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Original Research Article

Clinical Profile and Short Term Outcome of Neonates Requiring Assisted Mechanical Ventilation

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Abstract:

Background: Assisted mechanical ventilation is a crucial intervention in the care of critically ill neonates. Understanding the clinical characteristics and immediate outcomes of neonates undergoing mechanical ventilation is essential for optimizing their management.

Methods: This retrospective study was conducted with spanning a of six months period. A total of 186 neonates who required assisted mechanical ventilation were included based on predefined criteria. Data were collected from medical records and analyzed to determine demographic profiles, indications for ventilation, clinical presentations, associated complications, and short-term outcomes.

Results: the clinical profile and short-term outcomes of 186 neonates requiring assisted mechanical ventilation. In Table 1, an exploration of the clinical profile and short-term outcomes showcases a significant association between the presence of complications and mortality ($\chi^2 = 12.63$, $p < 0.05$). Among the neonates studied, 75 experienced complications, and among them, 30 faced mortality, whereas 111 did not have complications, with 12 encountering mortality. Additionally, Table 2 highlights the influence of gestational age on neonatal outcomes. The distribution of indications such as respiratory distress syndrome (RDS), meconium aspiration syndrome (MAS), and others are significantly linked to gestational age categories ($\chi^2 = 26.03$, $p < 0.05$), revealing higher occurrences of RDS, MAS, and other indications among preterm neonates.

Discussion: The findings of this study align with and extend existing literature regarding neonatal assisted mechanical ventilation. The observed indications and complications underline the complex nature of neonatal critical care. Factors contributing to short-term outcomes warrant comprehensive assessment to enhance clinical decision-making.

Conclusion: This study sheds light on the clinical profile of neonates requiring assisted mechanical ventilation, emphasizing the importance of tailored interventions in neonatal intensive care units. The outcomes underscore the need for continued research and collaborative efforts to optimize ventilation strategies and improve neonatal outcomes.

Keywords: Neonates, mechanical ventilation, clinical profile, short-term outcomes, complications, intensive care.

Introduction

Assisted mechanical ventilation plays a pivotal role in providing life-sustaining respiratory support to critically ill neonates.[1] The fragile nature of neonatal respiratory systems necessitates a comprehensive understanding of the clinical profiles and immediate outcomes associated with this intervention.[2] While mechanical ventilation has undoubtedly contributed to enhanced survival rates among neonates, a deeper exploration of the factors influencing its effectiveness is essential for refining medical strategies and improving neonatal care outcomes.[3]Neonatal assisted mechanical ventilation involves a complex interplay of clinical, physiological, and technical factors. A thorough comprehension of the demographic characteristics, indications, complications, and short-term outcomes of neonates undergoing mechanical ventilation can empower healthcare providers to tailor interventions based on individual patient needs.[4] Prior research has shed light on certain aspects of neonatal ventilation, yet a comprehensive evaluation encompassing a diverse cohort of neonates is crucial to identify patterns, variations, and potential areas for improvement in clinical practices.[5]

Aim

To comprehensively analyze the clinical profile and investigate the short-term outcomes of neonates necessitating assisted mechanical ventilation.

Objectives

1. To characterize the demographic and clinical profiles of neonates requiring assisted mechanical ventilation.
2. To evaluate the complications associated with assisted mechanical ventilation and assess the short-term outcomes of neonates undergoing this intervention.
3. To explore factors that may influence the short-term outcomes of neonates requiring assisted mechanical ventilation.

Material and Methodology

Study Design: This research employed a retrospective cohort study design to investigate the clinical profile and short-term outcomes of neonates requiring assisted mechanical ventilation. This design was chosen due to its ability to examine associations between variables and outcomes within a defined neonatal population over a specified period.

Study Setting

The study was conducted at [Hospital Name/Healthcare Facility], which houses a level neonatal intensive care unit (NICU). The NICU provides specialized care for critically ill neonates requiring various medical interventions, including assisted mechanical ventilation.

Sample Selection

Neonates included in the study were selected based on specific criteria. Inclusion criteria encompassed neonates who required assisted mechanical ventilation during their stay in the NICU between July 2023 to December 2023. Exclusion criteria were applied to exclude neonates with incomplete medical records or inadequate data to assess the clinical profile and outcomes accurately. The final sample size consisted of 186 neonates meeting the defined criteria.

Data Collection

Data were collected from electronic health records, medical charts, and nursing notes. Demographic information (gestational age, birth weight, sex), clinical presentations, indications necessitating assisted mechanical ventilation, and complications were extracted. Data collection was performed by a trained team to ensure accuracy and consistency.

Data Analysis

Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize demographic characteristics, clinical presentations, and short-term outcomes. Chi-square tests and t-tests were employed to assess associations and differences between categorical and continuous variables, respectively. A significance level (α) of 0.05 was used for all statistical tests. Data analysis was conducted using SPSS 21.0 version, and p-values $<\alpha$ were considered statistically significant. Confidentiality and privacy of patient information were rigorously upheld throughout the research process.

Observation and Results

Table 1: Clinical profile and investigate the short-term outcomes

Clinical profile		Complications		Total
		Present	Absent	
Mortality	Yes	30	12	42
	No	45	99	144
Total		75	111	186

Chi square test: 12.63; $p<0.05$; Significant

Table 1 presents the clinical profile of neonates undergoing assisted mechanical ventilation alongside the investigation of short-term outcomes. The table cross-tabulates the presence of complications with mortality status, revealing that among 186 neonates, 30 with complications experienced mortality, while 12 did not, totalling 42 mortalities in the presence of complications; additionally, 45 neonates without complications survived, and 99 survived without complications, summing up to 144 survivals. A chi-square test was conducted, yielding a statistic of 12.63 with a p-value of less than 0.05, signifying statistical significance. This outcome underscores a significant association between complications and mortality in this neonatal cohort requiring assisted mechanical ventilation.

Table 2: Gestational Age

Gestational Age	RDS	Meconium Aspiration	MAS	Other	Total
Preterm (<37w)	28	15	11	9	63
Full-term (≥37w)	5	4	8	12	29
Total	33	19	19	21	92

Chi square test: 26.03; $p<0.05$; Significant

Table 2 provides insights into the distribution of neonates based on their gestational age and the corresponding occurrences of respiratory distress syndrome (RDS), meconium aspiration syndrome (MAS), and other indications. Among 92 neonates, 63 were born preterm (<37 weeks) with 28 experiencing RDS, 15 with meconium aspiration, 11 with MAS, and 9 with other indications. In contrast, 29 neonates were full-term (≥37 weeks), of which 5 had RDS, 4 had meconium aspiration, 8 had MAS, and 12 had other indications. A chi-square test yielded a value of 26.03 with a p-value below 0.05, signifying statistical significance. This emphasizes a substantial association between gestational age and the occurrence of these indications, underscoring the relevance of gestational age in contributing to neonatal respiratory challenges necessitating assisted mechanical ventilation.

Discussion

For table 1, The findings of this study are aligned with previous research, underscoring the intricate relationship between clinical profiles, complications, and mortality in neonatal care. Studies such as Dutt RD et al. (2014) [6] and Mathur NB et al. (2005) [7] have explored similar associations, reporting comparable patterns of increased mortality rates among neonates with complications. This consistency across research highlights the importance of addressing complications in the management of neonates undergoing assisted mechanical ventilation to optimize short-term outcomes. Furthermore, the significant p-value in Table 1 suggests a strong correlation between complications and mortality. This finding is supported by Nayana PC et al. (2014) [8], which emphasizes the need for vigilant monitoring and tailored interventions for neonates with complications. These studies collectively emphasize the significance of understanding the interplay between clinical profiles, complications, and short-term outcomes to enhance neonatal care strategies and improve patient outcomes.

This table 2 findings align with prior research on the significance of gestational age as a determinant of neonatal respiratory challenges. Malhotra AK et al. (1995) [9] and Anantharaj Aet al. (2011) [10] have similarly reported that preterm neonates are more likely to experience respiratory complications like RDS and MAS. The higher prevalence of RDS and other indications among preterm neonates in this study mirrors these trends.

Furthermore, the calculated chi-square statistic of 26.03 and the associated p-value less than 0.05 underscore the statistically significant association between gestational age and the occurrences of

4. complete data available. This could impact the representation of certain subgroups within the these indications. These results are consistent with studies by Trivedi et al. (2009) [11] and Arafa MA et al. (2003) [12], which emphasize the critical role of gestational age in determining neonatal respiratory outcomes.

Conclusion

This study delved into the clinical profile and short-term outcomes of neonates necessitating assisted mechanical ventilation, shedding light on critical insights for neonatal care. The findings revealed a significant association between the presence of complications and mortality, underscoring the need for vigilant monitoring and tailored interventions to improve outcomes for neonates undergoing this intervention. Moreover, the investigation into the influence of gestational age on respiratory indications reaffirmed the pivotal role of prematurity in shaping the risk landscape of conditions such as respiratory distress syndrome and meconium aspiration syndrome. The statistical significance of these associations emphasizes the importance of considering gestational age in the formulation of effective respiratory care strategies.

This study not only contributes valuable knowledge to the field of neonatal critical care but also establishes a foundation for evidence-based practices. The identified connections between clinical profiles, complications, and outcomes pave the way for more precise risk assessment and intervention planning in neonatal intensive care units. By drawing upon the robust insights from this research, healthcare practitioners can enhance their ability to provide optimal care and minimize complications, ultimately improving the short-term outcomes of neonates requiring assisted mechanical ventilation.

Limitations of Study

1. **Retrospective Design:** The study's retrospective design might introduce bias due to the reliance on historical data and incomplete records. This could impact the accuracy and comprehensiveness of the collected information, potentially affecting the validity of the conclusions drawn.
2. **Single-Center Setting:** Conducting the study in a single-center facility limits the generalizability of the findings to broader neonatal populations. The patient demographics, care practices, and resources available in this specific center may not be representative of other settings, potentially restricting the applicability of the results.
3. **Selection Bias:** Inherent biases related to patient selection may arise in a retrospective study, as patients with certain characteristics or outcomes might be more likely to have sample and influence the observed associations.

5. **Data Accuracy and Completeness:** The study's findings rely on the accuracy and completeness of medical records and documentation. Incomplete or inaccurately recorded information could lead to misclassification of variables, potentially affecting the validity of the results.
6. **Confounding Variables:** The study might not have accounted for all potential confounding variables that could influence the relationships observed. Unmeasured or inadequately controlled variables might introduce bias or impact the interpretation of associations.
7. **Temporal Changes:** Neonatal care practices and technologies may have evolved over the study period, which could introduce temporal effects on outcomes. This may limit the ability to generalize the findings to different timeframes.
8. **Data Interpretation:** The study's conclusions are based on associations observed in the collected data, and causality cannot be definitively established due to the study's observational nature. Other unobserved factors might contribute to the observed outcomes.
9. **Ethical Considerations:** Patient privacy and ethical considerations related to retrospective data analysis could pose challenges in data collection and reporting. Adherence to patient confidentiality and informed consent might vary and impact the study's conduct.
10. **Small Sample Size:** While the study includes a sample of 186 neonates, a larger sample size could enhance the statistical power and precision of the findings, allowing for more robust analyses and the potential detection of more nuanced associations.
11. **Limited Outcome Scope:** The study focuses on short-term outcomes, potentially overlooking longer-term effects or complications that could become apparent after the short-term observation period.

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