

The Utility Of Peripheral White Blood Cell Count In Cases Of Acute Otitis Media In Children Between 2 Years And 17 Years Of Age

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Citation

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Abstract

Objective:

To determine whether the peripheral white blood cell (WBC) count may aid for making treatment decisions in children with uncomplicated acute otitis media (AOM).

Hypothesis:

A peripheral WBC count of 15,000 or higher could be used to make a decision for antibiotic treatment for uncomplicated AOM, thus avoiding unnecessary usage of antibiotics.

Background and significance:

AOM is a common clinical condition encountered in the pediatric emergency department. The diagnosis of AOM is based on symptoms of fever, otalgia and/or any or all of the following signs such as erythema, bulging, fluid behind tympanic membrane, having limited or absent mobility of tympanic membrane, and finally otorrhea. Unnecessary antibiotics use leads to antibiotic resistance among causes of otitis media. Decision-making in giving or avoiding antibiotics has been controversial. Watchful-waiting has been advocated in recent years for the treatment of uncomplicated AOM in children older than 2 years.

Materials and Methods:

Children with AOM between the ages of 2 and 17 years were included in the study after obtaining informed consent from their parents if they fulfill certain criteria.

Results:

A total of 100 patients were enrolled in the study. Seven patients with $WBC \geq 15,000$ were given antibiotics and one out of seven did not respond to the antibiotic requiring a change in antibiotic on day 3. Ninetythree patients with $WBC < 15,000$ were not given antibiotic on day 1 and treated symptomatically. Ninety out of 93 responded well to symptomatic treatment on day 3 as evidenced by resolution of their pain, but 3 out of 93 needed antibiotics on day 3 as their symptom did not improve.

Conclusion:

Using peripheral WBC count as a guide for prescription of antibiotics or for watchful-waiting has led to the reduction of unnecessary antibiotic use. The outcome of the study could help to guide the physicians to treat patients appropriately by avoiding unnecessary use of antibiotics without causing significant complication from the disease. This could also reduce the adverse effects of antibiotics as well as the increasing bacterial resistance to common antibiotics.

INTRODUCTION

AOM is a common infection in the pediatric population and

the most common cause of antibiotic prescriptions in the United States. The widespread use of antibiotics has resulted

in the emergence of drug-resistance 1, 2.

As per the practice guidelines of the American Academy of Pediatrics and American Academy of Family Physicians treatment with antibiotics is recommended for all cases of AOM in children up to 2 years of age. With children above 2 years of age, it is optional to treat with antibiotics or not, based on the individual case scenario 3.

Watchful-waiting approach with regard to AOM has been emphasized and advocated in recent years 4, 5. It has been shown that most children with mild or moderate AOM recover without antibiotics 6.

A study done in 1984 showed a significant correlation between elevated WBC count of 15,000 or more and culture positive middle ear effusions 7, but there was no such study showing a cut-off WBC count used to make decisions whether or not to give antibiotics in AOM. One study used this criteria for guiding antibiotic prescription in acute upper respiratory infection and nonspecific febrile illnesses 8 .

The goal of our study is to determine whether peripheral WBC count could be used to guide physicians in making a decision to treat uncomplicated AOM in children between the ages of 2 and 17 years.

METHODS AND MATERIALS

All patients with a diagnosis of AOM meeting the inclusion criteria were enrolled in the study. They were subjected to blood draw and a complete blood count (CBC) with differential was performed. Pain was assessed using the pain analog scale and temperature was measured rectally in children younger than 3 years of age and orally in children older than 3 years of age. Patients with WBC counts of 15,000 and more were given antibiotics in appropriate doses (amoxicillin 90 mg/kg/day for 10 days and in Penicillin allergy patients, Azithromycin 10 mg /kg/day on day 1 followed 5 mg/kg day for the following days; or Clindamycin 15mg/kg /dose q 12 hours for 10 days). Patients with WBC counts <15,000 were not treated with antibiotics and were observed with strict instructions to their parents to bring the child to the emergency department in the case that the symptoms worsen. Patients were reevaluated after 72 hours for any significant change in the patients' symptoms and signs. Patients' reevaluation included assessment of their pain using the pain analog scale and measurement of the body temperature. Patients who did not receive antibiotics initially, if still febrile (temp>101°F)

and/or have still otalgia, antibiotics were prescribed and those who were already receiving antibiotics were considered for alternative antibiotic treatment. Pain relieve was the primary outcome of the study and a decrease in body temperature the secondary outcome.

Inclusion criteria:

1. Children between the ages of 2 to 17 years with a diagnosis of AOM whose parents sign the informed consent.

Exclusion Criteria:

1. Children whose parents declined to sign the consent form.
2. Children with anatomical abnormalities such as cleft palate, children with genetic conditions such as Down syndrome, children with immunodeficiency (congenital and acquired) and patients with cochlear implants.
3. Children with an episode of otitis media in the month before the study begin as verified by old chart or talking to a private practitioner.

Statistical analysis:

To compare between the groups Chi-square test, Wilcoxon rank sum and McNemar's test was used.

RESULTS

A total of 100 patients were enrolled in the study (patient demographics, table 1).

Of these 100 patients 7 patients (7%) (Group B) had WBC count $\geq 15,000$ on day 1 and all received amoxicillin. Two patients had a pain score of 8 on day 1 and in one of the 2 patients the pain resolved on day 3 and the other one patient's pain score remained at 4 and the antibiotic was changed to Augmentin. The other 93 patients (93%) (Group A) had WBC count $< 15,000$ and received no antibiotics on day 1. Two patients continued to have a pain score of 4 on day 3 and another had a pain score of 5 on day 3. All 3 of them were given amoxicillin. All children remained afebrile on day 3. At the two week follow up all 100 patients had no pain and no fever and returned to normal TM findings.

The results of the pain assessments and WBC are summarized in table 2-5.

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Table 0

Statistics: The two tailed p-value Mc-nemar is <0.0001.

Groups	I	II
A	3	90
B	1	6

Table 1

Patient Demographics

	Male	Female
Age range in years	2-16	2-17
Mean ± SEM (Age in years)	(5.72 ± 0.38)	(7.41 ± 0.75)

Table 2

All patients with Otitis Media --Pain score on day 1

Pain score	Number of patients
1	0
2	0
3	0
4	1
5	34
6	51
7	12
8	2
9	0
10	0

Table 3

WBC count on day 1

WBC	Number of patients
WBC <15	93
WBC ≥ 15	7

Table 4

Pain scores on patients with with otitis media with wbc count <15,000

Pain Score	On day (1)
1	0
2	0
3	0
4	33
5	50
6	2
7	8
8	0
9	0
10	0

Graph 1

Depicting pain score on day 1of OM patients with WBC count <15,000

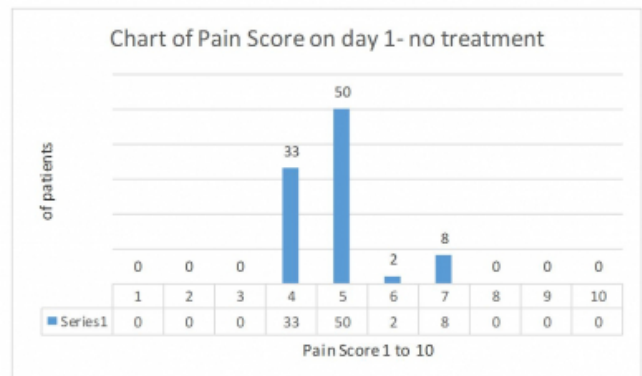


Table 5

Pain score on day 3 of patients with WBC < 15000

# of patients	Pain score
1	0
2	0
3	0
4	2
5	1
6	0
7	0
8	0
9	0
10	0

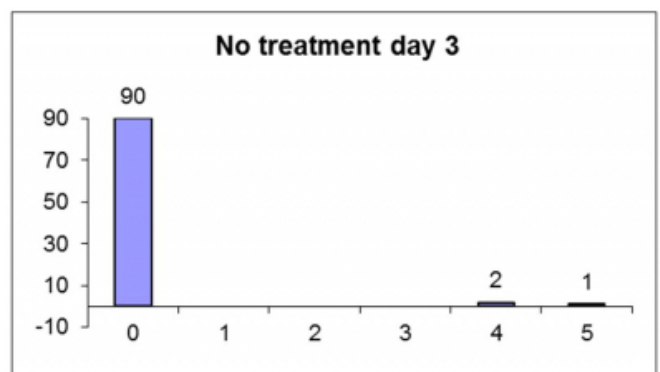
The 3 patients needed antibiotics had the pain scores as follows on day 3.

Two patients had a pain score of 4 on day 3 with day 1 score of 6.

One patient had a pain score of 4 on day 3 with day score of 7. They were all given Amoxicillin.

Graph 2

Depicting pts of OM with <15,000 on day 3 with no antibiotics



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The 3 patients needed antibiotics had the pain scores as follows on day 3.

Two patients had a pain score of 4 on day 3 with day 1 score of 6.

And 1 patient had a score of 5 on day 3 compared to score of 7 on day 1.

Table 6

Pain score of Patients of otitis media with white blood cell count >15,000 on day 1.

Pain Scale	Day 1
1	
2	
3	
4	
5	
6	1
7	4
8	2
9	
10	

Graph 3

Depicting pain score of OM patients on day 1 with wbc count >15,000

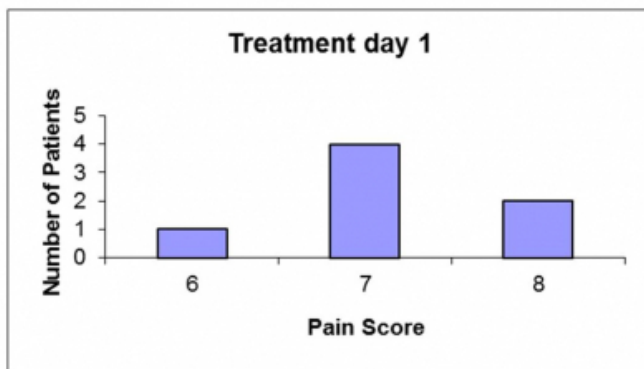


Table 7

Pain score on day 3 of patients with WBC ≥ 15,000

Pain score	Number of patients
1	0
2	0
3	0
4	1
5	0
6	0
7	0
8	0
9	0
10	0

One patient had a pain score of 8 on day 1 and on day 3 remained at 4 and antibiotic changed to Augmentin.

Graph 4

Depicting pain score on day 3 patients of OM with WBC>15,000

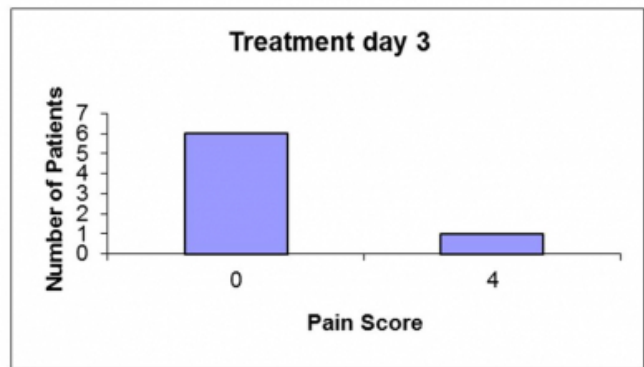


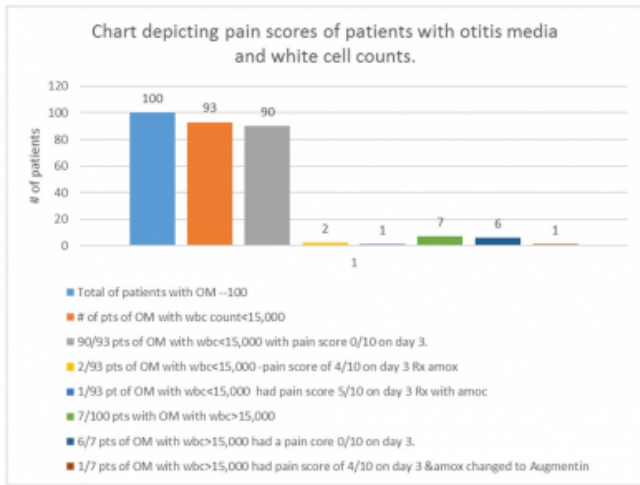
Table 8

Pain Scores in Patients with Otitis media

Pain Score	# of pts with White cell count <15,000			# of pts with White cell count ≥15,000		
	Pain score On day (1)	Pain score on day (3)	comments	Pain score on day (1)	Pain score on day (3)	comments
0	0	90	90 out of 93 had no pain on day (3)		6	6 out 7 had no pain on day 3
1						
2						
3						
4	53	2 out of 93	These 2 pts (had a pain score of 6 on day 1) treated with amoxicillin		1	This one pt Has a pain score of 8 on day 3 -antibiotic changed to Augmentin)
5	50	1 out of 93	This one pt (had a pain score of 7 on day 1)- treated with amoxicillin			
6	2				1 (Rx with amox)	
7	8				4 (Rx with amox)	
8					2 (Rx with amox)	
9						
10						

Graph 5

Depicting pain scores of patients with otitis media and white cell counts.



DISCUSSION

Watchful-waiting has been advocated and emphasized for uncomplicated AOM in recent years. This approach does not apply to children less than 2 years of age for many reasons including poor long-term prognosis 4, 9, 10. A systematic review was published in Annals of Emergency Medicine 11.

At the National Society of Academic Emergency Medicine Conference in May 2005, a Connecticut group of physicians presented a study in which antibiotics were withheld for children of 6 months to 2 years of age with a diagnosis of AOM. The study at the time of initial evaluation did not give any guidance with regard to prescribing antibiotics for AOM. According to this study, there was no statistical difference in the outcome of patients based on signs and symptoms of those patients not treated with antibiotics compared to those patients treated with antibiotics.

The diagnosis of otitis is made by the clinical presentation and by the physical exam 1, 3, 12, 13. There has been much discussion recently as to the necessity for the use of antibacterial agents at the time of diagnosis in children with uncomplicated AOM. There is no definitive criteria though when to make a decision to give antibiotics or to watch and wait. A recent randomized control trial has shown a substantial reduction of antibiotic use in children with AOM 5.

Studies have been conducted to evaluate the use of peripheral WBC count as means to identify patients potentially for higher risk of bacteremia as opposed to

benign viral etiology for febrile illness 8. A WBC of 15 has been used as a cut-off in the previous studies 7. Our study focused in using this cut-off value as an aid in decision-making regarding antibiotics prescription for children with AOM. This will give a more objective approach in concert with the clinical presentation to manage the patients with AOM. To our knowledge and through a search using PubMed, there was no study using WBC count as a guide to determine for antibiotic use in AOM in children. As we hypothesize WBC counts <15,000 favor benign course, likely viral etiology and no need to prescribe any antibiotics whereas WBC count >15,000 favors likely bacterial etiology and antibiotics can be prescribed.

The concern with AOM is the resulting complication that follows the primary infection. A recent review by Eskin commented that “Studies have shown that the hearing impairment associated with AOM did not show any difference regardless of the use of antibiotics. Follow-up audiometry failed to identify a difference in hearing loss between treatment and placebo groups; however, this result was reported in only 2 studies and was reported incompletely. Antibiotics did not prevent relapse (OR 1.00, 95% CI 0.78 to 1.26), perforation (OR 0.51, 95% CI 0.20 to 1.26), or development of otitis media in the contralateral ear (OR 0.45, 95% CI 0.16 to 1.23)” 11.

Adverse effects (vomiting, diarrhea, or rash) were more common in the antibiotic groups (number needed to harm: 8, 95% CI 5 to 23). In the included trials, one case of mastoiditis occurred in more than 2,000 children (rate=0.05%, 95% CI 0.0% to 0.15%), and this occurrence was in a patient treated with antibiotics 11

More alarming is the growing antibiotics resistance from inappropriate use of antibiotics 1, 14, 15. The risk-to-benefit ration has to be weight regarding the use of antibiotics. Antibiotics provide a small benefit for AOM in children. Because most cases will resolve spontaneously, this benefit must be weighed against the possible adverse reactions, which occur at about the same rate as the benefit. However, sicker patients may have a greater benefit from antibiotics than other patients 9. Possible advantages to delaying antibiotic therapy include reducing costs to patients and insurers, fewer side effects, and less emergence of antibiotic-resistant organisms in the patient and population as a whole 1-3, 16.

In our study, antibiotics use has been limited to only 7

children out of 100 (7%) using WBC count of 15 and greater as a guide to give antibiotics, in comparison 66% of the children had a pain score >5 (moderate to severe pain). Antibiotics would have been given to children if pain was used as criteria for antibiotics prescription. On follow up exam children whose WBC count was less than 15 were sent home with instruction to the parents to bring the child if anything changes (fever, severe pain, vomiting, etc). They did well without antibiotics. Pain has significantly resolved in the majority of the children and follow-up evaluation demonstrated no significant complication in the group that did not receive antibiotics.

Our study indicated that using WBC count as a guide reduced the use of antibiotics for children with uncomplicated AOM and watchful-waiting is appropriate. The result of our pilot study suggests that a WBC count of 15 and above can be used as a guide in making decisions to prescribe antibiotics to children with AOM.

Additional information about recommendation on management of AOM can be found at:
http://www.guideline.gov/summary/summary.aspx?doc_id=6009

ARTICLE SUMMARY

1. Why is this topic important?

This topic is important because it could address that unnecessary antibiotic use and subsequent increase in drug resistance among causes of AOM could be substantially reduced without compromising patient care.

2. What does this study attempt to show?

This study attempted to show that the use of antibiotics in uncomplicated AOM is not necessary and watchful-waiting is an acceptable approach using the WBC count as a cut-off point for making the decision.

3. What are the key findings?

The study showed improvement of symptoms without the use of antibiotics.

4. How is patient care impacted?

Our results showed that using antibiotics could be held for children with uncomplicated AOM using the WBC count as criteria for decision-making. This will help reduce the cost, the increase in antibiotic resistance and side effects of antibiotics without causing complications or compromising patient care.

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