



THE CORRELATION BETWEEN USING NASAL CPAP DEVICE AND NEONATAL OUTCOMES

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ARTICLE INFO

Received:

03th Aug 2018

Received in revised form:

24th Nov 2018

Accepted:

27th Nov 2018

Available online:

26th Dec 2018

Keywords: *Premature Newborns, Nasal CPAP, Respiratory Distress Syndrome*

ABSTRACT

Introduction and goal: Respiratory problems are the main cause of death and the most common causes of hospitalization in premature neonates in developing countries. More than 50% of the babies born under 31 weeks of gestational age will have respiratory distress syndrome (RDS), which is the cause for half of all neonatal deaths. In recent years, treatment with surfactant after birth as well as various mechanical techniques, such as using noninvasive ventilation with nasal continuous positive airway pressure (NCPAP) has improved the outcome of neonatal respiratory disease. **Materials and Methods:** This is a retrospective descriptive cross-sectional study that was carried out on neonates who used NCPAP device during the period of January to December 2015. Demographic data about these newborns including: gender, weight, gestational age, type of delivery, age, type of illness, duration for using the device and the final status of the newborns. The collected data were evaluated by using SPSS version 19. **Results:** From a total of 68 newborns with gestational age of 27-36 weeks who used NCPAP, 66% had full recovery. There was a significant relationship between the types of delivery, birth weight and gestational age with the final outcome of the newborns ($P < 0.05$). **Conclusion:** Early use of noninvasive ventilation with NCPAP in preterm infants with respiratory distress at birth can be associated with a better outcome.

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To Cite This Article: AlaeeKarahroudy F, Mahdavi Khanouki Z, Pour Arian Sh, Rezai-Zadeh A, (2018), "The Correlation between Using Nasal CPAP Device and Neonatal Outcomes", *Pharmacophore*, **9(6)**, 22-25.

Introduction

Respiratory problems are the main cause of death and the most common cause of hospitalization for preterm neonates in developing countries. Neonatal respiratory distress can be caused by prematurity, pneumonia, sepsis, diarrhea, and fetal factors [1]. Acute respiratory distress is the main reason for half of the neonatal mortality rate in the world. More than 50% of babies born under 31 weeks of gestational age develop RDS. Almost 80% of infants with pneumonia and neonatal sepsis show signs of respiratory distress. [2]. Prior to the development of the mechanical ventilation device, most of the infants with RDS lost their lives during the first week of life. The survival of premature babies has improved by using mechanical ventilation. However, endotracheal intubation and mechanical ventilation have been associated with complications such as; air leak syndrome, subglottic stenosis, bradycardia due to vagal nerve stimulation and infections [3]. In recent years, prenatal corticosteroids therapy in mothers, postnatal surfactant therapy and noninvasive mechanical ventilation such as CPAP has improved RDS outcome [4].

CPAP is a powerful and effective tool for the treatment of respiratory distress in low birth weight preterm infants. In a study of very low birth weight infants, the use of prophylactic CPAP which is based on the protocol (Endotracheal intubation, the administration of surfactant, extubation [INSUR]), and then put on Nasal CPAP(NCPAP), in preterm infants reduced the need for conventional mechanical ventilation followed by a decrease in the mortality and morbidity rate [1, 2]. Based on

these findings, the researchers concluded that there is a possibility to use such method in developing countries that have limited facilities such as ventilators and have less access to surfactant [1]. Some studies have shown that prophylactic use of NCPAP in preterm infants can also reduce the need for mechanical ventilation, pneumothorax and ultimately mortality, especially if it is used in parallel with surfactant therapy [5]. NCPAP is a noninvasive, highly effective device with a disposable nasal cannula that can minimize the risk of infection, thus it is recommended to be used as the cornerstone of therapy in preterm infants with RDS [6]. The use of NCPAP in comparison with intubation can reduce the incidence of Broncho pulmonary dysplasia in premature infants with RDS [7].

In this study we have investigated the factors related to infants using NCPAP and its correlation with their outcomes.

Method:

This was a retrospective descriptive and analytical study, which was performed in the neonatal intensive care unit of the Payambar Azam Hospital of Kerman University of Medical Sciences from January to December 2015. Information file records of any newborn including gender, gestational age, weight, and age, type of delivery, machine usage duration, the diagnosis, and the final status of each baby were collected. Data were analyzed using SPSS version 19 and Chi-square test and Z Fisher's exact test at a significance level of $P < 0.05$.

Result:

Total of 68 infants who had received NCPAP with the following criteria were included: gender, gestational age, birth weight, infant age and type of delivery (Table 1). Most of them (25 cases) were premature (gestational age < 37) admitted with diagnosis of RDS (Table 2). The duration of using NCPAP, in most babies (47 cases) was for a period of 6 days or less. The final outcomes of infants have been identified: as 46 cases improved (67.7%), 7 infants needed ventilator (10.3%) and were intubated, and 15 infants expired (22.1%), (table 3). Our findings showed that there is a significant reverse correlation between gestational age and birth weight with the final status of the infant ($p < 0.05$). The infants who were delivered by cesarean section mostly used NCPAP ($p < 0.02$), (Table 3).

Table 1. Distribution of variables in newborns

Variable		Kind of delivery (%)	Age of newborn	Weight	Gestational age	Gender (%)
			Hour (%)	Gram (%)	Week (%)	
Highest percent	Frequency	Cesarean (70.6)	24 (54.4)	1500-2500 (39.7)	< 36 (50.0)	Boy (57.4)
Lowest percent		Natural (29.4)	73-96 (8.8)	> 2500 (22.1)	> 38 (16.2)	Girl (42.6)

Table 2. Distribution of diagnosis in infants receiving CPAP device

Diagnosis	Diaphragmatic hernia	Congenital anomalies	Pneumonia	PPHN	Meconium aspiration	TTN	RDS	Prematurity
Frequency (%)	1.5	2.9	2.9	4.4	10.3	11.8	29.4	36.8

Table 3. Standard deviation of the variables affecting the final status of children

	Type of delivery		Gestational age (weeks)			Weigh (gram)		
	cesarean	Normal vaginal delivery	> 38	36-38	< 36	> 2500	1501-2500	< 1500
Recovery (%)	77.1	45.0	54.5	91.3	55.9	60.0	85.2	53.8
Connect to the ventilator (%)	8.3	15.0	0.0	4.3	17.6	6.7	3.7	19.2
Death (%)	14.6	40.0	45.5	4.3	26.5	33.3	11.1	26.9
P-Value	0.02		0/01			0.048		

Discussion:

In our study most of the infants were boys (57.4%), girls (42.6%), this could be explained by the fact that prevalence of prematurity in boys is 3 times more than girls [8]. Average weight of treated infants with NCPAP was 1,842.4 grams that are consistent with Gunlemaz et al. study [9]. Since most preterm infants who suffer from respiratory problems are low birth weight, therefore, it can cause high incidence using NCPAP.

In this study, among the infants, 48 babies were born through Cesarean section that is consistent with the study of Zahid Pasha et al. [10] Moraveji Asl et al. [11], and Liu et al. study [12]. This consistency is because those newborns through cesarean section had more respiratory problems and the main treatment that they received were NCPAP. Most babies in the first two hours after birth (37) were given NCPAP, which is consistent with the findings of Rostami and Attarian [4]. Usage duration of NCPAP devices in most infants (47) were about 6 days and the findings is consistent with Nigel et al. [13] and Yong et al. [14].

The findings of this study showed that, among demographic characteristics, correlation between the birth weight and gestational age and baby's final outcome was reverse and significant ($p < 0.05$). It can be assumed that birth weight and gestational age of the infants are the two main factors, determining the final status of a baby. Liu et al. [12] study aimed to determine risk factors in infants with RDS, revealed that babies born through caesarean section, and lower weight plus gestational age were at greater risk of RDS and required the use of NCPAP. Schmolzer et al. [7] study aimed to evaluate the role of NCPAP, in preventing death, respiratory problems and Broncho pulmonary dysplasia in premature infants by showing that the use of NCPAP in the first hours after birth in the delivery room reduced, mortality and the use of mechanical ventilation. A group of researchers in Neonatal Research Center of America [15] in 2010 compared the early use of surfactant therapy and NCPAP in preterm infants, and showed that it can be used as an alternative method to intubation and surfactant therapy. Heidarzadeh and colleagues [10] study in 2009 with the aim of comparing NCPAP and mechanical ventilation in preterm infants with RDS showed that in order to reduce mortality and morbidity after receiving surfactant, the tracheal tube can be removed and continue the respiratory support with NCPAP. The results of our study were consistent with the results of this study in reducing mortality and morbidity. Early and timely use of noninvasive NCPAP method in the first few hours after birth, in preterm infants with respiratory problems can promote full recovery and achieve favorable results.

Conclusion:

In the present study, it can be concluded that early use of noninvasive NCPAP, in the early hours after birth in preterm infants and infants with respiratory problems is associated with improving pulmonary function and reduces the need for intubation. Using NCPAP in newborn with high birth weight and high gestational age can increase recovery rate. It is recommended that using noninvasive NCPAP right after birth in NICU can reduce the need for mechanical ventilation and its complications and accordingly medical expenses and infant mortality.

Acknowledgments:

This article is extracted from the research projects No... approved Thus, researchers would like to thank all those who have worked on this study, especially supervisors, nurses and hospital staff of the in NICU in Payambar Azam hospital in Kerman. The authors would like to thank the Neonatal Research Center for their Academic, financial and editorial and also Research Consultation Center at Shiraz University of Medical Sciences for their invaluable assistance in editing this article.

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