Antimicrobial sensitivity profile of bacterial agent in recurrent tonsillitis patients

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Abstract:

Tonsillitis is inflammation of the pharyngeal tonsils. The inflammation usually extends to the adenoid and the lingual tonsils; therefore, the term pharyngitis may also be used. Most cases of bacterial tonsillitis are caused by group A betahemolytic Streptococcus pyogenes (GABHS). Tonsillitis remains one of the common diseases in developing countries. Prompt and appropriate treatment based on the knowledge of the causative microbiota and their antimicrobial susceptibility pattern will improve the treatment outcome and reduce time and resources spent on treatment. This study aims to the main organisms responsible for tonsillitis, their sensitivity and resistance to antibiotics, one hundred and forty five patients with Acute and chronic tonsillitis who presented to the (ENT) department in ENT in Al-Husain Teaching Hospital, Samawah city, from March 2021 to April 2022 were prospectively studied, The proportion of the cultures that were positive of significant growth, the proportion of these positive isolates that were Streptococcus spp. and varied sensitivity pattern obtained underpinned the important to advocate for culture isolates and susceptibility pattern guided treatment.

Key word: Antimicrobial, tonsillitis, patients.

Introduction:

Tonsils are immunologically more active in the first years of life. During aging, whereas lymphoid tissue regresses, sub epithelial tissue changes into fibrotic tissue and crypts alter into cavities filled with keratin. In case of infection, bacteria that inhabit the crypts spread into the tonsil and leave their toxins and other products in it, eventually leading to polymorphponuclear leukocyte infiltration, swelling, necrosis and surface ulceration in tonsils. Consequently, after acute infection, bacteria may inoculate into the core (1).

These infections are highly frequent especially in childhood. Although antibiotic therapy may be sufficient in the treatment of acute tonsillitis, tonsillectomy remains the treatment of choice in the management of recurrent and chronic tonsillitis (2).

Inappropriate antibiotic therapy against the pathogen in deep tissue or inadequate antibiotic levels in the tonsillar tissue leads to the continuation of the infection and the reinoculation of the surface (3). It has been claimed that the results of the cultures taken from tonsillar surfaces may not always show the real pathogen (4).

Bacterial agents such as Group A Beta hemolytic streptococci, staphylococcus aureus, hemophilus influenza, streptococcus pneumonia, Corynebacterium diptheriae and Neisseria gonorrhea are the main causes of tonsillitis (5). This microorganism is different from other agents causing tonsillitis for the following reasons: it may lead to Rheumatic fever and Acute Glomerulonephritis, its treatment is easy and it is still sensitive to penicillin. Medical therapy is the first step in the management of recurrent tonsillitis and surgical treatment is reserved for cases in which medical treatment fails. Recurrent tonsillitis is defined as infection of the tonsils associated with sorethroat, fever and tonsillar enlargement with more than six such episodes lasting for 3- 4 days in the 1st year, more than three episodes per year for two or more years (6) .

Chronic tonsillitis is defined as infection of the tonsils that’s unresponsive to medical therapy associated with halitosis, tender cervical adenitis and persistent sore throat: seven or more episodes of sore throat in the preceding year who were treated with antibiotics, five or more episodes of sore throat in the preceding two years and three or more episodes in each of the three preceding years. Tonsillitis with obstructive symptoms is defined as episodes of tonsillitis that present with the features of Obstructive sleep apnoea which is defined as 30 or more episodes of cessation of airflow at the nostrils and mouth for at least 10 seconds occurring during a seven hour sleep period.(6,7).

Many micro-organisms can induce inflammation in Waldeyer's ring. These include aerobic as well as anaerobic bacteria, viruses, and chlamydia, yeasts, parasites, and

rickettsia. Some of the organisms are part of the normal oropharyngeal flora that can become virulent, and some are external pathogens. Because the oropharynx is colonized by many organisms, most infections of the ring are polymicrobial. Because of the polymicrobial nature of most infections in and around Waldeyer's ring, it is often difficult to interpret data derived from clinical samples obtained from mucous surfaces and then differentiate between organisms that are colonizers and those that are invaders. However, an avirulent colonizer can become a virulent pathogen under certain conditions, especially in the chronic stage of the disease (7).

Enlargement of the chronically inflamed tonsil is due to the presence of a large number of lymphocytes, plus an increased amount of connective tissue, neutrophils, and occasional keratin cysts. Infrequently, enlargement is due to chronic abscesses. After an acute infection, the bacteria may be harboured within the core, leading to chronic infection. Determination of the core bacteriology may be important for several reasons. First, these bacteria may be the organisms that lead to the changes listed above. Secondly, the failure to eradicate the organisms in the core, whether it is from inappropriate antibiotic choice or from insufficient antibiotic penetration into the core, will allow either persistence of core infection or re-inoculation of the initially sterilized surface. Lastly, as suggested by several authors, bacteria harboured in the core may exert a protective effect on other pathogens, such as the protection of group A β-haemolytic streptococci from Penicillin by the β-lactamase production of Staphylococci (8, 9) .

Methods:

Sample collection:

One hundred and forty five patients with Acute and chronic tonsillitis who presented to the (ENT) department in ENT in Al-Husain Teaching Hospital, Samawah city,

from March 2021 to April 2022 were prospectively studied. The discharge was either frankly purulent, muco-purulent, serous or blood stained on occasion. Detailed clinical history regarding unique identification number, name, age, sex, duration of discharge, other associated symptoms and antibiotic therapy were taken. Sterile cotton swabs were used to collect mouth discharge from tonsil patients. Only those cases were selected who had not taken any treatment either systemic or local for the last 7 days [10, 11].

Culture and identification

The mouth discharge was collected by an ENT specialist under strict aseptic conditions using single-use mini-tip culture swabs, after cleaning the oral cavity with a spirit swab. The swabs were transported to the bacteriology laboratory in the biomedical complex at the Al-Husain Teaching Hospital and Laboratory Sciences for culture and susceptibility testing. The swab was directly inoculated on 5% sheep blood agar, chocolate agar, and MacConkey agar (HiMedia, USA). The blood and Mac- Conkey agar plates were incubated aerobically while chocolate agar was incubated under 5% CO2 atmosphere at 37 °C for 24–48 h. The isolates were identified by colony morphology, Gram stain, oxidase test, triple sugar iron agar, indole production, H2S production, citrate utilization, motility test, urease test, carbohydrate utilization tests, catalase, coagulase, DNase, bacitracin, and optochin susceptibility tests [12].

Antimicrobial sensitivity

Antimicrobial sensitivity testing for aerobic isolates was carried out by modified Kirby Bauer disc diffusion method on Muller Hinton agar. Results were interpreted in accordance with Clinical Laboratory and Standard Institute guidelines.

Statistical analysis

Correlations between variables were assessed using Student's t-test for numerical variables and using Chi-square test and Fisher exact test for categorical variables. P-value of < 0.05 was considered statistically significant.

Results:

During the 11 months finding period a total of 145 patients admitted for tonsil pain and discharge to the Ear, Nose and Throat (ENT) section at Al-Husain Teaching Hospital, Samawah city, who had chronic tonsillitis were enrolled. 91 (61.3%) were female and 54 (38.7%) were male. The mean age of the study participant was 32 years ranged from 18 to 60 years. 80 (52.3%) of them were aged below 25 years and 65 (47.7%) were between 16 and 30 years.

The bacterial strains were isolated from 145 positive culture swabs suggesting polymicrobial nature of bacterial flora in patients of tonsillitis. Streptococcus viridians (SV) group and Branhmellacatarrhalis (BC) were isolated from 103 swabs (73.21 %) which are considered as the normal bacterial flora of the throat. Along with Streptococcus viridians (SV) group and Branhmellacatarrhalis (BC) in decreasing order of frequency Staphylococcus aureus was isolated from 18 swabs (9.56%), followed by Streptococcus pneumoniae from 7 swabs (6.02%), Pseudomonas and E. coli from 3 swabs (3.10%) each, beta haemolyticStreptococci 3 swabs (2.11%) and Proteus vulgaris 1 swab (0.61%). (Table 1)

Antibiotic sensitivity pattern A total of 11 types of antibiotics were selected to test the susceptibility of the isolated bacteria which are ampicillin, erythromycin, ciprofloxacin, cotrimoxazole, tetracycline, chloramphenicol, cefaclor, gentamicin, tobramycin, netilmycin and vancomycin. (Table 1, 2)

Table 1: Bacterial isolates from tonsillar swabs:

No.	Bacterial isolates	No of Isolates	%
1	**Streptococcus viridans (SV), Branhamellacatarrhalis (BC)**	**108**	**73.21**
2	**Streptococcus viridans (SV), Branhamellacatarrhalis(BC) Staphylococcus species**	**18**	**9.56**
3	**Streptococcus viridans (SV), Brahamellacatarrhalis (BC) Streptococcus pneumoniae (SP)**	**7**	**6.02**
4	**Streptococcus viridans (SV), Branhamellacatarrhalis (BC) Pseudomonas aeruginosa**	**3**	**3.10**
5	**Streptococcus viridans (SV), Branhamellacatarrhalis (BC) E.coli**	**3**	**2.11**
6	**Streptococcus viridans (SV), Branhamellacatarrhalis (BC) Beta hemolytic Streptococcus**	**1**	**2.1**
7	**Streptococcus viridans (SV), Branhamellacatarrhalis (BC) Proteus species**	**1**	**2.01**
8	**Sterile/Contaminated**	**4**	
	total	**145**	**100**

Table 2: Antibiotic sensitivity pattern of Pseudomonas spp. isolates

Antibiotics	Pseudomonas
Tobramycin	81.61%
Ticarcillin/Clavulanic acid	42.96%
Meropenem	61.03%
Ciprofloxacin	52.18%
Ceftazidime	25.82%
Cefoperazone sulbactam	32.70%
Aztreonam	64.3%

Fig.2. show the Antibiotic sensitivity pattern of Pseudomonas spp. isolates

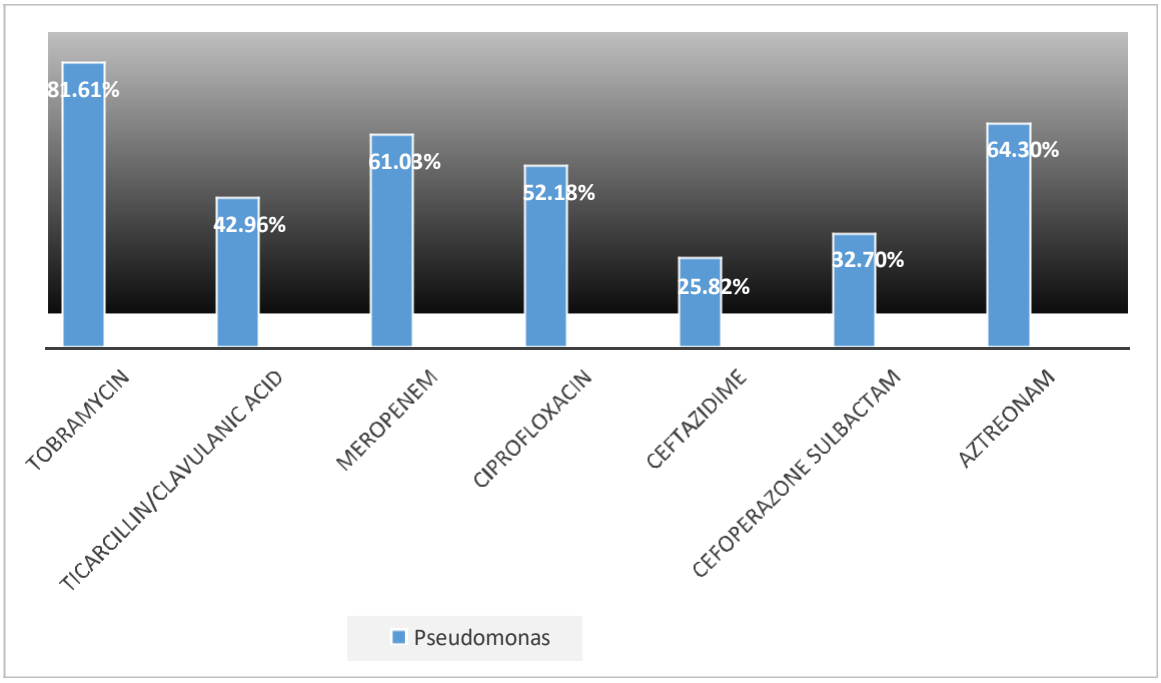
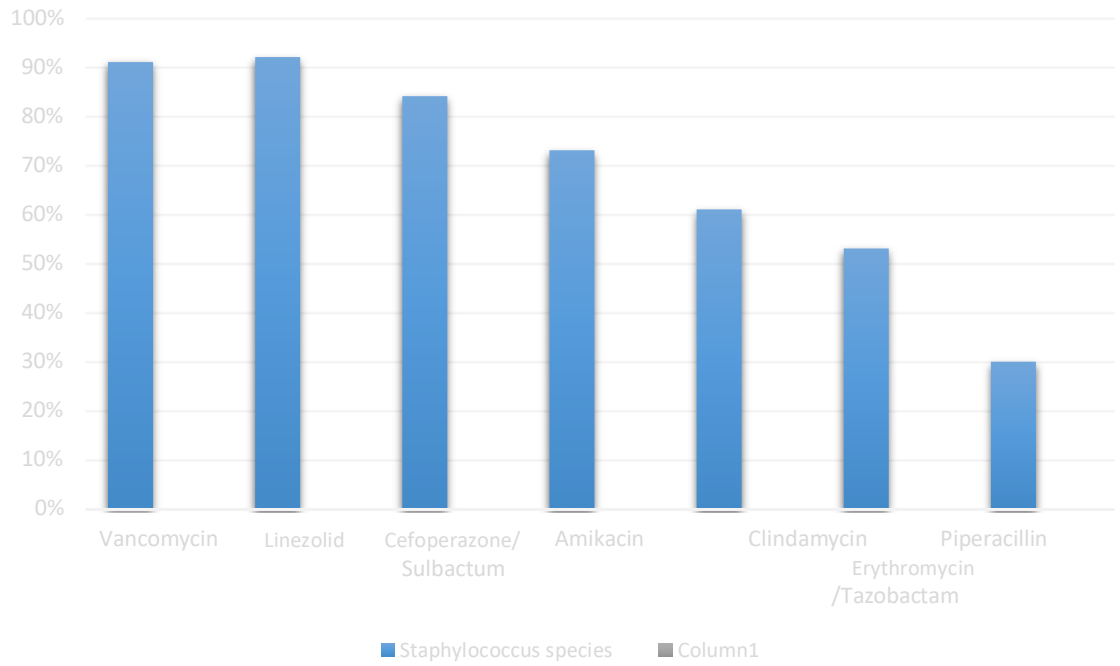


Table 3: Antibiotic sensitivity pattern of Staphylococcus aureus.

Antibiotics	Staphylococcus species
Vancomycin	91%
Linezolid	92%
Cefoperazone/ Sulbactum	84%
Amikacin	73%
Clindamycin	61%
Piperacillin /Tazobactam	53%
Erythromycin	30%

Fig.1. show the Antibiotic sensitivity pattern of Staphylococcus aureus



Discussion:

The pathogenesis of infectious / inflammatory disease in the tonsils most likely has its basis in their anatomic location and their inherent function as organ of immunity, processing infectious material, and other antigens and then becoming, paradoxically, a focus of infection/inflammation. Several pieces of direct and indirect evidence

indicate that the palatine tonsils are continuously engaged in local immune responses to microorganisms. If the tonsillar lymphocytes became overwhelmed with this persistent stimulation they may be unable to respond to other antigens; the immunological response, particularly in recurrent tonsillitis, may then be impaired.(13).

Tonsillar hypertrophy is the enlargement of the tonsils, but without the history of inflammation. Hyperplasia itself is not a disease, but only a result of increased immunologic activity. It does not necessary be due to inflammation or tonsillitis.(14,15) As a norm, all cases that presented with recurrent / chronic tonsillitis, a throat swab was the first line of management. Normal bacterial flora present in the oral cavity and oropharynx were cultured in most cases and antibiotic therapy was instituted based on the results obtained from the cultures grown by the throat swab. Several studies have disapproved this theory.(14-19). The most common organisms that were found in the tonsillar core were Group A betahemolytic Streptococcus, S. aureus, H. influenzae and S.pneumoniae.18,19 This correlates to our study in that the most common organisms isolated from the core in cases of recurrent / chronic tonsillitis were S. aureus and H. influenza.(20,21)

Antibiotics and antimalarial usage prior to presentation were high. This practice has a dire consequences since studies have shown that varied proportion of treatment administered both at home and at facilities were faulty either in dosage or in timing(18). This poor antibiotic practices could contribute to the poor susceptibility of the isolates to the commonly used antibiotics, which about a decade ago recorded good susceptibility to the same isolates (22). In the study by (23,24), Beta Hemolytic *Streptococcus* and *Staphylococcus aureus* showed 100% susceptibility to azithromycin, but in this study, the same organisms showed 70% and 54.5% respectively. A loss in sensitivity of 30% and 46.5% respectively in an interval of

14 years. Although Imipenem and Levofloxacin showed a good susceptibility. These are relatively new drugs, imipenem has no oral preparations and levofloxacin is not a commonly used drugs, so difficult to abuse in the community. Furthermore, some commonly used non-anti-psuedomonal drug like Azithromycin was included in the sensitivity because it is among the antibiotics commonly used in treatment of upper respiratory tract infection (25-28). This observed change is of great concern with the new WHO report that very few antibiotics currently in development address the serious and growing threat of antimicrobial resistance to classes of priority pathogens identified by World Health Organization, according to the Global Antimicrobial Resistance Surveillance System (GLASS) (29).

Conclusion:

The proportion of the cultures that were positive of significant growth, the proportion of these positive isolates that were Streptococcus spp. and varied sensitivity pattern obtained underpinned the important to advocate for culture isolates and susceptibility pattern guided treatment. This is not only an efficient approach to management of acute tonsillitis, but also a strong approach towards effective implementation of antibiotic stewardship.

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