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CLINICAL, SUBCLINICAL CHARACTERISTICS AND TREATMENT RESULTS OF NEONATAL RESPIRATORY DISTRESS IN NEWBORN INFANTS AT THE NEONATAL PEDIATRIC DEPARTMENT, XANH PON GENERAL HOSPITAL, HANOI

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ABSTRACT

Objective: Describe clinical and paraclinical characteristics and treatment results of respiratory failure in newborns at the neonatal department of Xanh Pon General Hospital in 2023 - 2024.

Subject and method: Study subjects: 258 medical records of neonates with respiratory distress treated at Xanh Pon General Hospital. Study design: Descriptive, retrospective data analysis.

Results: In our study, the proportion of male neonates (67.4%) was higher than that of female neonates (32.6%) and was predominant in both age groups. Neonates ≤1 day old accounted for the majority (67.4%), while those >1 day old comprised 32.6%. The most common clinical sign of respiratory distress was tachypnea >60 breaths/min (79.5%), cyanosis (79.1%). Laboratory findings included leukopenia in 15.5%, anemia in 17.8%, and thrombocytopenia in 5.8% of neonates. Hypoalbuminemia was observed in 72.9%, hypoglycemia in 19.8%, and elevated CRP levels in 36%. The referral rate to higher-level hospitals was 1.9%. A high proportion of neonates with respiratory distress required respiratory support, with oxygen therapy being the most common (33.7%), followed by CPAP (22.5%) and mechanical ventilation (17.4%). All cases (100%) required antibiotic treatment.

Conclusion: Respiratory distress in neonates presents with diverse clinical and paraclinical features, varying according to gestational age. The majority of affected neonates required respiratory support, yet most responded well to treatment.

Keywords: Respiratory distress, neonates, clinical features, paraclinical findings, treatment outcome.

1. INTRODUCTION

Acute respiratory failure is a dysfunction of the lungs, causing failure in gas exchange, leading to hypoxia and hypercapnia, and thus losing the ability to maintain PaO2, PaCO2, and pH at an acceptable level. This is a very common syndrome in the neonatal period, especially in the first few days. [1]. Clinical symptoms of respiratory distress in premature infants include tachypnea, grunting, and respiratory effort appearing immediately or within a few hours after birth, with subcostal retractions, intercostal retractions, and nasal flaring. As atelectasis and respiratory distress progress, symptoms become more severe, with cyanosis, lethargy, irregular breathing, apnea, and eventually heart failure if the lungs are unable to expand sufficiently, ventilate, and exchange oxygen [2], [3]. Neonatal respiratory distress is a leading cause of neonatal mortality and also a significant burden in terms of treatment costs[3]. The cure rate and discharge without complications in newborns

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with respiratory distress vary in many reports worldwide and in Vietnam[1], [2], [3], [4].

The Neonatal Department of Xanh Pon General Hospital is a leading unit for neonatal care in Hanoi, annually admitting and treating neonatal patients from lower-level facilities throughout the city and many other neighboring provinces. Each year, the department admits and treats many cases of neonatal respiratory distress. The research question posed is: "What are the clinical, paraclinical characteristics and treatment outcomes of respiratory distress in newborns at the neonatal department of Xanh Pon General Hospital?". To answer this question, we conducted this study to describe the clinical, paraclinical characteristics, and treatment outcomes of respiratory distress in newborns at the neonatal department of Xanh Pon General Hospital in 2023 - 2024.

2. SUBJECTS AND RESEARCH METHODS

2.1. Study Design: Cross-sectional. Research method: Descriptive, retrospective data analysis.

2.2. Location and time of study:

- Study period: From August 2024 – July 2025. Medical records of patients admitted between 9/2023 – 9/2024 were collected.

- Study location: Neonatal Department, Xanh Pon General Hospital.

2.3. Study Subjects

The study subjects were medical records of neonates with respiratory distress.

- *Inclusion Criteria:*

+ Neonates (≤28 days old)

+ Diagnosed and treated for respiratory distress at Xanh Pon General Hospital between 9/2023 and 9/2024.

Diagnostic Criteria for Respiratory Distress [5].

- *Clinical Criteria:*

At least one of the following signs:

+ Change in respiratory rate: tachypnea >60 breaths/min or bradypnea <30 breaths/min.

+ Signs of respiratory effort: severe chest retractions or nasal flaring or grunting.

+ Cyanosis when breathing ambient air: perioral cyanosis, acrocyanosis, or generalized cyanosis, SpO_2 <90%.

May or may not be accompanied by other symptoms: tachycardia or bradycardia, altered consciousness, decreased reflexes.

Paraclinical Criteria: PaO_2 <50 – 60 mmHg and/or $PaCO_2$ >60 mmHg and pH <7.25.

- *Exclusion Criteria:*

+ Children with insufficient information in their medical records.

+ Children with other genetic or congenital diseases.

2.4. Sample Size and Sampling Method

* Sample Size:

The sample size was determined using the formula for estimating a proportion in a population:

$$n = Z^2_{1-\alpha/2} \frac{pq}{d^2}$$

+ n: Minimum required sample size for the study.

+ α = 0,05 (Statistical significance level).

+ $Z_{1-\alpha/2}$ = 1,96 (Confidence coefficient).

+ p = 0,815 (Proportion of tachypnea in neonates with respiratory distress according to the study by Phan Thi Thuy Tue in 2023) [6].

+ q = 1 – p.

+ d = 0,05.

Applying the formula, we get:

$n = 1{,}96^2 \times (0{,}815.(1 - 0.815))/(0{,}05^2) = 231{,}686896...$

The minimum calculated sample size was n= 232

- *Sampling Method:* Convenient sampling was applied in this study.

Our study included 258 pediatric patients.

2.5. Research Variables:

- Clinical characteristics: Respiratory, cardiovascular, and neurological signs.

- Paraclinical characteristics: Complete blood count, blood biochemistry. Laboratory tests were compared with the Ministry of Health's reference tables for hematological, biochemical, coagulation, and blood gas tests by age - Treatment outcomes Treatment results (good: recovered, discharged; not good: death, requested discharge, transferred to higher-level hospital), supportive treatment methods (respiratory support: ambient air, oxygen therapy, CPAP, mechanical ventilation; intravenous nutrition, phototherapy for jaundice, antibiotics,

blood transfusion).

2.6. Data Collection: Secondary information was collected through retrospective review of medical records.

2.7. Data Processing and Analysis: After entering data into Epidata 3.0, it was transferred to Stata 14.0 software for analysis. Descriptive statistics were used to describe the proportion and frequency of qualitative variables, and mean, standard deviation, maximum, and minimum values for quantitative variables.

2.8 Research Ethics: The research proposal was approved by the leadership of the Faculty of Medicine and Dai Nam University, and permission was granted by the Neonatal Department of Xanh Pon General Hospital in Hanoi.

3. RESEARCH RESULTS

Table 1. Characteristics of Study Subjects by Age and Gender

Age (days) / Gender	≤1 day		>1 day		Total	
	SL	%	SL	%	SL	%
Male	124	68,9	50	64,1	174	67,4
Female	56	31,1	28	35,9	84	32,6
Total	180	69,8	78	30,2	258	100

Table 1 shows that in our study, the proportion of male neonates (67.4%) was higher than that of female neonates (32.6%) and was higher in both age groups. The proportion of neonates ≤1 day old accounted for the majority (67.4%) and those >1 day old accounted for 32.6%.

Table 2. Respiratory and Cardiovascular Signs

Characteristic		SL	%
Respiratory Rate	<30 bpm	8	3,1
	30 – 60 bpm	45	17,4
	>60 bpm	205	79,5
Cyanosis	Yes	204	79,1
	no	54	20,9
Grunting	Yes	118	45,7
	No	140	54,3
Apnea	Yes	18	7,0
	No	240	93,0
Nasal Flaring (PPCM)	Yes	7	2,7
	No	251	97,3
Chest Retractions (RLLN)	Yes	200	77,5
	No	58	22,5
SpO_2	<90%	103	39,9
	≥90%	155	60,1
Heart Rate	<100 bpm	4	1,6
	100 – 180 bpm	244	94,6
	>180 bpm	10	3,9
Total		258	100

Table 2 shows that the most common signs of respiratory distress were tachypnea >60 breaths/min (79.5%), cyanosis (79.1%), followed by chest retractions (77.5%), grunting (45.7%), and SpO_2 <90% (39.9%). Among abnormal cardiovascular signs in patients with respiratory distress, tachycardia accounted for 3.9% and bradycardia for 1.6%.

Table 3. Neurological Signs

Characteristic		SL	%
Muscle Tone	Decreased	9	3,5
	Normal	243	94,2
	Increased	6	2,3
Convulsions	Yes	6	2,3
	No	252	97,7

Table 3 shows that convulsions accounted for a low proportion of 2.3%. Abnormalities in muscle tone were low, with increased tone accounting for 2.3% and decreased tone for 3.5% .

Table 4. Hematological and Biochemical Laboratory Findings

Characteristic		SL	%
WBC	Decreased	40	15,5
	Normal	196	76,0
	Increased	22	8,5
	$\bar{X}$ ± SD	16,37 ± 7,93	
HGB	Decreased	46	17,8
	Normal	212	82,2
	$\bar{X}$ ± SD	162,48 ± 27,36	

Characteristic		SL	%
PLT	Decreased	15	5,8
	Normal	233	90,3
	Increased	10	3,9
	$\bar{X}$ ± SD	257,76 ± 83,36	
Glucose	Decreased	51	19,8
	Normal	195	75,6
	Increased	12	
CRP	$\bar{X}$ ± SD	4,06 ± 2,19	
	Increased	93	36,0
	Normal	165	
Albumin	$\bar{X}$ ± SD	5,47 ± 15,31	
	Decreased	188	72,9
	Normal	70	

Table 4 shows that neonates had decreased white blood cell count, hemoglobin, and platelet count with proportions of 15.5%, 17.8%, and 5.8% respectively. Among the biochemical characteristics, hypoalbuminemia was highest at 72.9%, followed by hypoglycemia at 19.8%. Elevated CRP was observed in 36%.

Table 5. Treatment Outcomes of Study Subjects

Treatment Outcome		SL	%
Not Good	Death, requested discharge	0	0
	Transferred to higher-level hospital	5	1,9
Good	Recovered, discharged	253	98,1
Total	250	100	

Table 5 shows that out of 258 neonates with respiratory distress, 1.9% were transferred to another hospital and 98.1% recovered and were discharged.

Table 6. Supportive Treatment Methods

Supportive Treatment Method		SL	%
Respiratory Support	Ambient air	68	26,4
	Oxygen therapy	87	33,7
	CPAP	58	22,5
	Mechanical ventilation	45	17,4

Supportive Treatment Method	SL	%
Intravenous nutrition	14	5,4
Chiếu đèn vàng da	97	37,6
Antibiotics	100	100
Blood transfusion	6	2,3

Table 6 shows that a high proportion of neonates with respiratory distress required respiratory support, with oxygen therapy being the most common (33.7%), followed by CPAP (22.5%) and mechanical ventilation (17.4%). All (100%) neonates with respiratory distress required antibiotic treatment.

4. DISCUSSION AND CONCLUSION

4.1. Clinical Characteristics

Among 258 neonates with respiratory distress, tachypnea >60 breaths/min was found in 205 neonates, accounting for 79.5%, followed by cyanosis (79.1%), chest retractions (77.5%), grunting (45.7%), and SpO2 <90% (39.9%). Similarly to our study, Uong Si Tuong's study (2020) at My Duc Hospital reported that the most common symptoms were tachypnea ≥60 breaths/min (76.5%), chest wall retractions (58.7%), and perioral cyanosis (35.2%) [7]. Hoang Thi Dung's study in 2021 noted tachypnea as the most common symptom, accounting for 86.1%, followed by cyanosis (84.5%), and severe chest retractions (81.6%) [8]. Among the signs of respiratory distress, tachypnea is a compensatory mechanism for increased CO2, hypoxemia, or acidosis (both respiratory and metabolic), and is a fairly common but non-specific symptom in many respiratory, cardiovascular, metabolic, or systemic diseases. Among abnormal cardiovascular signs in patients with respiratory distress, tachycardia accounted for 3.9% and bradycardia for 1.6%. Similar to our results, Nguyen Thi Le Huyen's study (2024) at the Pediatric Center, Bach Mai Hospital, reported that tachycardia was more common than bradycardia, with rates of 9.4% and 4.7% respectively [2]

Regarding neurological signs, hypoxemia significantly affects changes in the nervous system. In neonates, the permeability of brain blood vessels is high due to the lack of carbonic anhydrase, making them susceptible to intracranial hemorrhage and leading to respiratory distress. In our study, convulsions and muscle tone abnormalities were two common neurological signs. Among the 258 neonates with respiratory distress included in the study, 2.3% had convulsions. The proportion of children with abnormal muscle tone was 5.7%, with decreased muscle tone being more

common (3.5%). Our results are consistent with Hoang Thi Dung's study in 2021 on 245 neonates with respiratory distress, which reported 0.8% with convulsions, 22.4% with decreased muscle tone, and 0.8% with increased muscle tone [8].

4.2. Paraclinical Characteristics

Our study showed that decreased hemoglobin accounted for 17.8%, with an average of 162,48 ± 27,36 g/l. According to Nguyen Cong Khanh, red blood cell count and hemoglobin gradually decrease after birth, which can be physiological or pathological. Ngo Thi Kim Anh's study (2019) on early neonatal anemia at Thai Nguyen Central Hospital showed that anemia was mainly found in neonates with respiratory distress (52.2%) and there was no difference between preterm and full-term infants [9].

In neonates at birth, the white blood cell count is very high, ranging from 10 x 109/l to 100 x 109/l. After 24 hours, the white blood cell count begins to decrease to 10 – 12 x 109/l, similar to the white blood cell count during infancy. In children with respiratory distress due to infection-related causes, leukocytosis may be present, or in severe infections, leukopenia may occur. In our study, neonates with leukopenia accounted for 15.5%, while leukocytosis accounted for 8.5%. Our results are similar to Hoang Thi Dung's study in 2021 at Thai Nguyen Central Hospital, which reported leukopenia and leukocytosis rates of 34.7% and 0.4% respectively[8]. In contrast to our study, Ngo Minh Hue's study (2023) reported a leukopenia rate of 10.1%, more common in preterm infants (17.2%) than in full-term infants (5%). No cases of leukocytosis were reported[10].

Regarding biochemical laboratory findings, our study found that the rate of hypoglycemia was high at 19.8%. Nguyen Vo Loc's study (2019) on 108 neonates with hypoglycemia reported that respiratory distress was the most common cause of hypoglycemia in both preterm and full-term neonates, with rates of 50.8% and 34.0% respectively. The author also concluded that neonatal respiratory distress was not a risk factor for hypoglycemia in neonates with p>0.05[11].

CRP is considered an indicator reflecting systemic inflammatory activation, a manifestation of the body's non-specific inflammatory response to infection and trauma. In our study, elevated CRP levels accounted for a relatively high proportion of 36%. Similarly, Nguyen Phan Trong Hieu's study (2022) on 157 neonates with respiratory distress reported that 52/157 children had elevated CRP. However, the author noted that the change in CRP levels was not correlated with the treatment outcomes of neonates with respiratory distress [12].

4.3. Treatment Outcomes

n our study, the discharge rate for neonates was high at 98.1%, and 1.9% of children were indicated for transfer. The average treatment duration in our study was 10.82 ± 0,34 days. There was a difference in the average treatment duration between transferred children and those who recovered and were discharged, but this difference was not statistically significant. Similarly, Phan Nguyen Trong Hieu's study (2022) on 157 neonates with respiratory distress reported that 78.98% of children recovered and were discharged; 12.74% were transferred, and 8.28% died or were discharged at request[12]. Regarding respiratory support, our study is consistent with Le Nguyen Nhat Trung's study on 215 preterm neonates with gestational ages from 26 to 32 weeks, which reported that 57.7% of neonates received oxygen therapy, 14.9% breathed ambient air, and 13.9% received bag-mask ventilation or endotracheal intubation[13].

5. CONCLUSION

Neonatal respiratory distress presents with diverse clinical and paraclinical features, varying according to gestational age. A high proportion of neonates with respiratory distress required respiratory support, yet most responded well to treatmen.

REFERENCES

[1] Sweet, D.G., et al., European Consensus Guidelines on the Management of Respiratory Distress Syndrome - 2019 Update. Neonatology, 2019. 115(4): p. 432-450.

[2] Nguyen Thi Le Huyen, Do Tuan Anh, Pham Van Dem et al., Outcomes of care for premature neonates with respiratory distress and some related factors at the Pediatric Center, Bach Mai Hospital in 2023. Vietnam Journal of Medicine, 2024. Vol 534 (No. 1B - 2024): pp. 16-21.

[3] Nguyen Thu Tinh (2020) Neonatal respiratory distress. IN Phuc, V. M. (Ed.) Pediatrics Volume 2. Ho Chi Minh City National University Publishing House, pp. 169-191

[4] Ma Thi Hai Yen, Khong Thi Ngoc Mai, Treatment results of respiratory distress in premature neonates using nasal continuous positive airway pressure at Thai Nguyen Central Hospital. Journal of Science and Technology, Thai Nguyen University, 2021. Vol 226 (No. 14 (2021)): pp. 251-257.

[5] Ministry of Health, Neonatology, Guidelines for diagnosis and treatment of some childhood diseases, Decision No. 3312/QD - BYT dated 07/08/2015. 2015. pp. 185 - 257.

[6] Phan Thi Thuy Tue, Pham Van Anh and Nguyen Dinh Tuyen, STUDY ON CLINICAL, SUBCLINICAL CHARACTERISTICS AND SOME FACTORS RELATED TO SEVERE NEONATAL RESPIRATORY DISTRESS AT QUANG NGAI PROVINCIAL MATERNITY-PEDIATRIC HOSPITAL. Vietnam Journal of Medicine, 2023. 529 (1).

[7] Uong Si Tuong, Nguyen Thai Hau, Huynh Thanh Hung et al. Characteristics of respiratory distress in neonates at My Duc Hospital. Ho Chi Minh City Journal of Medicine, 2020. 24 (1): pp. 15 - 20.

[8] Hoang Thi Dung, Clinical, paraclinical characteristics and causes of respiratory distress in neonates at Thai Nguyen Central Hospital. 2021, University of Medicine and Pharmacy, Thai Nguyen University.

[9] Ngo Thi Kim Anh, Study on characteristics of anemia and some related factors in neonates in the early stage at Thai Nguyen Central Hospital. 2019, University of Medicine and Pharmacy, Thai Nguyen University. pp. 39 - 57.

[10] Ngo Minh Hue, Nguyen Dinh Hoc, Nguyen Thi Yen et al., Clinical and paraclinical characteristics of neonatal respiratory distress due to transient tachypnea at Thai Nguyen Hospital A. Journal of Science and Technology, Thai Nguyen University, 2023. 229 (1): pp. 68 - 74.

[11] Nguyen Vo Loc, Characteristics and some risk factors for hypoglycemia in neonates at Thai Nguyen Central Hospital. 2019, University of Medicine and Pharmacy, Thai Nguyen University. pp. 39 - 77.

[12] Nguyen Phan Trong Hieu, Tran Chi Thien and Nguyen Thanh Nam, EVALUATION OF TREATMENT OUTCOMES OF NEONATAL RESPIRATORY DISTRESS AND SOME RELATED FACTORS. Vietnam Journal of Medicine, 2022. 515 (1).

[13] Le Nguyen Nhat Trung, Le Thi Thuy Dung, Ngo Minh Xuan et al., Treatment outcomes of preterm neonates aged 26-34 weeks gestational age at Children's Hospital 2. Ho Chi Minh City Journal of Medicine, 2016. 20 (2): pp. 30 - 36.