

Determining the Aetiology and Outcome of Respiratory Distress in Neonates Hospitalized in the Neonatal Intensive Care Unit (NICU)Shruti¹, Arunika Prakash², Manoj Kumar Singh³, Bhupendra Narain⁴¹Senior Resident, Upgraded Department of Pediatrics, Patna Medical College and Hospital, Patna, Bihar, India²Senior Resident, Upgraded Department of Pediatrics, Patna Medical College and Hospital, Patna, Bihar, India³Associate Professor, Upgraded Department of Pediatrics, Patna Medical College and Hospital, Patna, Bihar, India⁴Associate Professor and HOD, Upgraded Department of Pediatrics, Patna Medical College and Hospital, Patna, Bihar, India

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Conflict of interest: Nil

Abstract:**Aim:** The aim of the present study was to determine the frequency of the causes and outcomes of respiratory distress in neonates hospitalized in the neonatal intensive care unit (NICU).**Material & Methods:** In this descriptive and cross-sectional study, all the neonates with respiratory distress (RD), who were admitted at NICU Upgraded Department of Pediatrics were included. The study was conducted for the duration of one year. The required demographic information was extracted from patients' dossiers. The collected data were analyzed using SPSS version 16.0.**Results:** About 68% of 100 neonates with RD were male. The mean neonatal age and mean birth weight were 5.22±7.18 days and 2743.9±727.9 grams, respectively. The minimum birth weight was 850 grams while the maximum was 4,500 grams. According to the results, intercostal muscle retraction, tachypnea, grunting, cyanosis, apnea and nasal flaring were the most common symptoms of NRD while RDS and TTN were the most common causes of respiratory distress. Furthermore, about 20% of the neonates died of the disease. The outcomes of NRD had a significant correlation with respiratory failure requiring mechanical ventilation, apnea, multiple and concurrent of respiratory symptoms and mean duration of hospitalization (p<0.05). Therefore, the variables that significantly correlated with infant mortality entered logistic regression model.**Conclusion:** It was found that RDS is the most common cause of respiratory distress in the hospitalized neonates. Moreover, infant mortality rate increased due to respiratory failure requiring mechanical ventilation and occurrence of apnea. It was concluded that improving the care of newborns requires mechanical ventilation and prevention of apnea leads to better outcomes and reduced infant mortality rate.**Keywords:** Neonate, Outcomes, Respiratory Distress.This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

The neonatal period (first month of life) conveys the most prominent dangers of death in the human life expectancy. To study neonatal mortality, it is required to know causes of disease, its distribution and transmission cause of death. [1] The most important cause of neonatal morbidity and mortality is respiratory distress (RD). Respiratory disorders are the most frequent causes of admission to the special care nursery both in term and preterm infants. [2] Respiratory distress is common, affecting up to 7% of all term newborns, and is increasingly common in prematurity [3] with increased survival of preterm and late preterm

neonates, management of respiratory distress in neonates has become challenging. [4,5]

Neonatal respiratory distress (NRD) is one the most common problems in the first few day of neonatal life which is diagnosed with the presence of one or more symptoms of tachypnea [transient tachypnea of the neonate (TTN)], or meconium aspiration syndrome (MAS), intercostal muscle retraction, grunting, nasal flaring and cyanosis. In addition, severe infection as pneumonia, persistent pulmonary hypertension of the newborn, and pneumothorax considered major causes. [6] NRD

has been reported to be prevalent in 5% to 29% of the NICU hospitalized neonates. [7-9]

The risk factors of NRD include prematurity, cesarean delivery, meconium-stained amniotic fluid, gestational diabetes, preeclampsia, multiple pregnancies, chorioamnionitis, oligohydramnios and structural disorders of lung. [10,11] Therefore, early diagnosis and timely treatment of NRD is of utmost importance; otherwise, it may cause respiratory failure as one of the most important causes of infant mortality i.e. it accounts for 15% of the total infant mortality. [12]

It is highly important to understand the exact history of NRD-associated factors such as complete history of before birth and post-birth delivery along with having a complete physical examination and reviewing laboratory & radiological findings in order to investigate the causes of neonatal respiratory distress. [13]

The aim of the present study was to determine the frequency of the causes and outcomes of respiratory distress in neonates hospitalized in the neonatal intensive care unit (NICU).

Material & Methods

In this descriptive and cross-sectional study, all the neonates with respiratory distress (RD), who were admitted at NICU Upgraded Department of Pediatrics were included. The study was conducted for the duration of one year.

Inclusion Criteria

- All newborn infants with respiratory distress who were hospitalized in NICU with post-natal age, of either sex, with any gestational age and birth weight, were included.

Exclusion Criteria

- Infants with postoperative respiratory distress, syndromic infants and congenital anomalies were excluded from the study.

Methodology

The required demographic information was extracted from patients’ dossiers about the conditions of the selected neonates in terms of neonatal age upon admission, birth weight, gender, gestational age, birth order, type of delivery, multiple birth, maternal disease, causes of respiratory distress, need for surfactant administration, need for mechanical ventilation, results of chest radiography, cardiac echocardiography, duration of hospitalization and outcomes of NRD using a researcher-made questionnaire.

Statistical Analysis

The collected data were analyzed using SPSS version 16.0 software. In order to estimate the probable risk factors in both groups, Chi-square and t-test were used. Logistic regression analysis was performed for multivariate tests. The significance level was calculated at 95%CI.

Results

Table 1: Demographic features of infants with respiratory distress

Variables		Frequency	Percentage
Gender	Male	68	68
	Female	32	32
Causes of NRD	RDS	36	36
	TTN	15	15
	MAS	8	8
	Pneumonia	30	30
	CHD	8	8
	Diaphragmatic Hernia	1	1
	Lobar Emphysema	1	1
	Asphyxia	1	1
Mean (± SD) neonatal age (days)			5.22 ± 7.18
Mean (± SD) birth weight (gr)			2743.9 ± 727.9
Birth weight	≤ 2,500 gr	≤1000 g	2
		1001 to 1500 g	5
		1501 to 2500 g	30
	> 2,500 gr	2501 to 4000 g	60
		≥ 4000 g	3
Mean gestational age (weeks)			36.58±3.54
Gestational Age	Preterm	< 28 weeks	2
		28 to 32 weeks	17
		33 to 36 weeks	13
	Term	≥ 37 weeks	68
Type of Delivery	Vaginal	40	
	Cesarean	60	

Maternal Diseases	Diabetes	3	3
	Pre-eclampsia	5	5
	PPROM	15	15
	Other	12	12
	No Disease	65	65
Multiple Pregnancy	Singleton	96	96
	Twin	3	3
	Triplet	1	1
Surfactant Administration	Yes	13	13
	No	87	87
Respiratory Failure Requiring Mechanical Ventilation	Yes	26	26
	No	74	74
Mean duration of hospitalization (days)			8.74±5.35
Outcomes of NRD	Discharge	80	80
	Death	20	20

About 68% of 100 neonates with RD were male. The mean neonatal age and mean birth weight were 5.22±7.18 days and 2743.9±727.9 grams, respectively. The minimum birth weight was 850 grams while the maximum was 4,500 grams. According to the results, intercostal muscle

retraction, tachypnea, grunting, cyanosis, apnea and nasal flaring were the most common symptoms of NRD while RDS and TTN were the most common causes of respiratory distress syndrome. Furthermore, about 20% of the neonates died of the disease.

Table 2: Comparison of infants with respiratory distress in terms of the outcomes of NRD

Variables		Discharge	Death	OR	95% CI		P-value
		Frequency	Frequency		Min.	Max.	
Gender	Male	56	12	1.439	0.495	4.183	0.504
	Female	24	8				
Causes of NRD	RDS	28	8	1.381	0.985	1.936	0.061
	TTN	15	0				
	MAS	6	2				
	Pneumonia	24	6				
	CHD	6	2				
	Other	1	2				
Multiple Pregnancy	Singleton	78	18	1.412	0.138	14.424	0.771
	Multiple	4	2				
Type of Delivery	Vaginal	32	8	0.788	0.279	2.228	0.653
	Cesarean	48	12				
Maternal Diseases	Diabetes	3	0(0)	1.208	0.499	2.925	0.676
	Pre-eclampsia	5	0(0)				
	Other	10	5				
	No disease	50	15				
Surfactant administration	Yes	9	4	1.467	0.354	6.079	0.598
	No	71	16				
Mean gestational age		36.73±0.37	35.94±1.12	0.942	0.821	1.081	0.396
Mean neonatal age		5.63±0.86	3.5±1.33	0.949	0.865	1.041	0.27
Mean birth weight		2789.2±79.12	2555.6±207.77	1	0.999	1	0.223
Mean duration of hospitalization		9.37±0.59	6.11±1.37	0.855	0.745	0.98	0.025

The outcomes of NRD had a significant correlation with respiratory failure requiring mechanical ventilation, apnea, multiple and concurrent of respiratory symptoms and mean duration of hospitalization (p<0.05). Therefore, the variables that significantly correlated with infant mortality entered logistic regression model.

Discussion

Neonatal respiratory distress (NRD) is one the most common problems in the first few day of neonatal life which is diagnosed with the presence of one or more symptoms of tachypnea, intercostal muscle retraction, grunting, nasal flaring and cyanosis. NRD has been reported to be prevalent in 5% to 29% of the NICU- hospitalized neonates. [14-17] The risk factors of NRD include prematurity, cesarean delivery, meconium stained amniotic fluid, gestational diabetes, preeclampsia, multiple

pregnancies, chorioamnionitis, oligohydramnios and structural disorders of lung. [18,19] Neonatal respiratory distress may root in pulmonary and extrapulmonary disease or has a benign cause such as transient tachypnea of the newborn (TTN) rather than a symptom of a serious infection, encephalopathy or congenital anomalies. A wide range of NRD causes include respiratory distress syndrome (RDS), transient tachypnea of the newborn (TTN), meconium aspiration syndrome (MAS), sepsis, pneumonia, early asphyxia, congenital heart disease (CHD), pulmonary anomalies etc. [20] However, the general principles of care are the same in all cases regardless of NRD causes. Therefore, early diagnosis and timely treatment of NRD is of utmost importance; otherwise, it may cause respiratory failure as one of the most important causes of infant mortality i.e. it accounts for 15% of the total infant mortality. [21]

About 68% of 100 neonates with RD were male. The mean neonatal age and mean birth weight were 5.22 ± 7.18 days and 2743.9 ± 727.9 grams, respectively. The minimum birth weight was 850 grams while the maximum was 4,500 grams. According to the results, intercostal muscle retraction, tachypnea, grunting, cyanosis, apnea and nasal flaring were the most common symptoms of NRD while RDS and TTN were the most common causes of respiratory distress syndrome. Furthermore, about 20% of the neonates died of the disease. The outcomes of NRD had a significant correlation with respiratory failure requiring mechanical ventilation, apnea, multiple and concurrent of respiratory symptoms and mean duration of hospitalization ($p < 0.05$). Therefore, the variables that significantly correlated with infant mortality entered logistic regression model. In Parkash's et al [22] study, RDS, TTN, pneumonia and MAS were considered as the most common causes of hospitalization for NRD. Comparing the results of the present study with other studies, it was approved that RDS, TTN, MAS and pneumonia, with different frequencies, were found as the most common causes of hospitalizing infants with respiratory distress in NICU of most centers. With regard to the symptoms of respiratory distress, the present study showed that 75.3% of infants had intercostal muscle retraction, 67.7% had tachypnea, 61.3% had grunting, 45.2% had cyanosis and 16.1% had nasal flaring. Swarnkar et al [23], found that intercostal muscle retraction, tachypnea, feeding impairment, grunting, nasal flaring, cyanosis were the most prevalent symptoms of neonatal respiratory distress. According to Parkash et al [22], the most common NRD symptoms were tachypnea, retraction, nasal flaring by 100 % frequency, than grunting and cyanosis by 60.9% and 40% frequency, consequently. Nevertheless, Swarnkar et al [23] showed that amongst the respiratory symptoms,

grunting and nasal flaring had higher specificity for neonatal respiratory distress while tachypnea, retraction and feeding impairment had higher sensitivity for the diagnosis of NRD. Abdelrahman et al [24] found that 36% of infants died due to RDS (86.7%) as the most common cause of infant mortality. The importance of NRD is that infants with respiratory distress have 2-4 times greater risk of death than the infants without respiratory distress. [23] It was found that the reason for the high frequency of RDS as the most common cause of infant mortality was prematurity, low birth weight and neonatal infection. [22]

Conclusion

It was found that RDS is the most common cause of respiratory distress in the hospitalized neonates. Moreover, infant mortality rate increased due to respiratory failure requiring mechanical ventilation and occurrence of apnea. It was concluded that improving the care of newborns requires mechanical ventilation and prevention of apnea leads to better outcomes and reduced infant mortality rate.

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