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Effects of Birth Weight (SGA/ AGA/ LGA) and Ponderal Index on Neonatal Mortality and Severe BPD in Extremely Preterm Infants

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BACKGROUND: Mild intrauterine stress could accelerate lung maturation, like the effects of antenatal corticosteroid therapy, in extremely preterm infants(EPI). During fetal period, acute undernutrition leads to reduced body weight and long-term undernutrition causes reduced length. Ponderal index [PI=BWt(g)x100/{Ht(cm)}^{3}] has been used for assessing fetal growth. AGA with low PI (LPI; <10%) would be in mild undernutrition and SGA with high PI (HPI; >90%) would be in severe undernutrition.

OBJECTIVES: Regarding the incidences of neonatal death and/or severe BPD in EPI, we hypothesized that 1) SGA would have higher, 2) LPI lower, and 3) AGA-LPI lower, but SGA-HPl highest.

SUBJECTS & GROUPS: This was a prospective cohort study using web-based VLBWI registry of Korean Neonatal Network. The total VLBWI subjects were 18,187 between 2013 and 2021. Among 9,034 subjects in 23 to 28 weeks of gestation, 7,903 subjects were finally enrolled by exclusion criteria. We did 3-steps studies; Study-I with 3 birth weight percentile groups (SGA, AGA, and LGA), Study-II with 3 PI percentile groups [LPI, Adequate PI(API), and HPI], and Study-III with 9 birthweight and PI percentiles groups (Each SGA, AGA & LGA with LPI, API and HPI).

METHODS: Primary outcomes were neonatal death and/or severe BPD. Maternal and early neonatal risk factors were analyzed by Multivariate logistic regressions using SPSS. P<0.05 was considered significant.

RESULTS: Mean gestational age was 26.7±1.6 weeks, birth weight 921±237g, and birth height 34.4±3.2cm. Mean PI was 2.226±0.294. Regarding the incidences of neonatal death &/or severe BPD, 1) SGA had higher than AGA and LGA; 2) LPI had lower than API and HPI; 3) while AGA-LPI had lower than all the other groups beside LGA-API, and SGA-HPI had the highest.

CONCLUSIONS: Regarding the incidences of neonatal death &/or severe BPD, they are different according to fetal anthropometric phenotypes (body weight & PI percentiles) in EPIs; 1) SGA has highest, 2) LPI has lowest, and 3) while AGA-LPI has lowest, SGA-HPI has highest. We speculate that AGA-LPI as mild nutritional stress would be beneficial, but SGA-HPI as severe nutritional stress would be harmful during postnatal period.

None declared.

STUDY-III: Multiple Logistic Regression for Death or Severe BPD (n=4,726)

Significant Variables in 9 Groups	Adjusted Odds Ratio (95% CI)	P-value
Groups (Reference: AGA-LPI)		<0.001
AGA-API	1.311 (1.016-1.693)	0.037
AGA-HPI	1.787 (1.273-2.509)	0.001
SGA-LPI	2.143 (1.304-3.521)	0.003
SGA-API	3.368 (2.373-4.779)	<0.001
SGA-HPI	10.937 (3.110-38.459)	<0.001
LGA-LPI	3.549 (1.121-11.230)	0.031
LGA-API	1.229 (0.833-1.813)	NS (0.299)
LGA-HPI	2.627 (1.354-5.099)	0.004
Gestational Age (Upward)	0.652 (0.607-0.701)	<0.001
Female (Reference: Male)	0.762 (0.667-0.872)	<0.001
Birth Head Circumference	0.866 (0.819-0.917)	<0.001
Maternal Age (Upward)	1.006 (0.990-1.023)	NS (0.434)
Artificial Reproductive Therapy	0.870 (0.726-1.042)	NS (0.131)
Maternal Diabetes	0.737 (0.588-0.924)	0.008
Maternal Hypertension	1.156 (0.933-1.431)	NS (0.185)
Chorioamnionitis	0.908 (0.788-1.047)	NS (0.183)
Prolonged Rupture Of Membrane	1.073 (0.928-1.241)	NS (0.343)
Abnormal Amniotic Fluid Volume	1.217 (1.016-1.457)	0.033
Antenatal Corticosteroid Therapy	0.829 (0.673-1.021)	NS (0.078)
Multipara	0.794 (0.688-0.917)	0.002
Multiple Gestation	1.122 (0.948-1.327)	NS (0.179)
Cesarean Section	1.181 (1.004-1.388)	0.044
1-minute Apgar Score ≤ 3	1.1814 (1.019-1.367)	0.027
5-minutes Apgar Score ≤ 3	0.875 (0.6688-1.146)	NS (0.332)
Resuscitation at Delivery Room	1.421 (1.025-1.970)	0.035
Body Temperature <36°C	1.140 (0.972-1.337)	NS (0.107)
pH < 7.10	1.185 (0.886-1.586)	NS (0.253)
Base Excess < 10mEq/L	1.264 (0.989-1.614)	NS (0.061)

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ASSOCIATIONS BETWEEN CLINICAL DATA AND PATHOHISTOLOGICAL CHANGES IN LUNGS OF VERY PRETERM INFANTS WITH BRONCHOPULMONARY DYSPLASIA

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Introduction. Bronchopulmonary dysplasia (BPD) is one of the most common chronic diseases in very preterm VLBW infants. To make clinical interventions for BPD prevention more effective, it is essential to establish the factors associated with histopathological changes in the lungs of VLBW with BPD.
The study aimed to determine the risk factors of histopathological changes in the lungs of VLBW infants who died of BPD.

Materials and methods. Among 1689 VLBW infants < 32 weeks of gestation who were cared for at the tertiary care center between January 2010 and December 2020, 35 died of BPD or had BPD but died due to other causes. Of these, autopsy data were available for 32 infants. They were included in the study in which we used information from medical records and autopsy protocols.

Results. The mean (SD) gestational age of infants was 26.718 (1.971) weeks, and the mean birth weight was 919.687 (242.918) grams. The median age of death was 31 (14-321) days. We revealed significant associations of maternal smoking with arterial vascular lesions ($rs=0.695$, $p<0.05$) and vascular hypertension lesions ($rs=0.466$, $p<0.05$) in infants' lungs. Intrauterine growth retardation increased the risk of extensive fibroproliferation ($rs=0.412$, $p<0.05$) and alveolar simplification ($rs=0.558$, $p<0.05$). In infants who had patent ductus arteriosus (PDA), muscle hyperplasia ($rs=0.451$, $p<0.05$) was detected more often. The longer duration of mechanical ventilation (MV) correlated with diffuse interstitial fibroproliferation ($rs=0.481$, $p<0.05$), airway epithelial lesions ($rs=0.349$, $p<0.05$), and airway muscle hyperplasia ($rs=0.360$, $p<0.05$). Also, in the lungs of infants who needed the longer MV and longer duration of oxygen therapy an increased incidence of extensive fibroproliferation was found ($rs=0.380$ and $rs=0.391$ accordingly, $p<0.05$). Other significant neonatal morbidities were not associated with pathomorphological changes in the lungs. Antenatal steroid prophylaxis decreased the incidence of diffuse interstitial fibrosis ($rs=-0.365$, $p<0.05$) but was associated with partial alveolar septal fibrosis ($rs=0.458$, $p<0.05$).

Conclusions. In our population of very preterm infants, the lack of antenatal steroid prophylaxis, presence of PDA, prolonged MV and oxygen therapy are associated with pathomorphological lung changes, which are more typical for the "old" BPD. Traditional preventive measures against BPD remain essential.

None

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MECONIUM ASPIRATION SYNDROME: CLINICAL ASPECTS AND SHORT OUTCOMES

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Introduction: Neonatal respiratory distress secondary to meconium aspiration syndrome (MAS) is a serious reason for admission to the neonatal intensive care unit (NICU). Its management is burdensome, and short-term complications are common.

Objectives: To describe the clinical and evolutionary aspects of MAS as well as therapeutic difficulties.

Patients and Methods: A retrospective cross-sectional study conducted at the Neonatal Intensive Care Unit of Monastir, spanning a period of 4 years [2017-2020]. We included all term newborns hospitalized for respiratory distress secondary to MAS.
Results: We collected 39 cases of MAS, accounting for 8% of admissions to the NICU and 31% of live births in the context of meconium-stained amniotic fluid. Advanced gestational age and fetal heart rate abnormalities were observed in 72% of cases. Perinatal asphyxia was confirmed in 44% of cases. Intubation at the delivery room was performed for 43% of patients. invasive mechanical ventilation was necessary for 82% of patients. Clinical presentation was complicated by shock (31%) and disseminated intravascular coagulation (13% of cases). Regarding therapy, the first ventilatory mode used was high-flow oxygen in 43% of cases. Nitric oxide was used in 7% of patients, and 30% required vasoactive drugs. Surfactant was administered to only one patient. Short-term complications included healthcare-associated infection (31%), pneumothorax (28%), and pulmonary hypertension (15%). One patient experienced alveolar hemorrhage with pneumopericardium. The mean length of hospital stay was 10 days [1-38 days]. The mortality rate was 10.25%.

Conclusion: Despite a better understanding of pathophysiology and the implementation of preventive measures, MAS remains a serious condition. Its treatment is still symptomatic and not standardized.

None declared

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SYNCHRONIZED VS. NON-SYNCHRONIZED NIPPV AS INITIAL RESPIRATORY SUPPORT IN PRETERM INFANTS: A RANDOMIZED STUDY

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INTRODUCTION: Non-invasive ventilation(NIV) methods are increasingly used to minimize the complications of invasive mechanical ventilation in preterm infants. Nasal intermittent positive pressure ventilation(NIPPV) is a commonly used, non-invasive method. Studies have shown that synchronized NIPPV(sNIPPV) is more effective than NIPPV and nasal continuous positive airway pressure(NCPAP), but further research is needed to determine the optimal mode of NIV for preterm infants. However, the effectiveness of sNIPPV compared to non-synchronized (nsNIPPV) as the primary mode in preterm infants is still unclear.
The purpose of this study was to compare the effects of sNIPPV and nsNIPPV as initial ventilation modalities in preterm infants with respiratory distress syndrome.

MATERIAL AND METHODS: This single-center, prospective study randomized infants born <32 weeks who required NIV to either sNIPPV or nsNIPPV after birth. Infants with congenital abnormalities were excluded. Both sNIPPV and nsNIPPV were delivered using Stephanie and Sophie' ventilators(Stephan, Medizintechnik, Gakenbach, Germany) via short nasal prongs. Synchronization was achieved through the Graseby capsule. The study's primary outcome was to determine the need for intubation within the first three days of life(DOL), while secondary outcomes included the settings used for NIPPV, blood gas parameters, number of apnea episodes during NIPPV, morbidities of prematurity, and mortality.

RESULTS: A total of 90 infants were included, with 45 receiving sNIPPV and 45 receiving nsNIPPV. The infants' gestational age and birth weight were similar between the two groups, as was their need for intubation during the first 3 DOL (p=0.962,p=0.697,p=0.327, respectively). Under equivalent mean airway pressure (MAP), the sNIPPV group had lower PEEP and FiO2 requirements(p=0.019,and p=0.005, respectively). The nsNIPPV group had a higher rate of intubation within 7 days (42.2%), but the difference was not statistically significant(p=0.120). Blood gas parameters, morbidities of prematurity, mortality, and length of hospitalization were similar between the two groups (p>0.05)(Table 1).

CONCLUSION: This study is the first prospective-randomized comparison of sNIPPV and nsNIPPV with equivalent MAPs and the use of the same device and interface. The study found that synchronization reduces PEEP and FiO2 requirements. It is expected that a larger sample size will yield better results in both the short and long term.
None declared.
1. sNIPPV vs. nsNIPPV.pdf (could not be inserted)

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NOVEL LOW-COST BUBBLE CPAP AS AN ALTERNATIVE NON-INVASIVE OXYGEN THERAPY FOR NEWBORN INFANTS WITH RESPIRATORY DISTRESS SYNDROME IN A TERTIARY LEVEL NEONATAL INTENSIVE CARE UNIT IN THE PHILIPPINES: A SINGLE BLIND RANDOMIZED CONTROLLED TRIAL

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INTRODUCTION: Respiratory distress syndrome (RDS) among premature infants is one of the major causes of neonatal death. The use of continuous positive airway pressure (CPAP) has become a standard of care for preterm newborns with RDS. In countries faced with the challenge of improving neonatal care, cost-effective innovations for respiratory support is a promising intervention. This study determined the efficacy of a low-cost bubble CPAP as an alternative non-invasive oxygen therapy for newborn infants with RDS.

MATERIAL AND METHODS: We did a single-blind randomized controlled trial in a Level III Neonatal Intensive Care Unit. We Randomized preterm newborns with RDS to receive oxygen therapy through bubble CPAP vs Mechanical ventilator-derived CPAP. Differences in arterial blood gases, oxygen saturation, number of surfactant and CPAP failure rate between study groups were analyzed.

RESULTS: Seventy preterm neonates equally divided into two groups were included with no drop out. No significant difference was noted on the partial pressure of arterial oxygen (PaO2) and oxygen saturation (SaO2) levels at p value > 0.05. A significant difference was noted on the partial pressure of CO2 (pCO2) between the two groups, with higher levels observed among those hooked to mechanical ventilator CPAP. No statistical difference was noted between groups in relation to the number of days until CPAP failure (RR 1 [95%CI 0.63–1.56], p = 1) and number of surfactants used.

CONCLUSION: This study has shown that the low-cost bubble CPAP is an efficacious alternate oxygen therapy among preterm neonates with RDS. It also showed that the number of surfactants used, and CPAP failure rates were comparable to conventional CPAP.

Keywords: Bubble CPAP; infant; premature; respiratory distress syndrome; ventilator-derived CPAP.
None declared

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THE IMPACT OF SMALL-FOR-GESTATIONAL-AGE (SGA) AND BRONCHOPULMONARY DYSPLASIA (BPD) ON PULMONARY OXYGEN DIFFUSION AT 36 WEEKS POSTMENSTRUAL AGE IN PRETERM INFANTS WITH GESTATIONAL AGE BETWEEN 24+0/7 AND 30+6/7 WEEKS: AN ITALIAN TWO-CENTER RETROSPECTIVE STUDY

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INTRODUCTION: The overrepresentation of small-for-gestational-age (SGA) preterm infants in those with bronchopulmonary dysplasia (BPD) poses a challenge in quantifying the extent to which these conditions independently affect respiratory outcomes. Data on pulmonary oxygen diffusion in SGA and BPD preterm infants remain limited. This study aims to evaluate the impact of SGA and BPD on pulmonary oxygen diffusion at 36 weeks (W) in preterm infants with a gestational age (GA) between 24+0/7 and 30+6/7W.

MATERIAL AND METHODS: We retrospective reviewed clinical data of preterm infants (GA 24+0/7-30+6/7W) who were born at the "G.Salesi" Children Hospital in Ancona (AN; 2004-2023) and "A.Gemelli" Hospital in Rome (RM; 2018-2022), Italy. SGA was defined as a birth weight<10°percentile according to the Italian chart, and the diagnosis of BPD was based on the physiological definition. The oxygen saturation to fraction inspired oxygen ratio (SFR) at 36W was the primary outcome. The association of SGA and BPD with SFR at 36W and the first quartile (Q1) of SFR at 36W was assessed by matched-group comparisons and multiple regressions.

RESULTS: 1341 preterm infants free of malformations and not classified for large-for-gestational-age were studied: 19.2% were SGA and 19.5% had BPD. The incidence of SGA in BPD and noBPD was 30.7% vs 16.5%, respectively. SFR values at 36W were available for 1089/1341 (81.2%) patients. SGA-BPD, AGA-BPD, and SGA-noBPD groups had a significantly lower (worse) SFR at 36W than those of AGA-noBPD (Figure 1). In the entire cohort, SGA was significantly associated with -9.8 points of SFR and 3.1-fold increased risk of Q1-SFR at 36W, while BPD with -71.7 points of SFR and 52.3-fold increased risk of Q1-SFR at 36W, after the adjustment for GA, sex, Apgar at 5min<7, brain injury, postnatal corticosteroids, and study center. In patients without BPD, SGA was significantly associated with -8.2 points of SFR, and 2.1-fold increased risk of Q1-SFR at 36W.

CONCLUSIONS: The findings of this study increase the evidence on adverse effects of SGA birth and BPD on lung development in preterm infants and highlight the importance of considering SGA status when assessing respiratory outcomes as it negatively affects them independently from BPD.

None declared