Journal of Rawalpindi Medical University

Open Access Original Article

DOI: 10.37939/jrmc.v29i2.2840

Efficacy Of Montelukast As A Therapeutic Option In Bronchiolitis

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Abstract

Objective: To determine the efficacy of Montelukast as a therapeutic option in treating bronchiolitis and establish a relationship between Montelukast and clinical outcomes in our children with acute bronchiolitis.

Methods: A descriptive cross-sectional study was conducted at Combined Military Hospital, Abbottabad, from September 2024 to November 2024.

Infants with bronchiolitis between the ages of 1 and 2 years were included in the study. Group A consisted of those with a history of prior montelukast use for more than two weeks before acute bronchiolitis, and Group B consisted of those who did not. Data was collected using a pre-designed form filled by paediatric residents. Relevant demographic and clinical data regarding various risk factors were recorded.

Results: A total of 230 children with bronchiolitis. The mean age of participants was 15.97 ±3.431 months. 74 (32.2%) patients had a history of prior montelukast ingestion, and 142 (61.7%) were categorised as low risk as per the clinical severity scale (CSS). Pearson Chi-square test revealed that CSS, oxygen saturations and need for Continuous Positive Airway Pressure (CPAP) differed significantly between group A and group B. P- value was 0.040, 0.050 and 0.020, respectively.

Conclusion: Most children had low CSS scores at this age. Those with a prior history of montelukast ingestion were less likely to desaturate, require CPAP or have a higher CSS score.

Keywords: Bronchiolitis, infant, montelukast, oxygen saturation, nasal continuous positive airway pressure, length of stay

Introduction

As per reports from the World Health Organisation, every year, one out of five deaths worldwide in children before the age of five years is because of an acute respiratory illness (ARI). This diagnosis of ARI includes a variety of illnesses, including upper and lower respiratory tract infections (LRTI) such as pneumonia, pharyngitis, tonsillitis, asthma, croup, bronchitis and bronchiolitis. Pneumonia alone contributes to illness in 2.6% of children in the United States of America.[1] After pneumonia, bronchiolitis is the second most common disease contributing to hospitalisations secondary to respiratory disease among young children.[2]

Pakistan's population stands at a staggering number of more than 230 million individuals. Almost 50% of its population is under 18 years of age.[3] Therefore, any illness affecting the young population is expected to impact a large number of people. Data from local studies have revealed that mortality from LRTI shows a decreasing pattern with increasing age. It contributed to 20% of deaths amongst children under one year of age and 12% of deaths amongst children under five years of age.[4] Similarly, another study quoted 20-30% mortality in children under 5 years as being from respiratory tract illness.[5]

Bronchiolitis was first described by two British doctors in a publication in the British Medical Journal in 1941. It was previously described as capillary bronchitis.[6] We now know that bronchiolitis is an illness involving the small bronchioles of the lungs that may result in resistance

Contributions:
Z.A - Conception of study
- Experimentation/Study Conduction
A.I, S.S, M.S.A - Analysis/Interpretation/Discussion
Z.A, S.S, M.S.A - Manuscript Writing
A.I, T.I - Critical Review

All authors approved the final version to be published & agreed to be accountable for all aspects of the work.

Conflicts of Interest: None
Financial Support: None to report
Potential Competing Interests: None to report

Institutional Review Board Approval
CMH-Atd-ETH-166-Paeds-24
12-08-2024
CMH, Abbottabad

Review began 06/02/2025
Review ended 17/05/2025
Published 30/06/2025

How to cite this article: Akhtar Z, Iqbal A, Sabir S, Aslam S, Aslam MS, Iqbal T. Efficacy Of Montelukast As A Therapeutic Option In Bronchiolitis. JRMC. 2025 Jun. 30;29(2). https://doi.org/10.37939/jrmc.v29i2.2840

to air flow. The resistance is due to the decreased diameter of air passages called bronchioles. It is a manifestation of constriction and deposition of debris and collection of mucus within the lumen of these narrow airways. Though Hubble et al attributed it mainly to influenza epidemics, it is now known that it may be caused by other viruses as well, such as the respiratory syncytial virus and adenovirus.[7]

Montelukast is a selective Cysteinyl leukotriene receptor antagonist that mediates its effect through its receptor by modulating various white blood cells, mostly monocytes and mast cells. It also has a receptor-independent mode of action that results in decreased production of inflammatory markers. It was previously only prescribed for asthma and allergic rhinitis, but recently evidence has emerged regarding its role in acute bronchiolitis, bronchiolitis obliterans and neurodegenerative illnesses.[8]

Numerous studies have been done regarding epidemiology, symptomatology and therapeutics of bronchiolitis worldwide. Management options vary from nebulizations with normal saline, adrenaline, ipratropium, steroids or hypertonic saline. Systemic steroids have also been considered therapeutic by certain studies. However, guidelines by the National Institute for Health and Care Excellence (NICE) emphasise inhaled oxygen and fluid therapy as the mainstays of treatment in patients not manageable by observation alone.[9]

It is, therefore, pertinent to study a disease that affects our population in such large numbers. The purpose of our study is to determine the efficacy of montelukast in the treatment of bronchiolitis and to establish a relationship between montelukast and the clinical outcome of bronchiolitis in our population.

Materials And Methods

A descriptive cross-sectional study was conducted at Combined Military Hospital, Abbottabad, from 15 Sep 2024 to 15 Jan 2025. The sample size was calculated keeping a confidence interval of 95% and precision of 5%. The expected prevalence of disease in the studied population was kept at 17.2% in Pakistan.[10] Minimum required sample size was found to be 218. Non-probability consecutive sampling technique was employed to gather the sample for this study. Ethical aspects of this study were addressed before the initiation of the study. Institutional approval for research was obtained vide letter number CMH-Atd-ETH-166-Paeds-24 dated 22 August. Informed consent was taken from parents or guardians of all patients enrolled in the study.

Bronchiolitis, being a clinical diagnosis rather than a radiological or laboratory diagnosis, the operative definition was taken from the NICE guidelines 2024. Any child with coryza for the past one to three days and persistent cough and increased respiratory rate or chest indrawing and rales or rhonchi was considered a clinical case of bronchiolitis.[9]

Inclusion criteria included any child presenting to the hospital between their first and second birthdays with the above-mentioned clinical vignette. Age was recorded in several completed months. All those with any congenital cardiac or pulmonary pathology, previously documented atopy or allergic reaction, failure to thrive and developmentally delayed were excluded from the study.

All those with crackles and auscultatory findings restricted to one particular zone or lobe of the lung were excluded from the study due to the possibility of pneumonia. Similarly, as only 30% of children with bronchiolitis develop fever, which is low grade and below 39 Celsius, all patients with fever documented as higher than 39 Celsius were excluded from the study for the same reason. Considering the high incidence of tuberculosis in Pakistan, any child with a Pakistan Paediatric Association Score of more than four or a history of contact with a bacteriologically positive tuberculosis patient was excluded from the study.

All demographic and clinical data were entered on a pre-designed form that was filled out by a paediatric resident. Prematurity was defined as birth before 37 completed weeks of gestational age. Vaccination status was inquired as per the Expanded Program of Immunisation schedule of Pakistan from the parents of children, and where possible, confirmed with the vaccination card of the child.[11]

Table 1: Wang Clinical Severity Score (CSS)

Score	Respiratory Rate	Wheezing	Retraction	General Condition
0	<30	None	None	Normal
1	30-45	Terminal expiration or audible only with a stethoscope	Intercostal recession	
2	40-60	Entire expiration or audible on expiration without a stethoscope	Trachea-sternal recession	
3	>60	Inspiration and expiration without a stethoscope	Severe with nasal flow	Irritable/lethargic/poor feeding

Clinical severity score for bronchiolitis was adopted from wang et al, Table 1.[12] Anyone with a score of less than five was categorized as low risk and those with score of five or more were categorized high risk. As per the recent NICE (National Institute

for Health Care Excellence) guidelines, the cut-off of saturations for oxygen therapy was kept at 90% rather than the previously used 94% cut-off. Similarly, decreased feeding was defined as a child having less than 50-70% of his usual feeds by the primary caregiver. Where the attendant could not recall feeds accurately, the absence of a wet nappy for the past 12 hours was taken as an indicator of decreased feeding. Length of stay was arbitrarily demarcated at less than or equal to 3 days and more than three days. The need for nasal continuous positive airway pressure (CPAP) and ventilation was also recorded during the duration of admission. Primary care-givers were asked if the patient had been prescribed montelukast on any of the previous visits to a health care facility. Patient was included in the receiving group if the drug had been given for at least the past 14 days, irrespective of the indication of prescription. Statistical analysis was performed using Statistical Package for Social Sciences version 23 (SPSS23). All qualitative data were expressed as frequencies and percentages, while quantitative data were expressed as mean and standard deviation. The Pearson chi-square test was used to compare independent variables between the montelukast receiving group and the montelukast not receiving group. The difference was considered statistically significant if the p-value was less than or equal to 0.05.

Results

A total of 230 patients fulfilled the inclusion and exclusion criteria during the study period. The mean age of participants was 15.97 ±3.431 months, as shown in Table 2. 125 (54.3%) patients were male and 105 (45.7%) patients were female. 74 (32.2%) patients had a history of prior montelukast ingestion. 159 (69.1%) patients were up to date with their vaccination as per the EPI schedule, while 71 (30.9%) patients were lagging behind the schedule or had a history of incomplete vaccination. A history of premature birth was present in 100 (43.5%) patients, while 130 (56.3%) children were born full term. When clinical severity scoring was done, 142 (61.7%) were categorised as low risk and 88 (38.3%) were categorised as high risk.

Clinical severity score (CSS) was less than five in 53 (71.6%) in group A and 89 (57.1%) of the patients in group B. P- value was 0.040, and hence the difference was statistically significant between the two groups, as shown in Table 3. Oxygen saturation was below 90% in 12 (16.2%) of patients receiving montelukast therapy and 44 (28.2%) patients from those not receiving any prior montelukast. P- value was 0.050 and hence considered statistically significant in our study. Similarly, P- P-value was 0.02 for comparison of CPAP therapy between group A and Group B. 14 (18.9%) children from group A and 53 (34%) children from group B did not require CPAP for their increased work of breathing.

Length of stay was less than 3 days in 22 (29.7%) patients amongst those receiving montelukast and 51 (32.7%) in group B. P-value was 0.762 and hence statistically not significant. Feeding was found to be reduced in 22 (29.7%) children from group A and 59 (37.8%) children from group B. P- value was 0.241 and not statistically significant. Only 2 (0.87%) patients required invasive ventilation from our study sample. Though they both belonged to the group not receiving montelukast, comparative analysis was not done due to the small number affected.

Table 2: Demographic features of patients participating in the study.

Parameters	
Age (mean ± SD)	15.97 ±3.431
Gender	
Male	125 (54.3%)
Female	105 (45.7%)
History of prior Montelukast ingestion over the past 2 weeks	
Yes	74 (32.2%)
No	156 (67.8%)
Vaccination status	
Up to date	159 (69.1%)
Incomplete	71 (30.9%)
History of premature birth	
Yes	100 (43.5%)
No	130 (56.3%)
Clinical severity score	
Less than 5	142 (61.7%)
More than or equal to 5	88 (38.3%)

Bronchiolitis remains one of those illnesses that, despite extensive research, is often not managed along lines of evidence-based medicine.[13] The main reason behind this is the lack of any evidence-based interventions in guidelines. Most guidelines advocate supportive rather than interventional treatment. The dilemma of 'doing nothing' while the child continues to be in respiratory distress is a difficult choice for both parents and doctors.[14] Demographic analysis of our study population revealed 54.3% of the patients being male, which is similar to findings of Mirkarimi et al in Iran.[15]

Table 3: Comparison of outcomes between the group receiving montelukast and the group with no prior montelukast ingestion.

	Before montelukast ingestion	No prior montelukast ingestion	P-value
CSS			0.040
Less than 5	53 (71.6%)	89 (57.1%)	
More than or equal to 5	21 (28.3%)	67 (42.9%)	
Oxygen saturations			0.050
<90%	12 (16.2%)	44 (28.2%)	
>/=90%	62 (83.8%)	112 (71.8%)	
CPAP			0.020
No	60 (81.1%)	103 (66%)	
Yes	14 (18.9%)	53 (34%)	
Length of stay			0.762
</=3days	52 (70.3%)	105 (67.3%)	
>3days	22 (29.7%)	51 (32.7%)	
Feeding			0.241
<70% of usual feeds	22 (29.7%)	59 (37.8%)	
Usual feeding pattern	52 (70.3%)	97 (62.2%)	

Discussion

Vaccination status of patients reporting to the hospital was similar to another cross-sectional study from Pakistan by Rahman et al, where 66% of the study population had been vaccinated.[16] We employed the CSS by Wang et al,[12] for documentation of severity of symptoms amongst subjects. Recently, a study published by Granda et al compared various bronchiolitis severity scores in a clinical scenario and concluded that there was no statistically significant difference in the capacity of each to predict outcomes in children.[17] Across cross-sectional study was conducted in Lahore, Pakistan, to study the incidence of preterm birth in our population. The prevalence of preterm birth was found in 21.64% of all births. Though it is much lower than our proportion of preterm births at 43.5%, it is pertinent to note that Hanif et al were studying a healthy population. Further studies may be required to explore the possibility of risk of bronchiolitis in premature babies.[18]

A randomised controlled trial (RCT) was conducted in Mayo Hospital Lahore in Pakistan to compare the efficacy of montelukast as a therapeutic agent for bronchiolitis.[19] The CSS was 0.07 ± 0.03 in the montelukast receiving group and 0.48 ± 0.32 in the control group. The difference was statistically significant. Though our study stratified the population into high and low risk groups, the impact of both studies corroborates with each other.

A variety of factors may contribute to the lengthening of hospital stay in children with bronchiolitis. Masarweh et al conducted a retrospective analysis of a massive cohort of more than 4500 children who were diagnosed with bronchiolitis.[20] It was found that a history of prematurity may increase length of stay (P-value=0.016). Another retrospective study evaluated the effect of Pramlukast on length of stay (LOS) in children admitted with bronchiolitis. The difference in LOS was not significant between those receiving Pramlukast and those who did not, which was supportive of our findings.[21] However, local data reveal a significant difference in mean LOS in patients receiving montelukast. P-value 0.000.[19] While both these studies compared mean LOS quantitatively, our study compared a shorter stay with a longer stay qualitatively.

Kamiab et al conducted a descriptive study to analyse various therapeutic strategies to manage bronchiolitis. Amongst the 100 patients studied, 37% received oxygen, which is comparable to the 34% receiving CPAP in our study from amongst those not receiving montelukast.[22] An RCT by Bisgaard evaluated the effect of montelukast not just in the acute phase during hospital admission, but also followed up patients for 8 weeks after initiation of treatment.[23] Though our study did not have a follow-up phase, the findings for oxygen requirement were similar to the percentage of patients experiencing desaturation in both groups.

Conclusions

The majority of children have low CSS scores irrespective of montelukast use. Those with a history of prior montelukast intake were less likely to have a higher CSS score, desaturate or require NCPAP.

References

1. Sharrow D, Hug L, Liu Y, You D. Levels and trends in child mortality. New York: United Nations Inter-agency Group for Child Mortality Estimation. 2020.

2. Sharif H, Jan SS, Sharif S, Seemi T, Naeem H, Rehman J. Respiratory Diseases' Burden in children and adolescents of marginalised population: A retrospective study in slum area of Karachi, Pakistan. Frontiers in epidemiology. 2023 Jan 11;2:1031666. https://dx.doi.org/10.3389/fepid.2022.1031666
3. Minhas S, Salawu A. Wikipedia and indigenous language preservation: analysis of Setswana and Punjabi languages. Frontiers in Communication. 2025 Jan 29;10:1442935. https://doi.org/10.3389/fcomm.2025.1442935
4. Gul A, Khan S, Arshad M, Anjum SI, Attaullah S, Ali I, Rauf A, Arshad A, Alghanem SM, Khan SN. Peripheral blood T cell response in human parainfluenza virus-associated lower respiratory tract infection in children. Saudi Journal of Biological Sciences. 2020 Oct 1;27(10):2847-52. https://dx.doi.org/10.1016/j.sjbs.2020.07.005
5. Naz R, Gul A, Javed U, Urooj A, Amin S, Fatima Z. Aetiology of acute viral respiratory infections common in Pakistan: A review. Reviews in medical virology. 2019 Mar;29(2):e2024. https://dx.doi.org/10.1002/rmv.2024
6. Hubble D, Osborn GR. Acute bronchiolitis in children. British Medical Journal. 1941 Jan 25;1(4177):107. https://dx.doi.org/10.1136/bmj.1.4177.107
7. Kliegman RM, Geme JW III. Nelson textbook of pediatrics. 22nd ed. 2 vols. Philadelphia (PA): Elsevier - Health Sciences Division; 2024.
8. Marques CF, Marques MM, Justino GC. Leukotrienes vs. Montelukast—activity, metabolism, and toxicity hints for repurposing. Pharmaceuticals. 2022 Aug 23;15(9):1039. https://dx.doi.org/10.3390/ph15091039
9. National Institute for Health and Care Excellence (NICE). *Bronchiolitis in children: diagnosis and management* [Internet]. London: NICE; https://www.nice.org.uk/guidance/ng9
10. Khan MA. Epidemiological studies on lower respiratory tract infection in children in the District Bannu, Khyber Pakhtunkhwa, Pakistan. The Egyptian Journal of Bronchology. 2022 Dec;16(1):17. https://dx.doi.org/10.1186/s43168-022-00119-9
11. Sreevatsava M, Burman AL, Wahdan A, Safdar RM, O'Leary A, Amjad R, Salam A, Quershi M, Ishaq R, Khan J, Khan J. Routine immunization coverage in Pakistan: a survey of children under 1 year of age in community-based vaccination areas. Vaccine. 2020 Jun 9;38(28):4399-404. https://dx.doi.org/10.1016/j.vaccine.2020.04.068
12. Wang EE, Milner RA, Navas L, Maj H. Observer agreement for respiratory signs and oximetry in infants hospitalized with lower respiratory infections. American Review of Respiratory Disease. 2012 Dec 17. https://doi.org/10.1164/ajrccm/145.1.106
13. Linssen RS, Schechter MS, Rubin BK. Bronchiolitis therapies and misadventures. Paediatric Respiratory Reviews. 2023 Jun 1;46:49-56. https://dx.doi.org/10.1016/j.prrv.2022.09.003
14. Dalziel SR, Haskell L, O'Brien S, Borland ML, Plint AC, Babl FE, Oakley E. Bronchiolitis. The Lancet. 2022 Jul 30;400(10349):392-406. https://dx.doi.org/10.1016/s0140-6736(22)01016-9
15. Mirkarimi M, Alisamir M, Saraf S, Heidari S, Barouti S, Mohammadi S. Clinical and epidemiological determinants of lower respiratory tract infections in hospitalized pediatric patients. International Journal of Pediatrics. 2020;2020(1):8844420. https://dx.doi.org/10.1155/2020/8844420
16. Rahman A, ullah Malik Q, Ikram F, Abbasi AN, Mumtaz S, Akram S. Assessment of Acute Gastroenteritis in Children Under Five Years of Age by Vesikari Score; A Comparative Analysis of the Efficacy of the Rota-Virus Vaccine. Pakistan Armed Forces Medical Journal. 2023 Oct 31;73(5):1262. https://dx.doi.org/10.51253/pafmj.v73i5.6580
17. Granda E, Urbano M, Andrés P, Corchete M, Cano A, Velasco R. Comparison of severity scales for acute bronchiolitis in real clinical practice. European Journal of Pediatrics. 2023 Apr;182(4):1619-26. https://dx.doi.org/10.1007/s00431-023-04840-5
18. Hanif A, Ashraf T, Pervaiz MK, Guler N. Prevalence and risk factors of preterm birth in Pakistan. J Pak Med Assoc. 2020 Apr 1;70(4):577-82. https://dx.doi.org/10.5455/JPMA.295022
19. Tasneem R, Shabir S, Ali M, Aziz S, Ahmad B, Rashid N. Comparison of Montelukast Versus Placebo For Management of Acute Bronchiolitis in Children. Age.;50(50.0):100-0.
20. Masarweh K, Gur M, Leiba R, Bar-Yoseph R, Toukan Y, Nir V, Gut G, Ben-David Y, Hakim F, Bentur L. Factors predicting length of stay in bronchiolitis. Respiratory medicine. 2020 Jan 1;161:105824. https://dx.doi.org/10.1016/j.rmed.2019.105824
21. Kubota J, Takahashi S, Suzuki T, Ito A, Akiyama N, Takahata N. Pranlukast treatment and the use of respiratory support in infants with respiratory syncytial virus infection. Plos one. 2022 May 27;17(5):e0269043. https://dx.doi.org/10.1371/journal.pone.0269043
22. Kamiab Z, Masoodpoor N, Kabotarkhani ZH. Treatment of Infants Admitted With Acute Bronchiolitis and its Comparison with Modern Treatment Methods in the Only University Hospital in Rafsanjan. Hormozgan Medical Journal. 2021 Sep 29;25(3):132-6. https://dx.doi.org/10.34172/hmj.2021.17
23. Sharif H, Jan SS, Sharif S, Seemi T, Naeem H, Rehman J. Respiratory Diseases' Burden in children and adolescents of marginalized population: A retrospective study in slum area of Karachi, Pakistan. Frontiers in epidemiology. 2023 Jan 11;2:1031666. https://dx.doi.org/10.3389/fepid.2022.1031666