Fahad *J Pure Appl Microbiol,* **12**(**4**), 1855-1859 Dec. 2018
http://dx.doi.org/10.22207/JPAM.12.4.20

Print ISSN: 0973-7510; Online ISSN: 2581-690X

RESEARCH ARTICLE

Types of Aerobic Bacteria Isolated from Iraqi Patients with Acute Tonsillitis and their Susceptibility to Different Antibiotics

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Abstract

This study was designed to identify aerobic bacteria that cause acute supportive tonsillitis and to study their patterns of sensitivity to different antibiotics used in treatment of tonsillitis in Baghdad hospitals. A total of 312 tonsil swabs were collected; 262 swabs from patients suffering from acute supportive tonsillitis in Ear Nose Trachea department, 50 swabs from volunteers who have no tonsil infections (for comparative study among isolates). Sixty two swabs were discharged and the remaining 250 swabs were cultured on blood agar and chocolate agar plates and incubated at 37°C for 24 hours. Isolates were purified by frequent sub culturing and identified on the basis of their morphology, Gram staining, cultural characteristics and biochemical reactions. *Streptococcus pyogenes*, *Streptococcus pneumoniae, Staphylococcus aureus, Staphylococcus epidermidis, Staphylococcus intermedius, Haemophilus influenzae and Haemophilus parainfluenzae. Streptococcus pyogenes* as the predominant species, whereas *Haemophilus parainfluenzae* was isolated from only one patient. All bacterial isolates were tested for their sensitivity to a number of antibiotics commonly used in treatment of tonsillitis in Baghdad hospitals by disc diffusion method. *Streptococcus* and *Staphylococcus* species were sensitive to Cephalosporin, Ciprofloxacin, Chloramphenicol, Erythromycin and Vancomycin, moderately sensitive to Gentamycin and Penicillin (60%) and resistant to Ampicillin (100%). *Haemophilus* species were sensitive to Cephalosporin and Chloramphenicol, but resistant to Ciprofloxacin, Gentamycin and Ampicillin.

Keywords: Aerobic Bacterial Causative Agent of Acute Tonsilitis.

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(Received: 29 October 2018; accepted: 17 December 2018)

Citation: Hayfaa Mahmood Fahad, Types of Aerobic Bacteria Isolated from Iraqi Patients with Acute Tonsillitis and their Susceptibility to Different Antibiotics, *J Pure Appl Microbiol*., 2018; **12**(**4**):1855-1859. http://dx.doi.org/10.22207/JPAM.12.4.20

INTRODUCTION

Acute tonsillitis is caused by one of several possible types of bacteria or viruses and usually lasts for 6 days. It commonly affects children of 5-10 years age. Bacteria cause tonsillitis more frequently in older children and adults than in young children. *Staphylococcus aureus* and *Streptococcus pyogenes* are the most common bacteria that cause tonsillitis. *Haemophilus influenzae* is also a frequent cause of tonsil infection[1]. *Klebsiella pneumoniae*, *Streptococcus pneumoniae*, *Escherichia coli and Enterobacter* may also cause tonsillitis, however they are more prevalent in adults[2,3]. *S. pyogenes* is a natural colonizer of the human oropharynx mucous membrane and causes a wide range of diseases in humans. It is responsible for various skin infections such as impetigo contagiosa and erysipelas, and localized mucous membrane infections of the oropharynx (e. g. tonsillitis and pharyngitis)[4]. Recurrent acute tonsillitis is a major medical and social problem, which, if antimicrobial treatment fails, leads to tonsillectomy[5]. For medical treatment of streptococcal tonsillopharyngitis, the recommendations for injectable penicillin and oral erythromycin are downgraded. First choice remains penicillin V but there is increasing acceptance of once-daily amoxicillin. Streptococcal pharyngitis is still a major infectious disease seen in pediatric office practice. The main job of the practitioner is to make an accurate diagnosis and provide appropriate treatment in timely fashion in order to prevent acute rheumatic fever[6].

In this study we tried to identify aerobic bacteria isolated from patients suffering from acute suppurative tonsillitis and determine their susceptibility to antibiotics. The study samples were from patients of different sex and age groups suffering from acute and recurrent supportive tonsillitis and residing in different areas of Baghdad. Healthy individuals were included to compare types of bacteria isolated.

MATERIAL AND METHODS

Bacterial isolates

Two hundred and sixty two throat swabs were collected from different patients who were clinically diagnosed as having tonsils infections with purulent discharges in (E.N.T), teaching hospital, in Baghdad.

Fifty Throat swabs were collected from volunteers who had no tonsils infections. Samples were immediately transferred to the laboratory and streaked directly on blood agar and chocolate agar, which were incubated aerobically at 37°C for 24 hours. The primary isolates were sub cultured on crystal violet blood agar, blood agar, chocolate agar, McConkey agar, and Mannitol salt agar; for purification and identification, isolates were examined for their Gram stain reaction and biochemical characteristics according to Barrow and Feltham[7], Ochei and Kolhatkar[8], and Cheesbrough[9].

Susceptibility of isolated bacteria to different antibiotics

All isolates were tested for sensitivity to the following antibiotics (commercial discs from Himedia laboratories Pvt Limited Mubai India): Penicillin (10 units), Vancomycin (30mcg), Gentamicin (10 mcg), Ampicillin (l0mcg), Erythromycin (15mcg), Ciprofloxacin (l0mcg), Chloramphenicol (30mcg), Cephalosporin)30mcg) Using disc diffusion technique. The diameters of zones of inhibition were used to classify isolates as sensitive, intermediate, or resistant according to the recommendations of the National Committee for Clinical Laboratory Standard[10].

RESULTS

One hundred fifty three patients (79%) were suffering from recurrent acute tonsillitis; while 37 (21%) patient were complained from first acute tonsillitis.

Bacteria Isolated from patients with acute suppurative tonsillitis; The organisms isolated were *Streptococcus species, Staphylococcus species and Haemophilus species*. (Table 1).

Bacterial isolates according to the age: Different species of bacteria isolated, in relation to age of patients (Table 2).

Bacterial isolates according to the gender: Different species of bacteria were isolated, in relation to sex of patients (Table 3).

The following species were identified: Forty-one strains of a *Streptococci*: 32 strains *S. mutans* and 9 strains *S. pneumoniae*, 29γ hemolytic strains of *S. salivarius*, 13 strains *Staphylococcus epidermidis*, 5 *Staphylococcus aureus,* 10 strains *Staphylococcus caprae*, 6 strains *Haemophilus parainfluenzae*.

Table 1. species of bacteria isolated from patients with acute suppurative tonsillitis.

Bacteria isolated	Number	Percentage
Streptococcus species	194	88.6 %
Staphylococcus species	21	9.6 %
Haemophilus species	4	1.8 %
Total	219	100 %

Sensitivity to antimicrobial agents

All bacterial isolates were tested for their sensitivity to a number of antibiotics commonly used in treatment of tonsillitis in Baghdad hospitals by disc diffusion method results (Table 4).

Table 2. Frequency of organisms isolated according to the age.

Isolates	Total No.	Children		Adult	
		No.	Percentage	No	Percentage
Streptococcus species	194	113	58.2 %	81	41.8 %
Staphylococcus species	21	10	47.6 %	11	52. 4 %
Haemophilus species	4	4	100 %	00	00 %

Table 3. Frequency of organisms isolated according to the gender.

Isolates	Total No.	Children		Adult	
		No.	Percentage	No	Percentage
Streptococcus species	194	40	20.6 %	154	79.4 %
Staphylococcus species	21	8	83.1 %	13	61. 9 %
Haemophilus species	4	4	100 %	00	00 %

Table 4. percentage of the sensitivity of bacteria isolated from patients with acute suppurative tonsillitis to different antimicrobial agents.

Isolates	No.	Types of antibiotic and percentage of resistance and sensitivity							
		Penicillin		Erythromycin		Ciproflxacin		Vancomycin	
		S%	R%	S%	R%	S%	R%	S%	R%
S. Pyogenes	188	60.6	25.6	81.9	12.2	87.8	8.0	81.4	13.8
S. Pneumoniae	6	50	16.7	83.3	16.7	66.6	16.7	16.7	50
Staph. aureus	15	6.7	86.6	80	13.3	66.7	20	80	13.3
Staph. epidermidis	3	66.7	33.3	100	00	100	00	100	00
Staph. intermedius	3	00	100	100	00	100	00	100	00
H. influenza	3	00	100	66.7	33.3	00	33.3	00	66.7
H. Parainfluenzae	3	00	00	100	00	100	00	100	00

DISCUSSION

In this study the isolated bacteria from patients with acute suppurative tonsillitis were streptococcus species (88.6%), which included *Streptococcus pyogenes*, the predominant (96.9%) (n = 188). Sun. *et al.,*[11], in their study in Taipei, Taiwan; found that the most common causes of acute suppurative bacterial tonsillitis in children was group A -hemolytic streptococci (*S. pyogenes*). The other isolated species of streptococci was *S. pneumoniae* which can be found in the nasopharynex of many healthy individuals[12]. However, Pyatkin, et al.,[13] reported that *S. pneumoniae* might cause tonsillitis; in this

study it was isolated in less frequency (3.1%). Streptococcus species were more common in children than in adults, (58.2%) (n = 113), (41.8%) (n = 81) respectively; (*S. pyogenes* 58% in children, 42% in adults; and *S. pneumoniae*, 66.7% in children, and 33.3% in adults). This result is similar to that obtained by Walsh *et al*,[14], who reported that *S. pyogenes* was found in around 55-70% in children up to 15 years of age, and only in 5% of adults over 35 years of age.

In recurrent tonsillitis, the pathogen may vary with the age of the patient and geographical locations[15,16]. *Staphylococcus species* remain an important component of commensal flora. They are opportunistic pathogens and some of the species isolated in this study are known to cause tonsillitis. *Staphylococcus aureus*, was predominant (71.4%) (n = 15) which is in agreement with Timon, *et al*.,[17] and it is considered second to *S. pyogenes* in attacking tonsils[18]. *Staph, epidermidis* and *Staph, intermedius* were isolated from (14.3%) (n = 3) of samples. These organisms were found more common in females than in males in proportions of (61.9%), and (38.1%) respectively and in more in adults (52.4%) than in children (47.6%). Other organisms isolated were *Haemophilus species*. All *Haemophilus species* isolated were from male children only. Cheesbrough[9], reported that some species of Haemophilus are normally found in the upper respiratory tract as a part of normal flora.

In our study we observed that females were, more predominantly, afflicted by *Streptococcus species* than males with a ratio of 4:1, despite the fact that there is no difference in the incidence of streptococcal infections in both sexes. Also, they were afflicted by *Staphylococcus species* more frequently than males in a ratio of 1.6:1. In fact, *Haemophilus species* were not isolated from females; they were all isolated from male children. However, no satisfactory explanation to this sex difference distribution could be stated. It was found that Children were, more predominantly, afflicted by *Streptococcus species* than adults, and both groups of age are semi-equally afflicted by *Staphylococcus species.*

Antimicrobial sensitivity testing revealed that *Streptococcus and Staphylococcus species* were sensitive to Cephalosporin, Ciprofloxacin, Chloramphenicol, Erythromycin and Vancomycin, moderately sensitive to Gentamycin and Penicillin (60%) and resistant to Ampicillin (100%). *Haemophilus species* were sensitive to Cephalosporin and Chloramphenicol, but resistant to Ciprofloxacin, Gentamycin and Ampicillin.

All isolates were found sensitive to Cephalosporin and Chloramphenicol (95.9%). Cephalosporin was more effective than Penicillin and all other drugs. This is in agreement with Pichichero et al.[19], who made randomized single blind evaluation of Cefadroxil and Phenoxymethyl Penicillin in the treatment of streptococcal pharyngitis. Their results suggested that Cephalosporin was more effective than Penicillin in the treatment of GABHs pharyngitis. Pichichero[20], studied explanations for Penicillin therapy failures in streptococcal pharyngitis. His results stated that Cephalosporin was more effective than Penicillin. Although Penicillin continues to be the recommended treatment for acute and recurrent tonsillitis, in our studies Penicillin proved to be the second drug since all strains isolated showed high resistance to it. On the other hand, as it is known, Erythromycin was an alternative treatment to Penicillin. In our results Erythromycin was more effective than Penicillin. According to Kelley, et al.,[21] Erythromycin is still remains the drug of choice for streptococcal throat infection. Their findings explained that no isolates were fully resistant to Erythromycin. Since Erythromycin is a popular alternative therapy for GABHs, the prevalence of resistant organisms in the community is important. Increasing rates of Erythromycin resistance have recently been reported. In Finland, rates of Erythromycin resistance as high as 24% had been demonstrated[22], In our study 40 patients received Erythromycin course, 20 of patients (50%) were recovered, although in disc diffusion method 84.4% of isolates were sensitive to Erythromycin, 4.6% were intermediate and only 11% of isolates were resistant. Also 64 patients received Ampicillin course none of them were recovered, in accordance to the results provided by sensitivity test (96.3% of isolates were resistant to Ampicillin). Antibiotic resistance has increased dramatically over the past 10 years. In many countries, penicillin resistance to *Streptococcus pneumoniae* is nearly 50% with resistance to other drugs rising as well[23]. Several explanations have been proposed for the failure of antibiotic in treatment of tonsillitis, but we suggested that

lack of compliance might be the first response of treatment failure. Despite antibiotics extraordinary value, the misuse and overuse of those miracle drugs in medicine endangers their continued effectiveness. The more antibiotics are used the more likely that bacteria will develop mechanisms to evade them[24].

CONCLUSION AND RECOMMENDATIONS

Our study confirms the findings of previous studies that *S. pyogenes* was the most probable causative agent of tonsillitis. In communities with a high incidence of penicillin failure, alternative antimicrobials should be considered. Cephalosporin and extended-spectrum macrolides represent logical options because of their demonstrated efficacy and safety.

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