

ROLE OF SURFACTANT ADMINISTRATION IN PREMATURE INFANTS WITH ACUTE RESPIRATORY DISTRESS SYNDROMEY. Vamseedhar¹, Y. Praveen Raju², Ch. Rama Mohan³**HOW TO CITE THIS ARTICLE:**

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ABSTRACT: BACKGROUND: The significant advancement in the treatment of acute respiratory distress syndrome can be attributed to prenatal identification of high risk pregnancies, prevention of illness through antenatal care, prenatal administration of glucocorticoids, advancement in respiratory support and surfactant therapy. These measures resulted in the reduction of mortality and morbidity rates in preterm infants. **AIM OF THE STUDY:** To find the efficacy of surfactant therapy in relation to time of administration. **MATERIALS AND METHODS:** We analyzed data of 122 preterm babies with Acute respiratory distress syndrome (ARDS) hospitalized in the Special Neonatal Care Unit (SNCU) of the Pediatric Department, Rajiv Gandhi Institute of Medical Sciences (RIMS), Kadapa, A. P., India. **RESULTS:** We investigated the clinical efficacy of surfactant therapy in relation to the time of administration and found that early treatment with surfactant is more effective and resulted in highly significant reduction of mortality rate ($p < 0.01$). **CONCLUSION:** Surfactant therapy is beneficial in preterm babies with acute respiratory distress syndrome (ARDS). So a reasonable recommendation is to treat the infants with surfactant as soon as the clinical signs of respiratory distress appear.

KEYWORDS: Infants, Glucocorticoids, Acute Respiratory Distress Syndrome (ARDS), surfactant, preterm.

INTRODUCTION: Surfactant is a naturally produced substance in the lungs and it is a kind of foamy, fatty liquid that acts like grease within the lungs. Without surfactant the air sacs in the lungs have difficulty staying open because they stick together. Surfactant allows the air sacs to remain open. Surfactant usually appears in the fetus lungs at about the 24th week of pregnancy and gradually builds up to its full level by the 37th week.

If a premature baby is lacking surfactant, artificial surfactant may be given. Surfactant is delivered using an artificial airway or breathing tube that is inserted into the trachea or windpipe, either immediately at birth for extremely premature babies or later once respiratory problems has revealed themselves. Surfactant is administered through the windpipe over the course of a few minutes. During this time, the baby will be turned and moved in an effort to distribute the surfactant to all parts of the lung. Depending on the severity of the lung condition, surfactant may be administered more than once.

Surfactant replacement therapy cannot begin until breathing has been stabilized, perhaps with mechanical ventilation, and the proper monitoring equipment has been set up. Preterm birth is the birth of baby before 37 completed weeks. As per the fact sheet by WHO¹ updated in November 2014, every year, an estimated 15 million babies are born preterm (before 37 completed weeks of gestation), and this number is rising. Of 65 countries with reliable trend data, all but 3 countries show an increase in preterm birth rates over the past 20 years.

Possible reasons for this include better measurement, increase in maternal age, underlying maternal health problems such as diabetes and high blood pressure, greater use of infertility

ORIGINAL ARTICLE

treatments leading to increased rates of multiple pregnancies, and changes in obstetric practices such as caesarian births before term. Across 184 countries, the rate of preterm birth ranges from 5% to 18% of babies born. Preterm birth complications are the leading cause of death among children below 5 years of age, responsible for nearly 1 million deaths in 2013.

Infant survival rate increases if the first dose of surfactant was given as soon as diagnosis of severe acute respiratory distress syndrome was established that is within 6 hours from birth.²

Respiratory distress syndrome, hyaline membrane disease, hyposurfactosis are the most common conditions in preterm infants, appearing in approximately 60% of infants born before 30 weeks gestation. The main cause of the disease is inadequate amount of lung surfactant. Surfactant replacement reduces mortality and morbidity rates in premature infants, reduces duration of ventilatory support, number of complications and medical costs. Surfactant therapy is not a substitute for an attempt to increase lung maturity by delaying premature delivery or by using antenatal corticosteroids with the aim of preventing ARDS.³⁻⁷

Many studies regarding surfactant therapy have been undertaken in the past.⁸⁻¹⁰ Prophylactic surfactant replacement is given to preterm neonates who are at high risk of developing acute ARDS in the delivery room, shortly after resuscitation, as they start to breathe. Rescue therapy refers to treatment given after the diagnosis is established, 2 to 24 hours after birth.^{5,11-13} Most centers use rescue therapy as the mode of treatment. Each regime increases oxygenation of ventilated preterm babies and reduces mortality and morbidity rates. This correlates with a significant reduction of medical costs.¹⁴⁻¹⁶ the aim of this study was to find the efficacy of surfactant therapy in relation to time of administration.

MATERIALS AND METHODS: The investigation included 122 preterm infants with Acute Respiratory Distress Syndrome Hospitalized in the Special Neonatal Care Unit (SNCU) of the Pediatric Department, Rajiv Gandhi Institute of Medical Sciences (RIMS), Kadapa, A. P., India. The investigated infants were divided into four subgroups, depending on the time of treatment they received, Group-A being the patients who received the dose of surfactant within 12 hours of birth, Group-B between 12- 24 hrs of birth, Group-C between 24 -72 hrs of birth and Group-D not given Surfactant therapy. The data was entered through Microsoft Excel 2010 software and Chi Square test was used for qualitative data.

STUDY PERIOD: Jan. 2014 to Dec. 2014.

INCLUSION CRITERIA: All the preterm babies admitted during the study period in special neonatal care unit of the department of Pediatrics, Rajiv Gandhi Institute of Medical Sciences (RIMS), Kadapa, A. P., India. Preterm babies based on New Ballard scoring are selected with maturity below 34 weeks of gestation. Preterm babies with RR>60/min are taken. Babies Grunting with Chest X-ray Suggestive of Hyaline Membrane disease are taken.

EXCLUSION CRITERIA: All border line term babies more than or equal to 35 weeks of gestation are omitted from the study.

RESULTS: Table 1 shows the outcome of illness of Group-A, Group-B, Group-C when compared with Group-D. We found that there is a highly significant difference between Group-A and Group-D ($p < 0.01$). In the study group which received surfactant within 12 hours of birth, 77.78% of infants survived. There is a significant difference between Group-B and Group-D ($p < 0.05$).

ORIGINAL ARTICLE

In the study group which received surfactant between 12-24 hours of birth, 72.73% of infants survived. There is no significant difference between Group-C and Group-D ($p > 0.05$). In the study group which received surfactant between 24-72 hours of birth, 60.00% of infants survived where as in not surfactant therapy group only 41.94% of infants survived.

Treatment	Survived (%)	Died (%)	Total (%)	P-Value
Group-A (Surfactant < 12 hrs)	14(77.78)	4(22.22)	18(100)	0.007(<0.01)*
Group-B (Surfactant between 12-24 hrs)	16(72.73)	6(27.27)	22(100)	0.013(<0.05)**
Group-C (Surfactant between 24-72 hrs)	12(60.00)	8(40.00)	20(100)	0.159(>0.05)***
Group-D (Not given Surfactant)	26(41.94)	36(58.06)	62 (100)	
Total	68	54	122(100)	

*Highly significance, ** significance, ***Not significance

Table 1: Outcome of illness in relation to time of surfactant therapy

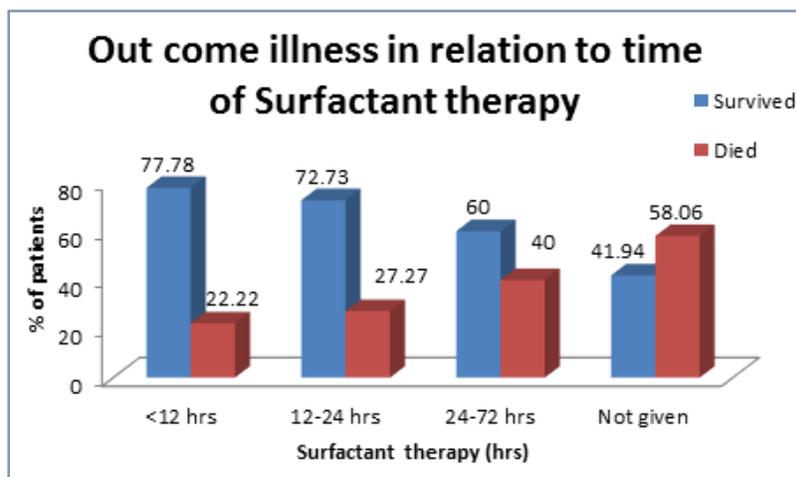


Chart 1

Table 2 shows that the outcome of illness between Surfactant therapy group and not Surfactant therapy group. Statistically there is a highly significant difference between Surfactant treatment group and not given surfactant treatment group ($p < 0.01$). In the study group which received surfactant therapy, 70.00% of infants survived where as in not surfactant therapy group only 41.94% of infants survived.

Treatment	Survived (%)	Died (%)	Total (%)
Surfactant	42(70.00)	18(30.00)	60(100)
Not given Surfactant	26(41.94)	36(58.06)	62 (100)
Total	68	54	122(100)

$\chi^2 = 9.73$ for 1 degrees of freedom and
P- Value is 0.002(<0.01), Highly Significant

Table 2: Outcome of illness in relation to time of Surfactant dose

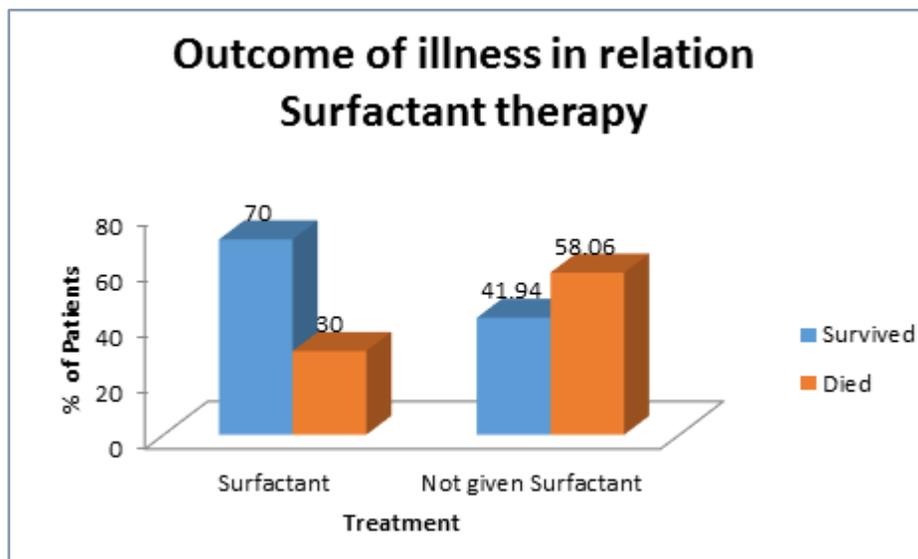


Chart 2

DISCUSSION: Many clinical trials, carried out during the 80s and 90s, showed that surfactant use in preterm infants significantly reduces mortality rate and complications which occurred within 28 days of birth.^{11,14} Our study, conducted on 122 preterm babies, showed that the overall percentage of survival in infants treated with surfactant was 70.00%. In most of the studies, treatment of ARDS with surfactant started between 2-4 hours after birth outside delivery room or in the delivery room within 15 minutes of birth after stabilization of the baby.^{9,17,18}

Ismeta Kalkan et.al.,² discussed that the first dose of surfactant was given as soon as diagnosis of severe Acute respiratory distress syndrome was established that is within 6 hours from birth (Early treatment) and after 6 hours (Late treatment). In their study group which received surfactant within 6 hours of birth, 34 (out of 43) infants survived, compared with 17 (out of 35) infants who received surfactant 6 hours after birth or later ($p < 0.005$) and the results confirm the advantages of early treatment vs. late treatment.

It is correlated with our study the first dose of surfactant was given as soon as diagnosis of severe acute respiratory distress syndrome was established i.e. within 12 hours from birth (early treatment), between 12–24 hrs and between 24-72 hours (late treatment).

In the study group which received surfactant within 12 hours of birth, 14 i.e 77.80% of infants survived, received surfactant between 12-24 hrs of birth, 16 i.e 72.73% of infants survived, 12 i.e 60.00% of infants survived when surfactant received between the 24-72 hrs of birth, where as in group who did not receive surfactant only 41.94% of infants survived ($p < 0.01$).

Our results confirm the advantages of early treatment. So a reasonable recommendation is to treat the infants as soon as clinical signs of developing respiratory distress appear. Waiting for the complete clinical picture to develop before commencing treatment will minimize the effect of surfactant therapy.^{19,20}

The treatment in the delivery room should be reserved for the smallest infants with the highest risk for developing acute ARDS and should be given by a person experienced in neonatal resuscitation and surfactant administration.²¹

ORIGINAL ARTICLE

CONCLUSION: Treat the infants as soon as clinical signs of developing respiratory distress appear. Waiting for the complete clinical picture to develop before commencing treatment will minimize the effect of surfactant therapy.

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ORIGINAL ARTICLE

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