

## Bacterial tonsillar microbiota and antibiogram in recurrent tonsillitis.

Babaiwa U.F.<sup>1</sup>, Onyeagwara N.C.<sup>2</sup> Akerele J.O.<sup>1</sup>

<sup>1</sup>Department of Pharmaceutical Microbiology, Faculty of Pharmacy, University of Benin, Benin City .Nigeria.

<sup>2</sup>Department of Surgery, School of Medicine University of Benin, Benin City, Nigeria.

### Abstract

The study of bacterial flora implicated in patients with recurrent tonsillitis in a Teaching, Tertiary Institution was carried out; to identify the main organisms responsible for tonsillitis, their sensitivity and resistance to antibiotics. At tonsillectomy, swabs of Surface and core tonsillar materials were taken and cultured, bacteria isolated were identified and their antibiogram determined using standard laboratory techniques. The most frequently isolated organisms were *Staphylococcus aureus* (70%) which was found to be the principal causative agent across all ages. *Streptococcus pyogenes* and *Pseudomonas aeruginosa* accounted for 14% and 2% respectively and were most frequently isolated in children from 0-6 years. This study demonstrated a marked difference between surface and deep core microflora of the tonsil in 20 patients, while in 40 patients there were no significant difference. All bacterial isolates were resistant to amoxicillin, amoxicillin /clavulanic acid and erythromycin to different degrees. Ciprofloxacin, gentamicin and cotrimoxazole; were moderately effective against the aetiologic tonsillar agents. Continuous surveillance on antimicrobial susceptibility of tonsillar materials is essential for detection of emerging trends and use of appropriate therapeutic interventions.

**Keywords:** Tonsillitis, antibiotics, antibiogram, *Streptococcus pyogenes* and *Pseudomonas aeruginosa*

Accepted December 27 2012

### Introduction

The tonsils are two tissue balls located at the back of the throat, usually associated with the control of infections in humans; they are susceptible to infection by: viruses, bacteria, Chlamydia and fungi; a condition known as tonsillitis [1].

Acute tonsillitis is one of the most common manifestations of the upper respiratory tract infections. It is common in children and considered to be the third most frequently diagnosed disease in paediatric medicine. The highest incidence occurs between 4-5 years; while school children between the ages of 6 and 12 years are highly predisposed. Its occurrence in elderly has been described as unusual [2].

Most patients who present with symptoms of acute tonsillitis experience only a limited disease course, a substantial portion of them receive pharmacologic treatment. The treatment of choice is Penicillin. Other antibiotics used in treatment, are amoxicillin, amoxicillin-clavulanic acid, macrolides, clindamycin or cephalosporines [3]. Research

shown that antibiotics are prescribed for approximately three quarter of patients with tonsillitis in the United States of America (USA) [4].

The prophylactic use of these drugs has not fully prevented and eradicated bacterial invasion, recrudescence occur requiring tonsillectomy, a procedure performed on approximately 800,000 patients annually [5-7].

Increasing data from reports suggest that bacteria, other than Beta haemolytic Streptococci may cause tonsillitis [8,9].

The microorganisms that cause this infection are undergoing constant changes with respect to their isolation and bio physiological features. Typically, patients who undergo tonsillectomy by way of intervention have been treated with multiple courses of antibiotics that failed to eradicate the infection completely or have had multiple recurrences of a presumed 'new' infection.

As part of the efforts to unravel the causes of these treatment failure and frequent recrudescence this study is de-

signed to identify the etiologic bacteria from tonsillar tissues of patients that have undergone tonsillectomy, following recurrent tonsillitis and determine their antibiogram.

## Method

### Study design.

This was a prospective study of consecutive patients undergoing tonsillectomy for recurrent tonsillitis at the University of Benin Teaching Hospital (UBTH) Benin City, Nigeria. Approval for this study was obtained from UBTH Institutional ethical review board and verbal informed consent was obtained from all patients after being briefed about the study.

### Study sample

All patients who presented to otolaryngology Department from August 2010-December 2011, for tonsillectomy following recurrent tonsillitis were included. All patients who came for tonsillectomy due to obstructive (not infectious), reasons were excluded. Seventy five patients including forty males and thirty five females with recurrent tonsillitis were used. Their ages range from 2-46years, mean age was 6years.

### Specimen collection and analysis

All specimens were collected at the time of surgery .After the induction of anaesthesia independent sterile swab

sticks were rubbed vigorously on the right and left tonsillar surface of each patient to obtain culture specimen.

Immediately after the tonsillectomy independent sterile swabs sticks were rubbed on the interior of the right and left tonsils to obtain the tonsillar deep culture. A total of 300 swabs from 75 patients were collected and immediately streaked onto different agar plates (blood agar, chocolate agar and Mac Conkey agar). The plates were observed for culture growth after 24hours of aerobic incubation. Susceptibility test of the isolates was carried out with agar diffusion assay according to the modified Kirby Bauer method [10]. The antibiotics used were selected based on the current first line drugs in the guideline of antibiotics usage in the study area.

The diameter of zones of inhibition obtained, were interpreted using the CLS I standard [11].

## Results

The 75 patients enrolled in the study included 40 males and 35 females; mean age of 6years; age range 2-46years. Fifty (50) patients were being treated with amoxicillin clavulanic acid, 10 patients with erythromycin antibiotics prior to admission. 15 patients had no antibiotics prior to admission. The recorded duration of symptoms was between 1-8years.

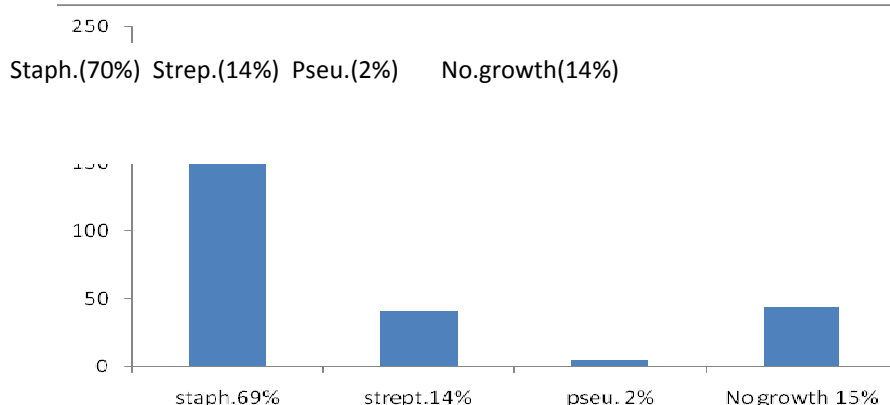


Figure 1. Microbiota of Tonsillar material (total number and percentage)

Table 1. Antibiotic susceptibility pattern of Staphylococcus aureus (n = 210)

Antibiotics	Sensitivity		Resistance	
	No of Isolates	Percentage	No of Isolates	Percentage
cotrimoxazole	111	53	99	47
Ciprofloxacin	170	81	40	19
Gentamicin	162	77	48	23
Erythromycin	19	9.0	191	91
Amoxicillin-Clavulanic acid	23	11	187	89
Amoxicilin	0	0	210	100

**Table 2.** Antibiotic susceptibility pattern of *Streptococci pyogenes* isolates (n = 42)

Antibiotics	Sensitivity		Resistance	
	No of Isolates	Percentage	No of Isolates	Percentage
cotrimoxazole	29	69	13	31
Ciprofloxacin	36	85	6	15
Gentamicin	25	60	17	40
Erythromycin	16	38	25	62
Amoxicillin-Clavulanic acid	6	14	36	86
Amoxicilin	0	0	42	100

Source: CLSI, 1995.

**Table 3.** Antimicrobial susceptibility pattern of *Pseudomonas aeruginosa*.(n=6)

Antibiotics	Sensitivity		Resistance	
	No of Isolates	Percentage	No of Isolates	Percentage
cotrimoxazole	2	33	4	67
Ciprofloxacin	6	100	0	0
Gentamicin	6	100	0	0
Erythromycin	0	0	6	100
Amoxicillin-clavulanic acid	0	0	6	100
Amoxicilin	0	0	6	100

**Table 4.** Distribution of bacterial isolates according to age group.

Bacterial isolate	Age group in years				
	0 - 6	7 – 13	14 - 20	21 - 27	>27
Staph	78	47	8	4	7
Strep	29	10	0	0	2
Pseu	6	1	0	0	0
No growth	28	9	0	0	5

***This article may be cited as:***

Babaiwa UF, Onyeagwara NC. Akerele JO. Bacterial tonsillar microbiota and antibiogram in recurrent tonsillitis. *Bio-medical Research* 2013; 24 (3): 298-302.

The most commonly isolated microorganisms (Figure 1) were *Staphylococcus aureus* (70%) *Streptococcus pyogenes* (14%) and *Pseudomonas aeruginosa* (2%). A total of 42 (14% ) cultured specimen showed no growth. This study demonstrated a marked difference between the surface and the deep-seated microflora in 20 patients. However, deep and surface culture isolates were found to be identical in 40 patients. In 6 patients the result of their right and left deep core tonsillar materials showed no growth. There was no growth from the tonsillar material obtained from six of the patients.

## Discussion

This study has shown the aerobic bacteria in tonsillar tissues of patients who presented for tonsillectomy in a

Teaching hospital and their antibacterial susceptibility pattern. *Staphylococcus aureus* was found to be the principal causative agent of tonsillitis in all age groups from this study. We found in this study a high incidence of *Staphylococcus aureus* (70%),as against *Streptococcus pyogenes* (14%),which were the traditional and often encountered etiologic agent in tonsillar infection. Our data are similar to some earlier reports where *Staphylococcus aureus* was the most frequently isolated organisms accounting for 29.3% followed by *Streptococcus pyogenes* 23.4% [12,13]. The microorganisms most frequently isolated among patients (0-6years) were *Pseudomonas aeruginosa* (100%) and *Streptococcus pyogenes* (29%).

In 20 patients, there was significant difference in bacterial isolates obtained from the tonsillar core (where most of

the sites were colonised with more than one organism) compared with that on the surface that were seldomly colonised by more than one organism. This is in line with previous studies where pathogenic microorganisms from the interior of the tonsil were different compared with surface bacteria in 48 patients [14]. Surface and core isolates were however, found to be similar in 40 patients; contrary to previous studies.

The susceptibility of the three principal microorganisms isolated showed that 81% of *Staphylococcus aureus* was susceptible to ciprofloxacin, 77% to gentamicin, but were conspicuously resistant to amoxicillin and amoxicillin – clavulanic acid combination; these are drugs that have been routinely used in the management of recurrent tonsillitis in this environment. This observation is similar to that obtained by previous studies; where *Staphylococcus aureus* had sensitivity of 88%, 73% to ciprofloxacin and gentamicin respectively [15]. It was also observed that *Streptococcus pyogenes* was sensitive to ciprofloxacin (85%), cotrimoxazole (69%), gentamicin (60%) and moderately sensitive to erythromycin (38%), but resistant to amoxicillin and its combination with clavulanic acid (Table 11). This is contrary to previous studies, where a sensitivity of close to 100% was recorded for amoxicillin. The observed resistance of *Staphylococcus aureus* and *Streptococcus* species to erythromycin could be partly explained by the fact that erythromycin was used as an alternative treatment of choice for infection caused by these agents in patients with hypersensitivity to penicillin [16].

The susceptibility profile showed that ciprofloxacin and gentamicin should be the treatment of choice for the recurrent tonsillitis in this area of study, as previously observed by workers where *Pseudomonas aeruginosa* and other aetiologic agents were highly sensitive to gentamicin and ciprofloxacin [17]. The use of ciprofloxacin in children should be seldom encouraged since this is contraindicated in such group of patients. The use of amoxicillin or amoxicillin – clavulanic acid combination as first choice drugs in recurrent tonsillitis should be discouraged as our data have shown increasing resistance of the aetiologic agents in recurrent tonsillitis in our setting. Our study has shown the imperative of continuous surveillance of antimicrobial susceptibility generally and in particular of tonsillar materials for early detection of emerging resistance trends and adjustment and usage of appropriate therapeutic interventions. Efforts would be made to evaluate possible anaerobic infectious agents associated with tonsillar materials in our future investigations. The possible role of fungi and viruses was not within the purview of this study.

## References

1. Eltonjohn24.Freechilddevelopment.com 2011.

2. Piedrola DM, Montiel NQ, Lopez IR, et al. Present situation of antibiotic resistances in tonsillar infections. *Acta Otorrinolaringol Esp* 2006; 57: 171-175.
3. Gaffney RJ, Cafferkey MT. Aetiology of normal and diseased tonsils assessed by fine-needle aspiration: *Haemophilus influenzae* and the pathogenesis of recurrent acute tonsillitis. *Clin Otolaryngol* 1998; 23: 181-185.
4. Richelle JC, Jerome RH, John GB, et al. Principle of appropriate antibiotic use for acute pharyngitis in Adults. *Ann Intern Med* 2001; 134: 6509-6517
5. Garcia de Lomas J, Gimeno C, Diez J, et al. Garcia – Ponte Ly Grupo Espanol para el Estudio de la Sensibilidad a Macrolidos en la Atencion Primaria. Sensibilidad a eritromicina y claritromicina de aislados de *Streptococcus beta-hemoliticos* de grupo A productores de faringoamigdalitis en la edad pediatrica: estudio multicentrico en la Atencion Primaria. *Enferm Infecc Microbiol Clin* 1999; 17: 24-28.
6. Gene A, Gonzalez-Cuevas A, Juncosa T, et al. Sensibilidad antibiotica de *Streptococcus pyogenes* en pediatria. *Enferm Infecc Microbiol Clin* 1998; 16: 272-274.
7. Bisno AL. Pharyngitis. In *Principle and Practice of Infectious Disease*, de Mandell GL, Bennett JE, Dolin R. Elsevier/Churchill Livingstone. 6<sup>th</sup> Ed. 2005: 752-758.
8. Paradise JL. Etiology diagnosis and antimicrobial treatment of Pharyngitis and pharyngotonsillitis. *Ann Otolrhinol Laryngol*. 1981; 90 (suppl 84): 75-78.
9. Brook I. Tonsillitis, in Brook I (ed): *Anaerobic Infection in Childhood*, Boston, GK Hall, 1983, pp 156-175.
10. Bauer AW, Kirby WM. Antibiotic susceptibility testing by standardized single disk method. *Am J Clin Pathol* 1966; 45: 493-496.
11. National committee for clinical laboratory standards (now CLSI). Performance standard for antimicrobial disk susceptibility Test. NCCLS document M2-A8. Wayne, Pa: National committee for clinical laboratory standard. 2003.
12. Kocaturk S, Demiray T, Incesulu A. et al. Comparison of adenoid and tonsil core cultures in chronic adenotonsillitis. *Kulak Burun Bogaz Ihtis Derg* 2003; 10: 105-109.
13. Mitchelmore IJ, Reilly PG, Hay AJ, et al. Tonsil surface and core cultures in recurrent tonsillitis: prevalence of anaerobes and beta-lactamase producing organisms. *Eur J Clin Microbiol Infect Dis* 1994; 13: 542-548. recurrent tonsillitis. *The Journal of Laryngology and Otology* 2007; 91: 911-913.
14. Rosen G, Samuel J, Vered I. Surface tonsillar microflora versus deep tonsillar microflora in recurrent tonsillitis. *The Journal of Laryngology and Otology*. 2007; 91: 911-913.
15. Omololu-Aso J, Kolawole DO, Omololu OO et al. Antibiotics sensitivity pattern of *Staphylococcus aureus* from fomites in the Obafemi Awolowo University Teaching Hospital Complex (OAUTHC) Nigeria. *International Journal of Medical Sciences*. 2011; 3(2): 32-36.
16. Low DE. Antimicrobial drug use and resistance among respiratory pathogens in the community. *Clin Infect Dis*. 2001; 33(suppl.3):206-213.

- 17 Adedeji GB, Fagade OE, Oyelade AA. Prevalence of *Pseudomonas aeruginosa* in clinical samples and its sensitivity to citrus extract. *African Journal of Biomedical Research* 2007; 10 (2): 183-187.

**\*correspondence to:**

Babaiwa U.F.  
Department of Pharmaceutical Microbiology  
Faculty of Pharmacy, University of Benin  
Benin City, Nigeria.