## **Original Research Article**

DOI: http://dx.doi.org/10.18203/issn.2454-5929.ijohns20182953

# Evaluation of antibiotic sensitivity pattern in acute tonsillitis

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Received: 17 June 2018 Accepted: 04 July 2018

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#### **ABSTRACT**

**Background:** The use of antibiotics against different pathogens in acute tonsillitis has been the general trend through the years. Penicillin has been the drug of choice for the management. But due to increased incidence of resistance in case of penicillin's, other antibiotics are also used for the treatment of acute tonsillitis. The study was conducted with the objective to find out the antibiotic sensitivity and susceptibility pattern against microbial pathogens in acute tonsillitis.

**Methods:** Our prospective observational study was carried out in the otorhinolaryngology department in Dr. D. Y. Patil Medical College, Hospital and Research Centre. The period of study was from June 2015 to August 2015. After getting approval from the Institutional Ethics Committee (IEC) throat swabs were collected randomly from 50 patients visiting the ENT OPD. An informed consent was obtained from every patient who was a part of this study before commencing the study.

**Results:** The commonly used antibiotics showed a higher resistance pattern as compared to the less commonly used antibiotics. Ampicillin and Amoxicillin showed poor sensitivity results in case of both *Streptococci* as well as *Staphylococci*.

**Conclusions:** Study findings therefore helped in perusing a guarded and judicious use of antibiotics in cases of acute tonsillitis and will thus help in improving the quality of antibiotic therapy provided to the patient.

**Keywords:** Acute tonsillitis, Antibiotics, Sensitivity

### INTRODUCTION

Tonsillitis is a frequent condition noticed in the ENT department of every hospital. One out of every 10 children visiting the ENT OPD, suffer from acute tonsillitis. It occurs when the trapped organisms infiltrate the mucosal barrier and attribute themselves to the epithelial cells, leading to cytokine production and complement activation. These series of reactions produce an inflammatory reaction in the tonsillar mucosa. Staphylococci and beta haemolytic Streptococci are the major organisms involved in the pathogenesis acute tonsillitis. Other pathogens involved are Group A beta haemolytic Streptococci, Klebsiella pneumoniae, E. coli. 3

The use of antibiotics against these bacteria has been the general trend through the years. Penicillin has been the drug of choice for acute tonsillitis. Other antibiotics preferred in penicillin allergic cases include are Cephalosporin, macrolides, erythromycin and tetracycline's etc.<sup>4</sup>

However, over the years, there has been an emerging trend of resistance to these antibiotics among the bacteria. Recent studies have shown biofilms as one of the causes. While some bacteria have managed to develop resistant enzymes like beta lactamase, some others have mechanisms that pump out the antibiotic. Since bacteria had developed a beta lactamase enzyme that degrades the beta lactam ring of antibiotics, beta lactamase resistant

antibiotics were developed. These antibiotics like Amoxicillin+Clavulanic acid have proved to be useful in the treatment of tonsillitis to a great extent. But, recent studies are showing an increasing resistance to these antibiotics too.

Till the time patients come to the ENT OPD, most of them have already taken at least a dose of antibiotic. However, they are unable to relieve themselves of the pain and discomfort. This may be an indication that the antibiotics used in common practice are not helpful and antibiotic resistance may be one of the reasons for the failure of these antibiotics.

Antibiotic sensitivity testing is a simple technique that demonstrates the susceptibility or resistance of various microorganisms to the antibiotics tested. This is useful in guiding the physician's choice of antibiotics by revealing the changing trends in susceptibility. This will lead to a wiser choice of antibiotics against acute tonsillitis. This study will give us an insight into the various pathogens that are the cause of tonsillitis and evaluating their antibiotic susceptibility will be useful in a more careful and planned use of antibiotics.

The objective of the present study was to find out the antibiotic sensitivity and susceptibility pattern against microbial pathogens in acute tonsillitis.

#### **METHODS**

This was a prospective observational study carried out in the otorhinolaryngology department in Dr. D. Y. Patil Medical College, Hospital and Research Centre. The period of study was from June 2015 to August 2015. After getting approval from Institutional Ethics Committee (IEC) and informed consent from the patients, throat swabs were collected from 50 patients randomly visiting the ENT OPD.

#### Inclusion criteria

Inclusion criteria were patients coming with a history of throat pain, pain on swallowing, fever, body ache and other constitutional symptoms. Patients with a clinical evidence of acute tonsillitis which includes congestion over the anterior pillar, redness of the tonsils, enlarged and tender jugulo-digastric lymph nodes.

#### Exclusion criteria

Patients with HIV/Immune compromised patients, diabetes, patients on steroid medications, patients with a history of chronic granular pharyngitis and patient belonging to an age group of more than 50 years were excluded from the study.

#### Procedure

Direct microscopy was done followed by isolation of the pathogens on different media- Blood agar, Chocolate agar, Mac Conkey agar, etc. Antibiotic sensitivity tests were performed on all pathogens isolated using the Kirby Bauer disc diffusion method on Muller Hinton agar.<sup>7</sup>

#### Statistical analysis

The data collected was tabulated and a master chart was prepared. The average sensitivity was calculated. The sensitivity of each antibiotic was compared with the average using the test of proportions. After obtaining the Z value, the p value was calculated. This was used to evaluate the statistical significance and to compare and contrast our study with previous studies.

#### **RESULTS**

Antibiotic resistance was seen in case of the commonly used antibiotics like ampicillin, amoxicillin, Amoxicillin+Clavulanic acid. Cephalosporins were less commonly used antibiotics and showed resistance in about 77.7% cases. Cotrimoxazole showed about 40% resistant cases. The less commonly used antibiotic was vancomycin however, showed high sensitivity (100%) followed by Linezolid (91.3%) and Clindamycin (81.4%). Erythromycin showed 76% sensitivity while ciprofloxacin showed a low sensitivity of 35.5% followed by Cephalosporins (22.2%).

Table 1: Resistance and sensitivity observed against various antibiotics.

Drugs	Total	Resistant	Percentage resistance (%)	Sensitive	Percentage sensitivity (%)
Methicillin	45	28	62.2	17	37.7
Gentamicin	45	6	13.3	39	86.6
Vancomycin	48	0	0	48	100
Erythromycin	46	11	23.9	35	76.0
Ciprofloxacin	45	29	64.4	16	35.5
Cotrimoxazole	40	16	40	24	60
Ofloxacin	24	16	66.6	8	33.3
Clindamycin	27	5	18.5	22	81.4
Linezolid	23	2	8.6	21	91.3
Ampicillin	41	24	58.5	17	41.4
Amoxycillin	34	19	55.8	15	44.1

Continued.

Drugs	Total	Resistant	Percentage resistance (%)	Sensitive	Percentage sensitivity (%)
Amoxycillin+clavulanate	26	19	73.0	7	26.9
Amikacin	14	4	28.5	10	71.4
Norfloxacin	3	0	0	3	100
Chloramphenicol	17	11	64.7	6	35.2
Tobramycin	13	6	46.1	7	53.8
Cephalexin	9	7	77.7	2	22.2
Cefotaxime	9	7	77.7	2	22.2
Ceftazidime	9	7	77.7	2	22.2
Imipenem	2	0	0	2	100
Tetracycline	12	9	75	3	25

Table 2: Average sensitivity and p value.

Antibiotics	Average sensitivity (%)	Test of proportion	P value
Methicillin		0.214	0.830
Gentamicin		4.615	0.001
Vancomycin		6.628	0.001
Erythromycin		3.80	0.001
Ciprofloxacin		0	1.0
Cotrimoxazole		1.640	0.101
Ofloxacin		1.426	0.154
Clindamycin		1.243	0.214
Linezolid		0.850	0.395
Ampicillin		0.214	0.830
Amoxycillin	30.285	0.218	0.327
Amoxycillin+Clavulanate		0.633	0.527
Amikacin		0.924	0.356
Norfloxacin		2.863	0.004
Chloramphenicol		1.964	0.050
Tobramycin		1.690	0.091
Cephalexin		3.195	0.001
Cefotaxime		3.195	0.001
Ceftazidime		3.195	0.001
Imipenem		3.195	0.001
Tetracycline		2.863	0.004

Table 3: Antibiotic susceptibility pattern of bacteria.

Antibiotics	Resistance towards MRSA (%)	Resistance towards MSSA (%)	Sensitivity towards Klebsiella (%)
Cotrimoxazole	High	•	
Oxacillin	High		
Ciprofloxacin		High	High
Ampicillin	Moderate	High	
Amoxicillin	Moderate	High	
Amoxycillin+Clavulanate	Moderate	High	
Imipenem			High

MRSA: Methicillin resistant *Staphylococcus aureus*; MSSA: Methicillin sensitive *Staphylococcus aureus*.

The average sensitivity of antibiotics was 30.285%. Statistically significant (p<0.005) sensitivity was observed in case of vancomycin, gentamicin, erythromycin, norfloxacin, imipenem and cephalosporins (Table 2). As shown in Table 3, MRSA showed high

resistance to Cotrimoxazole, oxacillin and a moderate resistance to Ampicillin, Amoxicillin and Amoxycillin+Clavulanate. MSSA showed a high resistance to Ciprofloxacin, Ampicillin, Amoxicillin and Amoxycillin+Clavulanate. Both these bacteria showed

high sensitivity to Vancomycin and Gentamycin. *Klebsiella* was sensitive to Imipenem and Ciprofloxacin.

#### DISCUSSION

Over the years, commonly occurring bacteria have shown various trends in the antibiotic susceptibility pattern. A number of antibiotics have thus become uncommon in treating tonsillitis due to the emerging resistance amongst the bacterial pathogens. An average sensitivity of 30.28% was observed. The highest sensitivity was shown to Vancomycin (100%) followed by Gentamicin (86.6%) and Erythromycin (76%), which was found to be statistically significant (p<0.005). Other commonly used antibiotics like Ampicillin, Amoxicillin however, showed low sensitivity. This finding was not statistically significant (p>0.005). The performance of Cotrimoxazole was also found to be above average with 60% sensitivity results, however, not statistically significant (p>0.005). Both methicillin resistant as well as methicillin sensitive Staphylococci showed sensitivity to vancomycin. This was found to be in accordance with the findings of Tsering in 2011.8 The high sensitivity of vancomycin may be due to its mechanism of inhibiting cell wall synthesis by binding to the building blocks of peptidoglycan wall of the bacteria. Also, vancomycin is the final resort used in case the other antibiotics fail. This may also be a cause of its high sensitivity pattern.

MRSA was found have maximum sensitivity to (100%).Gentamicin (71.4%) and Vancomycin Erythromycin (67.8%) was another drug to which these bacteria were found to be sensitive. While Amoxicillin Ampicillin showed 50% Amoxicillin+Clavulanate showed a better sensitivity of 57.14%. MRSA however showed a poor sensitivity towards the commonly used Ciprofloxacin (21.42%). This was different from the results of Eldeeb et al in 2006, who stated that about 90% of the staphylococci in his study were sensitive to Ciprofloxacin. Cotrimoxazole also significantly showed poor sensitivity of only 32.14%. This was contrary to the results of Goldberg in 2010.<sup>10</sup> This indicates the growing resistance of these bacteria towards Ciprofloxacin and Cotrimoxazole through the years due to the ability of the bacteria to undergo mutations and develop resistant enzymes like DNA gyrase.<sup>11</sup>

MRSA was thus found to have a sensitivity pattern similar to the studies of Brook et al, who also found that MRSA isolates were resistant to oxacillin, penicillin and erythromycin and were susceptible to clindamycin, and vancomycin.<sup>12</sup>

MSSA showed a sensitivity of 100% to vancomycin besides methicillin. Cotrimoxazole was also found to be effective in such cases with sensitivity of about 64.7%. This finding was not similar to that reported by Sadoh et al who reported no sensitivity to Cotrimoxazole.

However, the pattern of sensitivity to Ampicillin was in concordance to that reported by Sadoh et al, with our study showing a poor sensitivity to Ampicillin (17.64%).<sup>13</sup>

Though *Staphylococci* showed a poor sensitivity to Cotrimoxazole, *Klebsiella pneumonia* showed sensitivity to this antibiotic in all of its 3 isolates. Besides Cotrimoxazole, *Klebsiella* showed sensitivity to Amikacin and Norfloxacin with all the isolates being sensitive. Sensitivity was also seen towards antibiotics like Chloramphenicol, Tobramycin, Imipenem and Cephalosporins like Ceftriaxone with 2 out of 3 isolates being sensitive to these, which was of statistical significance (p<0.005). This was in accordance to the study conducted by Abdullah in 2013 which showed 97.7% sensitivity to Imipenem.<sup>14</sup>

Among the *Streptococci, Streptococcus pyogenes* and beta haemolytic Streptococci were both sensitive to Gentamicin, Vancomycin and Amoxycillin+Clavulanate. This finding, though not statistically significant, was found to be similar to Baquero et al.<sup>15</sup>

The commonly used antibiotics showed a higher resistance pattern as compared to the less commonly used antibiotics. Ampicillin and Amoxicillin showed poor sensitivity results in case of both *Streptococci* as well as *Staphylococci*. Amoxicillin+Clavulanicacid, however showed a better sensitivity in case of Streptococci as opposed to Staphylococci which were found to be moderately resistant to this antibiotic (57%).

MRSA was shown to have a higher resistance to Cotrimoxazole. MSSA however showed better sensitivity to this antibiotic. *Klebsiella* was also found to be sensitive to Cotrimoxazole besides other antibiotics like Imipenem. The antibiotic sensitivity tests revealed a higher sensitivity of all the isolated organisms to Vancomycin followed by Gentamycin and Erythromycin.

As the commonly used antibiotics showed a higher resistance pattern therefore, emphasis should be laid on the guarded and judicious use of antibiotics to treat infections like acute tonsillitis. This will thus help in providing a better quality of treatment to the patients, who are most commonly the children..

#### **CONCLUSION**

The findings of the study therefore help in perusing a guarded and judicious use of antibiotics in cases of acute tonsillitis and will thus help in improving the quality of antibiotic therapy provided to the patient.

Funding: No funding sources Conflict of interest: None declared

Ethical approval: The study was approved by the

Institutional Ethics Committee

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Cite this article as: Ingale MH, Mahajan GD. Evaluation of antibiotic sensitivity pattern in acute tonsillitis. Int J Otorhinolaryngol Head Neck Surg 2018:4:1162-6.