Efficacy and Safety of Levofloxacin in the Treatment of Community Acquired Pneumonia in Children

*Nuruzzaman M,[1] Hoque M,[2] Shamme SS,[3] Das S,[4] Ahmed DN[5]

Abstract

Background: Pneumonia is the leading cause of childhood death. In Bangladesh during 2018, 13% of total childhood death under five occur due to pneumonia. Common antibiotics for community acquired pneumonia (CAP) in children are Penicillins, Macrolides, Aminoglycosides and Cephalosporins. Levofloxacin may be an adequate option for empiric therapy in treatment of CAP in children because it gives the broad spectrum activity against both bacterial and atypical pathogens causing CAP.

Objective: This is a prospective, observational study carried out in the Department of Pediatrics, Sylhet MAG Osmani Medical College Hospital, Bangladesh during January to December, 2013 to see the efficacy and safety of levofloxacin in the treatment of CAP in children.

Method: Total 70 cases of CAP were enrolled and were treated with levofloxacin. The study cases were selected by purposive sampling. Total duration for receiving study drug was seven days. Dose of levofloxacin was10mg/kg 12 hourly in children 1year to <5 years age, where as it was 10 mg/kg/day in children ≥5 years.

Result: 91.43% cases were cured with the treatment of levofloxacin. Adverse effects of levofloxacin were found as skin rash in 2 cases and vomiting in 4 cases.

Conclusion: Levofloxacin is effective and safe in the treatment of CAP in children.

[Shaheed Syed Nazrul Islam Med Col J 2021, Jan; 6 (1):122-126]

Keywords: Community Acquired Pneumonia, Levofloxacin

Introduction

Pneumonia is an invasion of the lower respiratory tract, below the larynx by pathogens either by inhalation, aspiration, respiratory epithelium invasion, or hematogenous spread.[1] Among various type of pneumonia, community acquired pneumonia (CAP) is the most common and important from public health point of view. Pneumonia is the leading cause of childhood death, accounting for 16% of 5.6 million deaths of children aged less than 5 years globally, more than 95% of which occur in developing countries.[2] In Bangladesh, pneumonia claimed the lives of more than 12,000 children under five, which is more than 1 child every hour. 13 percent of child deaths were due to pneumonia in 2018.[3] The incidence of pneumonia among children age <5 years who live in the rural area is 0.23 episodes per child-year and urban areas is 0.56 episodes per child-year in Bangladesh.[4] Antibiotics are the mainstay in the treatment of CAP.

1. **Dr. Mohammad Nuruzzaman, Senior Consultant (Paediatrics), Shoheed Syeds Nazrul Islam Medical College Hospital, Kishoreganj. nuruzzamansomc31@gmail.com*
2. *Dr. Mujibul Hoque, Associate Prof. of Paediatrics, Sylhet MAG Osmani Medical College, Sylhet.*
3. *Dr. Sheikh Shamsunnahar Shamme, Junior Consultant (Paediatrics), Shoheed Syed Nazrul Islam Medical College Hospital, Kishoreganj.*
4. *Dr. Sujit Das, Assistant Professor (Paediatrics), Shoheed Syeds Nazrul Islam Medical College Hospital, Kishoreganj.*
5. *Dr. Dewan Nizam Uddin Ahmed, Senior Consultant (Paediatrics), Shoheed Syed Nazrul Islam Medical College Hospital, Kishoreganj.*

**For correspondence*

Empiric antibiotic therapy for inpatient are perenteral Penicllin (Amoxicillin/Amoxicillin with Clavulanate, Penicillin G), Cephalosporin (Cefuroxime,Cefotaxime, Ceftriaxone), Macrolid (Erythromycin, Azithromycin or Carithromycin), Clindamycin and Vancomycin.[5,6] But resistant strain of *Pneumococci* (6%) which is the most common organism causing CAP is noted worldwide.[7] Some recent study suggested that floruquinolons specially levofloxacin can be effectively used in the treatment of CAP in children.[8,9,10] Levofloxacin may be an adequate option for empiric therapy in treatment of CAP in children because it gives the broad spectrum activity against both bacterial and atypical pathogens causing CAP and studies suggest that it can be safely used in children.[11] This study was designed to see the efficacy and adverse effect of levofloxacin in the treatment of CAP in children.

Methods

Selection of Patients

This was a prospective study conducted in the Department of Pediatrics, Sylhet MAG Osmani Medical College Hospital, Bangladesh from January 2013 to December 2013. Children aged 1 -12 years were included in the study. CAP was diagnosed by the following criteria: 1) Signs and symptoms of pneumonia including at least 2 of the following: (a) fever (axiliary or oral temperature > 100.4°F); (b) cough for less than 21 days; (c) chest pain; (d) shortness of breath; (e) physical findings of consolidation and (f) white blood cell count >15000/ul or <5000/ul; 2) Chest x-ray showing evidence of lung infection (pulmonary opacity, pneumatocele). Hospital acquired pneumonia; suppurative lung disease and pleural effusion were excluded from the study. Children with CAP receiving levofloxacin before enrollment were also excluded from the study. After diagnosis as CAP children were enrolled in the study by purposive sampling. Cases satisfying the inclusion and exclusion criteria were enrolled in the study. A total of 70 cases of CAP were enrolled.

Intervention

Total 70 children received levofloxacin. Dose of levofloxacin was 10mg/kg 12 hourly in children 1year to <5 years age, where as it was 10 mg/kg/day in children ≥5 years.[12] All the enrolled patients received supportive care for CAP such as oxygen inhalation, oropharyngeal suction, maintenance of temperature, and nutrition. Total duration for receiving study drug was seven days. Regular follow up was given during study period. Response to treatment was assessed initially after 3 days and also after 7 days by clinical symptoms and signs (fever, cough, shortness of breath, chest pain, rales on auscultation, dullness to percussion, egophony). Additional chest x-ray was done during assessment at 7th days. Clinical responses were categorized as cured and treatment failure. If no response occurred after 3 days the respective antibiotic was stopped and another antibiotic suitable for CAP outside the study were started and that case was labeled as treatment failure. Clinical cure was determined by disappearance of the clinical signs and symptoms of pneumonia and resolution of radiological findings reported at admission. If there was no resolution of clinical signs and symptoms and radiological findings the case was labeled as treatment failure.

Data Collection and Statistical Analysis

Data were collected by a preformed and pre-tested structured questionnaire. Age variation was expressed in percentage and ratio. Sex differences, cure rate and adverse effect were showed in percentage.

Ethical Consideration

Informed written consent was taken from parents or legal guardian. Beforehand ethical permission was taken from the ethical

committee of Sylhet MAG Osmani Medical College, Sylhet, Bangladesh.

Results

A total 70 cases were treated with levofloxacin. The age and sex characteristic of the patients were shown in Table 1. Out of 70 patients 64 (91.43%) were cured with levofloxacin, 6 patients (8.57%) were not cured. During study period levofloxacin showed no major adverse effects. Adverse effects of levofloxacin were found as skin rash in 2 (2.85.7%) cases and vomiting in 4 (5.70%) cases. Skin rashes were transient in nature. No arthropathy was observed during the study period.

Table 1:Age and sex characteristics of CAP patients

Variables	Frequency (n=70)	Percentage
Age group (years)		
1 -3	26	37.14
4- 6	17	24.28
7-9	14	20.00
10-12	13	18.52
Sex		
Male	42	60.0
Female	28	40.0
Male: Female	3:2	

Table II: Cure rate of levofloxacin in the treatment of CAP

Clinical outcome	Frequency	Percentage
Cured	64	91.42
Not cured	6	8.57

Table III: Adverse effects of levofloxacin.

Adverse effects	Frequency	Percentage
Vomiting	2	2.8
Rash	4	5.7
Arthopathy	0	0
Headache	0	0
Photosensitivity	0	0

Discussion

Pneumonia is a one of the most common cause of childhood morbidity mortality. Effective and resource compatible antimicrobial management is one of the fundamental aspects of the treatment of CAP. In the present study age and sex characteristics of levofloxacin treated patient was almost identical.

The present study revealed that cure rate of levofloxacin was 91.43% (Table II). Bradley *et al*.[8] in their comparative study of levofloxacin in the treatment of children with community-acquired pneumonia showed that cure rate of levofloxacin was 94.3%. File *et al*.[13] in their study of intravenous and/or oral levofloxacin (500 mg once daily) or the comparative agents, parenteral ceftriaxone (1 to 2 g once to twice daily) and/or oral cefuroxime axetil (500 mg twice daily) in treatment of adults with community acquired pneumonia showed that clinical success rate of levofloxacin (96%) in the management of

adult with CAP. Rokonuzzaman et al.[14] in their study of oral/perenteral levofloxacin in adult found that cure rate was 96%. Cure rate of levofloxacin in these mentioned studies support the present study. Adverse effect of levofloxacin was found as skin rash in 2(2.85%) cases and vomiting was found in 4 (5.70%) cases (Table III).Skin rashes were transient in nature. There was no need to discontinue treatment in any case of this study. In the comparative study of Bradly *et al.*[8] adverse events leading to treatment discontinuation occurred in 2% levofloxacin-treated patient. The most frequent category of adverse events that were treatment-limiting involved the gastrointestinal system (1%). No single type of treatment-limiting adverse event occurred in more than 1% of children in the present study. Levofloxacin was as well tolerated as standard of care antibiotics for the treatment of CAP. Congress report from the 41st inter-science conference on antimicrobial agents and chemotherapy Chicago, IL, USA, states levofloxacin has no serious adverse reaction in children.[15]

As the diagnosis of CAP was not confirmed by bacteriological study, microbial cure rate was not determined in the present study.

Conclusion

Levofloxacin is effective in the treatment of CAP in children. Levofloxacin is also safe and well tolerated drugs. Large scale study may further strengthen its use in the treatment of CAP in children.

References

1. Ebeledike C, Ahmad T. Pediatric Pneumonia. Treasure Island (FL): StatPearls Publishing; 2020 Jan – [Updated 2020.08.12]. (Available at https://www.ncbi.nlm.nih.gov/books/NBK536940/).
2. Ferdous F, Ahmed S, Das SK, Chisti MJ, Nasrin D, Kotloff KL et al. Pneumonia mortality and healthcare utilization in young children in rural Bangladesh: a prospective verbal autopsy study. Tropical Medicine and Health. 2018.05.25; 46:17. (Available at http://doi.org/10.1186/s41182-018-0099-4).
3. Fighting for Breath in Bangladesh 2020: A call to action to stop children dying from pneumonia. Save The Children UK, UNICEF, Every Breath Counts Coalition.3rd edition, November 2019.Bangladesh, South Asia.(Available at https://stoppneumonia.org/wp-content/uploads/2019/11/Bangladesh-12.11.-2019-Web.pdf).
4. Naheed A, Saha SK, Breiman RF, Khatun F, Brooks WA, Arifeen SE, et al. Multihospital surveillance of pneumonia burden among children aged <5 years hospitalized for pneumonia in Bangladesh. CID. 2009; 48:S82-S89.
5. Alzomor O, Alhajjar S, Aljobair F, Alenizi A, Alodyani AR, Alzahrani M, Aljubab AW et al. Management of community-acquired pneumonia in infants and children: Clinical practice guidelines endorsed by the Saudi Pediatric Infectious Diseases Society. Int J Pediatr Adolesc Med. 2017 Dec; 4(4):153-158.
6. University of California San Francisco. Pediatric Guidelines: Respiratory Infections - Community-Acquired Pneumonia. Available from (https://idmp.ucsf.edu/pediatric-guidelines-respiratory-infections-community-acquired-pneumonia).
7. Pallares R, Linares J, Vadillo M, Cabellos C, Manresa F, Viladrich PF, Martin R and Gudiol F. Penicillin and cephalosporin and mortality from severe pneumococcal pneumonia in Barcelona. The New England Journal of Medicine.1995; 333:474-480.
8. Bradley JS, Arguedas A, Blumer JL, Saéz-Llorens X, Melkote R and Noel GJ. Comparative study of levofloxacin in the

treatment of children with community-acquired pneumonia. The Pediatric Infectious Disease Journal, 2007; 26: 868-878.
9. Chein S, Wells TG, Blumer JL, Kearnset GL, Bradly JS, Bocchini JA et al. (2005) Levofloxacin pharmacokinetic in children. The Journal of Clinical Pharmacology; 45, 153-160.
10. Rang HP, Dale MM, Ritter JM and Flower RJ, Rang and dale's pharmacology. Churchill Livingstone Elsevier, New York.2008; 660-678.
11. WHO. Fluroquinolones use in paediatrics: Focus on safety and place in therapy. 18th Expert Committee on the Selection and Use of Essential Medicines, Geneva, 2011; 1-13.
12. Chambers, H.F. and Deck, D.H. (2009) Sulfonamides, trimethoprim & quinolones. In: Katzung BG, Master SB and Trevor JA, Eds. Basic and Clinical Pharmacology, Prentice-Hall International Inc., New Delhi, 815-822.
13. File JR, Segreti J, Dunbar L, Player R, Kohler R, Williams RR et al. A multicentre, randomized study comparing the efficacy and safety of intravenous and/or oral levofloxacin versus ceftriaxone and/or cefuroxime axetil in treatment of adults with community-acquired pneumonia. Antimicrob Agents and Chemother, 1997; 41, 1965-1972.
14. Rokonuzzaman SM, Ali MH, Parvin S, Prasad D, Hossain ME, Haque R. Effectiveness of Levofloxacin in Community Acquired Pneumonia in Adult Bangladeshi Population. Medicine today. 2015; 27(2):9-13. Available from. DOI: (https://doi.org/10.3329/medtoday.v27i2.30037).
15. Prescot LM. (2002) Highlights of the 41st interscience conference on antimicrobial agents and chemotherapy. Pharmacy & Therapeutics. 2002; 77: 143-146.