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Fraction of Inspired Oxygen as a Predictor of CPAP Failure in preterms with Respiratory Distress Syndrome

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Abstract

Background: Respiratory distress syndrome (RDS) is one of the most common causes of NICU admission and neonatal death. It is mainly found in premature infants, the risk of developing into RDS increased with decreasing of gestational age and birth weight. Continuous positive airway pressure (CPAP) is a simple, non-invasive, and cost-effective therapy, particularly for preterm neonates with respiratory distress syndrome (RDS). It decreases the need for mechanical ventilation as well as the risks of mortality and bronchopulmonary dysplasia (BPD). The main aim of this study was to assess fraction of Inspired Oxygen as a Predictor of CPAP Failure in preterm with respiratory distress syndrome. Methods: This study enrolled on infant with Respiatroy distress on CPAP.

Keywords: CPAP Failure, Respiratory Distress, preterms.

1. Introduction

Respiratory distress syndrome (RDS) is a common breathing disorder that affects newborns. RDS occurs most often in babies born preterm, affecting nearly all newborns who are born before 28 weeks of pregnancy. Less often, RDS can affect full term newborns. RDS is more common in premature newborns because their lungs are not able to make enough surfactant. Surfactant is a foamy substance that keeps the lungs fully expanded so that newborns can breathe in air once they are born.

2. Patients and Methods

This study enrolled on infant with Respiatroy distress on CPAP

Each patient included in this study will be subjected to:

- Thorough history taking: including date of birth, sex, gestational age, type of feeding, mode of delivery, history of birth trauma, intra partum fever, history of premature rupture of membranes, history of maternal illness, drugs, history of previous siblings with neonatal distress , symptoms suggestive of respiratory distress in the form of (poor suckling, lethargy, tachypnea , tachycardia), date of onset of symptoms suggestive of respiratory distress .
- Careful clinical examination: including assessment of anthropometric parameters, neonatal reflexes , neurological examination , in addition to chest, cardiac and abdominal examination.

2.1. Ethical consideration:

An informed written consent was obtained from parents before participation, it will include data about aim of the work, study design , site , time, subject, tool and confidentiality.

An approval from Research Ethics Committee in Benha faculty of medicine was obtained.

2.2. Statistical Analysis

All data were collected, tabulated and statistically analyzed using SPSS 22.0 for windows (SPSS Inc., Chicago, IL, USA). Data were tested for normal distribution using the Shapiro Walk test. Qualitative data were represented as frequencies and relative percentages. Chi square test ($\chi 2$) and Fisher exact was used to calculate difference between qualitative variables as indicated. Quantitative data were expressed as mean ± SD (Standard deviation) for parametric and median and range for non-parametric data. Independent T test and Mann Whitney test were used to calculate difference between quantitative variables in two groups for parametric and non-parametric variables respectively. Binary logistic regression analysis using the stepwise method was used. Receiver operating characteristic (ROC) curve was constructed. All statistical comparisons were two tailed with significance Level of P-value ≤ 0.05 indicates significant, p <0.001 indicates highly significant difference while, P> 0.05 indicates Non-significant difference.

3. Results

Table (1) Demographic characteristics and clinical data among the studied groups

		RD patients (n=200)
Maternal age (years) Mean ± SD		30.56 ± 4.55
Parity Mean ± SD		2.16 ± 1.41
Mode of delivery	**CS**	167 (83.5%)
	VD	33 (16.5%)

This table shows that there is a significant difference between the groups regarding age

Table (2) Maternal history and risk factors among the studied groups

	RDS patients (n=200)
Preterm/RD history	117 (58.5%)
(Pregnancy induced HTN) PIH	70 (35%)
DM	34 (17%)
HTN	16 (8%)

This table shows that there is a significant difference between the groups regarding history of preterm/RD and PIH.

4. Discussion

Respiratory distress syndrome (RDS) is one of the most common causes of NICU admission and neonatal death. It is mainly found in premature infants, the risk of developing into RDS increased with decreasing of gestational age and birth weight; the incidence rate is 80% in infants <28 weeks gestation, 60% at 29 weeks, and 15-30% at 32-34 weeks, but declined with maturity to 5% at 35-36 weeks and is almost 0% by 39 weeks gestation. RDS accounted for 6.8% of cases of respiratory distress in term or near-term infants. However, the clinical characteristics, diagnostic criteria and treatment strategies of term neonatal RDS are very different from that in premature infants (**Sunil et al., 2019).**

The treatment of neonatal respiratory distress syndrome (RDS) with nasal continuous positive airway pressure (CPAP) is now widespread in preterm newborns who do not require intubation during post-birth stabilization. According to the 2016 European Guidelines on the management of RDS, early nasal CPAP is recommended as the first-choice treatment in infants <30 weeks' gestation, who are at risk of RDS, but do not require mechanical ventilation (MV). The key clinical benefit of the early initiation of CPAP is the potential avoidance of invasive ventilation with all the related sequelae. However, the efficacy of early CPAP may vary, and the success rate largely depends on the gestational age. Of note, infants who fail CPAP are at increased risk of death, pneumothorax, and bronchopulmonary dysplasia (BPD), among other morbidities (**Sweet et al., 2017).**

Surfactant deficiency has been suggested to be the main cause of CPAP failure; therefore, from a clinical perspective, it is vital to identify surfactant-deficient infants as soon as possible and to introduce early rescue surfactant therapy. Several factors predictive of treatment failure have been proposed in the literature, of which the maximum fraction of inspired oxygen (FiO2) in the first hours of life was most often reported (**Dargaville et al., 2016).**

Respiratory distress syndrome (RDS) is a common problem and underlying cause of death in premature infants (born before the 37th week of pregnancy) which result from an insufficient production of pulmonary surfactant. In the United States, RDS affects approximately 10 percent of premature newborns each year. low birth weight, lower gestational age, delivery between 34 and 36 weeks of gestation and elective labor induction are the main risk factors for RDS. Babies' lungs begin to develop in the embryo and continue until the age of three. Fetal lung maturity occurs with differentiation of type II pneumocytes which show a marked depletion in glycogen stores, and surfactant production begins. Therefore, premature birth can cause RDS because of insufficiency of surfactant production (**Martin et al., 2010).**

5. Conclusion

Close monitor patient On CPAp

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