Echo Findings in Neonates with Respiratory Distress

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Abstract: Background and objectives:-. Respiratory distress is the most frequent cause of neonatal intensive care unit (NICU) admission, and the individual management strategies should be the main task in NICUs for these infants. Common causes of RD include transient tachypnea of the newborn, respiratory distress syndrome, meconium aspiration syndrome, pneumonia, sepsis, pneumothorax, persistent pulmonary hypertension of the newborn. Congenital heart defect, airway malformations, and inborn errors of metabolism are less common etiologies. So, we do this work to determine and diagnose cardiac causes of respiratory distress in neonates. **Methods: C**ross sectional descriptive study enrolled 100 neonates with respiratory distress, 56 males and 44 females. The study was conducted in Neonatal intensive care unit (NICU), AL -Azhar university hospital, New Damietta from October 2016 to January 2018. **Results:** We found in this study there are 6 cases with cardiac problem from 34 full term neonates with percentage of 17.6% and 14 cases with cardiac problem from 66 preterm neonates with percentage of 21.2% which mean that cardiac problem are more common in preterm neonates. **Conclusion:** cardiac problems are more common in preterm, male neonates, newborn delivered by cesarean section and associated with maternal risk factors.

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1. Introduction

Respiratory distress (RD) is one of the most common causes of neonatal respiratory failure and neonatal death. Fifteen percent of term infants and 29% of late preterm infants admitted to the neonatal intensive care unit develop significant respiratory morbidities[1].

Respiratory distress in neonates presents a diagnostic challenge. Newborns with respiratory distress commonly exhibit tachypnea with respiratory rate more than 60 respirations per minute. They may present with grunting, retractions, nasal flaring and cyanosis [2].

Common causes of RD include transient tachypnea of the newborn, respiratory distress syndrome, meconium aspiration syndrome, pneumonia, sepsis, pneumothorax, persistent pulmonary hypertension of the newborn. Congenital heart defect, airway malformations, and inborn errors of metabolism are less common etiologies [3].

Preterm infants have more than twice as many cardiovascular malformations as do infants born at term and that 16 % of all infants with cardiovascular malformations are preterm. It also showed that there is an increased mortality rate among infants born preterm with a cardiovascular malformation. The additional effect of cardiovascular malformations on mortality rates is most marked for term and near-term infants, for whom mortality rates are otherwise low [4].

Previous studies of birth weight among infant with cardiovascular malformation reported a significant increase in the likelihood of being small for gestational age among infant with Teratology of fallot, complete Atrioventricular septal defect, hypoplastic left heart, large ventricular septal defect compared with those seen in postnatal life [5].

3. Patients and Method

It is a prospective, cross sectional descriptive study enrolled 100 neonates with respiratory distress, 56 males and 44 females. The study was conducted in Neonatal intensive care unit (NICU), AL -Azhar university hospital, New Damietta from October 2016 to January 2018.

Inclusion criteria

- Full term and preterm neonates with respiratory distress
- Both sexes

Exclusion criteria

- Asphyxia
- Sepsis
- Neonates with associated extracardiac malformations or genetic disorders

The protocol for the research project has been approved by the ethics committee of Pediatrics Department, AL -Azhar University. The work had been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration

of Helsinki) for experiments involving humans. The parents gave informed consent, they understood and signed it.

All the newborns included in the study were subjected to the following:

I. Comprehensive history taking including

Antenatal history:- Maternal age, maternal diseases, Drugs.

Natal history:- Gestational age, sex and mode of delivery, history of premature rupture of membranes.

Family history

Consanguinity, congenital anomalies

- Assessment of gestational age through analysis of maternal dates.
- Record Apgar score at 1 and 5 minutes [6]. if present.
- Birth weight, length, Head circumference.

II. Clinical examination for neonates

- Complete examination including cardiac, chest, abdominal and neurological.
- Weight, length, Head circumference.
- Gestational age by Ballard scores [7].

III. Investigations:

- Complete blood count (CBC) with different count.
- Oxygen saturation by pulse oximeter: Arterial partial oxygen pressure (PaO2) levels below 50 mmHg with cyanosis in room air, or the need for supplementary oxygen to maintain PaO2 > 50 mmHg, is indicative of NRDS [8].
- Arterial blood gases: A blood sample can determine levels of metabolic and respiratory acidosis which indicate anaerobic metabolism and atelectasis respectively [9].
- Echocardiography: has been performed by a single pediatric cardiologist at NICU using M-mode, Two-dimensional Color Doppler cardiac imaging, 7 MHz, 5 MHz-transducers frequency by the mean of Two-dimensional ECHO.
- For moderate sedation 0.15 mg/kg of midazolam was given to the patients prior to echocardiography [10].
- X –rays

Statistical methods:

- Data were coded and entered using the statistical package SPSS version 25. Data was summarized using mean and standard deviation for quantitative variables and frequencies (number of cases) and relative frequencies (percentages) for categorical variables. Comparisons between groups were done using unpaired t test [11].
- For comparing categorical data, Chi square ($\chi 2$) test was performed. Exact test was used instead when the expected frequency is less than 5 [12].
- P-values less than 0.05 were considered as statistically significant.

3. Results:

The results are shown in the following Tables (Tables 1-7).

Table 1: General Features of our studied cases

			Count	%
gestational age	Fullterm		34	34.0%
	preterm		66	66.0%
	Mean ± SD		35.62±2.81	
sex	Male		56	56.0%
	Female		44	44.0%
Mode of delivery	CS		76	76.0%
	Vaginal		24	24.0%
Maternal risk factors	-ve		64	64.0%
	+ve	Total	36	36.0%
		IDM	16	16.0%
		DM+HTN	6	6.0%
		Preeclampsia	6	6.0%
		Oligo	2	2.0%
		PP	2	2.0%
		PROM	2	2.0%
		Lupus	2	2.0%

Table 2: Echo findings in our studied cases

		Count	%
Echo findings	cardiac problem	20	20.0%
	No cardiacproblem	80	80.0%

Table 3: Relation between gestational age and cardiac findings

		gestational age				
		fullterm		preterm		P value
		Count	%	Count	%	
Echo findings	cardiac problem	6	17.6%	14	21.2%	0.673
	no cardiac problem	28	82.4%	52	78.8%	

Table 4: Cardiac findings in full term neonates

	Fullterm	
	Count	%
complex heart	1	2.9%
HypoplasticRV, DysplasticTV, PUL valve atresia	1	2.9%
PUL HTN	3	8.8%
Severe valvular AS, Aortic Arch hypoplasia	1	2.9%
No cardiac problem	28	82.4%

Table 5: Cardiac findings in preterm neonates

	Preterm	
	Count	%
D-TGA, ASD, PDA	1	1.5%
Hypertrophic Cardiomyopathy	1	1.5%
Hypoplastic left heart syndrome	2	3.0%
Large ASD, Dilated RA, RV	3	4.5%
PUL HTN	3	4.5%
Severe Coarctation of Aorta	2	3.0%
Suggest Tetralogy of Fallot	1	1.5%
Truncus Arteriosus, Large VSD	1	1.5%
No cardiac problem	52	78.8%

Table 6: Relation between cardiac findings and other parameters

		Echo findings (yes/no)				
		cardiac problem		no cardiac problem		P value
		Count	%	Count	%	
gestational age	full term	6	30.0%	28	35.0%	0.673
	preterm	14	70.0%	52	65.0%	
sex	male	12	60.0%	44	55.0%	0.687
	female	8	40.0%	36	45.0%	
mode of delivery	CS	15	75.0%	61	76.2%	1
	vaginal	5	25.0%	19	23.8%	
maternal risk factors	yes	14	70.0%	22	27.5%	< 0.001
	no	6	30.0%	58	72.5%	
maternal risk factors details	IDM	4	28.6%	12	54.5%	0.348
	DM+HTN	3	21.4%	3	13.6%	
	PE	3	21.4%	3	13.6%	
	OLIGO	1	7.1%	1	4.5%	
	PP	2	14.3%	0	.0%	
	PROM	0	.0%	2	9.1%	
	LUPUS	1	7.1%	1	4.5%	

Table 7: Relation between cardiac findings and X-ray findings

		Echo findings (yes/no)				
		cardiac problem		no cardiac problem		P value
		Count	%	Count	%	
X-ray findings	abnormal	17	85.0%	69	86.2%	1
	normal	3	15.0%	11	13.8%	
X-ray findings	specific patterns	2	10.0%	0	.0%	< 0.001
	cardiomegaly	7	35.0%	0	.0%	
	cardiomegaly, pneumonia	2	10.0%	0	.0%	
	RDS, cardiomegaly	1	5.0%	0	.0%	
	RDS	1	5.0%	25	31.2%	
	Bilateral pneumothorax	1	5.0%	1	1.2%	
	Pneumonia	1	5.0%	14	17.5%	
	Pneumothorax	0	.0%	4	5.0%	
	Pneumothorax, Pneumonia	1	5.0%	1	1.2%	
	TTN	1	5.0%	22	27.5%	
	others	0	.0%	2	2.5%	
	normal	3	15.0%	11	13.8%	
chest problems	pneumothorax	1	5.0%	5	6.2%	0.001
	Meconium aspiration	0	.0%	2	2.5%	
	Pneumonia	3	15.0%	14	17.5%	
	Pneumothorax, Pneumonia	1	5.0%	1	1.2%	
	RDS	2	10.0%	25	31.2%	
	TTN	1	5.0%	22	27.5%	
	no chest problem	12	60.0%	11	13.8%	

4. Discussion

In current study, cardiac problem are more common in preterm male neonates were born by cesarean section with maternal risk factors. In agree with our study[13], (2015) study the possible risk factors which are responsible for the development of respiratory distress due to cardiac causes were preterm (87.5%), male gender (67.4%), low birth weight (70.5%), <7 Apgar score (57.1%) and lower segment caesarian section (31.8%).

Our result similar to[14], (2014) study in Yemen found that CHD was more common in males (59.4%) than females (40.6%) with a male to female ratio of 1.46:1. This finding is similar to that reported in Iran (male to female ratio of 1.5:1) [15], Bangladesh (male to female ratio of 1.2:1) [16], and Pakistan (male to female ratio of 1.35:1) [17], (male to female ratio of 1.3:1) [18] and in Nepal (male to female ratio was 1.5:1)[19].

In Egypt, [20]. (2014) evaluated the effect of sex on the outcome of CHD in 312 children. 55% were males and 45% were females with male to female ratio 1.22:1. While in another Egyptian study by [21], (2017), 50 neonates were diagnosed as having CHD, out of them 39 (78%) were males with male to female ratio 3.55:1.

In agree with our results[13], (2015) study; found that 44% of newborns born of normal vaginal delivery compare to 56% newborns born of caesarean section developed CHD. Therefore, proper controlling programs should be implemented in order to prevent and reduce pregnancies leading to cesarean delivery and induced abortion [22].

As regard to other risk factors of CHD, maternal disease like maternal infection, diabetes mellitus and hypertension might increase occurrence of heart disease in neonates. 36% of our cases have maternal risk factors inform of 16% their mothers had gestational diabetes, 6 % their mothers had gestational diabetes and hypertension together, 6 % with pre eclampsic mothers, 2 % their mothers had history of oligohydraminous, 2 % their mothers had placenta previa, 2 % their mothers had history of premature rupture of membrane and 2 % their mothers had systemic lupus.

In agree with our study[16], (2013), found that (10%) mothers of affected neonates had a history of diabetes during pregnancy period, 8% hypertensive and 4% mothers gave a positive history of suggestive of infection during their pregnancy period.

Echo findings in our studied cases suggest cardiac findings in 20 cases and 80 cases with no cardiac findings. In [13], (2015) study, It was seen that 90% of the distress cases are of respiratory in origin, while 6% are of cardiac in origin and 4% are others like congenital diaphragmatic hernia, sepsis, birth asphyxia etc.

Conclusion and Recommendations

- Neonatal respiratory distress affects almost half of newborns. It is a major cause of neonatal admissions and has a high mortality rate. Many of its significant risk factors and etiologies are preventable.
- Adequate follow-up of pregnancy and labor for early detection of risk factors and timely intervention may improve the outcome of neonatal respiratory distress.
- Identifies independent predictors of neonatal respiratory distress with CHD in Egypt like: foetal distress, maternal diabetes and hypertension, elective caesarean delivery, prematurity and male gender.
- It is suggested to perform studies with larger sample size to assess these factors again because there are some discrepancies in the findings of different studies in this field.

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