

ANTIBIOGRAM OF PHARYNGEAL ISOLATES OF CHILDREN WITH PHARYNGOTONSILLITIS IN A SPECIALIST HOSPITAL IN GUSAU, NORTH-WESTERN NIGERIA

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ABSTRACT

Introduction: Pharyngotonsillitis is one of the common childhood infections caused by bacteria in 30 to 40% of cases. Bacterial causes are important due to the non suppurative sequelae caused by *Streptococcus pyogenes* and also associated complications. These microorganisms undergo constant changes and antibiotic resistance have been reported. **Objective:** To document organisms isolated from throat swab microscopy and culture with their antibiotic susceptibility pattern in children diagnosed with pharyngotonsillitis. **Methodology:** This was a retrospective analysis of throat swabs microscopy, culture and sensitivity results of children aged 0-13 years with a diagnosis of pharyngotonsillitis over a four year period. **Results:** Of the 144 results reviewed; 120 samples yielded 122 isolates, giving a culture positive yield of 83.3%. Males were 81 (56.2%) with a M:F ratio of 1.3:1. Majority of the children were under fives (58.3%). Gram positive organisms were 118 (96.7%), with *Streptococcus pyogenes* being the commonest organism isolated (79.5%), followed by *Staphylococcus aureus* (13.9%). Gentamicin (85.0%), Ofloxacin (64.2%) and Augmentin (51.7%) had the highest susceptibility rate, while the least was seen with Cefixime, Tetracycline, Levofloxacin and Netillin. *Streptococcus pyogenes* and *Staphylococcus aureus* were susceptible to Gentamicin and Ofloxacin, while all the *Streptococcus pneumoniae* were susceptible to Gentamicin. Multi drug resistance was seen with *Providencia spp* and *Serratia marcescens*. **Conclusion:** *Streptococcus pyogenes* was the commonest organism and Gentamicin, Ofloxacin and Augmentin were the antibiotics with the highest susceptibility. Gram negative organisms display high rate of multidrug resistance. Gentamicin could be considered as an option or an adjunct in the treatment of pharyngotonsillitis

Keywords: Antibiotics, Children, Susceptibility, Organisms, Pharyngotonsillitis

INTRODUCTION

Pharyngotonsillitis is one of the common childhood infections^{1,2} and it is mostly caused by viruses,^{1,2} however in about 30 to 40% of cases, bacteria have been implicated.³ Bacterial causes are important due to the non suppurative complications like rheumatic fever and glomerulonephritis caused by *Streptococcus pyogenes* (a group A β - haemolytic Streptococcus).^{1,2,4} *Streptococcus pyogenes* has been identified as the most frequent bacterial cause of pharyngitis globally.^{1,3-5} Nevertheless, it should be considered that not all the bacteria, viruses and fungi are harmful, some belong to the healthy flora.⁶ However, up to 10% of healthy children have been shown to be carriers of *Streptococcus pyogenes* on the tonsils with no clinical signs.⁶

The microorganisms causing pharyngotonsillitis are undergoing constant changes with respect to their isolation.⁷ Antibiotic resistance by organisms causing

pharyngotonsillitis have being reported.^{8,9,10}

There are few reports from Nigeria on organisms causing pharyngotonsillitis in children and their antibiogram profile.^{1,7,10} There have been no report on the organisms causing pharyngotonsillitis and their antibiotic susceptibility pattern in children in Gusau, Zamfara State, North-Western Nigeria. The justification for the study is to fill the existing knowledge gap. The objective of this study is to document organisms isolated from throat swab microscopy and culture with their antibiotic susceptibility pattern in children diagnosed with pharyngotonsillitis.

MATERIALS AND METHOD

This was a retrospective analysis of throat swabs microscopy, culture and sensitivity results of children aged 0-13 years with a clinical diagnosis of pharyngotonsillitis seen at Ahmad Sani Yariman Bakura Specialist Hospital (ASYBSH), Gusau, Zamfara State, North-Western Nigeria. The study covered a four year

period from 1st May 2013 to 30th April 2017. The microbiology laboratory unit patient registration books were used to retrieve patient information which included age, gender, isolated organisms from throat swab, their antibiotic susceptibility and resistance pattern. Isolation of viruses is not done in our hospital, as facilities are not available.

Isolation and identification of bacteria in ASYBSH, Gusau

All specimen collected were subjected to Gram stain and were inoculated on blood, chocolate and MacConkey agar plates. The plates of Blood and MacConkey were placed in an aerobic incubator while the chocolate plate was incubated in a carbon-dioxide enriched atmosphere for 18-24 hours after which the plates were read and isolates identified according to standard bacteriological methods. Zone diameters of inhibition around each disc were measured using a calibrated ruler and interpreted according to Clinical and Laboratory Standard Institute (CLSI) guidelines.^{11,12}

Antibiotic susceptibility testing

Disk diffusion assay was performed to assess the antibiotic susceptibility and resistance pattern of bacterial isolates. Selection of these antibiotics was based on availability of the disc in the laboratory. Abtek biological ltd disc one consisted of Ceftriaxone (30 μ), Cefuroxime (30 μ), Gentamicin (10 μ), Cefixime (5 μ), Ofloxacin (5 μ), Augmentin (30 μ), Nitrofurantoin (300 μ) and Ciprofloxacin (5 μ). While Himedia disc consisted of Ceftriaxone (30 μ), Gentamicin (10 μ), Co-trimoxazole (25 μ), Levofloxacin (5 μ), Neticillin (30 μ), Tetracycline (30 μ), Amoxycylav (30 μ) and Ofloxacin (5 μ). For the purpose of the study, results of Augmentin and Amoxycylav would be reported as Augmentin (both contain Amoxycillin clavulanic acid).

Results were reported as sensitive or resistant according to CLSI 2015 guide lines. An isolate was defined as being multidrug resistant if it is resistant to three or more of the antibiotic agents tested and based on the antibiotic categories as stated by Magiorakos et al.¹³

Ethical Approval

The ethical committee of the ASYBSH, Gusau, Zamfara State granted ethical approval for the study.

Statistical Analysis

The data obtained were checked, entered and analyzed using statistical package for social sciences (SPSS) version 20.0 (Chicago Illinois). Descriptive statistics was used to describe the frequency of continuous variables and are presented in tables. The Fisher's exact test was used to measure the association between qualitative variables. A p value of < 0.05 was considered to be statistically significant.

RESULTS

A total of 144 laboratory results were reviewed, of which there were 122 bacterial isolates from 120 samples while 24 samples yielded no growth. This gives a culture positive yield of 83.3% from the total samples. There were more males 81 (56.2%) than females 63 (43.8%), giving a M:F ratio of 1.3:1, which was significant (Fisher's exact =0.043). The mean age was 50.11 \pm 36.00 months, with a range of 1 month to 13 years. Majority of the children were 5 years and below as shown in table 1.

Table 1: Age range of study population

Age range (years)	Frequency	Percentage
<5	84	58.3
5-<10	43	29.9
10-13	17	11.8
Total	144	100.0

Up to 118 (96.7%) of the isolates were Gram positive, and two each (1.6%) were Gram negative and fungal agents respectively.

Streptococcus pyogenes was the commonest organism isolated accounting for 79.5%, followed by *Staphylococcus aureus*. *Candida spp* was isolated in two children whom were all males, while there were only two samples with mixed isolates. Table 2 shows the distribution of the isolates according to gender.

Table 2 : Distribution of isolates according to gender

Isolate	Males	Females	Total (%)
<i>Streptococcus pyogenes</i>	57	40	97(79.5)
<i>Staphylococcus aureus</i>	09	08	17(13.9)
<i>Streptococcus pneumoniae</i>	03	01	04(3.3)
<i>Providencia spp</i>	01	00	01(0.8)
<i>Serratia marcescens</i>	01	00	01(0.8)
<i>Candida spp</i>	02	00	02(1.6)
Total	73	49	122(100.0)

2 samples had multiple isolates

Gentamicin, Ofloxacin and Augmentin had the highest susceptibility rate, while the least susceptibility was seen with Cefixime, Tetracycline, Levofloxacin and Netillin as shown in Table 3 below.

Table 3: Bacteria specific antibiotic susceptibility pattern.

Antibiotic	Total bacterial isolates no (%)					Total 120
	<i>S. pyogenes</i> 98	<i>S. aureus</i> 17	<i>s.pneumoniae</i> 3	<i>Serratia</i> 1	<i>Providencia</i> spp1	
GEN	71(72.4)	14(82.4)	3(100.0)	0(0.0)	0(0.0)	88(85.0)
OFL	60(61.2)	14(82.4)	2(66.7)	1(100.0)	1(100.0)	77(64.2)
AUG	53(54.1)	8(47.1)	1(33.3)	0(0.0)	0(0.0)	62(51.7)
CTZ	29(29.6)	8(47.1)	2(66.7)	0(0.0)	0(0.0)	39(32.5)
CIP	49(50.0)	6(35.3)	1(33.3)	0(0.0)	0(0.0)	56(46.7)
CRX	22(22.5)	5(29.4)	1(33.3)	0(0.0)	0(0.0)	28(23.3)
CEF	7(7.1)	1(5.9)	0(0.0)	0(0.0)	0(0.0)	8(6.7)
LEV	7(7.1)	3(17.6)	0(0.0)	0(0.0)	0(0.0)	10(8.3)
NET	5(5.1)	2(11.8)	0(0.0)	0(0.0)	0(0.0)	7(5.8)
TCN	11(11.2)	1(5.9)	0(0.0)	0(0.0)	0(0.0)	12(10.0)
NIT	21(21.4)	5(29.4)	1(33.3)	0(0.0)	0(0.0)	27(22.5)

no= number %=percentage GEN=Gentamicin OFL= Ofloxacin AUG= Augmentin CTZ=Ceftriaxone CIP=Ciprofloxacin CRX=Cefuroxime CEF=Cefixime LEV=Levofloxacin NET=Neticillin TCN=Tetracycline

Streptococcus pyogenes and *Staphylococcus aureus* were highly susceptible to Gentamicin and Ofloxacin, while all the *Streptococcus pneumoniae* were susceptible to Gentamicin. *Providencia spp* and *Serratia marcescens* were found to be multidrug resistant.

DISCUSSION

This study has demonstrated the pattern of bacterial isolates from throats of children with pharyngotonsillitis in Gusau, Zamfara State, North-Western Nigeria. Majority of the children were males which is similar to findings by Sadoh *et al*¹ and Akinnibosun *et al*¹⁰ all from Benin but in contrast to findings by Kushwaha *et al*⁴ from India. Majority of the children were under fives, similar to the findings by Sadoh *et al*¹ and Babaiwa *et al*,⁷ however contrasting findings by Akinnibosun *et al*.¹⁰ The reason why majority were of this age group may be due to the

fact that they are susceptible to infections because their immune system is not well established. This could also be related to early exposure to some of these organisms in playing grounds, nursery and Islamic schools, and filthy environment. Sadoh *et al*¹ work had a similar age range of 3 months to 16 years, although the Babaiwa *et al*⁷ study was conducted in 2 to 46 years age range and in patients who were to have tonsillectomy. The reason for the disparity from the Akinnibosun *et al*¹⁰ study may be because it comprised of both children and adults, and the ages of the children were between 6-14 years.

Our culture positivity rate of 83.3% was similar to 86.0% reported by Babaiwa *et al*⁷ in Benin, Nigeria but higher than 67% obtained by Bakir *et al* in Iraq^{2,14} and 53.4% by Sadoh *et al*¹ in Benin, Nigeria.

Gram positive organisms were the majority, similar to findings in Iraq^{2,14} and Benin.^{1,7,10} Only 1.64% of the isolates were Gram negatives, which contrasts the findings by Bakir *et al.*^{2,14} The reason for the disparity maybe due to different geographic location as different countries and localities have identified different organisms. From this study, 1.64% of isolates were fungi, which is lower than 4.3% reported by Bakir *et al.*^{1,14} from Iraq.

Streptococcus pyogenes was the commonest organism isolated, this is similar to findings by Sadoh *et al.*¹ but contrasting findings by Babaiwa *et al.*⁷ and Bakir *et al.*^{1,14} who both isolated *Staphylococcus aureus* as the commonest agent.

This organism has been shown to be prevalent among school children.^{4,15} This bacteria has been reported to be responsible for 15-30% of cases of acute pharyngitis in children.^{15,16}

Staphylococcus aureus is a common organism implicated in this series accounting for 11.8%. This is similar to 12.83% reported by Sadoh *et al.*¹ It was the commonest organism reported by Babaiwa *et al.*⁷ and Bakir *et al.*^{1,14}

Streptococcus pneumoniae accounted for 2.1% of the isolates, which contrasts the findings in Jos,¹⁷ Nigeria where it accounted for over one third of bacterial isolates causing upper respiratory tract infections in children under the age of five years.¹⁷

Drug susceptibility measures the ability of the different antibiotics to inhibit bacterial growth.¹⁰ Gentamicin, Ofloxacin and Augmentin were the drugs with the highest susceptibility, however, quinolones are not used commonly in children. Variable susceptibility patterns have been reported by various authors. While Gentamicin and Augmentin were reported by Akinnibosun *et al.*¹⁰ to have the lowest susceptibility, all isolates in their study were found to be susceptible to

Ciprofloxacin. Babaiwa *et al.*⁷ reported that Ciprofloxacin, Gentamicin and Co-trimoxazole were of moderate susceptibility. However in their study, all isolates were resistant to Augmentin. Sadoh *et al.*¹ in their study reported 100% susceptibility to Cefuroxime and Gentamicin, with Co-trimoxazole having little or no susceptibility.

Streptococcus pyogenes, *Staphylococcus aureus* and *Streptococcus pneumoniae* were susceptible to Gentamicin, Ofloxacin and Augmentin with variable percentages, similar to other reports.^{1,7,10} *Serratia marcescens* has been reported by Kim¹⁸ and co-workers to be a multidrug resistant organism,¹⁸ which is similar to our findings. The low susceptibility observed by these organisms to different antibiotics could be explained by the increase misuse and abuse of antibiotics, self medication and use of fake drugs which can all lead to drug resistance.

CONCLUSION

From this study, it was observed that *Streptococcus pyogenes* was the commonest organism while Gentamicin showed highest sensitivity profile, followed by Ofloxacin and then Augmentin. Gram negative organisms display high rate of multidrug resistance. Despite the fact that Gentamicin had the highest susceptibility, it could be considered as an option or an adjunct in the treatment of pharyngotonsillitis only in children that have indication for parenteral route. However, Augmentin/ Amoxycylav given orally are alternatives to Gentamicin. Co-trimoxazole, Ceftriaxone and Cefuroxime commonly used antibiotics were moderately susceptible.

LIMITATIONS

The study being retrospective has the limitation of inability to identify children that had prior antibiotics and other clinical characteristics could not be obtained.

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