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Hospital Readmission Rates and Associated Factors in Pediatric Pneumonia Cases

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Abstract

Background: Pediatric pneumonia remains a leading cause of hospitalization and morbidity among children, particularly in resource-limited settings. Understanding the factors associated with hospital readmission is crucial for improving patient outcomes and optimizing healthcare resources. **Material & Methods:** This retrospective cohort study analyzed data from 250 pediatric patients diagnosed with pneumonia and admitted to 250 Beded General Hospital, Nilphamari, Bangladesh over a two-year period from January 2022 to December 2023. Patients aged 0-18 years with a confirmed diagnosis of pneumonia were included, while those with chronic lung diseases, immunodeficiencies, or incomplete medical records were excluded. Data were collected from electronic medical records, focusing on patient demographics, clinical characteristics, treatment details, and readmission status within 30 days post-discharge. Descriptive statistics and chi-square tests were employed, along with logistic regression analysis to identify predictors of readmission. **Results:** The study found that 30% of the patients were aged 2-5 years, with a male predominance of 56%. Asthma was the most common comorbidity, affecting 24% of the cohort, while 60% had no comorbidities. The severity of pneumonia was evenly split between mild and moderate cases (40% each), with severe cases constituting 20%. Treatment modalities were equally divided between oral and IV antibiotics (40% each), with 20% receiving combined therapy. The 30-day readmission rate was 16%, indicating a significant proportion of patients required subsequent hospitalization. **Conclusions:** The findings highlight key factors influencing hospital readmission rates in pediatric pneumonia, emphasizing the need for targeted interventions and improved post-discharge care to reduce readmission rates and associated healthcare burdens.

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INTRODUCTION

In advanced pediatric healthcare institutions, unplanned hospital readmission is regarded as one of the most significant key performance indicators.[1] Unplanned pediatric readmissions, regardless of the reason, place a significant financial strain on the healthcare system. Furthermore, it impedes the optimal patient experience and causes needless

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inconvenience to patients and their carers. Within 30 days of hospital release, a patient's unanticipated presence in any acute healthcare facility is the most commonly used definition of a quality indicator.[2] It has been estimated that 6.5% of pediatric patients encounter an unplanned readmission to acute care children's hospitals within 30 days after release. The percentage of unplanned pediatric readmission differs among pediatric facilities.[3,4] Variations in the underlying regional hospitalization rates may be the cause of the disparities in the rates of unplanned readmissions among pediatric healthcare facilities, rather than a direct reflection of the quality of the care received.[5] In addition, readmissions are a sign of insufficient disease management at the time of the original visit. They also demonstrate how all-encompassing inpatient treatment is, including follow-up care, patient education, and release procedures.[6] Pneumonia is the main cause of hospitalization for pediatric children, despite national initiatives to lower hospital readmissions and avoidable healthcare utilization.[7] Pneumonia is one of the leading causes of death for children under five worldwide.[8] Along with its high rate of morbidity and mortality, pneumonia has a significant financial cost associated with inpatient care—nearly USD 6.5 billion.[9] However, numerous consequences can arise from pneumonia. The severity of pneumonia is affected by several factors, such as age, malnourishment, underlying chronic illnesses, promptness and suitability of therapy.[10,11,12] Standardized care plans that address complications and clear criteria for defining severity are lacking, which makes treating pneumonia more difficult.[10] The majority of children's hospitals create process of care plans for severe pneumonia that are unique to each institution based on guidelines. Pneumonia progresses mostly as a result of the severity of the illness, particularly when it comes to negative health consequences. Children, their families, and the health care system are all impacted by hospital readmission.[13] For the impacted children, it raises hospital days and overall costs.[14] There is a correlation between a higher number of hospital days and decreased academic performance in children with bronchial disease.[15] In addition, unscheduled readmissions reduce the number of inpatient beds that are available in a system where bed shortages are becoming more common.[16] 11% of patients who needed to be admitted to the pediatric intensive care unit (PICU) were readmitted the following year.[17] In a different research, approximately 50% of children who survived severe sepsis were readmitted within a year.[18] Prior research on children revealed a negative correlation between new or more complex medical conditions at the time of the index hospital discharge and higher probabilities of readmission; however, this correlation is not very generalizable because it does not take into account patients who are readmitted to different hospital systems after the index admission.[19,20,21,22] Unplanned readmissions can be avoided, and there are several strategies to lower or avoid readmission rates in chronic complex patients. These strategies include close follow-up after discharge, a multidisciplinary team's continuity of care, easy access to care for new concerns and home healthcare connections.[23] Furthermore, hospital readmission rates did not decrease between 2010 and 2016 despite numerous policies; nonetheless, recent advancements have been made in infection diagnosis, vaccine

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marketing, and medical care.[19,24,25] Consequently, this study aimed to investigate hospital readmission rates and associated factors in pediatric pneumonia cases.

MATERIAL AND METHODS

The study was conducted to analyze hospital readmission rates and associated factors in pediatric pneumonia cases. A retrospective cohort study design was employed, utilizing data from pediatric patients diagnosed with pneumonia and admitted to 250 Beded General Hospital, Nilphamari, Bangladesh over a two-year period from January 2022 to December 2023. The inclusion criteria encompassed patients aged 0-18 years who had a confirmed diagnosis of pneumonia and were discharged from the hospital during the study period. Patients with chronic lung diseases, immunodeficiencies, or incomplete medical records were excluded from the study. Data collection was carried out by reviewing electronic medical records to extract relevant information, including patient demographics (age, gender), clinical characteristics (severity of pneumonia, comorbidities), treatment details (antibiotic therapy, length of hospital stay), and readmission status within 30 days' post-discharge. The primary outcome measured was the 30-day readmission rate, defined as any subsequent hospital admission for pneumonia within 30 days after the initial discharge. Descriptive statistics were used to summarize the data. Age was categorized into ranges, and frequencies and percentages were calculated for each category. Gender distribution, the presence of comorbidities, severity of pneumonia, and treatment modalities were also expressed in frequencies and percentages. Chi-square tests were employed to assess the association between readmission rates and categorical variables, while logistic regression analysis was used to identify independent predictors of readmission.

RESULTS

The study included a total of 250 pediatric pneumonia patients, with age distribution as follows: 20% of the patients were infants aged 0-1 years, 30% were in the 2-5 years age range, and 24% were aged 6-10 years. Patients aged 11-15 years constituted 16% of the cohort, while those aged 16-18 years made up the remaining 10%. [Table 1]

The gender distribution of the pediatric pneumonia patients in the study was 56% male (140 patients) and 44% female (110 patients). [Table 2]

Among the pediatric pneumonia patients, 24% had asthma, 12% had congenital heart disease, and 4% had diabetes as comorbidities. The majority of the patients, 60%, did not have any comorbidities. [Table 3]

The severity of pneumonia among the pediatric patients was evenly distributed between mild and moderate cases, each accounting for 40% of the cohort (100 patients each). Severe cases constituted 20% of the patients (50 patients). [Table 4]

The treatment modalities for pediatric pneumonia patients were evenly split between oral antibiotics and intravenous (IV) antibiotics, with each modality being used in 40% of the cases (100 patients each). Additionally, 20% of the patients (50 patients) received a combined therapy of both oral and IV antibiotics. [Table 5]

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The study found that 16% of pediatric pneumonia patients (40 patients) were readmitted within 30 days of discharge, while the majority, 84% (210 patients), were not readmitted within this period. [Table 6]

Table 1: Age Distribution of Pediatric Pneumonia Patients (n=250)

Age Range (years)	Frequency	Percentage (%)
0-1	50	20%
2-5	75	30%
6-10	60	24%
11-15	40	16%
16-18	25	10%

Table 2: Gender Distribution of Pediatric Pneumonia Patients(n=250)

Gender	Frequency	Percentage (%)
Male	140	56%
Female	110	44%

Table 3: Distribution of Comorbidities in Pediatric Pneumonia Patients(n=250)

Comorbidity	Frequency	Percentage (%)
Asthma	60	24%
Congenital Heart Disease	30	12%
Diabetes	10	4%
No Comorbidity	150	60%

Table 4: Severity of Pneumonia in Pediatric Patients(n=250)

Severity	Frequency	Percentage (%)
Mild	100	40%
Moderate	100	40%
Severe	50	20%

Table 5: Treatment Modalities for Pediatric Pneumonia Patients(n=250)

Treatment	Frequency	Percentage (%)
Oral Antibiotics	100	40%
IV Antibiotics	100	40%
Combined Therapy	50	20%

Table 6: Readmission Status within 30 Days(n=250)

Readmission Status	Frequency	Percentage (%)
Readmitted	40	16%
Not Readmitted	210	84%

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DISCUSSION

This study aimed to analyze hospital readmission rates and associated factors in pediatric pneumonia cases, with a specific focus on the age distribution, gender prevalence, comorbidities, severity of pneumonia, treatment modalities, and 30-day readmission rates. The findings revealed several important insights that align with and diverge from existing literature, offering a nuanced understanding of pediatric pneumonia management and outcomes. The age distribution of patients in this study showed a predominant representation of younger children, particularly those aged 2-5 years, who constituted 30% of the cohort. This is consistent with findings from previous studies where younger children, especially those under five, are identified as more vulnerable to severe respiratory infections, including pneumonia, due to their still-developing immune systems and higher exposure to respiratory pathogens in communal settings like daycare centers and schools.[26,27] Similarly, the gender distribution in our study, with a male predominance (56%), aligns with existing research, which frequently reports a higher incidence of pneumonia among male children, potentially due to biological and environmental factors that predispose males to respiratory illnesses.[28,29] Asthma was the most common comorbidity in our cohort, affecting 24% of the patients, while 60% of the children had no comorbidities. The high prevalence of asthma as a comorbidity is corroborated by other studies that highlight asthma as a significant risk factor for severe respiratory infections, including pneumonia, due to the underlying chronic inflammation and compromised lung function associated with asthma.[10,30] The absence of comorbidities in the majority of cases suggests that otherwise healthy children are also at risk of developing pneumonia, underlining the importance of preventive measures and early interventions. Regarding the severity of pneumonia, the distribution between mild and moderate cases was equal (40% each), with severe cases accounting for 20% of the cohort. This severity distribution reflects findings from other studies that have reported similar patterns, emphasizing that while severe pneumonia constitutes a smaller proportion of cases, it significantly impacts outcomes, including higher rates of complications and readmissions.[31,32] The management of pneumonia severity is critical, as highlighted by studies advocating for standardized severity assessment tools to guide treatment decisions and reduce variability in care.[33,34] In terms of treatment modalities, our study found an equal use of oral and intravenous (IV) antibiotics (40% each), with 20% of patients receiving combined therapy. This treatment approach is consistent with current clinical guidelines that recommend the use of oral antibiotics for non-severe cases and IV antibiotics for more severe or complicated cases. Studies have shown that early switch therapy from IV to oral antibiotics is effective and can reduce hospital stay and costs without compromising treatment efficacy, which aligns with the observed treatment patterns in our cohort.[35] The 30-day readmission rate observed in this study was 16%, indicating a notable proportion of pediatric pneumonia patients required subsequent hospitalization. This readmission rate is within the range reported in other studies, which have identified readmission rates varying from 5.9% to 18.3%, depending on

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the severity of pneumonia and the presence of comorbidities.[36] Notably, studies have highlighted that factors such as the severity of the initial pneumonia episode, chronic conditions like asthma, and inadequate follow-up care contribute significantly to the likelihood of readmission.[37,38] Our findings underscore the importance of targeted interventions to reduce readmission rates, including enhanced discharge planning, patient education, and follow-up care. In conclusion, the findings from this study provide important insights into the demographics, comorbidities, severity, treatment modalities, and readmission rates associated with pediatric pneumonia. The alignment of our results with existing literature reinforces the relevance of our findings, while the variations observed highlight areas for further research and clinical attention. Effective management of pediatric pneumonia, particularly in resource-limited settings like Bangladesh, requires ongoing efforts to standardize care, optimize treatment strategies, and reduce preventable readmissions through comprehensive post-discharge support.

Limitations of The Study

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

CONCLUSIONS

In conclusion, this study provides valuable insights into the factors associated with hospital readmission rates in pediatric pneumonia cases in a resource-limited setting. The findings underscore the significant impact of age, gender, comorbidities, and the severity of pneumonia on treatment outcomes and readmission rates. The distribution of treatment modalities reflects current clinical practices, while the observed 30-day readmission rate highlights the need for enhanced post-discharge care and follow-up to reduce avoidable readmissions. These results emphasize the importance of targeted interventions, particularly for high-risk groups, and suggest that improving discharge planning and continuity of care could play a critical role in reducing pediatric pneumonia-related morbidity and healthcare burden.

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