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Original article

Respiratory Distress in Neonatal Intensive Care Unit in Benha University Hospital

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Abstract:

Background: Respiratory distress is one of the most common problems in the first few days of life. Respiratory distress is a symptom complex that represents a heterogenous group of illness with varying incidence, etiology, clinical picture and outcome. In newborn infants, it may be due to either pulmonary or extra pulmonary causes. Aim of the work: **The aim** of this study is to assess the causes of respiratory distress in neonates admitted to the neonatal intensive care unit at Benha University Hospital. **Patients and methods**: This comparative cross-sectional study was carried out on all the neonates admitted in the NICU of the pediatric department at Benha University Hospital during the first 28 days of life, belonging to either gender and with gestational age more than 28 weeks and weight more than 1000 gram. **Results:** The present study showed that, 23.8% of NICU patients had respiratory distress. Regarding the diagnosis, transient tachypnea of the newborn (TTN) was present in 26% of the patients then meconium aspiration syndrome (MAS) and severe RDS (16% for each) then bronchopneumonia and moderate RDS (8% for each) . **Conclusion:** Our study revealed that 23.8% of NICU patients had respiratory distress. TTN and MAS were the most frequent causes.
Keywords: respiratory distress; neonates; NICU; outcome.

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Introduction:

Respiratory distress is one of the most common problems that neonates encounter within the first few days of life. According to the American Academy of Pediatrics, approximately 10% of the neonates need some assistance to begin breathing at birth, with up to 1% requiring extensive resuscitation. Other reports confirm that respiratory distress is common in the neonates and occurs in approximately 7% of them. Respiratory disorders are the leading cause of early neonatal mortality (0–7 days of age). They are the leading cause of morbidity in newborns and are the most frequent cause of admission to the special care nursery for both term and preterm infants. In fact, neonates with respiratory distress are 2–4 times more likely to die than neonates without respiratory distress (1). Respiratory

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distress describes a symptom complex representing a heterogeneous group of illnesses. So, respiratory distress is often defined as a clinical picture based on observed signs and symptoms irrespective of the etiology. Clinical symptoms most commonly cited as indicators of respiratory distress include tachypnea, nasal flaring, grunting, retractions (subcostal, intercostal, supracostal, jugular), and cyanosis. Other symptoms include apnea, bradypnea, irregular (seesaw) breathing, inspiratory stridor, wheeze and hypoxia (2)**.** The causes of respiratory distress in a newborn are diverse and multisystemic. Pulmonary causes may be related to alterations during normal lung development or transition to extrauterine life.

Normal lung development occurs in 5 phases. Respiratory disease may result from developmental abnormalities that occur before or after birth. Early developmental malformations include tracheoesophageal fistula, bronchopulmonary sequestration (abnormal mass of pulmonary tissue not connected to the tracheobronchial tree), and bronchogenic cysts (abnormal branching of the tracheobronchial tree). Later in gestation, parenchymal lung malformations including congenital cystic adenomatoid malformation or pulmonary hypoplasia from congenital diaphragmatic hernia or severe oligohydramnios, may develop. More common respiratory diseases, such as TTN, RDS, neonatal pneumonia, MAS, and persistent pulmonary hypertension of the newborn (PPHN), result from complications during the prenatal to postnatal transition period. Although mature alveoli are present at 36 weeks' gestation, a great deal of alveolar septation and microvascular maturation occur postnatally. The lungs are not fully developed until the ages of 2 to 5 years. Therefore, developmental lung disease can also occur after birth. Bronchopulmonary dysplasia (BPD), for example, is a significant lung disease that complicates prematurity due to arrested alveolarization in developing lungs exposed to mechanical ventilation, oxygen, and other inflammatory mediators before normal development is complete. As defined by an ongoing oxygen requirement at 36 weeks adjusted gestational age, BPD affects up to 32% of premature infants and 50% of very low-birth-weight infants. (3)**.**

The aim of this study was to assess the causes of respiratory distress in neonates admitted to the neonatal intensive care unit at Benha University Hospital.

Patients and methods:

Study design and participant:

This comparative cross-sectional study was carried out in NICU of the pediatric department at Benha University Hospital from October 2020 to April 2021. All neonates from birth to 28days of life belonging to either gender was admitted to the NICU with gestational age >28 wks and weight >1000gm were included. *The study was under the following inclusion and exclusion criteria:*

Inclusion criteria**:** - All neonates from birth to 28days of life**.** Weight more than 1000gm**.** Both sexes were included**.** Gestational age more than 28 weeks.

Exclusion criteria**:** Neonates developing respiratory distress post-operative**.** Syndromic neonates**.** Neonates with congenital heart anomalies**.**

Ethical consideration**:** Approval of the study protocol by the Ethical Committee of Benha University was obtained and

informed consent was obtained from the parents before enrollment in the study.

Methods: A standardized data sheet was utilized to record patient's history.

Full history taking: with special emphasis on sex, gestational age, mode of delivery, history of disease or medication during pregnancy, history of premature rupture of membrane (PROM), history of bleeding, history of any maternal risk factor, history of resuscitation**,** history of lethargy, delayed cry, poor feeding and low Apgar score 3 for 5min**.**

Clinical examination: General examination: Vital signs and anthropometric measurements (weight, length & head circumference). Neurological examination and neonatal reflexes. Chest examination: signs of respiratory distress**;** Grade 1: tachypnea (more than 60 breaths/mi) and nasal flaring**,** Grade 2: subcostal and intercostal retraction**,** Grade 3: grunting**,** Grade 4: cyanosis**.** Heart examination and abdominal examination.

Investigations:

Chest x-ray: The neonates were labeled as RDS if they developed respiratory distress within six hours and chest X-ray showed one or more of the following: Reticulogranular pattern and ground glass opacity. Hyperinflation, prominent perihilar markings and interlobar fissure. Patchy infiltrates with atelectasis.

CBC: Showing total leukocyte count either >30,000 or <5000 per ml.

ABG: acidosis with Ph<7 was labeled as having birth asphyxia.

Statistical analysis

Data collected throughout history, clinical examination, laboratory investigations and outcome measures were coded, entered and analyzed using Microsoft Excel software. Data were then imported into Statistical Package for the Social Sciences (SPSS version 20.0) software for analysis. Qualitative data are represented as number and percentage. Quantitative continues group are represented by mean ± SD. The following tests were used to test differences for significance; difference and association of qualitative variable by Chi square test (X^2). For differences between quantitative independent groups, t test was used. P value <0.05 was set for significant results & <0.001 for highly significant results.

Results:

Respiratory distress was detected in 23.8% of NICU patients and (76.2%) had no respiratory distress (Table 1)

Regarding sex, 44% of the patients were females and 56% were males. Regarding the mode of delivery, 66% were CS and 34% were vaginal. The age ranged between 1 and 21 days with a mean and standard deviation of 3.95±4.69. Gestational age ranged between 29 and 40 weeks with a mean and standard deviation of 35.20±3.39 (Table 2).

Table (1): Prevalence of respiratory distress in NICU.

Prevalence	No. (420)	%
Respiratory distress	100	23.8
No respiratory distress	320	76.2

Table (2): Demographic data among the studied patients.

Demographic data		No.	%
Sex	**Female**	44	44.0
	Male	56	56.0
Mode of delivery	**CS**	66	66.0
	Vaginal	34	34.0
		Range	**Mean ± SD**
Age (days)		1 - 21	3.95 ± 4.69
Gestational age(weeks)		29 - 40	35.20 ± 3.39

The commonest diagnosis was TTN, in 26% of the patients, then meconium aspiration syndrome and severe RDS (16% for each) then bronchopneumonia and moderate RDS (8% for each) (Table 3).

(Table 4) shows that 20% of the patients died and 80% survived.

There were no statistically significant differences between the died and survived patients regarding age and sex. While there was statistically significant difference between the died and survived patients regarding the gestational age and mode of delivery (Table 5).

There were statistically significant differences between the died and survived patients regarding the gestational age and diagnosis (Table 6).

Table (3): Diagnosis among the studied patients.

Diagnosis	No.	%
Aspiration pneumonia	2	2.0
Bronchopneumonia	8	8.0
Congenital pneumoniae	12	12.0
Diaphragmatic hernia	4	4.0
Meconium Aspiration	6	6.0
Mild RDS	16	16.0
Moderate RDS	8	8.0
Pulmonary hypoplasia	2	2.0
Sever RDS	16	16.0
TTN	26	26.0

Table (4): Outcome among the studied patients.

Outcome	No.	%
Died	20	20.0
Survived	80	80.0

Table (5): Comparison between died and survived patients regarding demographic data.

Demographic data			Died No. (20)	Survived No. (40)	t. test	P. value
Age (days)	**Mean ± SD**		3.20± 2.33	4.13± 5.11	0.797	0.427
Gestational age(weeks)	**Mean ± SD**		33.00± 3.30	35.75± 3.20	3.411	0.001
Sex	**Female**	**No.**	8	36	X^2	0.687
		%	40.0%	45.0%	0.162	
	Male	**No.**	12	44		
		%	60.0%	55.0%		
Mode of delivery	**CS**	**No.**	20	46	12.879	0
		%	100%	57.5%		
	Vaginal	**No.**	0	34		
		%	0%	42.5%		

Table (6): Comparison between died and survived patients regarding the diagnosis.

Diagnosis		Died	Survived	X^2	P. value
Aspiration Pneumonia	**No.**	0	2	47.917	
	%	0%	2.5%		0
Bronchopneumonia	**No.**	0	8		
	%	0%	10.0%		
Congenital Pneumoniae	**No.**	0	12		
	%	.0%	15.0%		
Diaphragmatic hernia	**No.**	2	2		
	%	10.0%	2.5%		
Meconium Aspiration	**No.**	4	2		
	%	20.0%	2.5%		
Mild RDS	**No.**	0	16		
	%	0%	20.0%		
Moderate RDS	**No.**	4	4		
	%	20.0%	5.0%		
Pulmonary hypoplasia	**No.**	2	0		
	%	10.0%	.0%		
Sever RDS	**No.**	8	8		
	%	40.0%	10.0%		
TTN	**No.**	0	26		
	%	0%	32.5%		

Discussion

There are 3 million neonatal deaths per year worldwide. Nearly all (99%) of them occur in low-income and middle-income countries and more than 60% of them occur in Africa and South Asia. Preterms, account for many of these deaths. Egypt is one of the ten countries with the largest number of preterm births (4).

Many tools to assess and predict neonatal mortality risk have been developed to overcome the problem of varied causes of neonatal mortality and different risk factors that predispose to it (5). Neonatal mortality prediction models are widely applied in high-income countries, which account for only 1% of neonatal deaths. Application of a prediction model in the setting can be done by using an existing model, remodeling and validating an existing model, or creating a new one (6).

The aim of this study was to assess the causes of respiratory distress in neonates admitted to the neonatal intensive care unit at Benha University Hospital.

The present study showed that, 23.8% of NICU patients had respiratory distress. In Parkash et al study (7), respiratory distress was found in 17.6% (7). On the other hand, a study reported neonatal pneumonia in 37.9% of the neonates with respiratory distress (8), while another study, (9) reported that, the overall proportion of neonates with RD admitted to the Black Lion Specialized Hospital NICU was 42.9% (95%CI: 39.3–46.1%). Among NICU patients, respiratory distress was found in 34% in Nepal (10), 33.4% in India (11), 34.3% in Egypt (12), 20.1% in Northern Italy (13), and in 8.83% in Portugal (14).

Regarding the diagnosis, the current study showed that, TTN was found in 26% of the neonates with respiratory distress then meconium aspiration and severe RDS (16% each) then bronchopneumonia and moderate RDS (8% each).

In another study, TTN, MAS and RDS were found in 14%, 17% and 23% of the neonates with respiratory distress respectively (7). However, results of another study in developing countries were 12%, 16% and 18% respectively. The differences are more likely to be due to better facilities in the hospitals. Dudell et al (15) and Aynalem et al (9) reported that, the common causes of RD were RDS and meconium aspiration, which is similar to findings from Nepal (10) and Egypt (14).

In another study, RDS was detected in 49.66% of neonates with respiratory distress followed by TTN in 22.07%, pneumonia in 17.2% and MAS in 6.2% (16). The study of Abou-Faddan et al. (17) revealed that RDS is the most common cause of neonatal respiratory disease (45.8%) followed by pneumonia and TTN (17).

Respiratory distress syndrome (RDS) is the commonest cause of respiratory distress in the preterm infants (1). Of neonates with RDS, 50% were preterm (18**)**. The incidence of RDS was 40.6% among premature infants who were admitted to the neonatal intensive care unit (19).

Conclusion

Our study revealed that 23.8% of NICU patients had respiratory distress. Transient tachypnea of the newborn (TTN), meconium aspiration syndrome (MAS) were important causes of neonatal respiratory distress.

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