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# Neonatal Pneumothorax Cases Managed with Chest Tube: A 5-Year Single-Center Experience

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## ABSTRACT

***Background:*** This study aimed to retrospectively evaluate the demographic characteristics, risk factors, treatment outcomes, and factors affecting mortality in neonatal pneumothorax cases treated with chest tubes in a tertiary neonatal intensive care unit.

***Methods:*** Data from 97 neonates diagnosed with neonatal pneumothorax and treated with chest tubes between January 2019 and October 2023 were analyzed in a retrospective cohort design. Patients' demographic characteristics, clinical findings, accompanying comorbidities, treatment processes, and outcomes were analyzed. Factors affecting mortality were determined using univariate and multiple logistic regression analyses.

***Results:*** Of the 97 cases included in the study, 72.2% were male. The mean gestational age was 33.4 ± 4.6 weeks, and the mean birth weight was 2313 ± 1022 grams. A diagnosis of pneumothorax was made within the first three days of life in 74.2% of cases. Pneumothorax was most commonly located on the right side (49.5%), and the most common accompanying pathologies were respiratory distress syndrome (33.0%) and congenital pneumonia (24.7%). The overall mortality rate was 37.1%. In multiple logistic regression analysis, 5th-minute Apgar score <7 (adjusted OR: 6.64; 95% CI: 2.07–21.28; p = 0.001), presence of bilateral pneumothorax (adjusted OR: 4.44; 95% CI: 1.12–17.62; p = 0.034), and low birth weight (OR: 8.41 for 1500–2499 g; OR: 9.53 for <1500 g) were determined as independent mortality predictors.

***Conclusion:*** The findings of this five-year retrospective cohort study demonstrate that mortality is significantly high in neonatal pneumothorax cases treated with chest tubes. Low birth weight, low 5th-minute Apgar score, and the presence of bilateral pneumothorax are strong and independent predictors of mortality. Close monitoring and early aggressive treatment approaches are essential to reduce mortality in newborns with these risk factors.

***Keywords:*** Chest tube, Mortality, Neonatal pneumothorax, Newborn, Risk factors

## Introduction

Neonatal pneumothorax (NP) is a serious condition commonly seen in neonatal intensive care units that increases the risk of morbidity and mortality. Air accumulation in the pleural space increases intrathoracic pressure, leading to lung collapse, ventilation-perfusion imbalance, and hemodynamic instability. Tension pneumothorax, in particular, displaces the mediastinum and reduces venous return, causing life-threatening cardiac effects (1, 2).

NP is more common with prematurity, low birth weight, meconium aspiration syndrome (MAS), respiratory distress syndrome (RDS), and invasive mechanical ventilation (MV) (3–5). Clinical findings vary depending on severity, but tachypnea, cyanosis, chest asymmetry, and decreased oxygen saturation are frequently observed. Anteroposterior and lateral chest

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radiography are the gold standard for diagnosis; the importance of radiation-free methods such as transillumination and point-of-care ultrasound (POCUS) is increasing (6, 7).

Treatment is determined based on the size of the pneumothorax and the patient's clinical condition. A conservative approach may be applied in minimally symptomatic cases (8). However, in cases showing hemodynamic or respiratory impairment, especially those with tension pneumothorax, urgent air evacuation is required; definitive treatment is usually achieved with chest tube thoracostomy (CTT) (9, 10). CTT is an invasive procedure and carries a risk of complications. Although there are studies in the literature on the risk factors and epidemiology of NP, comprehensive data focusing on cases treated with chest tubes are limited (11–13).

This study aimed to evaluate the demographic, clinical, and laboratory characteristics, risk factors, and treatment outcomes of NP cases treated with CTT at our center over the past five years.

## Methods

This retrospective cohort study was conducted among patients admitted to the Neonatal Intensive Care Unit (NICU) of Şanlıurfa Training and Research Hospital between January 1, 2019, and October 1, 2023. After obtaining the necessary institutional permissions, patient data were accessed through the electronic hospital record system in a manner that did not violate patient confidentiality.

The study population consisted of all newborns diagnosed with pneumothorax in our neonatal intensive care unit. Cases diagnosed with pneumothorax confirmed by chest X-ray and treated with tube thoracostomy using an 8 Fr (preterm) or 10 Fr (term) chest tube were included in the study. Cases managed with conservative treatment (oxygen support) or needle aspiration, patients who had a chest tube inserted following pleural effusion, chylothorax, hemothorax, or surgical procedures (e.g., repair of diaphragmatic hernia or esophageal atresia), as well as newborns with congenital heart disease requiring pediatric cardiovascular surgery or referred to an advanced center for this reason, were excluded from the study. Cases with incomplete or inaccessible medical records were also excluded from the analysis.

Data for this study were obtained through retrospective review of the hospital information management system and patient files. Demographic and perinatal characteristics, clinical findings related to pneumothorax, and treatment and outcome variables were recorded using a pre-established standardized data collection form.

Demographic and perinatal variables included gestational age (weeks), birth weight (grams), sex, mode of delivery (cesarean/ vaginal), 1st and 5th minute Apgar scores, requirement for positive pressure ventilation (PPV) at birth, and multiple gestation status. Variables related to pneumothorax included postnatal age at diagnosis (≤72 hours [early onset] or >72 hours [late onset]), lateralization (right/left/bilateral), and mode of respiratory support at diagnosis (invasive mechanical ventilation [IMV], non-invasive mechanical ventilation [CPAP or BiPAP], or free oxygen support). Clinical findings such as tachypnea, cyanosis, retractions, apnea, bradycardia, and desaturation were also evaluated. Concomitant comorbidities included meconium aspiration syndrome (MAS), respiratory distress syndrome (RDS), transient tachypnea of the newborn (TTN), neonatal pneumonia, culture-confirmed sepsis, and premature rupture of membranes (>18 hours).

Treatment and outcome variables included chest tube size (8 Fr or 10 Fr), mean chest tube dwell time (days), total intensive care unit length of stay (days), and final patient outcome (discharge or death).

The NCSS (Number Cruncher Statistical System) 2007 (Kaysville, Utah, USA) program was used for statistical analyses. Descriptive statistical methods (mean, standard deviation, median, frequency, ratio, minimum, maximum) were used when evaluating the study data. The normality of quantitative data was tested using the Shapiro–Wilk test and graphical evaluations. The Mann–Whitney U test was used for comparisons between two groups of variables that did not show a normal distribution. Pearson's Chi-square test, Fisher–Freeman–Halton test, and Fisher's exact test were used to compare qualitative data. Logistic regression analysis was used to examine the risk factors affecting the outcome. Significance was assessed at the $p < 0.05$ level.

### *Ethical approval*

The study protocol was approved by the Clinical Research Ethics Committee of Harran University Faculty of Medicine in accordance with the principles of the Declaration of Helsinki (Decision No: HRÜ/22.14.19).

## Results

During the study period, a total of 12,731 patients were admitted to the Neonatal Intensive Care Unit (NICU), and 123,916 births occurred at our hospital during the same period. The daily average number of births was 71. A total of 97 newborns were included in the study; 72.2% (n = 70) were male and 27.8% (n = 27) female. The incidence of neonatal pneumothorax was found to be 0.76% (Table 1).

The mean age at diagnosis was 4.75 ± 10.77 days, with 74.2% of cases diagnosed within the first 3 days and 25.8% diagnosed on or after the 4th day. The mean gestational age was 33.4 ± 4.58 weeks, and the mean birth weight was 2313 ± 1022 g. The cesarean delivery rate was 64.9%, and the singleton pregnancy rate was 95.9%. The Apgar scores at 1st and 5th minutes were 5.92 ± 2.13 and 7.36 ± 1.83, respectively, and the rate of cases with a 5th-minute Apgar score <7 was 29.9%.

The vast majority of cases diagnosed with pneumothorax (81.4%) had undergone invasive mechanical ventilation (IMV) in the pre-diagnosis period, and all cases (100%) were intubated following diagnosis (Table 2). Pneumothorax was

**Table 1.** Demographic and Birth Characteristics of Neonatal Pneumothorax Cases Treated with Chest Tube Insertion

| Characteristic | Category | n | % | Mean ± SD | Median (Min-Max) |
|---|---|---|---|---|---|
| Gender | Male | 70 | 72,2 | - | - |
| | Female | 27 | 27,8 | - | - |
| Age at Diagnosis (Days) | | | | 4,75 ± 10,77 | 2 (0 - 90) |
| | 0-3 days | 72 | 74,2 | - | - |
| | ≥4 days | 25 | 25,8 | - | - |
| Gestational Week | | | | 33,40 ± 4,58 | 34 (23 - 41) |
| | <28 weeks | 14 | 14,4 | - | - |
| | 28-31 weeks | 16 | 16,5 | - | - |
| | 32-33 weeks | 13 | 13,4 | - | - |
| | 34-36 weeks | 25 | 25,8 | - | - |
| | ≥37 weeks | 29 | 29,9 | - | - |
| Birth Weight (g) | | | | 2313 ± 1022 | 2500 (550 - 5400) |
| | <1000 g | 11 | 11,3 | - | - |
| | 1000-1499 g | 13 | 13,4 | - | - |
| | 1500-2499 g | 24 | 24,7 | - | - |
| | ≥2500 g | 47 | 48,5 | - | - |
| | >4000 g | 2 | 2,1 | - | - |
| Mode of Delivery | Cesarean | 63 | 64,9 | - | - |
| | NVD | 34 | 35,1 | - | - |
| Number of Pregnancies | Singleton | 93 | 95,9 | - | - |
| | Twin | 3 | 3,1 | - | - |
| | Triplet | 1 | 1,0 | - | - |
| 1st Minute Apgar | | | | 5,92 ± 2,13 | 7 (1 - 9) |
| 5th Minute Apgar | | | | 7,36 ± 1,83 | 8 (2 - 10) |

SD: Standard deviation; NVD: Normal Vaginal Delivery
Data are presented as mean ± standard deviation, number (n) and percentage (%), or median (minimum-maximum).
Gestational age categories: <28 weeks (extremely preterm), 28–31 weeks (very preterm), 32–33 weeks (moderately preterm), 34–36 weeks (late preterm), ≥37 weeks (term).

**Table 2.** Clinical Characteristics and Results of Neonatal Pneumothorax Cases Treated with Chest TubeInsertion

| Clinical Characteristics and Results | Category | n | % | Mean ± SD | Median (Min-Max) |
|---|---|---|---|---|---|
| Pre-Diagnosis Respiratory Support | Intubated | 79 | 81,4 | - | - |
| | Non-invasive mechanical ventilation | 15 | 15,5 | - | - |
| | Other | 3 | 3,1 | - | - |
| Post-Diagnosis Respiratory Support | Intubated | 97 | 100,0 | - | - |
| Pneumothorax Location | Right | 48 | 49,5 | - | - |
| | Left | 30 | 30,9 | - | - |
| | Bilateral | 19 | 19,6 | - | - |
| Chest Tube Stay Duration (days) | | | | 4,32 ± 2,76 | 4 (1-19) |
| | <6 days | 74 | 76,3 | - | - |
| | ≥6 days | 23 | 23,7 | - | - |
| Total Hospitalization Duration (days) | | | | 25,22 ± 26,76 | 15 (1-125) |
| Result | Discharged | 61 | 62,9 | - | - |
| | Exitus | 36 | 37,1 | - | - |

SD: Standard deviation. Data are presented as mean ± standard deviation, number (n) and percentage (%), or median (minimum-maximum).
Non-invasive mechanical ventilation: CPAP or similar non-invasive support methods.

**Table 3.** Comparison of Discharged and Exitus Groups in Neonatal Pneumothorax Cases with Chest Tube Insertion

| Characteristic | Category | Discharged (n=61) | Exitus (n=36) | p value |
|---|---|---|---|---|
| Gestational Age (weeks) | Mean ± SD | 34,80 ± 3,87 | 31,03 ± 4,76 | <0,001 |
| | Median (Min-Max) | 36 (24-40) | 31 (23-41) | |
| | <28 weeks, n (%) | 5 (35,7) | 9 (64,3) | |
| | 28-31 weeks, n (%) | 6 (37,5) | 10 (62,5) | |
| | 32-33 weeks, n (%) | 5 (38,5) | 8 (61,5) | |
| | 34-36 weeks, n (%) | 22 (88,0) | 3 (12,0) | |
| | ≥37 weeks, n (%) | 23 (79,3) | 6 (20,7) | |
| Birth Weight (g) | Mean ± SD | 2655,57 ± 892,00 | 1732,78 ± 975,72 | <0,001 |
| | Median (Min-Max) | 2800 (650-5280) | 1590 (550-5400) | |
| | <1000 g, n (%) | 2 (18,2) | 9 (81,8) | |
| | 1000-1499 g, n (%) | 7 (53,8) | 6 (46,2) | |
| | 1500-2499 g, n (%) | 11 (45,8) | 13 (54,2) | |
| | ≥2500 g, n (%) | 41 (83,7) | 8 (16,3) | |
| Mode of Delivery, n (%) | Cesarean | 34 (54,0) | 29 (46,0) | 0,013 |
| | Normal Vaginal Birth | 27 (79,4) | 7 (20,6) | |
| 1st Minute Apgar Score | Mean ± SD | 6,69 ± 1,88 | 4,61 ± 1,90 | <0,001 |
| | Median (Min-Max) | 7 (1-9) | 4,5 (1-8) | |
| 5th Minute Apgar Score | Mean ± SD | 8,02 ± 1,71 | 6,25 ± 1,46 | <0,001 |
| | Median (Min-Max) | 8 (3-10) | 6 (2-8) | |
| | <7, n (%) | 9 (31,0) | 20 (69,0) | |
| | ≥7, n (%) | 52 (76,5) | 16 (23,5) | |

SD: Standard deviation. Data are presented as mean ± standard deviation, number (n) and percentage (%), or median (minimum-maximum).
p<0.05 was considered statistically significant. Categorical variables were analyzed using the chi-square test, and continuous variables were analyzed using the Student t-test or Mann-Whitney U test.

most commonly located on the right side (49.5%), followed by the left side (30.9%) and bilateral (19.6%). The most common presenting symptom was isolated tachypnea in 68% of cases (n = 66), while tachypnea accompanied by low saturation was observed in 17.5% (n = 17) of cases. The mean chest tube dwell time was 4.32 ± 2.76 days (median: 4 days), and the tube was removed in less than 6 days in 76.3% of cases (n = 74). The mean length of hospital stay was 25.22 ± 26.76 days (median: 15 days); 62.9% of cases (n = 61) were discharged, while 37.1% (n = 36) resulted in death.

When concomitant risk factors were examined, the most common pathologies were respiratory distress syndrome (RDS) (33.0%; n = 32) and congenital pneumonia (24.7%; n = 24). These were followed by transient tachypnea of the newborn (TTN) (13.4%; n = 13), asphyxia (6.2%; n = 6), and congenital anomalies associated with RDS (9.3%; n = 9). Less common factors included lung hypoplasia with congenital anomalies (5.2%; n = 5), asphyxia with meconium aspiration syndrome (MAS) (2.1%; n = 2) or persistent pulmonary hypertension (PHT) (2.1%; n = 2), bilateral renal agenesis (2.1%; n = 2), isolated PHT (1.0%; n = 1), and sepsis (1.0%; n = 1). The most frequently observed symptom at the time of pneumothorax was isolated tachypnea (68.0%; n = 66), followed by decreased oxygen saturation along with tachypnea (17.5%; n = 17). Circulatory failure accompanied decreased saturation in 10.3% of patients (n = 10), while isolated low saturation was detected in 4.1% (n = 4).

No significant difference was observed between the discharged and deceased groups in terms of gender distribution; the discharge rate was 62.9% (44/70) in male infants and 63.0% (17/27) in female infants (p = 0.992). In the comparison based on the number of gestations, the mortality rate was 36.6% (34/93) in singleton births and 50.0% (2/4) in multiple gestations, and this difference was not statistically significant (p = 0.626). The mean postnatal age at diagnosis was 5.15 ± 12.55 days in the discharged group and 4.08 ± 6.86 days in the deceased group, and no significant difference was found between the two groups (p = 0.733). The mortality rate was 34.7% (25/72) in infants diagnosed within the first 3 days of life, while it was 44.0% (11/25) in those diagnosed on or after the 4th day.

Other comparative analyses between the discharged and deceased groups are summarized in Table 3. Gestational age and birth weight were significantly lower in the deceased group compared to the discharged group (p < 0.001 for both).

According to the comparative analyses presented in Table 4, a significant relationship was found between the type of pre-diagnosis respiratory support and mortality (p < 0.001). While 45.6% of intubated patients (n = 36) died, all patients who received non-invasive mechanical ventilation (NCPAP) or other respiratory support

**Table 4.** Comparison of Clinical Characteristics in Neonatal Pneumothorax Cases Treated with Chest Tube Insertion According to Outcome

| Clinical Characteristic | Category | Discharged (n=61) n (%) | Exitus (n=36) n (%) | p value |
|---|---|---|---|---|
| Pre-Diagnosis Respiratory Support | Intubated | 43 (54,4) | 36 (45,6) | <0,001 |
| | Non-invasive mechanical ventilation | 15 (100,0) | 0 (0,0) | |
| | Other | 3 (100,0) | 0 (0,0) | |
| Risk Factors | Lung Hypoplasia + Congenital Anomaly | 0 (0,0) | 16 (100,0) | <0,001 |
| | Other | 61 (75,3) | 20 (24,7) | |
| Location of Pneumothorax | Right | 34 (70,8) | 14 (29,2) | 0,035 |
| | Left | 20 (66,7) | 10 (33,3) | |
| | Bilateral | 7 (36,8) | 12 (63,2) | |
| Admission Symptoms | Tachypnea + Low Saturation | 15 (88,2) | 2 (11,8) | 0,075 |
| | Low Saturation + Circulatory Disorder | 5 (50,0) | 5 (50,0) | |
| | Isolated Low Saturation | 2 (50,0) | 2 (50,0) | |
| | Isolated Tachypnea | 39 (59,1) | 27 (40,9) | |
| Chest Tube Stay Duration (days) | Mean ± SD | 4,74 ± 2,82 | 3,61 ± 2,53 | 0,031 |
| | Median (Min-Max) | 4 (2-19) | 3,5 (1-10) | |
| | <6 days | 46 (62,2) | 28 (37,8) | |
| | ≥6 days | 15 (65,2) | 8 (34,8) | |
| Total Hospitalization Duration (days) | Mean ± SD | 31,93 ± 28,16 | 13,83 ± 19,81 | <0,001 |
| | Median (Min-Max) | 20 (7-125) | 6 (1-68) | |

SD: Standard deviation. Data are presented as mean ± standard deviation, number (n) and percentage (%), or median (minimum-maximum). Congenital anomaly: Major anomalies other than lung hypoplasia (such as limb anomaly, vertebral anomaly, neural tube defect). p<0.05 was considered statistically significant.

(n = 18) were discharged. When evaluated in terms of risk factors, it was observed that all patients with a combination of lung hypoplasia and congenital anomaly (n = 16) resulted in death, while the mortality rate in patients with other risk factors was 24.7% (n = 20) ($p < 0.001$). The location of pneumothorax also significantly affected outcomes; the mortality rate was 63.2% (n = 12) in bilateral pneumothorax, while it was significantly lower in unilateral cases (right: 29.2%, left: 33.3%; $p = 0.035$). A difference at the threshold of statistical significance was observed between the groups in terms of symptoms ($p = 0.075$), with a lower mortality rate (11.8%) in patients with tachypnea and low saturation compared to patients with isolated tachypnea (40.9%). The chest tube dwell time was statistically significantly shorter in the deceased group (3.61 ± 2.53 days vs. 4.74 ± 2.82 days; $p = 0.031$). Furthermore, the total length of hospital stay was also significantly shorter in the deceased group compared to the discharged group (13.83 ± 19.81 days vs. 31.93 ± 28.16 days; $p < 0.001$).

When the relationship between accompanying risk factors and outcome was evaluated, all patients diagnosed with TTN (100%; n = 13) were discharged, whereas all patients with congenital anomalies and lung hypoplasia (100%; n = 5), congenital anomalies with RDS combination (100%; n = 9), and bilateral renal agenesis (100%; n = 2) resulted in death. The mortality rate in patients diagnosed with RDS was 50% (n = 16), while the vast majority of patients with congenital pneumonia (95.8%; n = 23) were discharged. When asphyxia was seen alone, the mortality rate was 16.7% (n = 1), while in cases where asphyxia was accompanied by MAS or PHT, this rate rose to 50% (n = 1 patient each). All patients diagnosed with isolated PHT and sepsis (n = 1 patient each) were discharged.

The results of the multiple logistic regression analysis performed to determine the factors affecting mortality are presented in Table 5;

**Table 5.** Multiple Logistic Regression Analysis of Risk Factors Affecting Mortality

| Independent Variable | Category | p value | Adjusted Odds Ratio | 95% Confidence Interval |
|---|---|---|---|---|
| 5th Minute Apgar Score | <7 (vs ≥7) | 0,001 | 6,64 | 2,07 - 21,28 |
| Pneumothorax Location | | | | |
| | Right (Reference) | - | 1,00 | - |
| | Left | 0,380 | 1,72 | 0,51 - 5,76 |
| | Bilateral | 0,034 | 4,44 | 1,12 - 17,62 |
| Birth Weight | | | | |
| | Normal (≥2500g) (Reference) | - | 1,00 | - |
| | LBW(1500-2499g) | 0,002 | 8,41 | 2,20 - 32,18 |
| | VLBW(<1500g) | 0,001 | 9,53 | 2,65 - 34,35 |

LBW: Low birth weight, VLBW: Very low birth weight
The model was based on variables that were statistically significant at the p<0.10 level in univariate analysis. p<0.05 was considered statistically significant.

variables that were significant in the univariate analysis were included in the analysis. The analysis results revealed that a 5th-minute Apgar score <7 (adjusted OR: 6.64; 95% CI: 2.07–21.28; p = 0.001), the presence of bilateral pneumothorax (adjusted OR: 4.44; 95% CI: 1.12–17.62; p = 0.034), and low birth weight were independent predictors of mortality. According to birth weight categories, OR: 8.41 (95% CI: 2.20–32.18; p = 0.002) for 1500–2499 g (LBW), OR: 9.53 (95% CI: 2.65–34.35; p = 0.001) for <1500 g (VLBW), and no significant difference in mortality was found between left-sided and right-sided pneumothorax (p = 0.380).

## Discussion

Pneumothorax is more common in the neonatal period than in any other period of life and is associated with high mortality and morbidity. The incidence of neonatal pneumothorax (NP) varies between 0.5% and 3% among live births, but this rate can reach 1.5–20% when based on patients admitted to neonatal intensive care units (14–16). In our study, the incidence of NP among patients admitted to our NICU was found to be 0.76%. Our relatively low incidence compared to those reported in the literature may be due to the inclusion of only cases requiring chest tube placement and invasive intervention. In addition, the pressure-controlled ventilation strategies and the widespread use of non-invasive ventilation in our unit may also have contributed to the lower incidence.

The literature reports that male gender, low birth weight, prematurity, cesarean delivery, underlying lung disease (TTN, RDS, MAS), and positive pressure ventilation (PPV) at birth are major risk factors for NP (17–20). The findings of our study support this literature, with high rates of male gender (72.2%), prematurity (70.1%), and cesarean delivery (64.9%) observed in our cases. The fact that NP mostly develops within the first 72 hours postnatally (74.2%) emphasizes the importance of early-onset NP in the neonatal period and shows that routine follow-ups during this period are critical (16, 21). In addition, the location of pneumothorax was mostly unilateral (80.4%) in our study.

RDS, PPV application, and ventilator-associated lung injury (barotrauma/volutrauma) are known to be major causes increasing the incidence of NP (23, 24). The high rate of RDS (33%) in our study and the need for invasive mechanical ventilation in the vast majority of cases (81.4%) are consistent with this literature. However, our PPV application rate at birth (10.4%) was lower than that reported in some studies in the literature, which can be explained by the rapid transition to intubation in our delivery room resuscitation protocols.

Despite early diagnosis and aggressive treatment, NP-related mortality rates remain high, ranging from 10% to 65% in the literature (25–27). In our study, mortality was 37.1%, which is consistent with other studies in the literature. Our multiple logistic regression analysis showed that a 5th-minute Apgar score <7 increased the risk of mortality by 6.64 times, the presence of bilateral pneumothorax by 4.44 times, low birth weight (1500–2499 g) by 8.41 times, and very low birth weight (<1500 g) by 9.53 times. These findings strongly support that birth weight, 5th-minute Apgar score, and bilateral pneumothorax are independent predictors of mortality in NP.

Tan YL et al., in a retrospective study of 183 newborns in China, identified collapse of ≥1/3 of the lung, significant respiratory distress, and cyanosis as independent factors predicting the need for chest drainage (28). Jovandaric et al., in a retrospective study in Serbia, evaluated 74 cases of NP, showing that NP is more common in premature infants and that some complications can develop despite appropriate treatment (29). In our five-year single-center experience, analysis of 97 cases treated with chest tubes revealed that the factors most affecting mortality were very low birth weight, low 5th-minute Apgar score, and bilateral pneumothorax. Pre-diagnosis intubation status and congenital anomalies were also found to be significantly associated with mortality.

In a prospective randomized clinical trial conducted by Murphy et al. in Denmark, 60 symptomatic NP cases were examined, and needle aspiration was shown to significantly reduce the need for chest drainage (30). Bruschettini et al.'s Cochrane review, as a systematic review and meta-analysis covering international data, evaluated a total of more than 250 cases and found that needle aspiration and intercostal tube drainage yielded similar results in terms of mortality and complications, but that aspiration was a less invasive and safer option (31). These findings support that needle aspiration may be a safe and effective initial treatment method in appropriate cases, while chest tube placement plays a critical role in improving prognosis in high-risk newborns.

### *Limitations*

Limitations of our study include its single-center and retrospective design, the evaluation of only cases treated with chest tubes, and the exclusion of some potential confounders from the analysis. However, its strengths include a homogeneous patient population, an experienced team, and a five-year data set.

## Conclusion

In conclusion, neonatal pneumothorax is a serious condition requiring urgent intervention, and its mortality rate remains high. Our study emphasizes that low birth weight, low 5th-minute Apgar score, and bilateral pneumothorax are the strongest independent predictors of mortality. Close and intensive monitoring of patients with these risk factors is critical in reducing mortality.

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## Conflicts of interest

The authors declare no conflicts of interest.

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