

Original Article**The Shift of Bacterial Sensitivity with Antibiotics in Acute Tonsillitis.**Brihaspati Sigdel^{*1}, Sanjib Mani Regmi²¹Department of Otolaryngology & Head and Neck Surgery, ²Department of Microbiology, Gandaki Medical College, Pokhara, Nepal.Article Received: 20th September, 2020; Accepted: 5th December, 2020; Published: 30th June, 2021DOI: <http://dx.doi.org/10.3126/jonmc.v10i1.37807>**Abstract****Background**

The infection of tonsil may occur primarily or secondarily as a result of upper respiratory tract infection, usually preceded by a viral infection. Bacterial tonsillitis is most commonly caused by *Streptococcus pyogenes*. Penicillin remains the treatment of choice for *S. pyogenes* tonsillitis. The present study aimed to identify the bacterial pathogen in acute tonsillitis and their sensitivity to antibiotics.

Material and Methods

This prospective study was conducted in the Department of Otolaryngology and Head & Neck Surgery and Department of Microbiology, Gandaki Medical College, Pokhara Nepal from January 2018 to January 2019. Ninety-six patients who presented with acute tonsillitis and admitted in the hospital were included in the study.


Results

The commonest age group of acute tonsillitis was found to be between 21-30 years. *S. pyogenes* was the commonest isolate 32(33.3%) followed by *S. aureus* 19(19.8%). *Streptococcus pyogenes* was sensitive to Ampicillin (65.6%) and Cloxacillin (68.7%) while the isolates were more sensitive to levofloxacin and doxycycline. Carbapenem were found to be most effective drugs for intravenous treatment.

Conclusions

The most common bacterial isolates were *Streptococcus pyogenes*. The sensitivity of organism shift from ampicillin group to fluoroquinolones and tetracycline. Identification of bacterial isolates and their antibiotics sensitivity patterns could prevent resistance of bacteria to drugs and help in the proper management of acute tonsillitis.

Keywords: *Bacteriology, Streptococcus pyogenes, Tonsillitis*

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Introduction

The tonsils are subepithelial lymphoid collection in oropharynx between anterior and posterior pillar. It is a disease of childhood but also frequently seen in adults. These contain various types of lymphocytes (mainly B types) and secrete antibodies. The neutrophils are initial active participants in bacterial infection and inflammation. The infection may occur primarily or secondarily, usually preceded by a viral infection. In Acute tonsillitis, inflammation occurs in palatine tonsil, predominately affecting the school-going children. Acute suppurative tonsillitis in children is mainly caused by viruses such as Epstein-Barr virus, cytomegalovirus, influenza virus, parainfluenza virus, and adenovirus. Among the bacterial infections, it is mainly caused by group A streptococci.

Other bacteria include, Staphylococcus aureus, Pseudomonas aeruginosa, Hemophilus influenzae, Klebsiella spp. Patients of any age group may be affected by acute tonsillitis. Tonsillitis of viral origin is usually treated with supportive care while antibiotics are recommended to treat bacterial tonsillitis. Penicillin group antibiotics remain the treatment of choice for S. pyogenes tonsillitis. Acute tonsillitis is refractory to penicillin therapy poses a major medical problem in all age groups. Culture directed antibiotics administration is a standard technique to treat such cases to prevent antibiotics resistance.

The present study aimed to identify the bacterial pathogen in the case of hospitalized acute tonsillitis and their sensitivity patterns to antibiotics.

Materials and Methods

This prospective study was conducted in the Department of Otolaryngology and Head & Neck Surgery and Department of Microbiology, Gandaki Medical College, Pokhara Nepal from January 2018 to January 2019. This study was approved by the Institutional review committee of Gandaki Medical College. Written consent was taken from all the patients. Patients were explained about the study and its advantages. Patients having severe throat pain, difficulty in swallowing, malaise congested and pus point tonsil at oropharynx on examination were considered as acute tonsillitis cases, which were included in this study. The peritonsillar abscess, patient who denied study was excluded from the study. Using $n = z^2pq/d^2$ with 10% error, sample size is calculated to be 60. Ninety six patients who presented with acute tonsillitis and admitted in the hospital were enrolled in the study.

Two tonsillar swabs were taken aseptically from

each patient. Gram staining was performed on the first swab and the second swab was inoculated on Blood and MacConkeys agar plates. Bacterial isolates were identified by various biochemical tests using standard protocols. Antimicrobial susceptibility testing was performed on Muller Hinton Agar (MHA) by Kirby Bauer disc diffusion method as recommended by CLSI guidelines and manufacturer protocol (HiMedia, India). In case of S. pyogenes, AST was done in MHA supplemented with 5% sheep blood and incubated in 5-10% CO₂ environment. Data was collected using pre-formed Performa then entered into MS-excel sheet. Mean and standard deviation and descriptive statistics like frequency and percentage was analyzed by using SPSS version 23.

Results

The number of patients included in this study was Ninety-six. The mean age of patients was $26.6 \pm$ SD 12.1 years. The minimum age was five and the maximum age was seventy. The commonest age group of tonsillitis is between 21-30 years where the maximum number of 36 cases (37.5%) occurred followed by 22 cases (22.9%) in 11-20 years group. (Table 1) Males were affected more than females with M: F ratio 1.13:1. S. pyogenes was the commonest isolate 32(33.3%) followed by S. aureus 19(19.8%). No growth was found in 28 (29.1%) clinical specimen. (Table 2)

Table 1: Age-wise Distribution of patients having acute tonsillitis.

Age group	No. of patients	Percentage distribution
0-10	7	7.3
11-20	22	22.9
21-30	36	37.5
31-40	17	17.7
41-50	9	9.4
51-60	4	4.2
61-70	1	1.0
Total	96	100.0

Table 2: List of isolated organisms and their frequency.

Organism Isolated	No. of isolates	Percentage
S. pyogenes	32	33.3
S. aureus	19	19.8
P. aeruginosa	9	9.4
K. pneumoniae	4	4.2
S. pneumoniae	2	2.1
Proteus mirabilis	2	2.1
No growth	28	29.1
Total	96	100.0



Among the various antibiotics ampicillin and cloxacillin was found to have low sensitivity towards various pathogens isolated in our study. Among the oral antibiotics levofloxacin and doxycycline was found more effective. Aminoglycosides and imipenem which are given intravenously was also found to have higher sensitivity (Table 3.0)

Table 3: List of isolated organisms and their percentage of AST distribution.

Organism isolated	S.	S.	P.	K.	S.	P.	Overall	
	pyoge	aure	auro	pneumo	pneu	mira	sensitivity	
	ns	us	genosa	niae	moniae	bilis	/resistance	
Ampicillin	S	65.6	73.7	33.3	75	100	50	64.7
	R	34.4	26.3	66.7	25	-	50	35.3
Cloxacillin	S	68.7	78.9	44.4	75	100	100	70.5
	R	31.3	21.1	55.6	25	-	-	29.5
Levofloxacin	S	81.2	78.9	66.7	75	100	100	79.4
	R	18.8	21.1	33.3	25	-	-	20.6
Doxycycline	S	81.2	84.2	55.6	100	100	100	80.9
	R	18.8	15.1	44.4	-	-	-	19.1
Amikacin	S	87.5	89.5	77.8	100	100	100	86.7
	R	12.5	10.5	22.2	-	-	-	13.3
Gentamycin	S	84.3	89.5	66.7	75	100	100	83.8
	R	15.7	10.5	33.3	25	-	-	16.2
Cefotaxime	S	78.1	73.7	33.3	75	100	100	72
	R	21.9	26.3	66.6	25	-	-	28
Imipenem	S	90.6	89.5	88.9	100	100	100	91.2
	R	9.4	10.5	11.1	-	-	-	8.8

Discussion

Tonsillitis is a common disease in children and adults. The patient may present with a sore throat, difficulty in swallowing, fever, and a history of upper respiratory tract infection. In our study, 29 (30.1%) cases are below 20 years of age. These are the cases admitted for acute tonsillitis in our hospital. All kept in Intravenous antibiotics. 37.5% of patients were in the age group of 21-30 years followed by 31-40 which was similar to the previous study done by Lognathan et al. In this study, it was found that acute tonsillitis was more common in adults compared to children. This might be because children visited Pediatric Department and and got treated there too which is not included in this study.

Streptococcus pyogenes 32 (33.3%) was found to be the most common isolates in our study as it is the major pathogen causing bacterial tonsillitis worldwide. Our finding is most consistent with the studies of Ramirez et al and Ozek et al in which the distribution of *S. pyogenes* were 47 and 30 % respectively [11-13]. In our study the distribution of *Staphylococcus aureus* was found 19.8% which is higher than the study done by Loganathan et al (11.85%) but less than the study carried out by Jha et al and Lilja et al. We couldn't exclude the possibility that few *S. aureus* isolates might represent normal flora rather than a real pathogen causing acute tonsillitis. *Pseudomonas aeruginosa* is 3rd most common organism in our

study, but only single isolate of *Pseudomonas aeruginosa* found in study by Loganathan et al [10]. This organism was rarely seen study by brook et al [5]. We could not get significant growth of bacteria in 29.1% of clinical specimens. In a similar study done by Vijayashree et al, 18% clinical specimens did not yield any growth. It might be due to delay in specimen processing of few samples or the fastidious organism might cause acute tonsillitis.

It has been seen that isolated bacteria have variable sensitivity pattern to different antibiotics. Gram positive bacteria have more susceptible than gram negative bacteria. The drugs of choice for the treatment of acute tonsillitis are Amoxicillin or penicillin. Krober et al showed penicillin to be the most effective antibiotic to treat acute tonsillitis caused by bacteria. However, in our study *Streptococcus pyogenes* was found more sensitive to levofloxacin, doxycycline, aminoglycosides and carbapenem compared to ampicillin and cloxacillin. This is because most of the cases might have already taken oral amoxicillin or amoxicillin/clavulanic acid as these drugs are commonly given by pharmacists without a prescription and the patients might have developed resistance to them. The growing incidence of drug resistance in many bacteria may due to β -lactamase production by bacteria. Moreover, the permeability of these antibiotics in highly inflamed tonsillar is less that may lead to antibiotics resistance .

Staphylococcus aureus sensitivity is 65.5% with Ampicillin and 78.9 % with cloxacillin and levofloxacin. Imipenem was sensitive to 91.2% of cases followed by amikacin (86.7%) and Gentamycin (83.8%). A similar finding was found in a study done by Ramirez et al .

P. aeruginosa showed more resistance with ampicillin (66.7%) and cloxacillin (55.6%) in our study. similar finding was found in study by Alasil et al [20]. Although there is no obvious reason behind it. but there may be rapid shift of antibiotics from ampicillin which develop resistance. We found Imipenem had higher sensitivity 88.9% with *Pseudomonas* followed by amikacin (77.8%) The increasing antimicrobial resistance being observed is due to not getting right antibiotics in first time of treatment as empirical therapy so it may force to use higher antibiotics like imipenem as better option [21]. We found *Streptococcus pneumoniae* to be 100 % sensitive to all the antibiotics tested in our study. Mihajlović M also found *S. Pneumoniae* is 96.7% sensitive to penicillin [22].

This study encompasses of bacterial isolates growth in the aerobic or facultative anaerobic



environment. It excludes anaerobic bacteria. It is important to study molecular character of multidrug resistant isolate in future.

Conclusion

The commonest age group of acute tonsillitis was between 21-30 years. The most common bacterial isolate was *Streptococcus pyogenes*. Most sensitive drugs were doxycycline, levofloxacin, aminoglycosides and carbapenems. It showed the shift of sensitivity of organisms from ampicillin and cloxacillin to tetracycline and fluoroquinolones. Identification of bacterial isolates and their antibiotics sensitivity patterns could prevent resistance of bacteria to drug and guide proper treatment of acute tonsillitis.

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Conflicts of interests: None

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