



Article

Length of Hospitalization and Clinical Outcomes Pneumonia Patients at PKU Muhammadiyah Hospital, Bantul

^{1,6}Nurcholid Umam Kurniawan, ^{2,6}Novi Wijayanti Sukirto, ^{3,6}Elvina Prisilla, ^{4,6}Ana Budi Rahayu, ⁵Dewi Yuniasih, ^{3,6}Dewi Ari Mulyani, ⁷MH Muflihatul Ulfa

Email (Corresponding Author) : * nurcholid.umam@med.uad.ac.id

¹Department of Pediatric, Faculty of Medicine, Universitas Ahmad Dahlan, Yogyakarta

²Department of Internal Medicine, Faculty of Medicine, Universitas Ahmad Dahlan, Yogyakarta

³Department of Radiology, Faculty of Medicine, Universitas Ahmad Dahlan, Yogyakarta

⁴Department of Neurology, Faculty of Medicine, Universitas Ahmad Dahlan, Yogyakarta

⁵Department of Public Health, Faculty of Medicine, Universitas Ahmad Dahlan, Yogyakarta

⁶PKU Muhammadiyah Hospital, Bantul

⁷Department of Physiology, Faculty of Medicine, Universitas Ahmad Dahlan, Yogyakarta

ARTICLE INFO

ABSTRACT

Article history

Received 18-04-24

Revised 25-05-24

Accepted 25-05-24

Keywords

Length of stay,
Pediatric,
Pneumonia,
Outcome

Pneumonia is a lower respiratory tract infection that was the leading cause of death in developing countries in 2020, it was shown that pneumonia was the largest contributor to post-neonatal (14.5%) and under-five deaths (5.05%). The timing of hospital discharge for patients with pneumonia is determined primarily by the attending physician and is based on an assessment of the patient's clinical stability and the appropriate duration of inpatient medical therapy. The patient's discharge decision determines the length of hospital stay. To determine the length of hospitalization and clinical outcome improvement of pneumonia patients at PKU Muhammadiyah Bantul Hospital. This study was a cross-sectional descriptive study using a retrospective study conducted by taking medical record data at PKU Muhammadiyah Bantul Hospital. Pneumonia patients at PKU Muhammadiyah Bantul Hospital were dominated by the age group of 2 years old while by gender the majority were boys. Length of Stay (LOS) of pneumonia patients was highest with three days of treatment as many as 136 patients or 54.2%. Cumulatively within seven days, 98.80% of pneumonia patients showed good clinical outcomes and were allowed to leave the hospital. it is not known for certain that patient outcomes are related to the patient's length of stay because all patients returned home in improved condition after treatment at the hospital.

This is an open-access article under the [CC-BY-SA](https://creativecommons.org/licenses/by-sa/4.0/) license.



INTRODUCTION

Pneumonia is the leading cause of lethal illnesses in children and remains a substantial global health concern, especially for children under the age of five. Pneumonia accounted for 14% of all deaths in children under the age of five, causing the loss of 740,180 children in 2019, as reported by the World Health Organization (WHO) ¹. Pneumonia is a prevalent infection affecting the lower respiratory system, and it is the primary cause of mortality in less developed nations ². Approximately 80% of worldwide child mortality among children under the age of five occurs in Africa and Southeast Asia. According to the data, pneumonia is responsible for 19% of deaths, while diarrhea causes 17% of deaths. Prematurity, infection, and sepsis each account for 10% of mortality³.

Pneumonia is a prevalent infection affecting the lower respiratory system, and it is the primary cause of mortality in less developed nations². Approximately 80% of worldwide child mortality among children under the age of five occurs in Africa and Southeast Asia. According to the data, pneumonia is responsible for 19% of deaths, while diarrhea causes 17% of deaths. Prematurity, infection, and sepsis each account for 10% of mortality³. In Indonesia, the prevalence of pneumonia is significantly high, with 503,738 cases reported among children under the age of five. Out of these cases, 16,819 have been diagnosed with severe pneumonia ⁴. Based on the 2019 report from the World Health Organization, Indonesia has the tenth highest mortality rate for children under five due to pneumonia, with a rate of 32 per 1000 live births. This means that 2-3 children die from pneumonia every hour in Indonesia ¹. The prevalence of pneumonia in children under five in Indonesia according to RISKESDAS in 2018 was 4.8% based on the diagnosis of medical personnel or symptoms experienced by patients⁵. Meanwhile, Indonesia faces 21.7% of under-five deaths caused by pneumonia and 15%-30% of children with pneumonia must be hospitalized^{3,5}.

In terms of length of stay, hospitals differ significantly from one another. Results vary depending on the kind of hospital where the various research was carried out, leading to contradictory reports. Possible explanations for the discrepancies include variances in patient traits and attitudes, institutional features, and preferences for clinical treatment. Because of a variety of safe tactics and doable rules that have been put forth to cut down on the number of hospitalization days, the length of stay (LOS) looks to have dropped from nine to six days in recent years ⁶. A study mentioned that the hospitalization period for pneumonia patients is generally 8 days ⁷. Meanwhile, another study showed that the length of hospitalization (LOS) for children with pneumonia was 5-10 days ⁸. Regarding the average time to recover is four days, according to Tireore, the recovery time from severe pneumonia is significantly affected by weight, age, first

antibiotic administration, and antibiotic replacement⁸. The most results showing recovery or improvement (56.7%) were shown by a study conducted by Juwita⁹.

Regarding mortality caused by pneumonia, a study in South Africa observed a low mortality rate due to pneumonia¹⁰. Clinical factors associated with death or ICU admission include age¹¹, premature birth^{12,13}, or hypoxia. Clinicians should consider these risk factors to identify children who may require additional monitoring or early treatment¹⁰.

The time of hospital discharge for patients with pneumonia is determined primarily by the attending physician¹⁴ and is based on an assessment of the patient's clinical stability and the appropriate duration of inpatient medical therapy. The patient's discharge decision determines the length of hospital stay¹⁵. The attending physician considers factors that determine clinical stability and duration of treatment and may lead to a delay in discharge from the hospital. Based on this background, the researcher wanted to know the length of hospitalization and clinical outcomes of pneumonia patients at PKU Muhammadiyah Bantul Hospital.

METHODS

The study exclusively included pneumonia patients whose cases were documented in the medical records of the pediatric department at PKU Muhammadiyah Bantul Hospital. The data collection period spanned from January 1 to December 31, 2023. All eligible volunteers who satisfied the specified criteria were enrolled in the study within a predetermined timeframe. This study employed the purposive sampling method to choose the samples. The eligibility criteria for this study consisted of patients who were diagnosed with pneumonia and had comprehensive medical records at PKU Muhammadiyah Bantul Hospital between January 1 and December 31, 2023. The inclusion criteria were patients who were diagnosed with pneumonia and had complete and detailed medical records available during the specified period. The exclusion criteria were patients diagnosed with pneumonia who did not have complete medical record data or had unclear diagnoses. This study was conducted as a cross-sectional descriptive study. This study employed a retrospective approach by extracting medical record data from PKU Muhammadiyah Bantul Hospital. The univariate analysis focused on three variables: age, gender, and length of stay. Descriptive statistics, including frequencies and percentages, were used to summarize these variables..

RESULTS

The demographic analysis of pneumonia patients treated at PKU Muhammadiyah Bantul Hospital, as illustrated in Table 1, highlights that the predominant age group affected by pneumonia comprises children aged 2 years, accounting for 38.2% of the cases. This is closely

followed by infants aged 0-11 months, who represent 25.5% of the patient cohort, and children aged 1 year, who also constitute 38.2% of the cases. The least affected age group is children aged 3 years, comprising 15.5% of the cases. Further, the gender distribution among pneumonia patients at the same hospital indicates a distinct predominance of male patients, who constitute 62.9% of the total cases. Conversely, female patients account for 37.1% of the pneumonia cases. This gender disparity underscores a higher incidence of pneumonia among male patients within the studied population.

Table 1. Patient Characteristics Based on Age and Gender

	Total	Percentage
Age (Years)		
0	64	25.5
1	52	20.7
2	96	38.2
3	39	15.5
Gender		
Male	158	62,9
Female	93	37,1

Table 2. Length of Stay of Pneumonia Patients at PKU Muhammadiyah Hospital Bantul

LOS (Day)	n	%
1	1	0.4
2	24	9.6
3	136	54.2
4	48	19.1
5	25	10.0
6	10	4.0
7	4	1.6
8	1	0.4
9	1	0.4
10	1	0.4
Total	251	100

Table 2. details the duration of hospital stays, measured in days, for pneumonia patients admitted to PKU Muhammadiyah Hospital Bantul. The data encompasses 251 cases in total. The most frequent length of stay is three days, representing a substantial 54.2% of all cases. Hospital stays of four days were observed in 19.1% of cases, while a five-day stay accounted for 10.0%. Notably shorter stays, such as two days, were documented in 9.6% of the cases. Conversely, stays extending to six days or beyond were relatively uncommon, with six-day stays making up 4.0% of the cases, and seven-day stays constituting 1.6%. Stays of one, eight, nine, and ten days were

markedly rare, each accounting for less than 1% of cases. This distribution indicates that the majority of pneumonia patients at this hospital have relatively short hospitalizations, primarily ranging from three to five days.

DISCUSSION

Age characteristics in this study were categorized into four groups: patients aged 0 years (1-11 months), 1 year (12-23 months), 2 years (24-35 months), and 3 years (36- 47 months). Based on the age characteristics of pneumonia patients at PKU Muhammadiyah Bantul Hospital, it was found that pneumonia cases were dominated by the age group of 2 years. Pneumonia mostly affects the age group of toddlers and children ¹⁶. In toddlers with weak immune systems, pneumonia is a serious disease ¹⁷⁻¹⁹. Malnutrition can cause a child's immune system to become weak, especially in infants who are not exclusively breastfed for 0-6 months ²⁰. In this study, we cannot know the nutritional condition of the patient because there is no data recorded in the medical record. In children under five who are suffering from pneumonia, age is one of the risk factors for death in children under five¹. The older a toddler is, the lower the risk of dying from pneumonia when compared to younger toddlers ^{10,21}. This can occur because the immune system in children²² is still weak and not fully formed, as a result, the process of spreading infection becomes faster.

Gender Characteristics

Based on the table of gender characteristics of pneumonia patients, the majority of pneumonia patients were male, with the male-female ratio of 1.7:1. Similar findings from research on pediatric pneumonia patients in Nepal indicated a 1.5:1 male-to-female ratio ²³. Studies conducted in Bangladesh [9, 10] have found similar findings regarding health disparities and increased pneumonia cases among hospitalized male children compared to female children. In Bangladesh, the male-female ratio was 2:1 and 1.4:1, respectively. It could be that boys are more likely than girls to contract pneumonia and that boys receive greater attention in our culture. The claim that boys' respiratory tract diameters are smaller than girls' in the early stages of birth serves as one justification for this ailment ²⁴. Hormonal variations in males and females under five years old can also affect a toddler's immune system. Boys therefore have a higher risk of contracting viral and bacterial infections that cause pneumonia in young children (under five years old) ^{24,25}.

In regards to the gender gap in pneumonia severity, Naheed's research revealed that, although there was no gender difference in hospital treatment, the data showed a sex-based differential in pneumonia severity and fatalities among children admitted to Bangladeshi

hospitals. Consequently, they propose that their results necessitate additional research to examine the factors influencing parents' decision to seek medical attention for their children who have pneumonia in a society that values men over women and to comprehend the impact of gender disparities on the prognosis of childhood pneumonia in Bangladesh ²⁵.

Length of Stay (LOS) and Clinical Outcome of Pneumonia Patients

Our study found that the duration of hospitalization of pneumonia patients Length of Stay (LOS) of pneumonia patients was highest at three days, while the least number of hospitalized patients were on day one.—Most of the pneumonia patients at the Pediatric unit of PKU Muhammadiyah Bantul Hospital were discharged after 3 days of hospitalization. These findings are consistent with the Retrospective Cohort Study in Ethiopia which found that The median length of stay in the hospital was 4 days (interquartile range =3, 5) ⁸. Our finding is also similar to Brogan et al.'s finding that the median length of stay (LOS) varied amongst hospitals, with 25% having a median LOS of less than three days (interquartile range: one to three days). However, they discovered that differences in length of stay (LOS) between children with CAP who have private, public, and uninsured insurance raise questions about potential differences in hospital release guidelines depending on insurance type and status ²⁶.

Length of Stay (LOS) is the period required for a patient to be hospitalized, measured from the time the patient arrives until they are discharged from the hospital in a state of recovery or improvement and have been allowed to leave the hospital by a doctor²⁷. Hospitalization is a service for patients in health facilities including observation, diagnosis, treatment, rehabilitation, and other health service efforts by staying at the hospital.²⁸ Gender, hospitalizations in shared rooms, comorbidities, and socioeconomic status are among the variables that have previously been linked to LOS²⁸. There has been evidence that LOS risk increases with hospitalizations in shared rooms²⁹. Meanwhile, another study mentioned extended LOS was found to be independently correlated with pneumonia severity index (PSI) high-risk classes (IV and V), positive blood culture, admission to an intensive care unit (ICU), and multilobar involvement³⁰. In the meantime, weight, age, the initial antibiotic given, and the replacement of the antibiotic all had a major impact on how long it took to recover from severe pneumonia, according to a study conducted in Ethiopia⁸. Their suggestion is to make improvements to policies like feeding kids wholesome food and making sure underweight kids receive the care they need ⁸.

According to the outcome of pneumonia patients, living in a home where there are smokers, having a history of fever, compromised consciousness, cyanosis, pallor, having Ronchi on auscultation, and having an infection with the human metapneumovirus are all independent risk factors for a poor prognosis ³¹. The severity of pneumonia will affect the length of treatment

and will also affect the outcome. Pediatric CAP patients with a fever lasting more than 7 days and tachypnea are more likely to develop severe pneumonia ³².

Based on the analysis above, all pneumonia patients who underwent hospitalization at PKU Muhammadiyah Bantul Hospital showed good clinical outcomes, all patients were discharged in recovered conditions. It can be seen from the analysis that cumulatively within seven days, 98.80% of pneumonia patients showed clinical improvement and were allowed to leave the hospital. However, we were unable to pinpoint the evidence that led to all pneumonia patients being discharged in good condition, especially concerning the length of their hospitalization.

The weakness of this study is that it is not known for certain that patient outcomes are related to the patient's length of stay because all patients returned home in improved condition after treatment at the hospital. A regular diet and the patient's dedication to their pneumonia treatment regimen can assist reduce hospital stays, which is frequently a contributing factor in the brief stay. However, the patient's food and prescription details were not included in this study due to incomplete data regarding treatment history. Antibiotic use will optimize hospitalized patients' care for pneumonia, provided that the right dosages are administered to each patient. One major determinant of a patient's therapy success is the timing of drug administration. The patient's benefits and condition are taken into account when determining the medication administration regimen. Again, it's unfortunate that we are unable to address the crucial issues that actually. This study cannot show the factors that influence patient outcomes. It is hoped that future researchers will be able to add several other variables and measurement results that can be used as indicators for further research because there are still variables that have not been discovered by researchers regarding the factors that influence the length of stay in pneumonia patients.

CONCLUSION

Pneumonia patients at PKU Muhammadiyah Bantul Hospital showed the highest LOS on day three with 136 patients, while the longest LOS was on day eight with one patient and the shortest LOS was only one day with one patient. The clinical outcome of this study was 98.80% of patients recovered from pneumonia and were allowed to leave the hospital.

REFERENCES

1. World Health Organization. Pneumonia in children. Published 2019. <https://www.who.int/news-room/fact-sheets/detail/pneumonia>
2. Marangu D, Zar HJ. Childhood pneumonia in low-and-middle-income countries: An update. *Paediatr Respir Rev*. 2019;32:3-9. doi:10.1016/j.prrv.2019.06.001
3. Casman C, Nurhaeni N. DETERMINANT FACTORS OF LENGTH OF STAY AMONG UNDER-FIVE CHILDREN WITH PNEUMONIA DISEASES: A LITERATURE REVIEW. *Int J Nurs Heal Serv*. 2019;2(3):80-88.
4. Ihtasya S, Setyoningrum RA, Kusumaningrum D. Prevalence of Pneumonia Severity in Children

- under 5 Years Old at Primary Health Care of Tambakrejo, Surabaya. *JUXTA J Ilm Mhs Kedokt Univ Airlangga*. 2021;12(1):26-28.
5. Badan Penelitian dan Pengembangan Kesehatan. *Laporan Nasional Riskesdas 2018*. Lembaga Penerbit Badan Penelitian dan Pengembangan Kesehatan, Jakarta; 2018.
 6. Menéndez R, Cremades MJ, Martínez-Moragón E, Soler JJ, Reyes S, Perpina M. Duration of length of stay in pneumonia: influence of clinical factors and hospital type. *Eur Respir J*. 2003;22(4):643-648.
 7. Osman M, Manosuthi W, Kaewkungwal J, et al. Etiology, Clinical Course, and Outcomes of Pneumonia in the Elderly: A Retrospective and Prospective Cohort Study in Thailand. *Am J Trop Med Hyg*. 2021;104(6):2009-2016. doi:10.4269/ajtmh.20-1393
 8. Tirore LL, Abame DE, Sedoru T, et al. Time to recovery from severe pneumonia and its predictors among children 2–59 months of age admitted to pediatric ward of nigist eleni mohammed memorial comprehensive specialized hospital, hossana, ethiopia: retrospective cohort study. *Pediatr Heal Med Ther*. Published online 2021:347-357.
 9. Juwita DA, Maharani A, Permatasari D. Profile of Antibiotic Use in Pediatric Patients with Pneumonia at Dr. M. Djamil Hospital Padang, West Sumatra, Indonesia. *Age*. 9:30.
 10. Le Roux DM, Nicol MP, Vanker A, Nduru PM, Zar HJ. Factors associated with serious outcomes of pneumonia among children in a birth cohort in South Africa. *PLoS One*. 2021;16(8):e0255790.
 11. Chen L, Miao C, Chen Y, et al. Age-specific risk factors of severe pneumonia among pediatric patients hospitalized with community-acquired pneumonia. *Ital J Pediatr*. 2021;47:1-13.
 12. Ofman G, Pradarelli B, Caballero MT, et al. Respiratory failure and death in vulnerable premature children with lower respiratory tract illness. *J Infect Dis*. 2020;222(7):1129-1137.
 13. Smith LJ, McKay KO, van Asperen PP, Selvadurai H, Fitzgerald DA. Normal development of the lung and premature birth. *Paediatr Respir Rev*. 2010;11(3):135-142.
 14. Moeller JJ, Ma M, Hernandez P, Marrie T, Touchie C, Patrick W. Discharge Delay in Patients with Community-acquired Pneumonia Managed on a Critical Pathway. *Can J Infect Dis Med Microbiol = J Can des Mal Infect la Microbiol medicale*. 2006;17(2):109-113. doi:10.1155/2006/375645
 15. Eskandari M, Alizadeh Bahmani AH, Mardani-Fard HA, Karimzadeh I, Omidifar N, Peymani P. Evaluation of factors that influenced the length of hospital stay using data mining techniques. *BMC Med Inform Decis Mak*. 2022;22(1):280. doi:10.1186/s12911-022-02027-w
 16. Grimwood K, Chang AB. Long-term effects of pneumonia in young children. *Pneumonia (Nathan Qld)*. 2015;6:101-114. doi:10.15172/pneu.2015.6/671
 17. World Health Organization (WHO). Pneumonia in children. Published 2022. <https://www.who.int/news-room/fact-sheets/detail/pneumonia>
 18. Dean P, Florin TA. Factors associated with pneumonia severity in children: a systematic review. *J Pediatric Infect Dis Soc*. 2018;7(4):323-334.
 19. Zakrzewska M, Roszkowska R, Zakrzewski M, Maciorkowska E. Pneumocystis Pneumonia: Still a serious disease in children. *J mother child*. 2021;23(3):159-162. doi:10.34763/devperiodmed.20192303.159162
 20. Rytter MJH, Kolte L, Briend A, Friis H, Christensen VB. The immune system in children with malnutrition--a systematic review. *PLoS One*. 2014;9(8):e105017. doi:10.1371/journal.pone.0105017
 21. Williams DJ, Zhu Y, Grijalva CG, et al. Predicting severe pneumonia outcomes in children. *Pediatrics*. 2016;138(4).
 22. Hill DL, Carr EJ, Rutishauser T, et al. Immune system development varies according to age, location, and anemia in African children. *Sci Transl Med*. 2020;12(529):eaaw9522.
 23. Banstola A, Banstola A. The epidemiology of hospitalization for pneumonia in children under five in the rural western region of Nepal: a descriptive study. *PLoS One*. 2013;8(8):e71311.
 24. Ripoll JG, Guo W, Andersen KJ, et al. Sex differences in paediatric airway anatomy. *Exp Physiol*. 2020;105(4):721-731. doi:10.1113/EP088370
 25. Naheed A, Breiman RF, Islam MS, Saha SK, Tabassum Naved R. Disparities by sex in care-seeking behaviors and treatment outcomes for pneumonia among children admitted to hospitals in Bangladesh. *PLoS One*. 2019;14(3):e0213238. doi:10.1371/journal.pone.0213238
 26. Brogan T V, Hall M, Williams DJ, et al. Variability in processes of care and outcomes among children hospitalized with community-acquired pneumonia. *Pediatr Infect Dis J*. 2012;31(10):1036-1041.
 27. Islands Health. *Length of Stay vs. Expected Length of Stay in Acute Care*; 2024. <https://www.islandhealth.ca/sites/default/files/performance-measures/documents/length-of-stay-vs-expected-length-of-stay-in-acute-care.pdf>
 28. Marfil-Garza BA, Belaunzarán-Zamudio PF, Gulias-Herrero A, et al. Risk factors associated with prolonged hospital length-of-stay: 18-year retrospective study of hospitalizations in a tertiary

- healthcare center in Mexico. *PLoS One*. 2018;13(11):e0207203.
29. Chaudhury H, Mahmood A, Valente M. Advantages and disadvantages of single-versus multiple-occupancy rooms in acute care environments: a review and analysis of the literature. *Environ Behav*. 2005;37(6):760-786.
 30. Garau J, Baquero F, Perez-Trallero E, et al. Factors impacting on length of stay and mortality of community-acquired pneumonia. *Clin Microbiol Infect*. 2008;14(4):322-329.
 31. Jroundi I, Mahraoui C, Benmessaoud R, et al. Risk factors for a poor outcome among children admitted with clinically severe pneumonia to a university hospital in Rabat, Morocco. *Int J Infect Dis*. 2014;28:164-170.
 32. Muljono MP, Halim G, Heriyanto RS, et al. Factors associated with severe childhood community-acquired pneumonia: a retrospective study from two hospitals. *Egypt Pediatr Assoc Gaz*. 2022;70(1):30.