Applied Science Reports
www.pscipub.com/ASR
E-ISSN: 2310-9440 / P-ISSN: 2311-0139
DOI: 10.15192/PSCP.ASR.2015.9.3.157160

App. Sci. Report.
9 (3), 2015: 157-160

Determination of susceptibility of causal agents of bacterial conjunctivitis to antibiotics: Federal Medical Center, Imo State, Nigeria as Case Study

C.L. Eze , W. Braide, S.U. Oranusi and E. E. Mike-Anosike

Department of Microbiology, Federal University of Technology, PMB. 1526, Owerri, Imo State, Nigeria
Corresponding author email: wesleybraide2005@yahoo.com

Paper Information

Received: 7 January, 2015

Accepted: 22 February, 2015

Published: 20 March, 2015

Citation

Eze CL, Braide W, Oranusi SU, Mike-Anosike EE. 2015. Determination of susceptibility of causal agents of bacterial conjunctivitis to antibiotics: Federal Medical Center, Imo State, Nigeria as Case Study. Applied Science Reports, 9 (3), 153-160. Retrieved from www.pscipub.com (DOI:10.15192/PSCP.ASR.2015.9.3.157160)

A B S T R A C T

The prevalence and sensitivity pattern of common bacterial isolates from conjunctival specimen were investigated. Standard methods were adopted in the collection of samples from neonates, men and women and screening of the isolates. Staphylococcus aureus, Streptococcus pneumoniae and Haemophilus aegyptus were the predominant pathogens cultured, representing 28.12%, 23.08% and 19.23% respectively. Escherichia coli, Neisseria and Corynebacterium species were also isolated in different proportions. Some of the isolates are resistant to the antibiotics tested. Staphylococcus aureus for instance recorded 100% resistance to nitrofurantoin, ceporex, ampicillin, nilidixic acid, tetracycline and cotrimoxazole. Streptococcus pneumoniae, one of the most frequent isolates was 100 % resistance to, tetracycline and cotrimoxazole. All the isolates were resistant to chloramphenicol. Dust in the environment, infection from the birth canals of mothers, use of eye protective devices such as eye patches, contaminated hands and body surfaces as well as inadequate surgical procedures had been reported as potential sources of causative agents of conjunctivitis. The prevalence of multiple drug resistant conjunctival bacteria had been documented. Multiple antibiotic resistances are increasingly common in Staphylococcus aureus and Neisseria gonorrhea, which are major cause of nosocomial infection in hospital environment. Genetics of causal agents of conjunctivitis has been proved to be of great importance as a clone of non-typeable Streptococcus pneumoniae had been implicated in sporadic cases of conjunctivitis. Use of basofloxacin and related antibiotics in combination had proved effective, but the technology and administration of this potent remedy is not available to the rural dwellers were the disease is still prevalent. Therefore, suggestions are made to provide medical facilities to all and sundry and also to enforce rational drug use and laboratory investigation before any prescription and administration.

Key words: *conjunctivitis, causal agents, antibiotic profile*

Introduction

Bacterial conjunctivitis which occurs in patients of all ages is characterized by itching of the eyelid, grittiness on waking, infection of the lash follicle and redness of the eye (Tarabishy and Jeng, 2008). The infection is highly contagious, being easily transmitted by contaminated fingers, towels and handkerchief and contact with infected genital discharges (Baron, 1990; willey *et al*., 2008; Duguid e*t al*., 1980). The spectrum of organisms causing conjuctival disease varies around the world. Morrow and Abbot (1998) and Olatunji (2004) reported that *Staphylococcus aureus, Streptococcus pneumoniae* and *Haemophilus* sp are common causes of non- gonococcal bacterial conjunctivitis. The proportion of viral and allergic conjunctivitis has largely increased in recent years, but the share of bacterial conjunctivitis in the ophthalmological incidence still remain high, about 33% (Fox *et al*., 1995). In a neonatal intensive care unit, the most common organisms isolated in patients with conjunctivitis were coagulase-negative staphylococci, *S. aureus* , *Neisseria gonorrhea* and *Klebsiella* sp (Olatunji, 2004; Willey *et al*., 2008). Iwolakun *et al*. (2011) and Brook (2008) reported mixed cultures of *Pseudomonas,*

Corynebacterium sp, Klebsiella, Enterobacter aerogenes, Escherichia coli, S. aureus, Moraxella sp, coagulase negative staphylococci and Chlamydia trachomatis.

The bacteriological and plasmid analysis of some causal agents of conjunctivitis has been investigated by Iwalokun *et al*. (2011). Willey *et al*. (2008) and Baron (1990) had reported on the increasing multiple antibiotic resistance of *Staphylococcus aureus* and *Neisseria gonorrhea*. A healthy conjunctiva is necessary for the maintenance of a healthy and functional cornea. Infection of conjunctivitis and related ophthalmological diseases may spread to the cornea and results in keratoconjuctivitis, inclusion conjunctivitis and ulcer because of close proximity to the conjunctiva (Willey *et al*., 2008).
This paper reports on bacterial conjunctivitis and their response to some antibiotics among patients in the eye care unit of the Federal Medical Centre, Owerri, Imo State, Nigeria.

Materials and Methods

Collection of specimen

The tip of sterile swab sticks moistened with sterile physiological saline (0.9% NaCl) was used to collect profuse discharges from 60 (4 neonates, 21 adult female and 35 adult males) confirmed conjuctival patients that visited the Federal Medical Centre, Owerri, Imo State. Specimens were collected by gently rubbing the swabs along the lower fornix of the conjunctiva.

Inoculation of specimen

Swabs loaded with the specimen was gently streaked onto freshly prepared surface dried media (blood agar, chocolate agar, nutrient and MacConkey agar) and incubated at 37^0C for 48h (Ogbulie and Ojiakor, 2003; Cheesbrough, 2000).

Identification if bacterial isolates

Pure cultures were screened on the basis of colonial, microscopic and biochemical characteristics of the isolates (Beishir, 1987, Cheesbrough, 2000) and the identities confirmed with reference to standard manuals (Buchanan and Gibbons, 2000)

Antibiotics screening

Disc agar diffusion method described by Kirby-Bauer was adopted to determine antibiotic sensitivity test (Duguid *et al*., 1980). Twenty four old broth cultures of the identified bacteria were standardized (McFarland 0.5) and moistened with a sterile swab stick, and then gently streaked on the surface of freshly prepared Mueller Hinton agar, and allowed to stand for 30 minutes on the bench. Commercial antibiotic disc (Oxoid) of different concentrations was firmly placed equidistant from each other on the outer portion of the culture plate. Plates with the disc were allowed to stand for 3h and later incubated for 24-48h at 37^0C. Zones of inhibition measured in diameter were recorded after incubation.

Results

Colonial morphology and microscopic and biochemical characteristics of the bacterial isolates are shown in Tables 1 and 2 respectively. The predominant bacterial isolates include; Staphylococcus aureus (28.12%); Streptococcus pneumoniae (23.08%); Haemophilus aegyptuis (19.23%). Neisseria gonorrhoea, Corynebacterium and Escherichia coli were also isolated, representing 8.97%, 12.82% and 7.69% respectively (Table 3).

Staphylococcus aureus was sensitive to gentamycin, streptomycin and cotrimoxazole but showed high resistance to nitrofurantoin, colistin sulphate, ampicillin, nalidixic acid and tetracycline. Streptococcus spp was sensitive to nalidixic acid, streptomycin and nitrofurantoin but resistance to colistin sulphate, tetracycline and cotrimoxazole. Neisseria gonorrhoea and Corynebacterium species were sensitive to ampicillin and tetracycline. All the bacteria isolated from the infected patients were resistant to chloramphenicol (Table 4).

The enterobacteriaceae species generally showed resistance to ceporex and zinnate. Gentamycin was sensitive against 52.6% of all the isolates, whereas streptomycin was effective against over 57.7% of the species of the six genera isolated. Zinnate was sensitive against 56.4% of the isolates while nitrofurantoin was effective against 38.5% of the isolates. Cotrimoxazole was effective against 53.9% of the isolates (Table 4).

.

Table 1. Colonial and Microscopic characteristics of bacterial isolates from conjuctival specimens

Colonial characteristics	Grams reaction	Capsule	Spores	Motility	Probable identity
Smooth moist and shiny golden yellow colonies	Gram positive cocci in predominantly in clusters, few in tetrads and pairs	-	-	-	Staphylococcus sp
Small circular cream moist and shiny colonies	Gram positive diplococcic in chains	+	-	-	Streptococcus sp
Smooth moist and shiny pinpoint colonies	Small gram negative rods in singles and few in pairs	-	-	-	Haemophilus sp
Cream dull and dry serrated colonies	Gram negative oval and bean shaped colonies in pairs	-	-	-	Neisseria sp
Dull and dry cream umbonate shaped colonies	Gram positive pleomorphic rods with the shape of Chinese letters	+	-	-	Corynebacterium sp
Small circular moist and shiny colonies	Gram negative rods predominantly in singles	-	-	+	Escherichia coli

Table 2. Prevalence of bacteria of probable pathogenicity in conjuctival specimens

Bacterial isolates	No. of isolates	Percentage of isolates (%)
Staphylococcus aureus	22	28.21
Streptococcus pneumonia	18	23.08
Haemophilus aegytuis	15	19.23
Neisseria gonorrhea	7	8.97
Corynebacterium spp	10	12.82
Escherichia coli	6	7.69
Total	78	100

Discussion

The spectrums of bacteria isolated from conjuctival swabs were similar to the reports of others (Friedlaender, 1995; Merianos, 1995; Baron, 1990; Duguid et al., 1980; Willey et al., 2008). Staphylococcus aureus , Haemophilus aegyptus and Streptococcus pneumoniae were the most predominant. Neisseria gonorrhea, Escherichia coli and Corynebacterium species were also isolated.

A proportion of the bacterial isolates were resistant to some commonly used antibiotics. Staphylococcus aureus for instance recorded 100% resistance to nitrofurantoin, ceporex, ampicillin, nilidixic acid, tetracycline and cotrimoxazole. This corroborate with the findings of Bravenly and Milatovic (1987) and Baron (1990).

Streptococcus pneumoniae, one of the most frequent isolates was 100 % resistance to chloramphenicol, tetracycline and cotrimoxazole. High resistance of Streptococcus pnuemoniae to ampicillin (94.44%) and gentamycin (89%) had been reported by Morrow and Abbot (1998).

Some of the isolates, notably, Escherichia coli and Staphylococcus aureus may results from contamination or as commensals from the face and skin of many carriers with depressed immunity (Jone et al., 1990).

Neiserria gonorrhea isolated from the eyes of neonates is sexually transmitted and highly contagious pathogens (Willey et al., 2008). Gonoccocal ophthalmia also known as ophthalmia neonatorum is a disease condition in newborns infants transmitted through the birth canal of an infected mother (Willey et al., 2008; Duguid et al., 1980). Haemophilus aegyptus also known as "Koch-Weeks bacilli" is a commensal of the upper respiratory tract and is frequently isolated during epidemic involving camps and school environment (Baron, 1990). Corynebacterium species, though a part of the normal flora of the eye may become pathogenic when the immune system is compromised. Production of toxins contributes to the virulence of Corynebacterium species (Baron, 1990).

Greenhood et al. (2003) reported that penetrating injuries of the eyes and ophthalmic surgery may introduce a wide range of bacteria and fungi into the chambers of the eye which may give rise to hypopyon (pus in the eye). Choroidoretinitis, an infection of the back of the eye are seen in many diverse infectious diseases associated with immunocompromised individuals (Greenwood et al., 2003; Willey et al., 2008).

The high resistance of the bacteria to some narrow and broad spectrum antibiotics is worrisome giving the fact that the eye is usually exposed and susceptible to infections from dust and contaminated skin surfaces. Uncontrolled prescription of antibiotics by health workers and their indiscriminate use may account for the drug resistance resulting from mutant strains.

With the pattern of resistance to some of the antibiotics under investigations, the habit of drug abuse for the blind treatment of the infections, especially for the diseases of the eyes should be discouraged while the use of new and more effective antibiotics should be recommended. Basifloxacin a broad spectrum fluoroquinone has been reported as a novel anti-infective agent in the treatment of bacterial conjunctivitis (Peterno *et al*., 2009; Comstock *et al*., 2009; McDonald *et al*., 2009; Haas *et al*., 2009; Comstock *et al*., 2010).

References

Baron S.1990. Medical Microbiology. 4th edition, The University of Texas Medical Branch, Galveston, TX, USA. pp 413-415.

Beishir l. 1987. Microbiology in Practice. A Self- Instructions Laboratory Course, 4th edn. Harper and Row Publishers, New York, pp 96-111, 120-130, 238-272.

Bravenly I, Milatovic D.1987. Development of resistance during antibiotic therapy. Journal of Clinical Microbiology, 6: 1-10.

Brook I.2008. Ocular infections due to anaerobic bacteria in children. J. Pediatr Ophthalmol Strasbismus, 45(2): 78-84

Buchannan RE, Gibbon NE.2000. Bergeys Manual of Determinative Bacteriology, Williams and Wilkins Co. Baltimore, USA.

Cheesbrough M.2000. District Laboratory Practice in Tropical Countries Part 2.Cambridge University Press, UK.

Comstock TL, Karpecki PM, Morris TM, Zhang J.2010. Basifloxacin: a novel anti-infective for the treatment of bacterial conjunctivitis. Clinical Ophthalmology, 4: 215-225.

Comstock TL, Pterno MR, Lynch JA, Decory H, Usner DW.2009. Efficacy and safety of basifloxacin ophthalmic suspension 0.65 in pediatric patients with bacterial conjunctivitis. Optometry, 80(6): 296-297.

Cowan, S.T (1976). Cowan and Steel's Manual of the identification of Medical Bacteria. 2nd edition, Cambridge University Press.

Duguid JP, Marmion BP, Swain RHA.1980. Mackie and McCartney Medical Microbiology. 13th edition, William Clowes Limited, London. p 592, 599.

Fox TF, Wang W, Cheng AF.1995. Use of eye patches in phototherapy: effects on conjunctival bacterial pathogens and conjunctivitis. Pediatric Infectious Disease Journal, 149(12): 1091-1094.

Friedlaender MH .1995. A review of the causes and treatment of bacterial and allergic conjunctivitis. Journal of Clinical Therapy, 17(5): 80-100.

Greenhood D, Slack RCB, Peutherer JF.2003. Medical Microbiology, A Guide to Microbial Infections: Pathogenesis, Immunity, Laboratory Diagnosis and Control. 16th edition, Churchhill Livingstone, New York, USA. p 631

Haas W, Piller CM, Zurenko GE, Lee JC, Brunner LS, Morris TW.2009. Basifloxaxacin, a novel fluoroquinolone has broad-spectrum in vitro activity against aerobic and anaerobic bacteria. Antimicrob Agents Chemother, 53(8): 3552-3560.

Iwalokun BA, Oluwadun A, Akinsinde KA, Niemogha MT, Nwaokorie FO.2011. Bacteriologic and plasmid analysis of atiologic agents of conjunctivitis in Lasos, Nigeria. Journal Ophthal inflamm infect, 1: 95-103.

Jones D, Bord RG, Sussmamm.1995. Staphylococci Society for Applied Microbiology. Symposium Series No. 19. Blackwell Scientific Oxford.

McDonald MB, Protzko EE, Brunner LS.2009. Efficacy and safety of basifloxacin ophthalmic suspension 0.6% compared with moxifloxacin ophthalmic solution 0.5% for treating bacterial conjunctivitis. Ophthalmology, 116(90): 1615-1623.

Merianos A, Condon RJ, Tapsall JW, Jayathissa S, Mulvey G, Lane JM, Petal MS, Rouse L.1995. Epidemic gonococcal conjunctivitis in central Australia. Medical Journal of Australia, 162(4); 178-181.

Morrow GL, Abbott RL .1998. Conjunctivitis. Am Far Physician, 57(4): 735-746.

Ogbulie JN, Ojiakor OA.2003. Biological and Agricultural Techniques. 1st edition, WEBSMEDIA, Owerri, Imo State, Nigeria.

Olatunji FO.2004. A case control study of ophthalmia neonatorum in Kaduna II. Causative agents and antibiotic sensitivity. WAJM, 23: 215-220.

Paterno MR, Comstock TL, Lynch JA, Usner DW.2009.basifloxacin ophthalmic suspension 0.6% is safe and well tolerated in patients with bacterial conjunctivitis. Invest Ophthalmol Vis Sci, 50: 2674.

Tarabishy AB, Jeng BH.2008. Bacterial conjunctivitis: a review for internists. Cleve Clin. J. Med, 75(7): 507-512.

Willey JM, Sherwood LM, Woolverton CJ .2008. Prescott, Hartley and Kleins Microbiology. 7th edition. McGraw-Hill Companies Inc, New York, USA. pp 966, 974-975