

MICROBIOLOGICAL PROFILE OF BACTERIAL CONJUNCTIVITIS IN IBADAN, NIGERIA

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SUMMARY

Objective: In bacterial conjunctivitis, clinical presentations are not diagnostic of the causative agent, therefore, microbiological analysis is mandatory for specific treatment option. This study was undertaken to determine the microbiology profile of bacterial conjunctivitis in our environment.

Methodology: This is a laboratory-based study carried out in the Medical Microbiology Laboratory of University College Hospital, Ibadan, Nigeria. Conjunctival swabs collected from 365 patients with clinically diagnosed conjunctivitis, were analysed by standard bacteriological methods.

Results: Bacterial pathogens were detected in 342 (93.7%) conjunctival samples while 23(6.3%) were sterile. Of the pathogens, 256 (74.9%) were *Staphylococcus aureus*, 35(10.2%) Coagulase- negative staphylococci, 22 (6.4%) *Pseudomonas aeruginosa*, 11(3.2%) *Escherichia coli*, 7(2.1%) *Klebsiella* species, 5(1.5%) *Streptococcus pneumoniae*, 4(1.2%) *Haemophilus influenzae*, 1(0.3%) *Proteus mirabilis* and 1(0.3%) *Neisseria gonorrhoeae*. The highest rate of conjunctivitis 96(26.3%) was found among infants and children (0-10years). Resistance rates to most of the tested antibiotics were high. However, 67% of them were susceptible to ceftriaxone while only 39.2% were susceptible to chloramphenicol.

Conclusions: This study has recorded high antibiotic resistance in bacterial pathogens of conjunctivitis in this environment; therefore, determining the susceptibility pattern of these pathogens to available antibiotics is crucial to effective management of bacterial conjunctivitis.

Keywords: Conjunctivitis, bacteria, microbiological profile

INTRODUCTION

Bacterial conjunctivitis is common and affects all age groups. They are mainly caused by bacteria such as *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Staphylococcus aureus* and *Neisseria gonorrhoeae* in the normal host. In the new born, who often get this infection from the vaginal fluids of their mothers during birth, *N.gonorrhoea* and *Chlamydia trachomatis* are the most common causes^{1,2}. *S.pneumoniae*, *P.aeruginosa*, and *S.aureus* may also cause acute conjunctivitis in neonates or children³. In sexually active teenagers and adults, *C.trachomatis* and *N.gonorrhoea* have been implicated. In young children, *H.influenzae* can cause severe conjunctivitis.⁴ In adults, isolates are *S.pneumoniae*, *S.aureus*, and *Staphylococcus epidermidis*⁵, *Serratia marscescences*,⁶ *S.pneumoniae*, *P.aeruginosa*⁷ and *Moraxella* species have

been implicated in institutional outbreaks of bacterial conjunctivitis. Gonococcal conjunctivitis rarely occurs without sexual transmission, and suspicion for possible sexual abuse should be maintained in prepubertal children.⁸ *Neisseria meningitidis*, however, is an uncommon cause of acute bacterial conjunctivitis.

Typically, transmission of the infection involves exogenous routes of infection via airborne fomites, hand-to-eye contact, contact with genital secretions and contact with upper respiratory tract infection secretions. Less frequently, infection may spread to the conjunctiva from the eyelids, lacrimal drainage apparatus, face, or paranasal sinuses. Hematogenous route of infection is however rare. The most common presentation

is a red eye and the main tasks are to exclude potentially serious causes of a red eye and then decide whether the conjunctivitis is infective, allergic, or due to other causes, so that a suitable management could be instituted. Clinical presentations are not diagnostic of the causative agent, therefore microbiological analysis, with cytology, cultures, and microbial susceptibilities are mandatory. The specific antimicrobial therapy should then be based on the laboratory findings.⁹ This study was therefore designed to determine the prevalence and pattern of antibiotic susceptibility among bacterial pathogens of conjunctivitis in our environment.

METHODOLOGY

This is a laboratory-based study conducted in the diagnostic Medical Microbiology Laboratory of University College Hospital, Ibadan, Nigeria, between September 2002 and October 2003.

Age (Years)	No (%)
< 10	96 (26.3)
10-20	18 (4.9)
21-40	40 (11)
51-60	58 (15.9)
> 60	86 (23.6)
Unspecified	67 (18.4)
Total	365 (100.1)
Sex	No (%)
Male	216 (59.2)
Female	149 (40.8)
Total	365 (100.0)

Table 1. Distribution of patients with bacterial conjunctivitis by age and sex

Specimen collection

Three hundred and sixty-five conjunctival swabs sent to Medical Microbiology Laboratory for analysis were separated from other specimens for the purpose of this study.

These were collected in the Eye clinic of University College Hospital by ophthalmologists, from patients with clinically diagnosed conjunctivitis.

Isolation and identification of bacterial eye pathogens

The conjunctival swabs were inoculated on Blood agar, MacConkey agar and Chocolate media and incubated at 37°C for 24hrs. Discrete colonies of bacterial isolates recovered were subjected to Gram-staining and various biochemical tests for identification.

Antibiotic susceptibility testing

Preparation and standardization of inocula

Standard bacterial suspensions were prepared as follows: Colonies of each strain of bacterial isolate were

Bacterial Pathogen	No (%)
<i>Staphylococcus aureus</i>	256(74.9)
<i>Pseudomonas aeruginosa</i>	22(6.4)
<i>Escherichia coli</i>	11 (3.2)
Coagulase-negative staphylococci	35 (10.2)
<i>Klebsiella</i> species	7 (2.1)
<i>Streptococcus pneumoniae</i>	5 (1.5)
<i>Haemophilus influenzae</i>	4 (1.2)
<i>Proteus mirabilis</i>	1 (0.3)
<i>Neisseria gonorrhoeae</i>	1 (0.3)
Total	342(100.1)

Table 2. Distribution of bacterial pathogens of conjunctivitis

emulsified in 3ml volume of saline to the turbidity of 0.5 MacFarland standards.

Procedure for Sensitivity Testing

Sterile swabs were then dipped into these standard bacterial suspensions and plated on Mueller-Hinton agar sensitivity plates. The plates were covered for five minutes to dry. Various antibiotic sensitivity discs (six per plate) were placed on each plate and incubated at 37°C for 24hours.¹⁰ The bacterial pathogens were tested against the following antibiotics: gentamycin, erythromycin, ceftriaxone, ofloxacin, chloramphenicol, amoxicillin /clavulanate, amoxicillin and cloxacillin. These were the antibiotics that were readily available in the environment under study. After 24hrs incubation, the plates were examined for zones of inhibition around each of the antibiotic disc.

These were measured and compared with interpretive chart to determine the sensitive and the resistant strains.

Demographic information regarding age and sex of patients were also obtained and recorded. The prevalence rate of methicillin-resistant *S. aureus* among the *S. aureus* strains isolated was, however, not determined in this study.

RESULTS

Three hundred and forty-two bacterial pathogens were isolated and identified from the conjunctival swabs of three hundred and sixty-five patients with clinically diagnosed conjunctivitis at the eye clinic of University College Hospital, Ibadan, South Western Nigeria.

These patients consisted of 216 (59.2%) males and 149(40.8%) females, and they were aged between 3 months and 88 years (Table 1). Bacterial pathogens were detected in the conjunctival samples of 342 (93.7%) patients, while 23 (6.3%) showed no growth.

Two hundred and fifty-six (74.9%) of the pathogens identified were *Staphylococcus aureus*, 22(6.4%) *Pseudomonas aeruginosa*, 11(3.2%) *Escherichia coli*, 35(10.2%) coagulase-negative staphylococci, 7(2.1%) *Klebsiella* species, 5(1.5%) *Streptococcus pneumoniae*, 4(1.2%) *Haemophilus influenzae*, 1(0.3%) *Proteus mirabilis*, and 1(0.3%) *Neisseria gonorrhoea* (Table 2). Two hundred and ninety-six (86.5%) of these bacterial pathogens were Gram-positive bacteria, while only 46 (13.5%) were Gram-negative (Table 3). The *in vitro* susceptibility pattern of these bacterial pathogens to antibiotics as assessed by the antibiotic disc diffusion test is shown in Table 4.

Isolates	Number	%
Gram-positive	296	86.5
Gram-negative	46	13.5
Total	342	100.0

Table 3. Distribution pattern of Gram-positive and Gram-negative pathogens in bacterial conjunctivitis.

DISCUSSION

The present study has shown that the most common bacterial pathogen of conjunctivitis in this environment is *Staphylococcus aureus*, being responsible for 74.9% of all cases. This is in keeping with some other studies which have demonstrated the same trend.^{3,5} The prevalence of methicillin resistance among the isolated *S.aureus* responsible for bacterial conjunctivitis in this study was not determined, therefore, further studies will need to be done in this regard. However, a study conducted by Okesola *et al* in 1999 in the same hospital, showed a prevalence rate of 12% among the strains of *S.aureus* isolated.¹¹ Cavuoto *et al* in 2003 reported an increase from 4.4% in 1994 to 42.9% in 2003 of MRSA isolates from paediatric patients with bacterial conjunctivitis.¹² Taiwo and his colleagues in 2001 reported a prevalence rate of 34.7% of MRSA among *S.aureus* isolates in Ilorin, in the North Central part of Nigeria.¹³ The highest rate of bacterial conjunctivitis was found among infants and children (0-10 years). The rate was also higher in males (59.2%) than in females (40.8%).

The susceptibility pattern of pathogens to antibiotics is variable in this study; however, recent studies have shown increasing resistance of bacterial pathogens of conjunctivitis to many antibiotics.⁹ The same was the case in the present study where the resistance rates to many of the antibiotics were rather high. The pathogens demonstrated relatively good susceptibilities to erythromycin (57%) and ceftriaxone (67%) but susceptibilities to the remaining antibiotics were rather poor, 31.3% to amoxicillin, 42.7% to amoxicillin/

Table 4. Antibiotic susceptibility pattern of bacterial pathogens of conjunctivitis

Isolates	Amoxicillin No (%)	Amoxicillin/ clavulanic acid No (%)	Chloramphenicol No (%)	Gentamycin No (%)	Erythromycin No (%)	Ofloxacin No (%)	Ceftriaxone No (%)	Cloxacillin No (%)
<i>Staph aureus</i> (n=256)	81(31.6)	116(45.3)	106(41.4)	79(30.9)	169(66.0)	69(27.0)	177(69.1)	90(35.2)
<i>P. aeruginosa</i> (n=22)	0(0.0)	0(0.0)	0(0.0)	12(54.6)	0(0.0)	14(63.6)	12(54.6)	0(0.0)
<i>E. coli</i> (n=11)	3(27.3)	3(27.3)	2(18.2)	8(72.7)	0(0.0)	6(54.6)	10(90.9)	0(0.0)
Coagulase-negative staphylococci (n=35)	18(51.4)	20(57.1)	15(42.9)	20(57.1)	20(57.1)	4(11.4)	16(45.7)	16(45.7)
<i>Klebsiella</i> species (n=7)	0(0.0)	1(14.3)	3(42.9)	4(57.1)	0(0.0)	6(85.7)	4(57.1)	0(0.0)
<i>S. pneumoniae</i> (n=5)	5(100.0)	5(100.0)	5(100.0)	4(80.0)	4(80.0)	1(20.0)	5(100.0)	4(80.0)
<i>H. Influenzae</i> (n=4)	0(0.0)	1(25.0)	2(50.0)	3(75.0)	2(50.0)	0(0.0)	3(75.0)	0(0.0)
<i>P. mirabilis</i> (n=1)	0(0.0)	0(0.0)	1(100.0)	1(100.0)	0(0.0)	1(100.0)	1(100.0)	0(0.0)
<i>N.gonorrhoeae</i> (n=1)	0(0.0)	0(0.0)	0(0.0)	1(100.0)	0(0.0)	0(0.0)	1(100.0)	0(0.0)
Total (N=342)	107(31.3)	146(42.7)	134(39.2)	132(38.6)	195(57.0)	101(29.5)	229(67.0)	110(32.2)

clavulanate, 39.2% to chloramphenicol, 38.6% to gentamycin, 29.5% to ofloxacin and 32.2% to cloxacillin. In the present study, susceptibility rate to chloramphenicol was 39.2%, but in a study conducted by Modarres et al, the susceptibility was reported to be approximately 84%.¹⁴ Similarly, Adegbehingbe, in a study conducted in Ile-Ife, Nigeria in 2000, reported susceptibility rate of 68.9% to chloramphenicol and 89.8-97.8% to ciprofloxacin, a quinolone¹⁵. In our study, however, susceptibility to ofloxacin, another quinolone, was 29.5%. Ofloxacin, rather than ciprofloxacin was included in this study because it was more commonly used in our hospital to treat bacterial conjunctivitis. The low susceptibility to these agents observed in this study, may be due to increased rate of abuse of these antibiotics especially ofloxacin and chloramphenicol in our community. *Staphylococcus aureus*, the most prevalent pathogen in our study was most susceptible to ceftriaxone (69.1%), and least to ofloxacin (27%), an antibiotic that is commonly used for bacterial conjunctivitis in the study location.

The various antibiotics used to treat bacterial conjunctivitis in Nigeria are either used topically or systemically or both depending on the severity of the condition or the type of pathogen involved. Gonococcal conjunctivitis, however, is treated both systemically and topically because of the usual source of infection which is the genitourinary tract.

CONCLUSIONS

In Nigeria, many physicians start therapy empirically without culturing the conjunctiva and, laboratory investigations are ordered for only after treatment has failed. Unfortunately, antibiotic resistance is increasing among these conjunctival pathogens. Moreover, susceptibility of the bacterial pathogens to the common ophthalmic antimicrobial agents is rather low as demonstrated in this study. Therefore, determining the susceptibility pattern of these pathogens to the commonly available antibiotics is of utmost importance in the effective management of bacterial conjunctivitis.

Further studies also need to be done to determine the prevalence rate of methicillin resistance among the strains of *S.aureus* isolated as pathogens of conjunctivitis in this environment and their molecular characterization.

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