

Incidence and Risk Factors for Prolonged Stay in Children Hospitalised with Pneumonia

NIRMAL KUMAR MOHAKUD¹, MADHUSMITA MISHRA², RATIKANTA TRIPATHY³, MANAS RANJAN MISHRA⁴

ABSTRACT

Introduction: Lower Respiratory Tract Infection (LRTI) is one of the common causes of morbidity and mortality in children and is responsible for hospitalisation.

Aim: The current descriptive epidemiological study aimed to analyse the risk factors for the prolonged hospital stay in children suffering from LRTIs.

Materials and Methods: From August 2016 to July 2017, a total of 245 patients admitted for LRTI in the Department of Paediatrics, KIMS was included in the current investigation. Current diagnosis, demographic profile and length of hospital stay were examined and data were analysed using GRAPH-PAD-PRISM software version 7.0.

Results: All the 245 children were identified with LRTI. Gender wise distribution showed 173 (70.6%) males and 72 (29.4%) females. The mean hospital stays for female patients (6.15 days) were higher than males (7.07 days) ($p < 0.05$) with an average duration of 6.8 days. The hospital stay was significantly higher in children with an age range of 11-14 years in comparison to 1 mo-1 year aged children ($p = 0.001$). Among different groups of LRTIs, patients suffering from Pneumonia had a longer duration of hospitalisation (8.15 days).

Conclusion: Among children, the duration of hospitalisation was higher in males indicating that gender has a role in susceptibility and severity of the disease. Prolonged hospital stay was observed in children > 10 years of age. Therefore, early diagnosis and treatment options should be made for this age group of children to prevent prolonged hospitalisation.

Keywords: Lower respiratory tract infection, Morbidity, Paediatric patients

INTRODUCTION

LRTI is often used as a synonym for pneumonia. Pneumonia is an inflammatory condition of the lung primarily affecting small air sacs known as alveoli. Typically symptoms include few combinations of productive or a dry cough, chest pain, fever, and trouble in breathing [1]. LRTIs are a major cause of morbidity and mortality worldwide specifically in children aged less than five years. It results in nearly 1.9 million childhood deaths per year, of which 20% are estimated to occur in India [2]. Acute respiratory tract infection is most common in children under five years of age and represents 30-50% of the paediatric medical admissions [2]. LRTI includes pneumonia and atypical pneumonia which collectively manifest a major portion of infectious diseases worldwide [3,4]. Currently, LRTI is considered as a major cause of hospitalisation in children worldwide [4,5]. In Odisha, only a few reports are available on hospital stay of paediatric subjects < 5 years suffering from pneumonia. The current investigation was conducted to examine factors contributing to a prolonged hospital stay in children affected with LRTI and further proposed improvements to reduce it.

MATERIALS AND METHODS

In this retrospective study with a total of 245 paediatric patients, data were collected from August 2016 to July 2017 in the Department of Pharmacology and Paediatrics, KIMS, KIIT University, Bhubaneswar, Odisha, India. The study was approved by the Institutional Ethics Committee (IEC).

Inclusion criteria: (1) Patients in the age group of 1 month to 14 years who were admitted in the in-patient Paediatric department by recent fever ($> 37.5^{\circ}\text{C}$), cough and/or dyspnea, tachypnea, and sputum; (2) fixed moderate or fine rales or dry rales during inspiration detected by lung auscultation [6-8]; and (3) radiological confirmation of pneumonia was defined as the presence of consolidation (a dense or fluffy opacity with or without air bronchograms), other infiltrate (linear and patchy alveolar or interstitial densities), or pleural effusion [9].

Exclusion criteria: (1) Patients with any coexisting infections or other co-morbid conditions; (2) syndromic and immunocompromised patients and (3) subjects whose parents refused to give consents or whose data was not available.

Data Collection and Statistics

Information related to diagnosis, the demographic profile of patients and duration of hospital stay were collected from a total of 245 paediatric in-patients treated for LRTI. Consent was taken from parents/relatives. Collected data were entered into the Microsoft Excel and were analysed using GRAPH-PAD-PRISM software version 7.0 to examine the statistically significant difference between groups. A p-value of less than 0.05 was considered statistically significant. The test applied were t-test and f-test.

RESULTS

Out of 245 infected children, 72 were female and 173 were male. The mean hospital stays for female and male patients were 6.15 days and 7.07 days respectively indicating a significant association between gender and hospital stay ($p = 0.02$) [Table/Fig-1]. [Table/Fig-2] showed the age-wise average duration of hospital stay in LRTI children. The mean average duration of hospital stay for all age group was 6.80. It was found that older age groups had a longer duration of hospital stay in comparison to younger children ($p = 0.001$) [Table/Fig-2]. The average hospital stay in different subtypes of LRTI patients was calculated and results were shown in [Table/Fig-3]. Different LRTI subtypes had a strong association with duration of hospital stay ($p = 0.001$). In present study pneumonia patients had a longer hospital stay [Table/Fig-3].

Sex	N	Mean hospital stay	Std. deviation	t-test	df	p-value
Female	72	6.15	2.72	-2.42	242	0.02*
Male	173	7.07	2.66			

[Table/Fig-1]: Average hospital stay in male and female gender.
* denotes $p < 0.05$ indicating significant association between gender and hospital stay

Age group	N	Mean hospital stay	Std. deviation	F-test	df	p-value
0-1 years	122	5.91	2.18	14.181	3	0.001
2-5 years	33	6.67	2.94			
6-10 years	59	7.64	2.89			
11-14 years	31	8.84	2.44			
Total	245	6.80	2.70			

[Table/Fig-2]: Average hospital stay in different age group.

Types of disease	N	Mean hospital stay	Std. deviation	F-test	df	p-value
Bronchiolitis	42	6.60	2.38	6.233	3	0.001
LRTI	102	6.50	2.62			
Pneumonia	53	8.15	2.76			
WALRI*	48	6.15	2.67			
Total	245	6.80	2.70			

[Table/Fig-3]: Average hospital stay in different sub-types of lower respiratory tract infection.

*Wheeze associated lower respiratory infection

DISCUSSION

The longer period of hospitalisation in patients due to any infectious disease becomes an economic burden for the society. In our retrospective investigation, the mean duration of hospital stay was 6.8 days for LRTIs. Similar findings were observed in other parts of India where hospital stay ranged from 5.7 to 6.5 days [10-12]. However, another report indicated that the mean length of hospital stay in subjects affected with severe pneumonia was 13.7 days [12]. Another report revealed that the overall median length of stay in a population affected with pneumonia ranged from 5 to 6 days, whereas, the period varied from 6 to 21 days for those patients who were admitted to tertiary centres of Canada [13]. In present study, the LRTI cases according to severity were not classified. The duration of hospital stay affects the economic burden of the patients as shown by a study on the cost of management of severe pneumonia in children [12]. In developing nations like India, the prolonged hospital stay is an economic burden for middle or lower class population.

In this study, we found a significantly higher duration of hospital stays in patients with pneumonia as compared to other subtypes. This result was expected as pneumonia represents a serious health situation among children and the disease is bacterial origin; therefore, requires active management and patient has to stay for the prolonged time period in the hospital to get recovery.

As reported earlier, the severity of LRTI is higher in males as compared to females [14,15]. These studies further indicate that pneumonia cases caused by bacteria need longer hospitalisation than viral infection. A study by Shruthi KV et al., also supported the evidence of the higher occurrence of severe LRTI in males compared to females [16]. Muenchhoff M et al., showed that there was a stronger humoral and cellular immune response to infection in females than males [17,18]. Present study showed higher numbers of males than females (173 vs. 72 out of total 245 cases). But, a study by Arnold FW et al., showed that female patients were likely to take a longer time to improve clinically when compared to males [19]. It is assumed that understanding the gender-specific difference in the prevalence of respiratory tract infection may help to develop treatments for an early cure or early preventive measures to limit the spread of disease and to reduce the duration of hospital stay. Although not specifically documented, during present study we also observed that the parents of a male child were more concerned regarding the recovery of the child and preferred to stay longer in the hospital.

There are contradictory reports on the association between disease severity and different age groups of patients. Present study showed

a longer hospital stay in higher age groups of children (11-14 years) as compared to subjects with lesser age. Present data matched with previous studies conducted in western part of India that showed a strong correlation between age and disease severity. Additionally, this study also showed that the duration of hospital stay depends on the duration of illness of children before hospitalisation [20]. On the other hand, no correlation was seen between duration of hospital stay and age of patients [21]. In this study, the number of children in 11-14 years age group was less in number. A higher number of sample in this age group might have provided a more concrete results.

LIMITATION

Sociodemographic profile like the educational level of parents, the economic condition of parents should have been considered to find any relation with them. More number of cases including a government hospital should have given more accurate figures.

CONCLUSION

The mean average duration of hospital stay for pneumonia was 8.15 days whereas for overall LRTI is 6.8 days. Present study shows gender, age group and sub-types of LRTI as risk factors for the hospital stay. The hospital stay was more in males compared to females and also more in the age group of 11 to 14 years which is statistically significant. We observed more hospital stay in children affected with pneumonia. Knowledge regarding the risk factors may help the clinicians in better treatment and also limit the spread of LRTIs in children.

ACKNOWLEDGEMENTS

The authors duly acknowledge Prof. Duryodhan Samal for his support and encouragement to conduct this study. We are thankful to Dr. Arpit Shrivastava for reviewing this article. Also, our gratitude to the patients and parents for their co-operation.

REFERENCES

- [1] Carol Turkington, Bonnie Ashby (2007). The encyclopedia of infectious diseases (3rd ed.). New York: Facts on File. p. 242. ISBN 0-8160-6397-4. Retrieved 21 April 2011
- [2] Madhi SA, Klugman KP. Acute respiratory infections. Disease and Mortality in Sub-Saharan Africa. 2nd edition.
- [3] Richter J, Panayiotou C, Tryfonos C, Koptides D, Koliou M, Kalogirou N, et al. Aetiology of acute respiratory tract infections in hospitalized children in Cyprus. PLoS ONE. 2016;11(1):e0147041.
- [4] Rudan I, Boschi-Pinto C, Biloglav Z, Mulholland K, Campbell H. Epidemiology and etiology of childhood pneumonia. Bulletin of the World Health Organization. 2008;86(5):408-16B.
- [5] Nair H, Simões EA, Rudan I, Gessner BD, Azziz-Baumgartner E, Zhang JS, et al. Global and regional burden of hospital admissions for severe acute lower respiratory infections in young children in 2010: a systematic analysis. The Lancet. 2013;381(9875):1380-90.
- [6] Subspecialty Group of Respiratory Diseases, Society of Pediatrics, Chinese Medical Association, et al. Guidelines for Management of Childhood Community Acquired Pneumonia (For Trial Implementation) (I). Chin J Pediatr. 2007;45(2):83-90. Available at <http://zhhekzz.yiigle.com/CN112140200702/43061.htm>
- [7] Subspecialty Group of Respiratory Diseases, Society of Pediatrics, Chinese Medical Association, et al. Guidelines for management of childhood community acquired pneumonia (For Trial Implementation) (II). Chin J Pediatr. 2007;45(3):223-25. Available at <http://zhhekzz.yiigle.com/CN112140200703/43245.htm>
- [8] World Health Organization. (2018). Pneumonia. [online] Available at: <http://www.who.int/news-room/fact-sheets/detail/pneumonia> [Accessed 5 May 2018].
- [9] Mackenzie G. The definition and classification of pneumonia. Pneumonia. 2016;8:14. Available at <https://doi.org/10.1186/s41479-016-0012-z> [Accessed 5 May 2018]
- [10] Jose S, Rajashekarachar Y, Basavanthappa SP, Naidu BR. Evaluation of antibiotic usage on lower respiratory tract infections in paediatric department-an observational study. International Journal of Contemporary Pediatrics. 2016;3(1):146-49.
- [11] Udaya K, Murteli VB, Desai A. Clinical profile of children with pneumonia admitted at tertiary care hospital, Belgaum: a prospective study. Indian Journal of Child Health. 2017;4(3):352-55. Available at <https://atharvabub.net/index.php/JCH/article/view/29>
- [12] Zhang S, Sammon PM, King I, Andrade AL, Toscano CM, Araujo SN, et al. Cost of management of severe pneumonia in young children: systematic analysis. Journal of Global Health. 2016;6(1):010408.

- [13] Banerji A, Panzov V, Robinson J, Young M, Ng K, Mamdani M. The cost of lower respiratory tract infections hospital admissions in the Canadian Arctic. *International Journal of Circumpolar Health*. 2013;72(1):21595.
- [14] Papadopoulos NG, Gourgiotis D, Javadyan A, Bossios A, Kallergi K, Psarras S, et. al. Does respiratory syncytial virus subtype influences the severity of acute bronchiolitis in hospitalized infants? *Respiratory Medicine*. 2004;98(9):879-82.
- [15] Marrie TJ, Huang JQ. Low-risk patients admitted with community-acquired pneumonia. *The American Journal of Medicine*. 2005;118(12):1357-63.
- [16] Shruthi KV, Bhandare B, Adarsh E. Prescribing pattern of drugs in paediatric in-patients with lower respiratory tract infection at a tertiary care hospital. *WJPPS*. 2016;5(4):2396-409.
- [17] Muenchhoff M, Goulder PJ. Sex differences in pediatric infectious diseases. *The Journal of infectious diseases*. 2014;209(suppl_3):S120-26. Available at <https://doi.org/10.1093/infdis/jiu232>
- [18] Fish EN. The X-files in immunity: sex-based differences predispose immune responses. *Nat Rev Immunol*. 2008;8:737-44. Available at <https://www.ncbi.nlm.nih.gov/pubmed/18728636>
- [19] Arnold FW, Wiemken TL, Peyrani P, Mirsaeidi M, Ramirez JA. Outcomes in females hospitalised with community-acquired pneumonia are worse than in males. *European Respiratory Journal*. 2013;41(5):1135-40.
- [20] Naik JD, Jain SR, Mathurkar MP, Suryawanshi SP, Kamble SV, Babar SD. Study of clinical profile and certain modifiable risk factors associated with acute respiratory infection cases admitted in a tertiary care hospital. *International Journal of Contemporary Pediatrics*. 2016;3(1):129-33.
- [21] Sahu S, Satapathy D, Sahu T, Tripathy R, Das B, Pradhan S. A study of acute respiratory tract infection cases admitted to a tertiary level health centre. *Health and Population*. 2002;25:186-93. Available at <http://medind.nic.in/hab/t02/t4/habt02i4p186.pdf>

PARTICULARS OF CONTRIBUTORS:

1. Associate Professor, Department of Paediatrics, Kalinga Institute of Medical Sciences, Bhubaneswar, Odisha, India.
2. M. Pharm, Department of Pharmaceutical Science, Utkal University, Bhubaneswar, Odisha, India.
3. Assistant Professor, Department of Pharmacology, Kalinga Institute of Medical Sciences, Bhubaneswar, Odisha, India.
4. Associate Professor, Department of Pharmacology, Kalinga Institute of Medical Sciences, Bhubaneswar, Odisha, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Manas Ranjan Mishra,

Associate Professor, Department of Pharmacology, KIMS, KIIT University, Bhubaneswar -751024, Odisha, India.

E-mail: drmmishra@gmail.com

Date of Submission: **Jan 05, 2018**

Date of Peer Review: **Mar 07, 2018**

Date of Acceptance: **May 28, 2018**

Date of Publishing: **Aug 01, 2018**

FINANCIAL OR OTHER COMPETING INTERESTS: None.