

Simple Early-Life Predictors of Respiratory Disease in Infants with Oligohydramnios

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Introduction

- Pulmonary hypoplasia can cause various respiratory complications, ranging from neonatal death to transient respiratory distress.
- Oligohydramnios is a significant risk factor for pulmonary hypoplasia.
- Infants exposed to oligohydramnios resulting from preterm premature rupture of membranes (pPROM) are particularly vulnerable to acute respiratory morbidity such as bronchopulmonary dysplasia (BPD), pulmonary hypertension (PH), and pneumothorax (PNX).

- This study aimed to identify non-invasive early-life

Methods

- **Study Design:** Retrospective cohort study
- **Study Population:** Low birth weight infants (VLBWI) affected by oligohydramnios resulting from pPROM.
- **Inclusion**
 - Between January 2013 and December 2023
 - Born at Seoul National University Hospital, Korea
 - VLBWI (birth weight < 1500g) with oligohydramnios identified on prenatal ultrasound due to pPROM
- **Exclusion**
 - Death due to causes other than respiratory problem (e.g., NEC, infection)
- **Measured Parameters**
 - Birth anthropometrics: Thoracic circumference (TC), Birth body weight (Wt), Length, and Head Circumference (HC)
 - Respiratory Outcomes: BPD (NICHD definition), PH, and PNX. Respiratory Severity Score (RSS) calculated at day 14 of life
* RSS=MAP (Mean Airway Pressure) x FiO₂

- Multivariate logistic regression analysis

Results

Table 1. Demographic and clinical characteristics of the non-BPD and BPD groups

| | No BPD (N=25) | BPD or Death (N=81) | p-value |
|------------------------------------|---------------|---------------------|------------------|
| Gestational age (week) | 30.35±0.32 | 26.82±0.24 | <0.001 |
| Sex (M/F) | 11/14 | 37/44 | 0.883 |
| SGA | 4 | 5 | 0.21 |
| Chorioamnionitis | 14 | 56 | 0.144 |
| Gestational diabetes | 1 | 13 | 0.18 |
| Gestational hypertension | 1 | 2 | 0.558 |
| Prenatal steroid | 12 | 41 | 0.819 |
| Singleton/multiple | 8/17 | 43/38 | 0.065 |
| Thoracic circumference (TC) | 23.5 (1.35) | 21.0 (3.5) | <0.001 |
| TC/Birth body weight | 18.46 (2.44) | 23.66 (7.32) | <0.001 |
| TC/Length | 0.61 (0.04) | 0.62 (0.04) | 0.098 |
| TC/Head circumference | 0.84 (0.09) | 0.89 (0.07) | 0.012 |
| RSS ≥3 at day 14 of life | 0 | 33 | <0.001 |
| Pulmonary hypertension | 0 | 45 | <0.001 |
| Pneumothorax | 2 | 21 | 0.057 |

Patient parameters, Number, Mean ± Standard deviation or Median (interquartile range)

- In the multivariate analysis, **the presence of BPD** was significantly associated with
 - **Gestational age** (p=0.001, adjusted odds ratio (OR) 0.344, 95% confidence interval (CI) 0.178-0.662), and
 - **TC/Wt ratio** (p=0.018, adjusted OR 1.476, 95% CI 1.070-2.036).

Results

Table 2. Demographic and clinical characteristics of the non-PH and PH groups

| | No PH (N=61) | PH (N=45) | p-value |
|------------------------------------|--------------|-------------|------------------|
| Gestational age (week) | 28.7 (3.36) | 26.0 (4.0) | <0.001 |
| Sex (M/F) | 24/37 | 24/24 | 0.153 |
| SGA | 8 | 1 | 0.075 |
| Chorioamnionitis | 41 | 29 | 0.812 |
| Gestational diabetes | 7 | 7 | 0.54 |
| Gestational hypertension | 2 | 1 | 1.000 |
| Prenatal steroid | 32 | 21 | 0.556 |
| Singleton/multiple | 26/35 | 25/20 | 0.188 |
| Thoracic circumference (TC) | 22.5 (2.75) | 20.0 (4.0) | <0.006 |
| TC/Birth body weight | 21.0 (5.66) | 24.4 (8.57) | <0.002 |
| TC/Length | 0.6 (0.04) | 0.63 (0.04) | 0.268 |
| TC/Head circumference | 0.9 (0.08) | 0.89 (0.07) | 0.177 |
| RSS ≥3 at day 14 of life | 3 | 30 | <0.001 |
| BPD | 36 | 45 | <0.001 |
| Pneumothorax | 5 | 18 | <0.001 |

- In the multivariate analysis, **the presence of PH** was significantly associated with **RSS ≥3 at day 14**. (p<0.001, adjusted OR 36.191, 95% CI 6.584-198.938)

- TC/Wt and PH were not statistically significantly associated. (p=0.096, adjusted OR 0.878, 95% CI 0.754-1.023)

Table 3. Demographic and clinical characteristics of the non-PNX and PNX groups

| | No PNX (N=83) | PNX (N=23) | p-value |
|---------------------------------|---------------|-------------|------------------|
| Gestational age (week) | 27.86 (3.43) | 26.0 (4.57) | <0.041 |
| Sex (M/F) | 40/43 | 8/15 | 0.253 |
| SGA | 74 | 1 | 0.68 |
| Chorioamnionitis | 56 | 12 | 0.753 |
| Gestational diabetes | 12 | 2 | 0.73 |
| Gestational hypertension | 2 | 1 | 0.524 |
| Prenatal steroid | 41 | 12 | 0.814 |
| Singleton/multiple | 43/40 | 8/15 | 0.148 |
| Thoracic circumference (TC) | 22.0 (3.5) | 20.5 (5.8) | 0.602 |
| TC/Birth body weight | 21.5 (7.23) | 23.81 (9.1) | 0.143 |
| TC/Length | 0.62 (0.04) | 0.64 (0.06) | 0.013 |
| TC/Head circumference | 0.89 (0.07) | 0.89 (0.08) | 0.447 |
| RSS ≥3 at day 14 of life | 9 | 14 | <0.001 |
| BPD | 60 | 21 | 0.057 |
| Pulmonary hypertension | 27 | 18 | <0.001 |

- In the multivariate analysis, **the presence of pneumothorax** was significantly associated with

- **PH** (p<0.001, adjusted OR 8.341, 95% CI 2.599-26.772), and
- **TC/Ht ratio** (p=0.007, adjusted OR 3285389506.8, 95% CI 382.621-2.821E+16).

Conclusions

- Early-life anthropometric measurements and clinical parameters, such as the TC/Wt ratio, TC/length ratio, and RSS at day 14, may serve as simple, non-invasive predictors of respiratory complications in VLBWI with oligohydramnios.
- These measures could help identify infants at increased risk for conditions like BPD, PH, and pneumothorax, enabling risk stratification and guiding management.

References

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