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The Incidence of Respiratory Distress Syndrome among Preterm Infants Admitted to Neonatal Intensive Care Unit: A Retrospective Study

Maryam Saboute[1], Mandana Kashaki[1], Arash Bordbar[1], Nasrin Khalessi[2*], Zahra Farahani[3]

[1]Department of Pediatrics, Akbarabadi Hospital, Iran University of Medical Sciences, Tehran, Iran
[2]Department of Pediatrics, Ali Asghar Hospital, Iran University of Medical Sciences, Tehran, Iran
[3]Maternal Fetal and Neonatal Research Center, Tehran University of Medical Sciences, Tehran, Iran
Email: *nasrinkhalessi@yahoo.com

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Abstract

Background: Respiratory distress syndrome (RDS) or hyaline membrane disease (HMD) is the most common cause of neonatal morbidity and mortality in preterm infants. We aimed to determine the frequency of RDS among 3 groups of preterm infants and the value of some related factors. Methods: A cross-sectional, descriptive analytical investigation was carried out in the NICU ward of Akbarabadi Hospital (Tehran-Iran) during spring 2011. Newborns' data were collected and assessed by using their hospital medical records. Seventy-three preterm infants with gestational age < 34 weeks were hospitalized in the NICU. All participants were divided into 3 groups: extremely preterm (<28 weeks), very preterm (28 to <32 weeks) and moderate preterm (32 to 34 weeks). Frequency of RDS and some related factors were compared among 3 groups. Results: RDS was observed in 65.6% of all participants; however frequency of RDS was not different between three groups. An inversely correlation was found between gestational age and mortality rate (p = 0.05). In regard to Betamethasone administration prior to birth, this interval was significantly longer in alive neonates in comparison to infants who died (p < 0.05). Conclusion: RDS was frequent in preterm neonates with gestational age < 32 weeks. Time of Betamethasone administration prior to birth can significantly influence on neonatal mortality rate.

Keywords

Respiratory Distress Syndrome, Neonatal Intensive Care Unit, Preterm Infant, Mortality Rate

*Corresponding author.

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1. Introduction

Respiratory distress syndrome (RDS) or hyaline membrane disease (HMD) is a main cause of morbidity and mortality in the early neonatal period. Related to the degree of prematurity, it occurs in 7% - 50% of neonates. It is also responsible for 30% - 40% of newborns' hospital admission. The significant cause of RDS is deficiency of alveolar surfactants due to immaturity of Type II pneumocyte, resulting low compliance of lungs, alveolar surface tension, decreased gas exchange and a demand for high ventilatory pressures. The clinical manifestation of RDS includes apnea, cyanosis, grunting, inspiratory stridor, nasal flaring, poor feeding, tachypnea, retractions in the intercostals, subcostal, or suprasternal spaces. These signs and symptoms are present at birth or shortly afterwards with getting worse over the first 48 - 72 hours of infant's life [1]-[5].

Before 1960 oxygen therapy was the only treatment for infants born with RDS. Continuous positive airway pressure (CPAP) was designed in the early 1970's and antenatal corticosteroids were introduced in 1972. After 1990 Surfactant treatment, new ventilators and developed ventilation techniques were the last treatments which dramatically improved the outcomes of infants with RDS [6].

Preterm labor is the most common problem (7% to 10% of deliveries) lead to the neonatal death in the second half of pregnancy and RDS is the most common cause of neonatal morbidity and mortality in preterm infants [7] [8]. Many studies confirmed an inverse relationship between RDS and gestational age [9] [10]. In contrary much progress in perinatal care, respiratory disrtress syndrome still remains a major neonatal problem [11]. In the present study we aimed to determine the incidence of RDS between 3 groups of preterm infants (extremely, very and moderate) then we assessed the value of some related factors.

2. Method and Material

A cross sectional, descriptive analytical investigation was performed at the NICU ward of Akbarabadi Hospital; a tertiary referral center and also one of the teaching hospitals affiliated to Iran University of Medical Sciences (Tehran-Iran) during spring 2011.

Infants with gestational age ≤ 34 weeks who admitted to the NICU for at least a day due to RDS from April 1, 2011 to June 31, 2011 entered the study. Exclusion criteria were missing data, congenital malformation and RDS accompanied by other complications. The charts of all infants were studied by using their hospital medical records and newborns' data were collected. The basic information including sex, weight, height, head and chest circumference, history of RDS, treatment (mechanical ventilation), prevention (betamethasone administration prior birth), complications (mortality) and some para clinical data (cranial ultrasound finding) were gathered and recorded in some check lists. RDS diagnosis had been established based on clinical symptoms and chest X-ray findings. To determine the association between RDS and mother's preeclampsia, simultaneously we assessed maternal obstetric medical records. All preterm subjects were divided into 3 groups based on WHO identification [12]; extremely preterm (<28 weeks), very preterm (28 to <32 weeks) and moderate preterm (32 to 34 weeks). Finally we compared frequency of RDS among 3 groups and evaluated correlations between some related factors, as well. The software package SPSS version 19 was used to perform the statistical analysis. The Student's T test, Chi Square and Mann-Whitney analysis were applied where applicable. With the proposed sample size of 78, the study had a power of 80%. The level of significant was considered $p < 0.05$.

Patients' data were considered secret and as no intervention was carried out in our study, we did not ask for patients consent. Ethics approval for the study was obtained from the institutional review board of Iran University of Medical Sciences.

3. Result

Of 78 NICU admitted preterm neonates (≤34 weeks), 5 newborns were excluded due to missing data, severe cardiac congenital anomalies, RDS accompanied by sepsis and meconium aspiration syndrome. The target population consisted of 73 preterm neonates of three groups (extremely preterm, very preterm and moderate preterm). Mothers of 7 neonates (9.58%) had preeclampsia. Cranial ultrasound had been performed for 24 cases. All demographic data are shown in **Table 1**.

A positive relationship was seen between anthropometric measurements and gestational age. Of all participants, 42 cases (65.6%) with mean birth weight 1464.7619 ± 478.05622 gram suffered from RDS. Although no significant correlations were seen among 3 groups' gestational age and RDS ($p = 0.207$), this syndrome was

Table 1. Demographic characteristics of all participants.

Variables	n (%)
Type of delivery	
C/S	40 (54.5)
NVD	33 (45.5)
Sex	
Male	45 (61.9)
Female	28 (38.1)
Weight	
<1000	12 (16.4)
1000 - 1500	38 (52.5)
>1500	22 (30.1)
G/age	
<28 week	13 (17.8)
28 - 32 week	38 (52.1)
32 - 34 week	22 (30.1)
Mechanical ventilation	
No	48 (56.9)
Yes	25 (43.1)
Mother's preeclamsia	7 (9.58)
Cranial ultrasound	
Normal	24
Abnormal	2

Table 2. Comparison of factors between 3 groups.

Age	Weight Mean ± SD gr	HC Mean ± SD Cm	CC Mean ± SD Cm	Length Mean ± SD Cm	RDS n (%)	Mortality n (%)	Duration of hospitalization Mean ± SD (days)
<28 week	1020 ± 238.88	25.77 ± 1.69	22.27 ± 2.41	36.54 ± 2.54	$\frac{8}{13}$ (61)	$\frac{10}{13}$ (76)	27 ± 20.99
28 - 32 week	1421.57 ± 257.5	28.10 ± 10.71	24.75 ± 2.25	40.49 ± 3.65	$\frac{24}{38}$ (63)	$\frac{13}{38}$ (34)	13.71 ± 11.86
32 - 34 week	2049.09 ± 326.25	30.97 ± 1.16	27.9 ± 1.70	46.52 ± 2.66	$\frac{10}{22}$ (45)	$\frac{3}{22}$ (13)	13.33 ± 8.30
P value	0.00*	0.00*	0.00*	0.00*	0.207	0.05*	0.122

HC: head circumference, CC: Chest circumference.

more frequent in two groups with gestational age < 32 weeks than neonates with gestational age 32 - 34 weeks (61% - 63% vs. 45%). An inversely significant correlation was observed between gestational age and mortality rate (p = 0.05, r = 0.01); 76.9% of extremely preterm neonates died in neonatal period. No relationship was found between RDS and sex or birth weight of neonates (p = 0.317, 0.065). Neonatal mortality did not differ among 2 genders (male; 56.5%, female 43.5%, p value = 0.137), as well. Although extremely preterm neonates had longer hospitalization period in compare to those in other groups, this difference was not significant (p value = 0.122) (**Table 2**). In regard to single dose Betamethasone administration in admission time prior to child birth, there was no statistically significant difference between healthy neonates and cases with RDS (17.56 ± 30.57 vs. 22.44 ± 41.17 hours; p value = 0.676). On the other hand interval between corticosteroids administration and birth was significantly longer in alive neonates in compare to infants who died (27.92 ± 46.42, 9.35 ± 11.98 hours, p = 0.048). No correlation was also found between time of Betametasone administration and need for mechanical ventilation (p value = 0.286). The correlation between preeclampsia and RDS was not statistically

significant (p = 0.38). Mann-Whitney Test also showed no association between abnormal brain finding via ultrasound examination and gestational age (p value = 0.067).

4. Discussion

As the majority of RDS cases occur in preterm infants, obstetric and neonatal strategies are needed to prevent premature delivery and its related morbidity and mortality [1]. In the present study we have reviewed the incidence of respiratory distress in preterm infants. Based on our results 65.6% of population study had history of RDS which is higher than that were reported by previous studies. Zhang pointed to 50% as the incidence of RDS in preterm infants born before 30 weeks of gestation [4]. Khattab also reported Respiratory distress syndrome in 30% - 40% as the cause of admission in the neonatal period [3]. RDS was also shown in 23% of neonates admitted to the NICU with gestational age > 28 wks by Arit *et al*. [13]. Caner *et al*. indicated the incidence of RDS in 40.6% of 613 premature infants who admitted to the neonatal intensive care unit [14]. The reasons for these differences in the epidemiology may relate to differences in the categorized gestational age of participant.

No significant correlations were observed between 3 groups' gestational age and frequency of RDS that may due to our small sample size. RDS was more frequent in neonates with gestational age < 28 and 28 - 32 weeks by 61% - 3% and in newborns 32 - 34 weeks by 45%. This finding showed that all preterm infants with gestational age ≤ 34 weeks are at approximately equal risk for RDS.

Results showed an inversely correlation between gestational age and mortality rate. In compatible to our results Arit demonstrated much of the mortality rate in neonates with low gestational age and low birth weight [13]. Fidanovski also detected higher risk of mortality in infants with lower birth weight and shorter gestational age in 126 premature infants hospitalized at Pediatric Intensive Care Unit [15].

According to the findings a longer term interval between corticosteroids administration and birth (27.92 ± 46.42 hours) significantly reduced mortality rate ($p < 0.05$). In consistent to our results, Morris *et al*. showed that antenatal corticosteroids prior to premature delivery have had a crucial impact on neonatal mortality. They reported the greatest benefit in neonates born between 1 and 7 days after receiving corticosteroids [1].

Several studies assessed the incidence of RDS in preterm infants but our study suggests that respiratory distress from any cause may occur in more than half of preterm infants with gestational age ≤ 34 weeks. More over this report provides evidences that RDS may relate other important factors like neonate's weight, apgar score, mode of delivery. However we suggest this topic should be considered in future studies. On the other hand this study had some limitations. The number of our sample size was too small. We did not consider some other factors like apgar score, surfactant replacement therapy, number of antenatal corticosteroids doses administered prior to birth. Several relevant clinical data were not available in the neonates' hospital records that certainly affected on our results.

5. Conclusion

RDS was frequent in preterm neonates with gestational age < 32 weeks. Time of Betamethasone administration prior to birth can significantly influence on neonatal mortality rate. Focus on predicting RDS and risk factors have the potential effects on RDS incidence.

Conflict of Interest

The authors declare that there is no conflict of interests.

References

[1] Morris, I. and Adappa, R. (2012) Minimizing the Risk of Respiratory Distress Syndrome. *Paediatrics and Child Health*, **22**, 513-517. http://dx.doi.org/10.1016/j.paed.2012.08.012

[2] Edwards, M.O., Sarah, J. and Kotecha, S.K. (2013) Respiratory Distress of the Term Newborn Infant. *Paediatric Respiratory Reviews*, **14**, 29-37. http://dx.doi.org/10.1016/j.prrv.2012.02.002

[3] Khattab, A. (2015) Tei index in Neonatal Respiratory Distress and Perinatal Asphyxia. *The Egyptian Heart Journal*, **67**, 243-248. http://dx.doi.org/10.1016/j.ehj.2013.12.084

[4] Zhang, L., Cao, H., Zhao, S., Yuan, L., Han, D., Jiang, H. and EI, A.L. (2015) Effect of Exogenous Pulmonary Surfactants on Mortality Rate in Neonatal Respiratory Distress Syndrome: A Network Meta-Analysis of Randomized Con-

trolled Trials. *Pulmonary Pharmacology & Therapeutics*. In Press, Accepted Manuscript, Available Online 18 August 2015.

[5] Varvarigou, A.A., Thomas, I., Rodi, M., Economou, L., Mantagos, S. and Mouzaki, A. (2015) Respiratory Distress Syndrome (RDS) in Premature Infants Is Underscored by the Magnitude of Th1 Cytokine Polarization. *Cytokine*, **58**, 355-360. http://dx.doi.org/10.1016/j.cyto.2012.03.005

[6] Jobe, A.H. (2012) What Is RDS in 2012? *Early Human Development*, **88S2**, 42-44.

[7] Stevens, T.P., Blennow, M. and Soll, R.F. (2004) Early Surfactant Administration with Brief Ventilation vs Selective Surfactant and Continued Mechanical Ventilation for Preterm Infants with or at Risk for RDS. *Cochrane Database of Systematic Reviews*, **3**, Article ID: CD003063.

[8] Atarod, Z., Taghipour, M., Roohanizadeh, H., Fadavi, S. and Taghavipour, M. (2014) Effects of Single Course and Multicourse Betamethasone Prior to Birth in the Prognosis of the Preterm Neonates: A Randomized, Double-Blind Placebo-Control Clinical Trial Study. *Journal of Research in Medical Sciences*, **19**, 715-719.

[9] Niknafs, P., Faghani, A., Afjeh, A., Moradinazer, M. and Bahman-Bijari, B. (2014) Management of Neonatal Respiratory Distress Syndrome Employing ACoRN Respiratory Sequence Protocol versus Early Nasal Continuous Positive Airway Pressure Protocol. *Iranian Journal of Pediatrics*, **24**, 57-63.

[10] Jing, L., Hai Ying, C., Hua-Wei, W. and Xiang, Y.K. (2015) The Role of Lung Ultrasound in Diagnosis of Respiratory Distress Syndrome in Newborn Infants. *Iranian Journal of Pediatrics*, **25**, e323.

[11] Gortner, L. and Tutdibi, E. (2011) Respiratory Disorders in Preterm and term Neonates: An Update on Diagnostics and Therapy. *Zeitschrift für Geburtshilfe und Neonatologie*, **15**, 145-151. http://dx.doi.org/10.1055/s-0031-1285835

[12] Torchin, H., Ancel, P.Y., Jarreau, P.H. and Goffinet, F. (2015) Epidemiology of Preterm Birth: Prevalence, Recent Trends, Short- and Long-Term Outcomes. *Journal de Gynécologie Obstétrique et Biologie de la Reproduction* (*Paris*), **44**, 723-731. http://dx.doi.org/10.1016/j.jgyn.2015.06.010

[13] Arit, P., Nighat, H., Zubair, A.K. and Abdul Sattar, Sh. (2015) Frequency, Causes and Outcome of Neonates with Respiratory Distress Admitted to Neonatal Intensive Care Unit, National Institute of Child Health, Karachi. *Journal Pakistan Medical Association*, **65**, 771-775.

[14] Caner, I., Tekgunduz, K.S., Temuroglu, A., Demirelli, Y. and Kara, M. (2015) Evaluation of Premature Infants Hospitalized in Neonatal Intensive Care Unit between 2010-2012. *The Eurasian Journal of Medicine*, **47**, 13-20. http://dx.doi.org/10.5152/eajm.2014.38

[15] Fidanovski, D., Milev, V., Sajkovski, A., Hristovski, A., Sofijanova, A., Kojić, L. and Kimovska, M. (2005) Mortality risk Factors in Premature Infants with Respiratory Distress Syndrome Treated by Mechanical Ventilation. *Srpski Arhiv za Celokupno Lekarstvo*, **133**, 29-35. http://dx.doi.org/10.2298/SARH0502029F