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Original Article

Risk factors contributing to weaning failure from continuous positive airway pressure to high flow nasal cannula in neonates with respiratory distress syndrome

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Abstract

Background Respiratory distress syndrome (RDS) is one of the most frequent causes of mortality and morbidity in neonates. High flow nasal canule (HFNC) is a step ladder modality of alternative oxygen therapy for weaning to reduce the workload of breathing and the need for intubation.

Objective To identify the risk factors contributing to weaning failure from continuous positive airway pressure (CPAP) to HFNC in neonates with RDS.

Methods This study was a retrospective observational study in neonates aged less than 36 weeks weighing less than 2500 grams who underwent CPAP to HFNC weaning from 2019 to 2021 in Dr. Kariadi Hospital, Semarang, Central Java, Indonesia.

Results There were 108 patients included in this study. Our bivariate analysis found significant differences in gestational age, age at the start of weaning, body weight at the start of weaning, FiO_2 levels, history of maternal chorioamnionitis, patent ductus arteriosus (PDA), anemia, apnea of prematurity (AOP), and sepsis in neonates with RDS. Multivariate analysis showed that the most dominant factors were FiO2 levels of more than 25% at the start of weaning (OR11.16; 95%CI 1.83 to 63.12; P=0.009), anemia (OR 7.70; 95%CI 1.39 to 42.67; P=0.019), AOP (OR 19.64; 95%CI 4.27 to 90.35; P<0.001), and sepsis (OR 10.93; 95%CI 2.37 to 45.53; P=0.002)

Conclusion FiO_2 setting of more than 25% at the start of weaning, anemia, AOP, and sepsis produce a significant probability of HFNC weaning failure. **[Paediatr Indones. 2024;64:78-86; DOI: 10.14238/pi64.1.2024.78-86**].

Keywords: *high flow nasal cannula failure; respiratory distress syndrome*

Respiratory distress syndrome (RDS), known as surfactant-deficiency disorder or previously known as hyaline membrane disease (HMD), is a common cause of respiratory distress in newborns, especially in preterm neonates. This syndrome is one of the main causes of respiratory failure in neonates that can cause death or admission to the NICU.[1-4]

Various forms of oxygen therapy have been used to treat infants and children with respiratory distress. Oxygen supplementation by nasal cannula in infants and children is flow-restricted due to lack of humidification. Mechanical ventilation via an endotracheal tube is another option for acute respiratory failure, but it has various complications, including nosocomial pneumonia and prolonged PICU/NICU care.[5,6] Long-term use of CPAP causes several complications such as nasal trauma, pulmonary air leak syndrome, and gastric distention. The HFNC is a step ladder modality of alternative oxygen therapy

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for weaning to reduce the workload of breathing and the need for intubation. Clinical trials have proven the effectiveness of HFNC as a primary and secondary therapy for respiratory distress. This HFNC can improve lung compliance and gas exchange fraction in the alveoli and capillaries, as well as reduce upper airway dead space, lower airway resistance, reduce metabolic load, reduce workload of breathing and create positive air pressure needed by the lungs.[6-9]

There is an urgent need for a study to identify the risk factors and the early detection of HFNC weaning failure thereof to improve RDS management and prevent mortality and morbidity in neonates. This study aimed to identify the risk factors contributing to weaning failure from CPAP to HFNC in neonates with RDS.

Methods

A retrospective study was conducted in Dr. Kariadi Hospital, Semarang, Central Java, Indonesia from 2019 to 2021. All neonates with RDS that were aged less than 36 weeks and weighed less than 2500 grams who underwent CPAP to HFNC weaning were enrolled in this study.

Exclusion criteria in this study were incomplete medical records, major congenital anomaly (gastroschisis, omphalocele, labiopalatoschisis), syndromes and disorders, or any history of surgical management. All data were obtained from medical records. RDS was defined as a minimum of two out of three criteria including: tachypnoea (respiratory rate > 60 times per minute), retraction (intercostal, subcostal, sternal, or suprasternal), and abnormal respiratory sounds (stridor, wheezing, moaning, gasping).

Patients were classified into HFNC failure or success group. Failure was defined as requiring reinsertion of the HFNC within 24 hours after changing to conventional oxygen therapy or requiring CPAP, non-invasive ventilator (NIV) or endotracheal intubation during the HFNC weaning period. While success was considered as successful weaning from CPAP to HFNC within 24 hours.[10] Variables identified in this study comprised of gestational age, chronological age, body weight at start of weaning, FiO_2 level at the start of weaning, history of chorioamnionitis, history of patent ductus arteriosus (PDA), history of anemia, history of apnea of prematurity (AOP), and history of sepsis. Categorical data were presented as N (%). Chi-square or Fisher exact test was employed to the odd ratio with a 95% confidence interval. Data was considered statistically significant if $P<0.05$. All data with $P<0.25$ was then processed with multivariate analysis with logistic regression. This study was approved by institutional ethical committee of Faculty of Medicine, Diponegoro University, Indonesia.

Results

There were 108 patients included in this study. The subjects of this study were classified into two groups, namely the HFNC success and the HFNC failure group. The classification into these groups was determined based on the results of the evaluation of HFNC oxygen weaning within 24 hours. In this study, there were 61 subjects in the HFNC success group and 47 subjects in the HFNC failure group (**Table 1**).

Based on the bivariate analysis, it was found that all the risk factors in the failure (case) group had significant differences with the success (control) group. Gestational age of less than 34 weeks significantly increased the chances of experiencing HFNC weaning failure, 4.15 times more compared to gestational age of more than 34 weeks (OR 4.153; 95%CI 1,292 to 13,1348; P=0.023). Age at the startof weaning of less than 4 dayswas statistically significant as a protective factor for HFNC weaning failure (OR 0.289; 95%CI 0.111 to 0.752; P=0.016). Subjects with body weight at the start of weaning <1100gram were at a significantly higher risk (9 times more) of experiencing HFNC weaning failure compared to body weight > 1100 grams (OR 9,014; 95%CI 1.889 to 43.008; P=0.004). FiO2 levels of more than 25% before weaning also significantly increased the risk (14.7 times more) compared to FiO2 levels of less than 25% (OR 14,769; 95%CI 5.285 to 41.269; P<0.001). Maternal history of chorioamnionitis during delivery presented a 5.2 times higher risk of experiencingHFNC weaning failure than mothers without chorioamnionitis (OR 5.235; 95%CI 1.966 to 13,940; P=0.001).

Clinical manifestations of subjects with PDA gave them 10 times greater chance of weaning failure

Table 1. Subject characteristics in this study

Characteristics	Groups		P value
	HFNC failure (n=47)	HFNC success (n=61)	
Mean body birth weight (SD), grams	1280 (297)	1500 (305)	<0.001*
Mean mother's age (SD), years	32 (7)	30 (7)	0.588*
Mean chronological age (SD), days	13 (23)	6 (28)	<0.001**
Mean gestational age (SD), weeks	30 (3)	32 (3)	0.006**
Mean body weight at the start of HFNC weaning (SD), grams	1380 (285)	1495 (302)	<0.001**
History of pregnancy, n (%)			0.837**
Primigravida	10(9.3)	12(11.1)	
Multigravida	37(34.3)	49(53.4)	
Labor method, n (%)			<0.001**
Spontaneous	4 (3.7)	29(26.9)	
Cesarean section	43(39.8)	32(29.6)	
Sex, n (%)			0.344**
Male	21(19.4)	34(31.5)	
Female	26(24.1)	27(25.0)	
Antenatal steroid, n (%)			<0.001**
Yes	41(38)	32(29.6)	
No	6(5.6)	29(26.9)	

than those without PDA (OR 10.114; 95%CI 2.138 to 47.856; P=0.002). Subjects with anemia had a 6.9 times greater chance experienced HFNC weaning failure than those without anemia (OR 6.913; 95%CI 2.706 to 17.661; P<0.001). Subjects with AOP had a 21.5 times greater chance of weaning failure compared to those without AOP (OR 21,533; 95%CI 7,972 to 58,165; P=0.001), while sepsis presented an 18.1 times greater chance of experiencing HFNC weaning failure than those without sepsis (OR 18.18; 95%CI 6.65 to 49.69; P<0.001) (**Table 2**).

The results of the bivariate chi square revealed independent variables with P value < 0.05. Subjects with P value <0.25 were further processed with multivariate analysis. Variables that qualify for multivariate analysis using logistic regression were: (1) gestational age (gestation); (2) age at the start of weaning (3) body weight at weaning expansion; (4) the level of FiO_2 at the start of weaning (FiO_2 weaning); (5) history of maternal chorioamnionitis; (6) PDA; (7) anemia; (8) AOP; and (9) sepsis. Multivariate analysis showed that the most dominant factors influencing HFNC weaning failure in RDS infants were FiO_2 levels of more than 25% at the start of weaning (OR 11.1; 95%CI 1.83 to 63.12; P=0.009), anemia (OR 7.7; 95%CI. 1.39 to 42.67; P=0.019), AOP (OR 19.6; 95%CI 4.27 to 90.53; P<0.001) and sepsis (OR10.3; 95%CI 2.37 to 45.5; P=0.002) (**Table 3**). Based on the results of the multivariate analysis, patients with FiO_2 levels equal or more than 25%, anemia, AOP, and sepsis have a 79% probability of experiencing HFNC weaning failure.

Discussion

This study was a retrospective study to identify factors that influence HFNC weaning failure in preterm infants. Subjects' characteristics in this study were dominated with gestational age of <34 weeks and chronological age at the start of weaning was more than 4 days. Most subjects weighed more than 1100 gram with FiO_2 setting at the start of weaning of more than 25%.

Our bivariate analysis found a significant difference between the HFNC failure and HFNC success groups. Gestational age of less than 34 weeks presented a 4.15 times higher chance of experiencing HFNC weaning failure compared to those with a gestational age of more than 34 weeks (OR 4.153; 95%CI 1.292 to 13.1348; P=0.023). This study was consistent with previous studies that examined risk factors for HFNC failure as initial therapy for infants of more than 30 weeks gestational age, which found

Table 2. Bivariate analysis of risk factors

Variables	Groups		OR (95% CI)	P value
	HFNC failure (n=47)	HFNC success (n=61)		
Gestational age, n(%)			4.153 (1.292 to 13.1348)	0.023
< 34 weeks	43 (91.5)	44 (72.1)		
≥34 weeks	4 (8.5)	17 (27.9)		
Age at the start of HFNC weaning, n(%)			0.289 (0.111 to 0.752)	0.016
<4 days	7 (14.9)	23 (37.7)		
≥4 days	40 (85.1)	38 (62.3)		
Body weight at the start of HFNC weaning, n(%)			9.014 (1.889 to 43.008)	0.004
< 1100 g	11 (23.4)	2 (3.3)		
≥1100 g	36 (76.6)	59 (96.7)		
FiO_2 levels at the start of HFNC weaning, n(%)			14.769 (5.285 to 41.269)	<0.001
>25 %	29 (61.7)	6 (9.8)		
≤25 %	18 (38.3)	55 (90.2)		
History of chorioamnionitis, n(%)			5.235 (1.966 to 13.940)	0.001
Yes	19 (40.4)	7 (11.5)		
No	28 (59.6)	54 (88.5)		
PDA, n(%)			10.114 (2.138 to 47.856)	0.002
Yes	12 (25.5)	2 (3.3)		
No	35 (74.5)	59 (96.7)		
Anemia, n(%)			6.913 (2.706 to 17.661)	<0.001
Yes	24 (51.1)	8 (13.1)		
No	23 (48.9)	53 (86.9)		
AOP, n(%)			21.533 (7.972 to 58.165)	<0.001
Yes	38 (80.9)	10 (16.4)		
No	9 (19.1)	51 (83.6)		
Sepsis, n(%)			18.18 (6.65 to 49.69)	<0.001
Yes	33 (70.2)	7 (11.5)		
No	14 (29.8)	54 (56.5)		

Table 3. Multivariate analysis of risk factors with Backward Wald

Variables	OR (95%CI)	P value
Body weight	12.681 (0.878 to 183.26)	0.062
FiO_2	11.168 (1.831 to 63.120)	0.009
Anemia	7.709 (1.393 to 42.676)	0.019
AOP	19.648 (4.273 to 90.353)	0.000
Sepsis	10.391 (2.371 to 45.530)	0.002

a significant difference between the success HFNC and failed HFNC groups [35.6 (SD 3.0) *vs.* 33.7 (SD 2.7) weeks; P=0.005). This study also showed that the younger the gestational age, the higher the HFNC weaning failure by 22.1-29.9%.[3]

Another retrospective study also showed that a subject's gestational age <32 weeks was a significant risk factor for HFNC failure in preterm infants with RDS. The study found that preterm infants <32 weeks of age had a 3.3 times higher risk of HFNC failure (OR 3,351; 95%CI 1.041 to 10,793; P=0.043).[11] Another study on the effects of HFNC compared to CPAP found that the failure rate was higher at 28 to 32 weeks (23.7%) compared to 33-34 weeks (14.8%).[12] In contrast to this study, HFNC was not used as initial therapy but as a weaning therapy from previous use of CPAP.

The recent study showed that gestational age is significantly related to the incidence of respiratory system disorders. The relationship between

gestational age and respiratory function in infants is still controversial. Prematurity was said to be one of the factors for oxygen therapy failure in neonates. Immaturity of lung tissue and weakness of respiratory muscles will worsen the condition of RDS in preterm patients and present a high risk of the development of bronchopulmonary dysplasia (BPD) making it difficult to wean off of oxygen therapy.[13,14]

Our study found that age at the start of weaning of less than 4 days, although statistically significant, was a protective factor for HFNC weaning failure (OR 0.289; 95%CI 0.111 to 0.752; P=0.016). Study on the relationship between the timing of starting HFNC weaning and HFNC failure has so far not been established. A previous study showed that there was a significant difference between the age at the time of treatment in the failed HFNC group compared to the successful HFNC where the failure rate was higher at the younger correction age [29.8 (SD 2.1) *vs.* 31.3 (SD 2.0) days; P< .0001].[14]

The mechanism between weaning time and HFNC weaning failure in preterm infants with RDS remains unclear. The hypothesis is that the possibility of severe lung tissue damage in the subject requires longer oxygen therapy. Another hypothesis is that the use of long-term oxygen therapy will cause hyperoxia associated with increased production of oxygen free radicals that cause tissue damage in premature infants whose antioxidant capacity is still immature.[15]

We also found that lowweight at the start of weaning was found to be a risk factor for HFNC weaning failure in infants with RDS. Bivariate analysis of our study found that the weight at the start of weaning <1100 grams presented a 9 times higher chance of HFNC weaning failure compared to body weight >1100 grams (OR 9,014; 95%CI 1.889 to 43.008; P=0.004). This supported the previous study which displayed that there was a significant difference between body weight at the time of treatment in the HFNC failed group compared to the HFNC success group [1044 (SD 296) *vs.* 1275 (SD 320) grams; P<0.0001].[14]

Another previous study comparing failure after 72 hours of HFNC and CPAP administration in 272 infants with HNFC therapy as primary ventilatory support after birth, also showed failure rates in the range of 12.9-38% and 26.3%, respectively. Treatment failure was found in infants with birth weight >1000 grams.[13,16] Another study reported that the average weight of infants who were successfully oxygenated was 1611 (SD 432) grams. Low weight is suspected to be one of the factors for failure of oxygen therapy in neonates. Low birth weight and very low birth weight neonates with respiratory distress have to exert more energy as the respiratory muscles are still weak thus they are at higher risk for apnea and require long-term oxygen supplementation.[17]

Another risk factor that influences HFNC weaning failure was the FiO_2 setting at the start of weaning. Subjects who needed FiO_2 support more than 25% had a 14.7 times significantly higher chance of weaning failure compared to those with lowel starting FiO_2 setting. Previous study found a significant difference in FiO_2 between the HFNC success and HFNC failure groups. The study showed that the group with failed HFNC tended to require a higher setting of FiO_2 to maintain oxygen saturation at 88-94% than the HFNC successful group [35 (SD 0.06) % *vs.* 25 (SD 0.06) %; P=0.001] with a cutoff FiO_2 setting of 28% based on the ROC curve (sensitivity 89.7% and specificity 69.1%).[13] Another retrospective study also demonstrated that subjects requiring FiO_2 >35% were at a significant risk for HFNC therapy failure in preterm infants <32 weeks with RDS. The study found that preterm infants <32 weeks with FiO_2 >35% had a 3.9 times greater risk of HFNC therapy failure (OR 3,911; 95%CI 1,639 to 9,333; P=0.002).[11] In contrast to this study where HFNC was used as a weaning method from CPAP, HFNC in previous studies were used as initial therapy for RDS.

Study on high FiO_2 levels as a risk factor for failure of oxygen therapy is currently mostly done on CPAP administration but not much on HFNC. Another prospective multicenter study in preterm infants <30 weeks who were given initial CPAP therapy found that higher FiO_2 requirement was a predictor of CPAP treatment failure. The ROC analysis (73% sensitivity and 57% specificity) found that FiO_2>29% used in the first 2 hours of life was a statistically significant predictor of CPAP failure (AUC 0.7; 95%CI 0.62 to 0.74; P<0.001).[18] A previous prospective study in preterm infants <32 weeks suggested an FiO_2 of more than 30% in the first hour of life as a predictor of CPAP failure.[19,20]

Acidosis, hypercarbia and high FiO2 settings

are suspected to be one of the risks of oxygen therapy failure in neonates. Good oxygenation is determined by the area for gas exchange in the lungs. A high oxygen fraction is needed by preterm infants to compensate for inadequate lung aeration due to less than optimal gas exchange area. Hyperoxia conditions are associated with increased production of oxygen free radicals that cause tissue damage in premature infants whose antioxidant capacity is still immature. Another hypothesis is that the patient may have severe lung tissue damage and thus require a higher fraction of oxygen.[15]

This study found that subjects with a history of maternal chorioamnionitis during delivery were at 5.2 times significantly greater risk of experiencing HFNC weaning failure than those without (OR 5.235; 95%CI 1.966 to 13,940; P=0.001). This result was in line with the previous study that found a significant difference in the history of maternal chorioamnionitis between the HFNC success and failed groups where 19 (17.8%) patients with a history of chorioamnionitis had failed HFNC. The study found that preterm infants <34 weeks with a maternal history of chorioamnionitis had a 2.9 times greater risk of HFNC failure than those without chorioamnionitis (OR 2.92; 95%CI 1.17 to 7.31; P=0.02).[14] Another retrospective study of factors influencing CPAP weaning also found that patients with a history of maternal chorioamnionitis during labor took longer to take CPAP than those without chorioamnionitis. Lung injury caused by inflammatory mediators in the immature lung is suspected to be a predisposing factor for developing BPD in these patients.[19] Maternal chorioamnionitis can cause fetal inflammatory response syndrome which increases the risk of BPD. Intrauterine exposure to proinflammatory cytokines or antenatal infection can trigger an uncontrolled inflammatory process in the lungs that may affect the alveolarization process and pulmonary vascular development. Chorioamnionitis can damage alveoli and pulmonary vascular development and modulate fetal/neonatal immune responses. Proinflammatory cytokines found in umbilical vessels such as G-CSF, IL-6, IL-8, are selectively increased in infants exposed to severe chorioamnionitis where the amount of IL-6 at birth correlates with morbidity of respiratory function at 6-12 months of age.[20-22]

Clinical manifestations of premature infants with PDA are one of the risk factors for HFNC weaning failure. Our study found that PDA was significantly associated with HFNC weaning failure based on bivariate and multivariate analyses. Subjects with PDA had a 10 times significantly greater risk than those without PDA (OR 10.114; 95%CI 2.138 to 47.856; P=0.002) to experience HFNC weaning failure. This study results supported the previous study examining the risk factors for HFNC failure as initial therapy for infants more than 30 weeks gestation where there was a significant difference in subjects with PDA between the groups with successful HFNC and failed HFNC (35% *vs.* 25%; P<0.001).[13] Another study also found a significant relationship between PDA and failure of HFNC therapy where 34-week preterm infants with PDA had a 3.6 times greater risk of HFNC treatment failure than those without PDA (OR 3.61; 95%CI 1.62 to 8.07; P=0.02). The study showed that patients with a history of PDA who were already in therapy had a relatively higher success rate for HFNC.[14] Another retrospective study also demonstrated that PDA was a significant risk factor for failure of HFNC therapy in preterm infants <32 weeks with RDS. The study found that preterm infants <32 weeks with PDA were 7.6 times more likely to fail HFNC therapy than those without PDA (OR 4,317; 95%CI 1,420 to 13,046; P=0.01).[11] Another retrospective study examining factors influencing CPAP weaning in the United States also found that patients with PDA took longer to use CPAP than those without PDA.[19] PDAs with large systemic-to-pulmonary shunts (left-to-right shunts) can cause an increase in pulmonary flow and lead to lung remodelling, so the neonates will need longer respiratory support to maintain adequate ventilation, which in turn can increase the likelihood of morbidity.[14,23]

The other clinical manifestation which is a risk factor based on this study is anemia. Our study also found a significant difference between HFNC failure and success group, where RDS preterm infants with anemia had a 6.9 times significantly higher chance of experiencing HFNC weaning failure compared to those without anemia (OR 6.913; 95%CI 2.706 to 17.661; P<0.001). Previous study have shown that low hematocrit levels are associated with the incidence of BPD in preterm infants. The study also concluded that the incidence of anemia in newborns, both term and preterm, was one of the comorbidities

for the duration of oxygen supplementation therapy. Anemia can interfere with the normal adaptation process from placenta-based respiration to lung-based respiration, thereby initiating an inflammatory cascade that causes lung tissue injury and progression to BPD.[24] A retrospective study examining factors influencing CPAP weaning found that patients with anemia took longer to take CPAP than those without anemia. The effect of anemia on the duration of NCPAP may be due to decreased oxygen delivery and increased workload of breathing and cardiac workload.[19]

Another risk factor that significantly influences HFNC weaning failure is AOP. Bivariate and multivariate analysis showed significant differences between the history of AOP and HFNC weaning failure. Subjects with AOP had a 21.5 significantly greater risk of weaning failure compared to those without AOP (OR 21,533; 95%CI 7,972 to 58,165; P=0.001). There has not been much study on the relationship between AOP and HFNC weaning failure. The literature stated that HFNC can be used as initial therapy for AOP in preterm infants. Studies comparing HFNC with NCPAP for AOP captured no difference in the severity of apnea.[25] Preterm infants have immature respiratory control in both central and peripheral chemoreceptors as well as poor neuromuscular control to maintain a patent airway. Late-preterm infants with RDS have a higher risk of developing AOP. Dysregulation of peripheral chemoreceptors due to early postnatal hypoxemia may be related to the susceptibility of infants with RDS to develop AOP. The effectiveness of chemoreceptors depends on the central response mechanism that corresponds to the degree of maturation of brain tissue that is not yet attained in late-preterm infants. The slower ventilatory response associated with hyperoxia is known to increase the frequency of AOP. This is one of the problems that causes prolonged oxygen supplementation and weaning failure in neonates with RDS.[26,27]

Sepsis is a known risk factor for HFNC therapy failure. Our study found that sepsis is a risk factor for HFNC weaning failure in preterm infants with RDS. Subjects with sepsis had an 18.1 times greater risk of experiencing HFNC weaning failure than those without sepsis (OR 18.18; 95%CI 6.65 to 49.69; P<0.001). There are not many studies regarding the relationship between sepsis and HFNC weaning failure. A previous retrospective study found that sepsis significantly affected the CPAP weaning time of preterm infants <32 weeks.[19] A multicenter RCT that compared HFNC and CPAP as the mainstay of treatment for RDS in infants, found that sepsis was one of the reasons for treatment failure in both groups.[28] This present study differs from reports of single center RCTs in older children comparing NIV and HFNC in septic patients. The study found no statistically significant difference between the 2 groups in the rates of reintubation and extubation failure between the two groups. The in-hospital mortality rate in the two groups was also not significantly different.[29] Sepsis also contributes significantly to mortality and morbidity in premature infants in the NICU. Recent studies have shown that the mechanism of organ failure in sepsis is related to decreased oxygen utilization associated with mitochondrial dysfunction rather than due to poor oxygen delivery to the network. This comorbidity causes oxygen demand to increase due to lung tissue injury caused by the infectious process. Multi-organ failure in sepsis can cause a decrease in pulmonary perfusion so that it requires a longer duration of oxygen therapy.[30,31]

Based on multivariate analysis, there were several significant risk factors for HFNC failure including FiO_2 at the start of weaning of more than or equal to 25%, anemia, AOP and sepsis. FiO_2 > 25% at at the start of weaning (OR 11.1; 95%CI 1.83 to 63.12; P=0.009), anemia (OR 7.7; 95%CI 1.39 to 42.67; P=0.019), AOP (OR 19.6; 95%CI 4.27 to 90.53; P< 0.001) and sepsis (OR 10.3; 95%CI 2.37 to 45.5; P=0.002), presented a 79% probability of HFNC weaning failure. This result was in conjunction with the recent multianalysis study that showed factors influencing HFNC therapy failure after extubation, which were maternal chorioamnionitis (OR 2.92; 95% CI 1.17 to 7.31; P=0.02), PDA (OR 3.61; 95%CI 1.62 to 8.07; P=0.002) and age at initiation of therapy (OR 0.76; 95%CI 0.61 to 0.94; P=0.008). Chorioamnionitis and PDA are known risk factors for BPD in premature infants.[7] In conclusion, an FiO2 setting of more than 25% at the start of weaning, anemia, AOP, and sepsis present a high probability of HFNC weaning failure.

Conflict of interest

None declared.

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