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Study of effectiveness of surfactant in treatment of respiratory distress syndrome in newborn.

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Introduction

Surfactant is an important treatment modality in preterm babies with respiratory distress syndrome (RDS). Since its use in early 1990s it has led to decrease the mortality, morbidity and cost of treatment.[1,2] Surfactant can be given as prophylactic, early or late rescue. The admini stration of prophylactic surfactant is totally depends on gestational age and / or expected high risk of RDS. In rescue therapy, surfactant is given after failure of continuous positive airway pressure (CPAP) which is defined as inspired oxygen concentration of more than 30% along with clinical assessment of work of breathing, direction of improvement or worsening and general clinical condition of the baby. Early rescue is the use of surfactant within two hours while late rescue is the use of surfactant after two hours. Repeat dose is given only when there is lack of improvement, persistent high oxygen requirement more than 30%, increased work of breathing on non-invasive or continuing need for mechanical ventilation.[3-7]

Pulmonary surfactants are the complex of specific lipids, carbohydrates and proteins which secreted by type II alveolar epithelial cells. This complex is amphiphilic (i.e. it contains both hydrophilic & hydrophobic groups), which perfectly works to decrease surface tension at the air– liquid interface and acts as surface-active agent in the alveoli during the respiratory cycle.[8-11]

Surfactant replacement therapy reduces the incidence of pulmonary interstitial, pneu Mo thorax, emphysema and the combined outcome of death or BPD, compared with no surfactant replacement these findings suggest that lung injury is mitigated after surfactant replacement. The medical morbidities, such as intraventricular haemo rrhage, health care–associated infections, BPD, retino pathy of prematurity, necrotizing

enterocolitis and patent ductus arteriosus, has not changed with surfactant replacement, but this definitely reduces

reduction in mortality with surfactant replacement therapy.[12- 14] Surfactant replacement is effective for larger and more mature preterm infants with established RDS.[15-17]

Prophylactic surfactant use in delivery room has been out of practice now due to the use of antenatal maternal steroid and use of CPAP in the delivery room which has decreased the requirement of surfactant in preterm babies.[18-20] Early rescue therapy is beneficial in decreased the risk of neonatal death, acute lung injury and chronic lung disease compared to late rescue in babies with RDS.7 Short term risks include hypoxemia, hyperventilation, bradycardia, pulmonary haemorrhage, blockage of endotracheal tube, hypocarbia, pneu motho rax, hypotension.[21-23]

Very few data regarding surfactant use has been published, so in the present study we tried to highlight the effectiveness of surfactant in treatment of respiratory distress syndrome in new born.

Aims & objectives

1. To evaluate the effectiveness of surfactant in treatment of respiratory distresssyndrome in new-born.
2. To study the outcome of surfactant therapy.

Material & methods

Present study is the prospective observational study conducted at SRTR Government Medical college, Ambajogai, Maharashtra, india. The study population was the all new-borns delivered with RDS in government medical college and tertiary health care center.

Sample Size: 120

Inclusion criteria

1. All new-born delivered with RDS at Tertiary Centre.

Exclusion criteria

1. New-born with gestational weight < 500 gm.
2. Congenital heart diseases.
3. Severe congenital malformations.
4. Birth asphyxia
5. Patient or parents or care takers not willing and refused to give consent.

New born presenting with RDS satisfying the inclusion criteria will be enrolled into the study, after getting written informed consent from the parents/guardians. A detailed history in all cases will be taken including Maternal history. Through clinical examination was done – vitals, general physical examination and systemic examination. Surfactant were administered by 'INSURE' technique (Intubation – SUR fact ant administration - Extubation) OR LISA(Least Invasive Surfactant Therapy) in the selected new born**.** Surfactant were administered and only those who needed ventilatory support for various complications were further mechani cally ventilated**.**

Statistical analysis

Data was entered in windows excel format. Frequency tables and measures of central tendency (mean) and measures of dispersion (Standard deviation) were obtained by using the statistical package SPSS software. Outcome variables with a p-value less than

0.05 were selected and cross-tabulation was done to determine the strength and direction of the association between variables.

Results

Table 1: Distribution of study subjects according to outcome.

Outcome	Number	Percentage (%)
Discharge	86	72
Death	34	28
Total	120	100

Graph 1: Distribution of study subjects according to outcome.

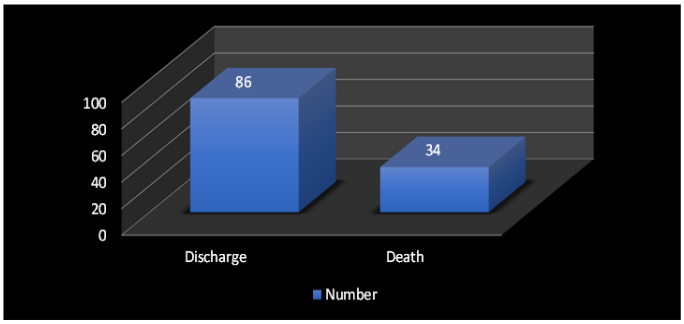


Table 2: Correlation between weight (gm) and outcome.

Weight (gm)	Discharge	Percentage (%)	Death	Percentage (%)	p value
500-750	1	1	10	8	0.0001
751-1000	16	13	7	6	
1001-1250	18	15	6	5	
1251-1500	22	18	7	6	
>1500	28	23	4	3	

Graph 2: Correlation between weight (gm) and outcome.

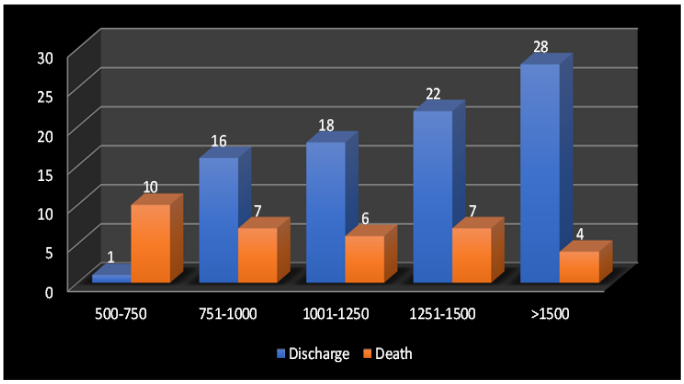


Table 3: Correlation between Gestational age (weeks) and outcome.

Gestational age(weeks)	Discharge	Percentage (%)	Death	Percentage (%)	p value
24-27	5	4	10	8	0.0001
28-30	28	23	19	16	
31-34	53	44	5	4	

Graph 3: Correlation between Gestational age (weeks) and outcome.

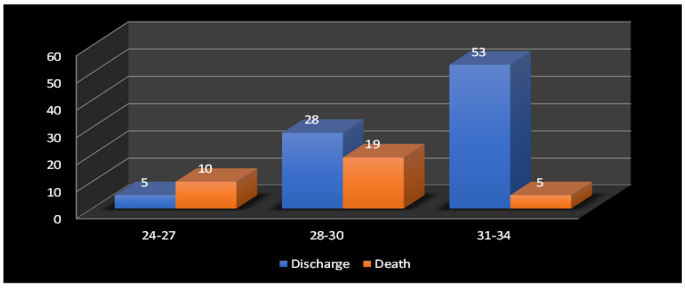


Table 4: Correlation between Time of Surfactant Therapy and outcome.

Time of Surfactant Therapy	Discharge	Percentage (%)	Death	Percentage (%)	p value
Early	45	38	16	13	0.0073
Late	41	34	18	15	

Graph 4: Correlation between Time of Surfactant Therapy and outcome.

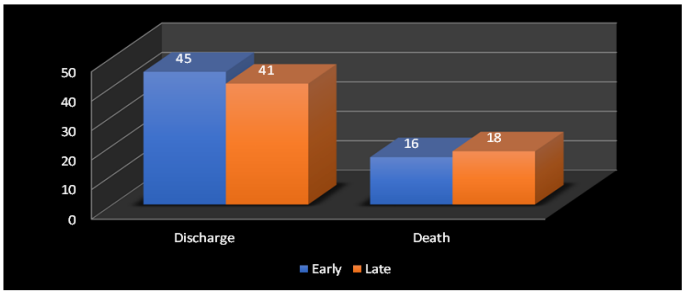


Table 5: Correlation between type of Surfactant Therapy and outcome.

Type of Surfactant	Discharge	Percentage (%)	Death	Percentage (%)	p value
Survanta	54	45	24	20	0.5253
Neo surf	32	27	10	8	

Graph 5: Correlation between type of Surfactant Therapy and outcome.

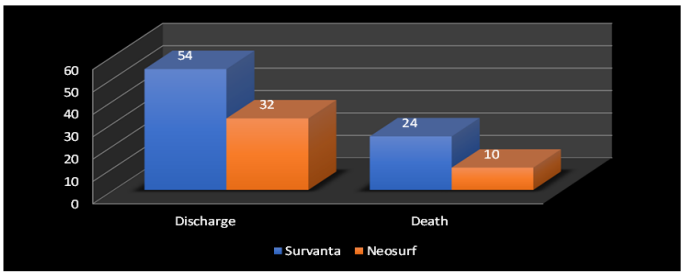
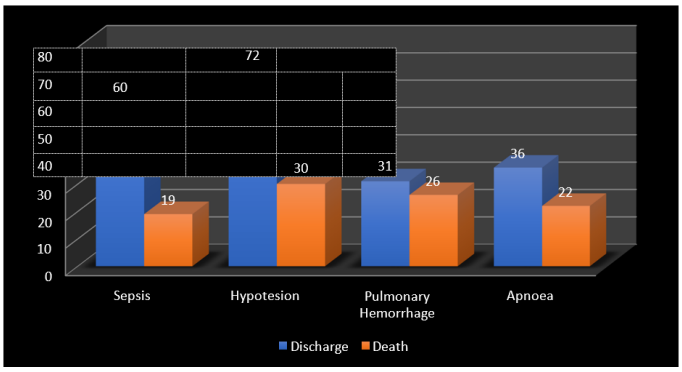


Table 6: Correlation between complications and outcome among new-born treated with surfactant replacement therapy.

Compilations	Discharge	Percentage(%)	Death	Percentage (%)	p value
Sepsis	60	50	19	16	0.1657
Hypotension	72	60	30	25	0.7771
Pulmonary Haemorrhage	31	26	26	22	0.0001
Apnoea	36	30	22	18	0.0273

Graph 6: Correlation between complications and outcome among new-born treated with surfactant repla cement therapy.



Discussion

In the present study 86 (72%) study cases were survived and discharged after treatment while 34 (28%) were died. Phuljhekle S et al[24] in their study found that among overall patient outcome only 24 babies had intact survival after surfactant therapy and 76 succumbed (to RDS and/or other co-morbidities). The survival rate in the study done Naidu J et al[25] was 53.7%,in the study by Hemasree et al[26] it was 86.1%, in the study of Verder et al[27] it was 57%,in the study of Reininger et al[28] it was 50%.Prasad M et al[29] in the similar study mentioned that overall outcome Of the 150 study subjects who were given surfactant is tabulated, among them 68(45.3%) were died and 82(54.7%) have been discharged.

Among babies with weight 500 to 750 gm 1 was discharged while 10 (8%) were died, among babies with weight 751 to 1000 gm 16 (13%) were was discharged while 7 (6%) were died, among babies with weight 1001 to 1250 gm 18 (15%) were was discharged while 6 (5%) were died, among babies with weight 1251 to 1500 gm 22 (18%) were was discharged while 7 (6%) were died while among babies with weight more than 1500 gm 28 (23%) were discharged and 4 (3%) were died. Phuljhele S et al24 mentioned that the babies with birth weight above 650grams were having risks or clinical features of RDS, birth weight bands were (85-89% for 650-1200gms, while 50-57% for >1200 gms; For the association between weight of baby and outcome p value was 0.013).Naidu J et al129 in the similar study stated that majority of preterm in present study group had a birth weight of 1500-1799gms (40%), those between 1250-1499gms are (36.7%) and those between 1000-1249 accounting for 23.30%.

The 5 (4%) babies with gestational age between 24 to 27 weeks were discharged while 10 (8%) were died. The 28 (23%) babies with gestational age between 28 to 30 weeks were discharged while 19 (16%) were died. The 53 (44%) babies with gestational age between 31 to 34 weeks were discharged while 5 (4%) were died. Phuljhele S et al[24] in their study mentioned that out of total hundred eligible preterms between 24-34 weeks gestational age had risks or clinical features of RDS, gestation age subgroups (all died with 24-27 weeks prematurity, while less mortality(86.7%) in 28-30wks, and least 52.6% was seen in 31-34wks maturity groups; p=0.00005).Naidu J et al[25] in their study mentioned that mortality was higher among 28-30 wks. gestational age group in the present study(50%) which is comparable to 50% in a study by Anil Narang et al[30].

The association between early and late administration of SRT was significantly associated with outcome (p value 0.0073).

After differencing babies under study for type of surfactant given we observed that 54 (45%) babies given Survanta were discharged and 24 (20%) were died. Among the babies given Neo surf 32 (27%) were discharged and 10 (8%) were died. The difference between type of surfactant and outcome was significant p value 0.5253.

The complications seen in the present study was sepsis, hypotension, pulmonary hemorrhage, apnoea. Among babies with sepsis 60 (50%) were discharged and 19 (16%)were died p value was 0.1657. Among babies with hypotension 72 (60%) were discharged and 30 (25%) were died p value was 0.7771. Among babies with pulmonary hemorrhage 31 (26%) were discharged and 26 (22%) were died p value was 0.0001. Among babies with apnoea 36 (30%) were discharged and 22 (18%) were died p value was 0.0273.Phuljhele S et al[24] mentioned that Among our study subjects, total 77% babies had features of sepsis with culture positive septicemia documented in 68 % (68/100), culture negative or only clinical sepsis was found in 9% patients (n=9) and only 23% babies (n=23) had no clinical/proven sepsis till their hospital stay. Among immediate complications encountered in our study, 15% patients suffered pulmonary hemorrhage, 30% had hypotension and 11% had apnea. Prasad M et al[29] stated that in their study out of the 150 babies 2 babies (1.3%) had air leak as complication, 22(14.7%) had apnea,1 baby (0.7%) had BPD/CLD,16(10.7%) had hypotension,1 baby (0.7%) had IVH,25 babies (16.7%) had pulmonary hemorrhage as complication, and the remaining 83(55.3%) had no complications.

conclusion

Among all 72% babies were discharged while 28% were died. The difference between weight of baby for outcome was significant (p value 0.0001). Survival rate increased along with increasing weight of baby. The difference between gestational age of baby for outcome was significant (p value 0.0001). Survival rate increased along with increasing gestational age of baby. Time of surfactant therapy was significantly associated with outcome (p value 0.0073). Type of surfactant was not significantly associated with outcome (p value 0.5253). SRT is an effective, safe and feasible intervention in tertiary care center neonatal units and has the potential to reduce neonatal mortality. The maximum impact on survival was seen among the preterm babies and babies with lowbirth weight.

References

1. Engle WA. Surfactant-replacement therapy for respiratory distress in the preterm and term neonate. Pediatrics. 2008 Feb 1;121(2):419-32.DOI: https:// doi. org/ 10.1542/peds.2007-3283

2. Suresh GK, Soll RF. Overview of surfactant repla cement tri- als. J Perinatol. 2005 May;25(2):S40-4.DOI: https://doi.org/10.1038/sj.jp.7211320

3. Polin RA, Carlo WA. Surfactant replacement therapy for preterm and term neonates with respiratory distress. Pedi- atrics. 2014 Jan 1;133(1):156-63.DOI: https://doi.org/10.1542/peds.2013-3443

4. Bellos I, Fitrou G, Panza R, Pandita A. Comparative effica- cy of methods for surfactant administration: a network meta-analysis. Arch Dis Child Fetal Neonatal Ed. 2021 Jan

14. DOI: http://dx.doi.org/10.1136/archdischild-2020-319763

5. Kendig JW, Ryan RM, Sinkin RA, Maniscalco WM, Notter RH, Guillet R, et al.

Comparison of two strategies for sur- fact ant prophylaxis in very premature infants: a multicenter randomized trial. Pediatrics. 1998 Jun 1;101(6):1006-12. DOI: https://doi.org/10.1542/peds.101.6.1006

6. Rojas-Reyes MX, Morley CJ, Soll R. Prophylactic versus select- tive use of surfactant in preventing morbidity and mortality in preterm infants. Cochrane Database Syst Rev. 2012, Issue 3. Art. No.: CD000510. DOI: 10.1002/14651858.CD000510.pub2

7. Kansakar P, Shrestha N, Prajapati A, Chalise SP, Mishra SK. Outcome of Surfactant replacement therapy for respiratory distress syndrome in preterm babies. Journal ofNepal Paediatric Society. 2022 Nov 27; 42 (1): 97-101.

8. Hock Heim K. Uber einige befunde in den Lungen von Neuegeborenen und die Bezehehung derselben zur Aspiration von Fruchtwasser. Centralbl Pathol 1903; 14: 537-8

9. Gitlin D, Craig JM. The nature of the hyaline membrane in asphyxia of the new- born. Pediatrics 1956; 17: 64-71

10. Avery ME, Mead J. Surface properties in relation to atelectasis and hyaline mem- brane disease. Am J Dis Child 1959; 97: 517-23

11. Ainsworth SB, Milligan DW. Surfactant therapy for respiratory distress syndrome in premature neonates: a comparative review. American Journal of Respiratory Medicine. 2002 Dec;1:417-33.

12. Suresh GK, Soll RF. Overview of surfactant replacement trials. Journal of perinatology. 2005 May; 25 (2): S40-4.

13. Philip AG. Neonatal mortality rate: is further improvement possible?. The Journal of Pediatrics. 1995 Mar 1;126(3):427-33.

14. Soll RF, Morley CJ. Prophylactic versus selective use of surfactant in preventing morbidity and mortality in preterm infants. Cochrane Database Syst Rev. 2001; (2): CD 000510

15. Dunn MS, Kaempf J, de Klerk A, de Klerk R, Reilly M, Howard D, Ferrelli K, O'Conor J, Soll RF, Vermont Oxford Network DRM Study Group. Randomized trial comparing 3 approaches to the initial respiratory manage ment of preterm neonates. Pediatrics. 2011 Nov; 128 (5):e1069-76.

16. Escobedo MB, Gunkel JH, Kennedy KA, et al Texas Neonatal Research Group. Early surfactant for neonates with mild to moderate respiratory distress syndrome: a multicenter, randomized trial. J Pediatr. 2004; 144 (6): 80 4–808.

17. Polin RA, Carlo WA, Committee on Fetus and New- born, Papile LA, Polin RA, Carlo W, Tan R, Kumar P, Benitz W, Eichenwald E, Cummings J. Surfactant replacement therapy for preterm and term neonates with respiratory distress. Pediatrics. 2014 Jan;133(1):156-63.

18. Soll RF. Early versus delayed selective surfactant treatment for neonatal respiratorydistresssyndrome. N

19. Hellström-Westas L, Svenningsen NW, Bell AH, Skov L, Greisen G. Cerebroelectrical depression follow ing surface- tant treatment in preterm neonates. Pediatrics. 1992 Apr 1; 89 (4): 643-7. DOI: https:// doi. org/ 10.1542/peds.89.4.643

20. Canadian Paediatric Society, Fetus and New-born Committee. Recommendations for neonatal surfactant therapy. Paediatr Child Health. 2005 Feb 22; 10 (2): 109-16. DOI: https://doi.org/10.1093/pch/10.2.109

21. Shrestha L, Shrestha P. Mortality and Morbidity Pattern of Preterm Babies at Tribhuvan University Teaching Hospital. J Nepal Paediatr Soc. 2013 Sep 1; 33 (3). DOI: 10.3126/jnps.v33i3.9200

22. Yadav SK, Giri A. Safety of Early Rescue Surfactant Replacement Therapy for Preterm Neonates with Respiratory Distress Syndrome at Neonatal Intensive

Care Unit of a Tertiary Hospital. J Nepal Paediatr Soc. 2019 Dec 31;39(3):162-7. DOI: 10.3126 /jnps. v39i3. 27321

23. Ganesh BK, Sudhir A, Eva G. Experience of Surfactant Ther- apy and Outcome in Preterm Neonates with Respiratory Distress Syndrome. Med Phoenix. 2019 Sep 23;4(1):31-5.

24. Phuljhele S, Rathia SK, Chukka Akal JK. Com parison of survival outcome in early versus late surfactant therapy in preterm neonates with respiratory distress

syndrome at a tertiary care centre: A randomized control trial (Open). Int J Med Res Rev. 2017;5(07):754-64.

25. Naidu J. Kireeti AS, Lokesh B, Dudala SR. Study Of The Outcome Of Early And Late Rescue Surfactant Administration In Preterm Babies. Asian Journal of Health Sciences. 2014 Dec 31;2(2).

26. Hemasree Kandraju a Srinivas Murki a Sreeram Subramanian a Pramod Gaddam a Ashok Deorari b Praveen Kumar c. Early Routine versus Late Selective Surfactant in Preterm Neonates with Respiratory Distress Syndrome on Nasal Continuous Positive Airway Pressure: A Randomized Controlled Trial. Neonatology 2013; 103:148–154.

27. Verder H, Albertsen P, Ebbesen F: Nasal continuous positive airway pressure and early surfactant therapy for respiratory distress syndrome in new-borns of less than 30 weeks' gestation. Pediatrics 1999; 103:E24.

28. Reininger A, Khalak R, Kendig JW: Surfactant administration by transient intubation in infants 29 to 35 weeks' gestation with respiratory distress syndrome decreases the likelihood of later mechanical ventilation: a randomized controlled trial. J Perinatol 2005; 25: 703–708.

29. Prasad M. Harsha KS. Outcomes Of Surfactant Therapy In New-borns With Respiratory Distress Syndrome In Relation To Age Of Presentation To NICU Of MGM Hospital. European Journal of Molecular & Clinical Medicine.;9(07):2022.

30. Narang A, Praveen Kumar P et al., Surfactant therapy for hyaline membrane disease .Indian Pediatrics 2001; 38:640-646.