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Antibiotic Susceptibility of Conjunctival Microflora of Cataract Patients Prior to Surgery in Wukari LGA, Taraba State, Nigeria

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Abstract

The eye harbours bacteria that make up its indigenous flora. These bacteria are capable of causing diseases when they lose co-dependence and co-regulation with the host. The ocular bacterial flora of one hundred cataract patients submitted for surgery were studied. At least 72 hours prior to sample collection, patients were placed on topical application of amethocaine. Conjunctival swabs were collected from each of the cataractous eyes and cultured aerobically on Blood, MacConkey, and Nutrient agar. Bacterial isolates were then subjected to antibiotic sensitivity testing to discern antibiotic susceptibility and resistance patterns. Of the 100 patients submitted for surgery, 60% were males while 40% were females while their ages ranged from 4 – 90. Of the 134 eyes sampled, only 62 (46.3%) were culture sensitive. Of the 111 bacterial isolates recovered from the 62 culture sensitive samples, 83 (74.8%) were coagulase negatives Staphylococcus, 17 (15.3%) were Staphylococcus aureus, 7 (6.3%) were Corynebacteriumspp while 4 (3.6%) were Streptococcus spp. The bacterial isolates recovered showed little resistance to Ampiclox (6.2%) and Amoxil (8.7%), some showed intermediate susceptibility to Chloramphenicol (3.1%), while 100% susceptibility were discovered for the other tested antibiotics. The importance of these organisms, especially those showing resistance and intermediate susceptibility to antibiotics, in the pathogenesis of post-cataract surgery complications is worrisome. Hence, good knowledge of ocular bacterial flora of healthy individuals and patients is important in maintaining good eyesight as well as choosing antibiotic for prophylaxis of post-cataract complications.

Keywords

Cataract Surgery, Prophylaxis, Antibiotic Sensitivity, Co-dependence, Bacterial Flora

1. Introduction

The human eye, as an organ, is not exempted from diseases, infections, or disorders. Vision loss and blindness are among the highly rated disabilities in the world, leading to substantial social, economic, and physiological effects [1]. According to a survey carried out by World Health Organisation (WHO) in 2012, the main causes of blindness are cataract (51%), glaucoma (8%), age-related macular degeneration, AMD (5%), childhood and corneal opacities (4%), uncorrected refractive errors and trachoma (3%), and diabetic retinopathy (1%); 21% of blindness are caused by undetermined causes [2].

Cataract is the cloudiness or opacification of the eye lens; a term which has been known to mankind for centuries, rising out of the Medieval Latin translations of Arabic writings as a sort of shorthand term for expressing the pathology of the condition- 'humourthat flowed down into the eye'[3, 4]. The rate of development of a cataract varies from individual to individual and may even vary between the two eyes. It starts out as a quite small dot in the eye and enlarges till it becomes matured at which time it has completely distorted vision. According to the American Academy of Ophthalmology (AAO), most age-related

cataracts tend to be chronic while those in younger people tend to be acute [5].

The development of cataract is mostly considered a multifactorial one; some causes are shared by different cataract types while some types have distinct causes [6]. The major causes to have been identified in the development of cataract include: diabetes mellitus [6, 7], hypertension [8, 9], nutrition [10-12], age [13], gender [14], heredity [15-17], alcohol [18, 19], smoking [20-22], and radiation [23].

Cataract surgery is the most commonly performed ophthalmic operation and bacteria have been implicated in the vast majority of post-surgical complications [24, 25]. Hence, proper and adequate knowledge of the microbial colonization of the conjunctiva of patients submitted to surgery and their antibiotic sensitivity may provide a better guide in choosing an antibiotic for prophylaxis [26].

2. Materials and Methods

DESCRIPTION OF THE STUDY AREA: Wukari is largely a cosmopolitan and multi-religious town which was once a major part of the great Kwararafa Confederacy which later split [27]. The region is dominated by the Jukuns, a people believed to be descendants of 'Wapan', a tribe believed to have migrated from Yemen in the Arabian Peninsula in Kukawa [28]. Located between longitude 7°57' and latitude 9°42' of the equator, the town is bounded by Ibi LGA, Donga LGA, Gassol LGA and UkumLGA to the North, East, Northeast and South respectively [29]. The town, having a land area of about 4,308km^2 and a population of 241,546 people is dominated by farmers, cattle rearers, fishermen and traders [30]. Wukari is home to Federal University Wukari and Kwararafa University. The major languages spoken are Jukun, Kutep, Tiv, Hausa, and Fulani [31].

COLLECTION AND CULTURE OF SAMPLES: Outpatients attending a primary eye care centre for cataract surgery were selected for the study. Patients were screened for underlying medical conditions/history as well as the different medications which they were on. Visual acuity test was carried out on the patients as part of the preparation for surgery. Prior to sample collection, topical application of amethocaine eye drops was given to each of the patients. Patients were already on topical application of the amethocaine for at least 72 hours. Sterile disposable dry cotton swabs were used to swab the entire surface of the conjunctival cul-de-sac from outer to the inner canthus with special care to avoid lid margins and eye lashes. A total of one hundred and thirty-four (134) conjunctival swabs were collected from one-hundred cataract patients submitted for surgery. Collected conjunctival swabs were transported immediately for microbiological analysis at the microbiology laboratory of Federal University Wukari in a cryoblock.

Collected swabs were directly cultured on freshly prepared nutrient agar, 5% sheep blood agar, and MacConkey agar plates by spreading across the surface of the agar plate to create a lawn. Inoculated plates were then allowed to stay under room temperature for 10 minutes before incubating at ambient temperature of 37°C for 24 hours.

ISOLATION AND IDENTIFICATION OF BACTERIAL ISOLATES: Distinct bacterial colonies were plated out on freshly prepared nutrient agar plates using the streak plate method of bacterial isolation. Bacterial isolates were identified using morphological features of the colonies, and standard biochemical and sugar utilization tests [32, 33, 34].

ANTIBIOTIC SENSITIVITY TEST: The bacterial isolates were subjected to antibiotic sensitivity testing to ascertain susceptibility or resistance to different concentrations of antibiotics using the Kirby-Bauer method of antibiotic sensitivity test [35]. The inocula were standardized with sterile normal physiologic saline using the 0.5 McFarland standard and then inoculated on freshly prepared Mueller-Hinton agar by streaking across the surface of the agar plate to create a bacterial lawn. The surface of the agar plates were allowed to settle before aseptically placing antibiotic sensitivity discs on them. Pre-diffusion was allowed to take place before incubating test plates at ambient temperature of 37°C for 24 hours.

Commercially marketed antibiotic sensitivity discs, Optudisc (TP 34-948) were purchased and contained Ciprofloxacin (10µg), Norfloxacin (10µg), Gentamicin (10µg), Amoxil (20µg), Streptomycin (30µg), Rifampicin (20µg), Erythromycin (30µg), Chloramphenicol (30µg), Ampiclox (20µg), and Levofloxacin (20µg).

3. Results

Bacteria were isolated from 62 (46.3%) of the 134 eyes studied. Of these 62 eyes, single bacterial isolates were detected in 28 eyes (45.16%), two bacterial isolates were detected in 21 eyes (33.87%), three bacterial isolates in 11 eyes (17.74%) while 2 eyes (3.23%) had four bacterial isolates. Of the 100 cataract patients submitted to surgery, 60% were males while 40% were females and their age groups ranged between 4 and 90 years. Table 1 shows the classification of the cataract patients based on their gender. Table 2 depicts the classification of the cataract patients based on their age groups. It can be deduced from table 2 that the vast majority, 87 (87%) of the patients are older than 50 and their cataract could be said to be age-related. Table 3 depicts the frequency and percentage of bacterial isolation from the conjunctiva of cataractous eyes. Of the 111 bacterial isolates recovered, 83 isolates (74.8%) were Coagulase Negative Staphylococci, 17 isolates (15.3%) were *Staphylococcus aureus*, 7 isolates (6.3%) were *Corynebacterium* spp while 4 (3.6%) isolates were Streptococcus spp. Table 4 shows the sensitivity of the bacterial isolates to different concentrations of antibiotics. The bacterial isolates recovered showed little resistance to Ampiclox (6.2%) and Amoxil (8.7%), some showed intermediate susceptibility to Chloramphenicol (3.1%), while 100% susceptibility were discovered for the other tested antibiotics.

Table 1. *Classification of cataract patients based on their gender.*

Gender	Frequency (%)	Mean age (years)
Male	60.0	58.5±15.31
Female	40.0	50.75±16.12

Table 2. *Classification of cataract patients based on age.*

Age group	Frequency (%)
1-10	3
11-20	1
21-30	2
31-40	7
41-50	19
51-60	30
61-70	23
71-80	11
81-90	4

Table 3. *Bacteria isolation from cataractous eyes.*

Bacteria isolate	No. of Strains N=111	Percentage (%)
Coagulase Negative Staphylococcus	83	74.8
Staphylococcus aureus	17	15.3
Corynebacteriumspp	07	6.3
Streptococcus spp	04	3.6

Table 4. *Antibiotic sensitivity pattern of ocular bacterial flora from cataractous eyes.*

Antibiotics	Susceptible (%)	Intermediate (%)	Resistant (%)
Ciprofloxacin	100.0	0.0	0.0
Norfloxacin	100.0	0.0	0.0
Gentamicin	100.0	0.0	0.0
Amoxil	91.3	0.0	8.7
Streptomycin	100.0	0.0	0.0
Rifampicin	100.0	0.0	0.0
Erythromycin	100.0	0.0	0.0
Chloramphenicol	96.9	3.1	0.0
Ampiclox	93.8	0.0	6.2
Levofloxacin	100.0	0.0	0.0

4. Discussion

The eye harbours bacteria that make up its indigenous flora which are capable of causing diseases when they lose co-dependence and co-regulation with the host. Majority of the cataract cases, 87% could be said to age-related as cataract is a disease prevalent mostly among the middle-aged and individuals older than 40 years of age [13]. It is known that as people age, some of the proteins in their eyes clump together and starts to cloud a small area of the lens [36].

The four bacterial isolates recovered and their frequency of recovery correlates with those recovered in other studies [25, 26]. The high frequency of recovery of coagulase negative Staphylococci is also corroborated by these studies.

The recovered bacterial species obviously displayed variations in their sensitivity patterns to the different concentrations of antibiotics. The isolates were completely susceptible to Gentamicin, Streptomycin, Rifampicin, Norfloxacin, Erythromycin, Ciprofloxacin and Levofloxacin in no specific order. Some of the isolates displayed intermediate susceptibility to Chloramphenicol (3.1%) while some were resistant to Ampiclox (6.2%) and Amoxil (8.7%). Resistance to Amoxil and Ampiclox could imply the possible production of penicillinases by some of the Staphylococcus spp.

5. Conclusion

Coagulase negatives Staphylococcus are the major colonizers of the conjunctiva of cataractous eyes. Although these organisms were resistant to Gentamicin, Streptomycin, Rifampicin, Norfloxacin, Erythromycin, Ciprofloxacin and Levofloxacin, in no specific order, some are somewhat resistant to Chloramphenicol, Amoxil and Ampiclox. The importance of these organisms, especially those showing resistance and intermediate susceptibility to antibiotics, in the pathogenesis of post-cataract surgery complications is worrisome.

6. Recommendation

Good knowledge of ocular bacterial flora of healthy individuals and patients is important in maintaining good eyesight as well as choosing antibiotic for prophylaxis of post-cataract complications.

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