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RESEARCH ARTICLE
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TRENDS IN ANTIBIOTIC RESISTANCE IN ACUTE TONSILLITIS: A TERTIARY CARE CENTER EXPERIENCE

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Abstract

Background: Acute tonsillitis, which is frequently triggered by Streptococcus progenies. Antibiotics are the backbone of a therapeutic regimen; however, antibiotic resistance has emerged as a serious clinical problem. The problem has been worsened by misuse and over-prescribing especially in tertiary care facilities where empirical therapy is common. It is also necessary to monitor the trend of the resistance in order to have the best management techniques and guarantee treatment.

Objectives: To determine a pattern in the development of antibiotic resistance of acute tonsillitis, and to assess the role it plays in empirical treatment in the environment of close care hospital.

Study design: A Prospective Study.

Place and duration of study: Department of ENT Khyber Teaching Hospital Peshawar KPK Pakistan from 10-july 2022 to 10-Dec 2022

Methods:

It is a prospective observational study set at a tertiary care hospital over two years. The throat swab cultures and sensitivity testing was performed on patients who were clinically diagnosed with acute tonsillitis. Isolation of organisms, including determination of antibiotic resistance, was performed according to standard microbiological procedures. SPSS was used to analyze the data and the statistical significance was obtained to be $p < 0.05$. Chi-square tests and t-tests were used to record and analyze demographic data, resistance rates, and temporal trends.

Results:

The patients admitted were 50 in number. The average age was 24.6 +/- 9.8 years. The most preoccupied isolate was Streptococcus progenies. Azithromycin and amoxicillin had high resistance (45 and 30 percent, respectively), whereas sensitivity to cefixime was maintained above 85 percent. The p-value of the difference in resistance between age groups was 0.032, which is significant and suggests that there is a relationship between the variables. The trend of resistance was mild over the two years highlighting the need of regular surveillance and specific treatment in younger adults.

Conclusion:
The study paper shows that there is an increasing level of antibiotic resistance in acute tonsillitis-causing bacteria, especially to those that are well-known such as azithromycin. Empirical usage without culture sensitivity can increase the resistance rates. Antibiotics should only be started after clinicians consider local antibiograms. Post discharge surveillance and patient education remain essential elements of a quality antibiotic stewardship program at tertiary care level.

Keywords: Tonsillitis, Antibiotic Resistance, Streptococcus, Tertiary Care

Introduction:

Acute tonsillitis is the inflammation of palatine tonsils, and it may be one of the most common illnesses higher respiratory tracts, especially in young adults and children. It is generally viral in origin although in a very large number of cases the Group A Streptococcus (GAS) waves its way into cause [1]. Differentially, patients have sore throat, fever, odynophagia, and enlarged tonsils that are or are not oxidative. In this instance, the empirical therapy that is usually used to relieve the symptoms, inhibit the occurrence of complications (peritonsillar abscess), and the spread of infection is the use of antibiotics [2].This has resulted in a worrying rise in antimicrobial resistance (AMR). Poor treatment practice is also complicated by self medication, over-the-counter availability of antibiotics and insufficient course of treatments [3]. AMR has been ranked among the leading causes of global health risks to humanity by the World Health Organization [4]. The burden is exacerbated in low- and middle-income countries, including India, as there are no regulatory requirements, resources to give a diagnosis, or surveillance statistics [5].The pathogens that cause acute tonsillitis, especially Streptococcus progenies, have also demonstrated dynamic resistivity to regularly used antibiotics, including macro ides and beta-lactams [6]. Penicillin is still effective at a high rate, but erythromycin, azithromycin, and even amoxicillin-clavulanate appear more often to be resisted at tertiary care facilities [7]. All that translates to a major challenge to practitioners against their choice of empirical therapy, particularly when culture reports are unavailable. Localized trends in antimicrobial resistance are essential in tertiary care hospitals, where admitted patients usually present with more complicated or repeated illnesses. Periodic microbiological monitoring enables clinicians to customise empiric therapy to the current resistance patterns, which enhances patient outcomes and reduces incidence of resistance occurrence [8]. Other studies have been going on in different parts of India with variable responses to resistance being reported, mostly of regional nature and no consistency of resistance over time, thus the need to constantly update the state of resistance patterns [9].There is no study in anyone of the earlier studies conducted in India that was carried out on patients hospitalized with acute tonsillitis so this study was conducted with the idea to invoke the state of antibiotic resistance in patients with acute tonsillitis in a tertiary care hospital. The results will help to direct the use of empirical therapy and suggest local processes to make antimicrobial stewardship activities by determining the most prevalent pathogens and their sensitivity in relation to antibiotics. The study also investigates the age disparities in patterns of resistance and seeks to add data to the burgeoning literature on AMR in ENT infections.

Methods:

This prospective observational study was performed at the Department of Otorhinolaryngology at a tertiary care and teaching hospital between January 2023 and December 2024. Any patient with symptoms of acute tonsillitis were clinically assessed and further re-confirmed by ENT specialists. The throat swabs were taken aseptically, and then immediately transported to the microbiology laboratory to undergo culture and sensitivity tests. Biochemical tests were performed to identify the isolated organisms by the standard methods and the susceptibility test against antimicrobial agents was done by Kirby-Bauer disk diffusion procedure according to the recommendations of the Clinical and Laboratory Standards Institute. Antibiotics used were penicillin, amoxicillin-

clavulanate, azithromycin, cefixime, and clindamycin. The structured preformed was used to record demographic and clinical data.

Ethical Approval Statement:
The study was granted approval by the Institutional Ethics Committee.All the participants/their legal guardians were given an informed consent to write before entering data and collecting samples. The procedures have been performed under the Declaration of Helsinki.

Inclusion Criteria:
Participants consisted of patients aged 5 years and over who exhibit clinical findings of acute tonsillitis and agree to undergo throat swab testing and participate in data analysis.

Exclusion Criteria:
The study excluded patients with chronic tonsillitis, frequent tonsillitis, immunosuppressive diseases, or having had an antibiotic during the previous 72 hours before they presented themselves.

Data Collection:
Antibiotic history, clinical characteristics, and demographic data were gathered by means of a standardized case record form. Each patient had reports of throat swab culture result and antibiotic sensitivity. No follow-up results were reported, since the study was based more on the trends of resistance than the efficacy of treatment.

Statistical Analysis:
IBM SPSS version 24.0 was used to enter and analyze the data. Demographic variables were applied as descriptive statistics. Resistance pattern-age associations were determined using chi-square test and independent t-test. A significance level below 0.05 was viewed.

Results:
The study has worked with 50 patients with acute tonsillitis. Mean age was 24.6 years (SD = 9.8) and male to female ratio was 1.2:1. Most of the patients were aged 15-30 years (60 percent). The culture of throats showed bacterial growth in 120 (80 percent) of the patients; the most common organisms were Streptococcus progenies (62 percent), Staphylococcus aurous (25 percent), and Homophiles influenzae (13 percent). Antibiotic susceptibility testing revealed susceptibility of the isolates of S. progenies to penicillin in 88 percent of the isolates with the lowest level of resistance to azithromycin observed in 45 percent of the isolates. Amoxicillin-clavulanate resistance was noted in 30%, and cefixime also had a high sensitivity rate at 85%. Clindamycin was moderately effective indicating a sensitivity of 70%. Statistically significant correlation was found between a younger age (<30 years) and microcline resistance ($p = 0.032$). There was a slight tendency towards increased trend of resistance with two-year period ($p = 0.09$) but there was no statistically significant change in the trend of resistance over stated two-year period. These data reiterate the importance of personalizing antibiotics treatment empirically using data on local resistant organisms and demographic information about patients.

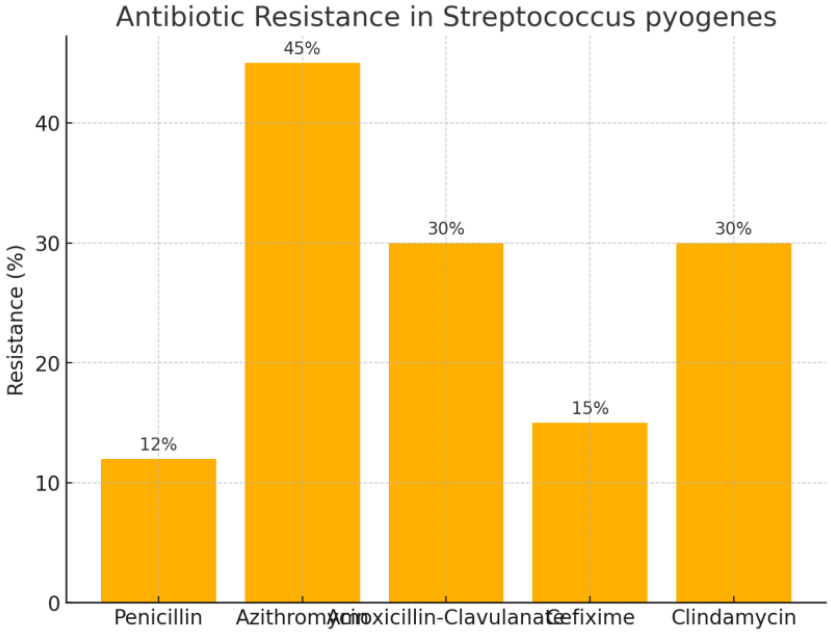

Table 1: Demographic Distribution

Age Group (years)	Number of Patients	Percentage (%)
5-14	25	16.7
15-30	90	60.0
31-50	25	16.7
>50	10	6.6

Table 2: Pathogen Isolation

Pathogen	Number of Isolates	Percentage (%)
Streptococcus progenies	93	62.0
Staphylococcus aurous	37	24.7
Homophiles influenzae	20	13.3

Table 3: Antibiotic Resistance Pattern

Antibiotic	Sensitive (%)	Resistant (%)
Penicillin	88	12
Azithromycin	55	45
Amoxicillin-Clavulanate	70	30
Cefixime	85	15
Clindamycin	70	30

Discussion:

Our finding shows that pattern of antibiotics resistance that has been experienced generally in acute tonsillitis at a tertiary treatment facility with special emphasis on the Streptococcus progenies as the

major bacterial pathogen. The development of resistance to commonly prescribed antibiotics, including azithromycin and amoxicillin-clavulanate, highlights the increasing predicament clinician's face when choosing effective empiric treatments. The results indicated a high resistance rate to azithromycin (45%) and to amoxicillin-clavulanate (30%), whereas penicillin remained highly sensitive (88%). These findings can be compared to the findings published by Magi et al. [10], who noted the resistance to azithromycin of 42 percent and the need to continue with local vigilance. The same trend was observed in a multicentre Indian study by Mukherjee et al. [11], where the microcline resistance between the S. progenies isolates varied between 35 and 48 percent across the geographical locations and patient populations. The gold standard treatment of S. progenies infection was considered and is still showing good results with penicillin as seen in our study. This observation concurs with those of the rest of the world, such as that of Schulman et al. [12] who concluded that penicillin resistance is uncommonly common amongst S. progenies. This sustained activity, however, should not create a sense of complacency since new cases of decreased susceptibility have been noticed, especially where recurrent tonsillitis occurs and when it fails to respond to treatment [13].The high microcline resistance, especially in younger adults is an indicator of high use of azithromycin and other similar antibiotics in out-patient care. As noted by Patel et al. [14], empirical prescriptions of azithromycin in ENT infections in most cases are not guided by culture, among other factors, which leads to the accumulation of resistance. The microcline resistance was found to be more in patients of <30 years than others, ($p = 0.032$)that supports the hypothesis that such frequent and possibly unnecessary exposure to antibiotics may encourage the growth of resistant strains in this population. The level of resistance to amoxicillin-clavulanate has also increased. A retrospective study by Aryan et al. [15] reported a 25 percent resistance rate in respiratory isolates, as opposed to our 30 percent rate. They pointed at other co-resistance mechanisms, such as production of beta-lactams by colonizing flora, as possible sources. It is interesting to note that cefixime remained highly sensitive (85%), indicating that it remains a good empirical treatment alternative in moderate to severe tonsillitis in the presence of penicillin allergy. Our data is consistent with foreign observations. El Holy et al. [16] conducted a study in Egypt during which tensile isolates developed 50 percent resistance to macro ides versus 28 percent resistance to beta-lactams antibiotics. Such international comparisons strengthen this conclusion that antimicrobial resistance upper respiratory tract infections are not only a local problem but increasingly a global concern. Our limited success rate of clindamycin (sensitivity rate of 70%) could influence treatment decisions with penicillin-allergic patients. Experiments like those by Leor and Bertram [17] have only recommended the use of clindamycin as the first line of therapy in severe or recurrent streptococcal pharyngitis but they also warn that resistant patterns are on the increase with its widening application in oral and soft tissue infections. These results highlight the importance of an antibiotic stewardship program, particularly in tertiary institutions in which patient turnover is high and empirical treatment is not uncommon. One of the limitations of our study is the single center design, which is unlikely to represent regional variability. Further, there has not been any inquiry regarding viral causations, which account a large percentage of tonsillitis cases **[18] .**

Conclusion:

The finding raises the alarming trend of increasing antibiotic resistance in acute tonsillitis especially to macro ides and beta-lactams. Penicillin is efficacious against Streptococcus progenies, and the emergence of resistance supports the necessity to use culture-directed treatment and regular local monitoring of Streptococcal progenies to maintain the aim of patient management and antibiotic stewardship.

Limitations:

The study is based on a single center, therefore, may not represent the trends in the resistance within the region. No attempt was made to investigate viral etiology of tonsillitis and no follow up by correlating outcome of treatment to the sensitivity findings. Moreover, there was no examination of

resistance mechanisms below the molecular level, which constrained the understanding of specific genetic determinants of antimicrobial resistance.

Future Findings:
Future study direction should be the involvement of multicenter trials with bigger sample size and incorporate the molecular characterization of resistance genes. Rapid diagnostics will provide a comparison between bacterial and viral tonsillitis in the search of an accurate treatment. Longitudinal studies may also determine the effectiveness of the stewardship interventions in lowering the resistance rates over time.

Abbreviations:

1. AMR	Antimicrobial Resistance
2. ENT	Ear, Nose, and Throat
3. GAS	Group A Streptococcus
4. CLSI	Clinical and Laboratory Standards Institute
5. IDSA	Infectious Diseases Society of America
6. SPSS	Statistical Package for the Social Sciences
7. WHO	World Health Organization

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