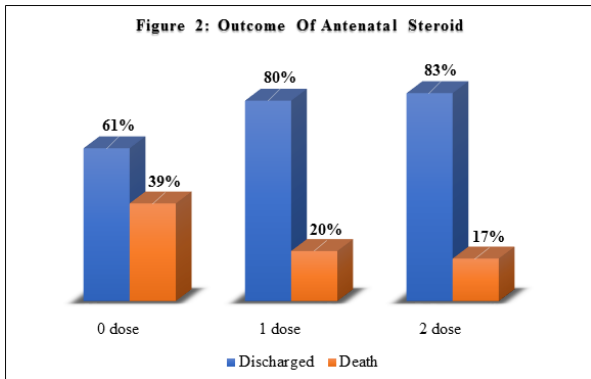
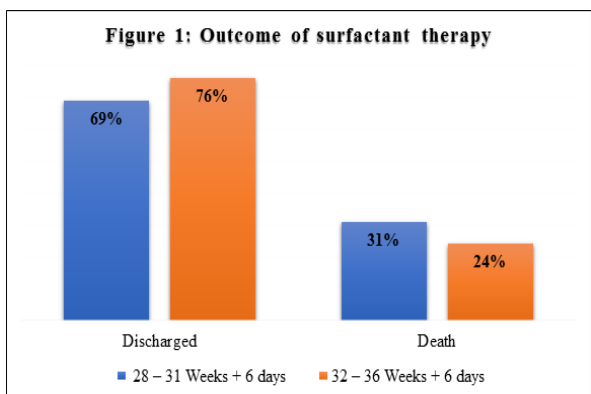
mothers in this study was  $28.03 \pm 4.1$  yrs. Duration of CPAP support and mechanical ventilation required in all babies was  $52.40 \pm 30.7$  hrs and  $26 \pm 12.7$  hrs. After surfactant therapy, expansion of lungs occurred radiologically in duration of  $10.45 \pm 5.4$  hrs. average time for 1<sup>st</sup> and 2<sup>nd</sup> surfactant therapy dose given in  $3.17 \pm 2.1$  hrs and  $9.62 \pm 4.2$  hrs respectively. Duration of hospital stay in the babies whose were discharged was  $10.95 \pm 6.25$  days. Overall, we observed that 83% babies were discharged whose mother received adequate antenatal steroids (2 doses) and 80% was the discharge rate in whom mothers received only one dose of steroid, whereas the discharge rate was only 61% amongst the babies whose mother did not receive antenatal steroid at all.

**Table 1: Demographics and clinical parameter**

No.	Variables	Mean
1	Gestational age	$31.33 \pm 2.8$ wks.
2	Birth weight	$1293.02 \pm 324$ gms.
3	Silverman's score at 1hr of birth	$6.07 \pm 1.2$
4	grunting, tachypnoea, chest retraction started after birth	$1.83 \pm 1.14$ hrs.
5	Apgar score at 1 min	$6.03 \pm 1.15$
6	Apgar score at 5 min	$7.53 \pm 0.77$
7	Mothers age	$28.03 \pm 4.1$ yrs.
8	Duration of bubble CPAP	$52.40 \pm 30.7$ hrs
9	Duration of mechanical ventilation	$26 \pm 12.7$ hrs
10	Radiologically lung expansion duration	$10.45 \pm 5.4$ hrs
11	1st dose surfactant application	$3.17 \pm 2.1$ hrs
12	2nd dose surfactant application	$9.62 \pm 4.2$ hrs
13	Hospital stay	$10.95 \pm 6.25$ days

**Table 2: Neonatal parameter**

No.	Variables	Total	Discharged	Death	P value
1	Gestational Age				0.53
	28 – 31 weeks + 6 days	45	31	14	
	32 – 36 weeks + 6 days	25	19	06	
2	Antenatal Steroids				0.16
	0 dose	33	20	13	
	1 dose	25	20	05	
	2 doses	12	10	02	
3	Cause of death	Gestational age			0.77
		28 – 31 weeks + 6 days	32 - 36 weeks + 6 days		
	Pulmonary haemorrhage	5	04	01	
	Septicaemia	7	05	02	
	NEC	4	03	01	
	IVH	4	02	02	



**DISCUSSION**

In this study 70 preterm babies were observed over duration of one-year period. The mean birth weight of preterm babies with HMD was  $1293.02 \pm 324$  grams and mean gestational age was  $31.33 \pm 2.8$  weeks. Among 70 preterm babies with HMD receiving ST, 50 (71%) babies discharged from the hospital and 20 (29%) babies expired. Among 20 expired babies, 5 due to pulmonary hemorrhage, 7 due to septicemia, 4 due to NEC, 4 due to IVH. After surfactant therapy pulmonary hemorrhage occur due to changes in lung compliance, increased left to right shunting across a PDA (patent ductus arteriosus) and increased pulmonary blood flow. Other complication occurs like IVH due to preterm babies’ vessels are fragile so more chance to occur bleeding leads to IVH, septicemia occur due to preterm babies have more chance to occur sepsis and NEC occur due in preterm babies’ gut mucosa is not mature. In which out of 70 babies who had given surfactant therapy 71% babies were discharged so it suggests that surfactant therapy lead to decrease mortality in preterm babies. average time for 1st and 2nd surfactant therapy dose given in  $3.17 \pm 2.1$  hrs and  $9.62 \pm 4.2$  hrs respectively. Duration hospital stay in that babies whose were discharged in days of  $10.95 \pm 6.25$  days. Overall, we observed that 83% babies were discharged whose mother received adequate antenatal steroids (2 doses) and 80% was the discharge rate in whom mothers received only one dose of steroid, whereas the discharge rate was only 61% amongst the babies whose mother did not receive antenatal steroid at all. So, it suggests that antenatal steroids lead to lung maturation so this leads to improve morbidity and mortality in preterm babies. (1,2,3,4).

**CONCLUSION**

The use of surfactant therapy has improved the survival outcome and decreased the associated morbidities and mortality in preterm babies with HMD. After surfactant therapy out of 70 babies 50(71%) babies were discharged. The maximum impact of survival was seen among the preterm babies of 32- 36 weeks with birth weight of 1200 -2000 grams.

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