

**ORIGINAL RESEARCH**

# Analysis of Azithromycin Versus Amoxicillin-Clavulanate in the Management of Acute Sinusitis in Children at a Tertiary Care Hospital

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## ABSTRACT

**Background:** This study was conducted to assess the comparison of azithromycin versus amoxicillin-clavulanate in the treatment of acute sinusitis in children. **Materials and Methods:** This study comprised 100 children in the age range of 5 to 15 years, 50 of them were boys and 50 were girls. All patients had a throat and nasal smear on culture and antibiogram, as well as a paranasal sinus X-ray and laboratory results. Azithromycin was administered in a single daily dose of 10 mg/kg for three days to patients with positive bacteriological findings in the nose and X-ray obvious sinusitis (maxillary sinus was the predominant site of inflammation). Alternatively, amoxicillin-clavulanate was administered three times a day at a dose of 45 mg/kg for ten days along with twice-daily use of ephedrine hydrochloride nasal decongestive solution. A paranasal sinus X-ray was performed and a checkup of throat and nasal smear 10–15 days after starting medication was done. **Results:** There were 50 male subjects and 50 female subjects. Fifty of the 100 patients received azithromycin treatment (Group 1), and the other fifty received amoxicillin/clavulanate (Group 2). There were fifty male and fifty female children among the total of 100 observed. 40 between 10-15 years old and 60 between 5-10 years old made up the age distribution. After 20 days, the therapeutic impact was visible in certain patients. It was observed that both the antibiotics were well tolerated. Adverse event rates were modest in both therapy groups, and azithromycin and amoxicillin/clavulanate did not differ significantly from one another. Neither agent was responsible for any significant adverse responses that occurred. **Conclusion:** When treating acute sinusitis, azithromycin given once daily for three days is just as effective as amoxicillin and clavulanate given three times daily for ten days.

**Keywords:** Azithromycin, Amoxicillin-Clavulanate, Acute sinusitis, children, treatment.

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## INTRODUCTION

Sinusitis, defined as an inflammation of the mucosal lining of one or more of the paranasal sinuses, can be classified arbitrarily by the duration of clinical symptoms into acute (<30 days), subacute (30–90 days), and chronic (>90 days) disease.<sup>1-4</sup> Acute sinusitis can be caused by viral, bacterial, or fungal infections, environmental irritants, and allergy.<sup>5</sup> Acute bacterial sinusitis (ABS) usually results from secondary bacterial infection of the sinus. It has been

estimated that approximately 7.5% of upper respiratory tract infections (URI) in children are complicated by ABS.<sup>6-8</sup> Despite its prevalence, ABS is often overlooked in young children because the clinical manifestations are often non-specific and due to the misconception that bacterial sinusitis is rare in this age group. Without adequate treatment, ABS can result in subacute or chronic sinusitis as well as in serious or life-threatening complications. Therefore, ABS may pose a diagnostic and therapeutic challenge

to primary care pediatricians who are not familiar with this condition.<sup>1-3</sup> This study was conducted to assess the comparison of azithromycin versus amoxicillin-clavulanate in the treatment of acute sinusitis in children.

### MATERIALS AND METHODS

This study comprised 100 children in the age range of 5 to 15 years, 50 of them were boys and 50 were girls. All patients had a throat and nasal smear on culture and antibiogram, as well as a paranasal sinus X-ray and laboratory results. Azithromycin was administered in a single daily dose of 10 mg/kg for three days to patients with positive bacteriological findings in the nose and X-ray obvious sinusitis (maxillary sinus was the predominant site of inflammation). Alternatively, amoxicillin-clavulanate was administered three times a day at a dose of 45 mg/kg for ten days along with twice-daily use of ephedrine hydrochloride nasal decongestive solution. A paranasal sinus X-ray was performed and a checkup of throat and nasal smear 10–15 days after starting medication was done.

### RESULTS

There were 50 male subjects and 50 female subjects. Fifty of the 100 patients received azithromycin treatment (Group 1), and the other fifty received amoxicillin/clavulanate (Group 2).

There were fifty male and fifty female children among the total of 100 observed. 40 between 10-15 years old and 60 between 5-10 years old made up the age distribution. We obtained throat and nasal smears, cultures, and antibiograms from each group that was observed.

It was observed that both the antibiotics were well tolerated Adverse event rates were modest in both therapy groups, and azithromycin and amoxicillin/clavulanate did not differ significantly from one another.

Neither agent was responsible for any significant adverse responses that occurred. Azithromycin treatment administered as a single dose of 10 mg/kg over three days was just as effective as amoxicillin/clavulanate treatment administered three times a day for ten days at a rate of 45 mg/kg.

**Table 1: Gender-wise distribution of subjects.**

Gender	Number of subjects
Males	50
Females	50
Total	100

**Table 2: Age-wise distribution of subjects.**

Age	Number of subjects
5-10 years	60
10-15 years	40

**Table 3: X-ray findings**

Location	Number of patients treated	Improvement after treatment	Recovery after treatment
Maxillary sinus	80	09	71
Frontal sinus	15	00	15
Ethmoid sinus	05	01	04
Total	100	10	90

### DISCUSSION

Azithromycin is an antibiotic. Since its discovery, it has been FDA-approved for respiratory tract infections such as pneumonia, genitourinary infections such as chlamydia, and enteric infections such as typhoid, and has also been extensively studied with malaria.<sup>9</sup> This drug has an absolute oral bioavailability of 35–42% in healthy volunteers and patients with cystic fibrosis. Upon administration of a single 500 mg oral dose, tissue concentrations exceed the minimum inhibitory concentration that would inhibit 90% of likely pathogens (MIC<sub>90</sub>), phagocytic concentrations can reach over 200 times serum concentrations and, due to a half-life of 68 h, such effective levels can be maintained for several days.<sup>10</sup> Azithromycin's massive localisation to phagocytic cells and subsequent delivery to sites of infection as

part of the innate immune system has enabled this macrolide to successfully mitigate a plethora of infections over the last 50 years and is a hallmark of this broad-spectrum therapeutic.<sup>11</sup>

The combination of amoxicillin and clavulanate is an oral antibiotic widely used in the treatment of mild-to-moderate bacterial infections including sinusitis, bronchitis, otitis media, cellulitis and community acquired pneumonia. Amoxicillin-clavulanate is currently the most common cause of clinically apparent, drug induced acute liver injury both in the United States and Europe. The combination of amoxicillin and clavulanate is a commonly used antibiotic which is active against many bacterial organisms that cause sinusitis, bronchitis, otitis media, skin and tissue infections and community acquired pneumonia. The combination consists of

amoxicillin, which is a semisynthetic, third generation penicillin and clavulanate which is a beta lactam that acts as an inhibitor of beta lactamase, the major bacterial enzyme responsible for penicillin resistance. Amoxicillin-clavulanate was approved for use in the United States in 1984 and, currently, approximately 6 million prescriptions are filled yearly, making it one of the most common antibiotic regimens used. Current indications are for mild-to-moderate bacterial infections due to known or suspected penicillinase resistant gram positive or gram-negative organisms. This combination is provided in multiple dose combinations, typically as 250 to 875 mg amoxicillin with 125 mg of clavulanate, given two to three times daily for 7 to 10 days.<sup>12</sup> This study was conducted to assess the comparison of azithromycin versus amoxicillin-clavulanate in the treatment of acute sinusitis in children.

In this study, there were 50 male subjects and 50 female subjects. Fifty of the 100 patients received azithromycin treatment (Group 1), and the other fifty received amoxicillin/clavulanate (Group 2). There were fifty male and fifty female children among the total of 100 observed. 40 between 10-15 years old and 60 between 5-10 years old made up the age distribution. We obtained throat and nasal smears, cultures, and antibiograms from each group that was observed. We examined the X-ray results from the initial assessment and the tenth day of therapy. The maxillary sinus was predominant based on sinus location. X-rays showed an excellent response to azithromycin therapy for the maxillary sinus infection on the tenth day of treatment. After 20 days, the therapeutic impact was visible in certain patients. It was observed that both the antibiotics were well tolerated. Adverse event rates were modest in both therapy groups, and azithromycin and amoxicillin/clavulanate did not differ significantly from one another. Neither agent was responsible for any significant adverse responses that occurred.

Kalapan I et al<sup>13</sup> compared the efficacy and tolerability of a 3-day course of azithromycin with a 10-day course of amoxicillin/clavulanate in the treatment of acute sinusitis in adults. One hundred adult patients with acute sinusitis were included in an open, randomized study. Clinical diagnosis of sinusitis was confirmed by nasal endoscopy, sinus radiography, and (when possible) by culture of sinus aspirate. Patients were randomized to receive azithromycin (500 mg once daily for 3 days) or amoxicillin/clavulanate (625 mg every 8 hours for 10 days). A significantly faster resolution of signs and symptoms of sinusitis was observed in the azithromycin-treated patients. By the end of therapy (days 10-12), 95% of the patients in the azithromycin group and 74% in the amoxicillin/clavulanate group were cured. The remaining patients' conditions were improved. By the follow-up visit, cure was achieved in 98% of the azithromycin-treated patients, and 91% of the amoxicillin/clavulanate-treated patients.

Treatment failure was observed in three patients from the amoxicillin/clavulanate group, and relapse occurred in one patient from each group. Bacteriologic eradication was achieved in 23 of 23 and 21 of 24 patients treated with azithromycin and amoxicillin/clavulanate, respectively. Both drugs were well tolerated. Two patients (4%) from the azithromycin group and five patients (10%) from the amoxicillin/clavulanate group reported mild gastrointestinal disturbances. In adults with acute sinusitis, a 3-day course of azithromycin was as effective and well tolerated as a 10-day course of amoxicillin/clavulanate. A significantly simpler dosage regimen and faster clinical effect were the advantages of azithromycin. Alagić-Smailbegović J et al<sup>14</sup> compared the efficiency of azithromycin and amoxicillin-clavulanate in treatment of acute sinusitis in children. Seventy patients were included in the age between 5 and 15 years. Beside ENT and pediatricians examination, nasal and throat smear on culture and antibiogram was taken from all the patients, as well as, X-ray of paranasal sinuses and laboratory findings, followed by check-up of nasal and throat smear and X-ray of paranasal sinuses. Azithromycin in single daily dose of 10 mg/kg during three days showed same efficiency as amoxicillin-clavulanate given three times per day in dose of 45 mg/kg during ten days.

## CONCLUSION

When treating acute sinusitis, azithromycin given once daily for three days is just as effective as amoxicillin and clavulanate given three times daily for ten days.

## REFERENCES

1. American Academy of Pediatrics, Subcommittee on Management of Sinusitis and Committee on Quality Improvement. Clinical practice guideline: management of sinusitis. *Pediatrics*. 2001;108(3):798–808. doi: 10.1542/peds.108.3.798.
2. Leung AKC, Kellner JD. Acute sinusitis in children: diagnosis and management. *J Pediatr Health Care*. 2004;18(2):72–76.
3. Leung AKC. Acute sinusitis. In: Leung AKC, editor. *Common Problems in Ambulatory Pediatrics: Specific Clinical Problems*. Vol. 1. New York: Nova Science Publishers Inc; 2011. pp. 207–214.
4. Zacharisen M, Casper R. Pediatric sinusitis. *Immunol Allergy Clin North Am*. 2005;25(2):313–332. vii. doi: 10.1016/j.iac.2005.02.002.
5. Brook I. Acute sinusitis in children. *Pediatr Clin North Am*. 2013;60(2):409–424.
6. Arora HS. Sinusitis in children. *Pediatr Ann*. 2018;47(10):e396–e401.
7. DeMuri G, Wald ER. Acute bacterial sinusitis in children. *Pediatr Rev*. 2013;34(10):429–437.
8. Smith MJ. Evidence for the diagnosis and treatment of acute uncomplicated sinusitis in children: a systematic review. *Pediatrics*. 2013;132(1):e284–296.
9. Taylor W., Richie T., Fryauff D., Ohrt C., Picarima H., Tang D et al. Tolerability of azithromycin as malaria prophylaxis in adults in northeast Papua, Indonesia.

- Antimicrob. Agents Chemother. 2003;47(7):2199–2203.
10. Kong F.Y., Rupasinghe T.W., Simpson J.A., et al. Pharmacokinetics of a single 1g dose of azithromycin in rectal tissue in men. *PloS One*. 2017;12(3).
  11. Lode H., Borner K., Koeppel P., Schaberg T. Azithromycin—review of key chemical, pharmacokinetic and microbiological features. *J. Antimicrob. Chemother.* 1996;37(suppl C):1–8.
  12. LiverTox: Clinical and Research Information on Drug-Induced Liver Injury [Internet]. Bethesda (MD): National Institute of Diabetes and Digestive and Kidney Diseases; 2012-. Amoxicillin-Clavulanate.
  13. Klapan I, Culig J, Oresković K, Matrapazovski M, Radosević S. Azithromycin versus amoxicillin/clavulanate in the treatment of acute sinusitis. *Am J Otolaryngol.* 1999 Jan-Feb;20(1):7-11.
  14. Alagić-Smailbegović J, Saracević E, Sutalo K. Azithromycin versus amoxicillin-clavulanate in the treatment of acute sinusitis in children. *Bosn J Basic Med Sci.* 2006 Nov;6(4):76-8.