

## Conjunctival Bacterial Normal Flora and Antibiotic Sensitivity in Patients Undergoing Cataract Surgery in Maiduguri

Musa ZY <sup>1</sup>, Askira BH <sup>1</sup>, Waziri MA <sup>1</sup>, Zailani SB <sup>2</sup>, Ali KB <sup>2</sup>

### ABSTRACT

**Background:** Bacterial infections are the most common cause of postoperative endophthalmitis with gram positive bacteria accounting for most cases. The flora of the eyelids and conjunctiva are the most frequent source of infection. Knowledge of the conjunctival bacterial flora is therefore important to provide an informed choice of appropriate antibiotics for postoperative prophylaxis in patients undergoing cataract surgery or other intraocular surgeries.

**Objectives:** To determine the bacterial normal flora of the conjunctiva and their antibiotic sensitivity with a view to determine the appropriate choice of prophylactic postoperative antibiotic in patients undergoing cataract surgery in Maiduguri.

**Materials and Methods:** This was a prospective cross-sectional study conducted on adult patients scheduled for cataract surgery at the University of Maiduguri Teaching Hospital and the State eye hospital Maiduguri from February 2018 to October 2018. Surgery was either small incision cataract surgery (SICS) or extra capsular cataract surgery (ECCE) with lens implantation. The sample included one hundred eyes of one hundred patients

**Results:** A total of 95 eyes of 95 patients was analysed. The patients were between the ages of 18-85 years with a mean age of 58.11± 12.3 years, with a male to female ratio of 1.1:1. Positive bacterial cultures were found in 31 (32.6%) of the patients and negative cultures were found in 64 (67.4%) of the patients. In 28 (90.3%) of the patients the bacteria cultured were gram positive while in 3 (9.7%) the bacteria were gram negative rods. The commonest bacterial isolate was *Staphylococcus epidermidis*, isolated in 14 (45.2%) patients followed by *Staphylococcus aureus* in 13 (41.9 %). Ciprofloxacin was the most sensitive (93.3%) antibiotics tested followed by chloramphenicol (87.5%),

**Conclusion:** The commonest bacterial isolate was *Staphylococcus epidermidis*, followed by *Staphylococcus aureus*. Ciprofloxacin was the most sensitive antibiotic tested followed by chloramphenicol.

**Keywords:** Conjunctival flora, sensitivity, antibiotics, cataract surgery.

Department of <sup>1</sup>Ophthalmology, <sup>2</sup>Medical Microbiology, University of Maiduguri Teaching Hospital.

### Corresponding Author

Dr Musa ZY, Department of Ophthalmology, University of Maiduguri Teaching Hospital, PMB 1414, Maiduguri, Borno State, Nigeria.  
Email: zainyero@yahoo.com

### Introduction

Globally cataract is the commonest cause of blindness. The Nigeria national blindness and visual impairment survey revealed that 43% of all blindness in adults aged 40 years and above in Nigeria was due to cataract<sup>1</sup>.

The prevalence of cataract-related blindness was found to be 1.8% (95% CI: 1.57-2.05)<sup>1</sup>. Cataract surgery is one of the most frequently performed operations in the world<sup>2</sup>. It is also the most common eye surgery performed in most eye units in Nigeria<sup>3</sup>. Like any other surgery, cataract surgery has its own

### Access this article online

Quick Response Code



website: [www.bornomedicaljournal.com](http://www.bornomedicaljournal.com)

DOI: 10.31173/bomj.bomj\_158\_16



complications, one of which is postoperative endophthalmitis. Postoperative endophthalmitis is a very devastating cataract surgery complication and one of the most dreaded because it can result in profound loss of vision. This loss of vision can occur in as much as 80% of cases<sup>4</sup>. Bacterial infections are the most common cause of postoperative endophthalmitis, and gram positive isolates account for most cases<sup>5,6,7</sup>.

The flora of the eyelids and conjunctiva are the most frequent source of infection. Other potential sources of infection include contaminated solutions and instruments, the air in the theatre, and the surgeon or operating room personnel<sup>8</sup>. Instillation of 5% povidone iodine into the conjunctival sac before surgery and the use of prophylactic postoperative antibiotics are some of the preventive measures taken to prevent postoperative endophthalmitis in the study area.

The knowledge of the conjunctival bacterial normal flora and their sensitivity pattern in an environment is therefore important to provide an informed choice of appropriate antibiotics for postoperative prophylaxis in patients undergoing cataract surgery or other intraocular surgeries. To our knowledge this study has never been conducted in this study area. Moreover, this kind of study must be done regularly due to the dynamic nature of bacterial resistance to antibiotics<sup>9</sup>.

This study was conducted to determine the bacterial normal flora of the conjunctiva and their antibiotic sensitivity in adult patients undergoing routine cataract surgery in Maiduguri.

### Materials and Methods

This was a prospective cross-sectional study conducted on adult patients scheduled for cataract surgery at the University of Maiduguri Teaching Hospital and the State eye hospital Maiduguri from February 2018 to October 2018. Surgery was either small incision cataract surgery (SICS) or extra capsular cataract surgery (ECCE) with lens implantation. The sample included one

hundred eyes of one hundred patients. Inclusion criteria included all consenting consecutive patients aged 18 years and above undergoing cataract surgery. Exclusion criteria included patients below 18 years of age, those with conjunctivitis, patients on antibiotics and those with ocular surface disease such as meibomitis and dry eye. Conjunctival swab was taken by one of the ophthalmologist using a sterile cotton tip swab. This was taken from the inferior conjunctival fornix, starting from the medial canthus to the lateral canthus and back of the eye undergoing cataract surgery. Care was taken not to touch the cornea or the lid margins. The swab was taken before the application of any antibiotics or anaesthetic drops to the eye on the day of surgery and samples were transported immediately to the medical microbiology laboratory of UMTH, Maiduguri for processing.

The samples were inoculated unto blood Agar, chocolate Agar and Mac Conkey Agar plates and were incubated aerobically at 37°C for 24 hours for bacterial growth. Positive cultures were identified systematically. The obtained organisms were first identified by direct smear films using Gram stain. Cultural characterisation was done using specific biochemical test for each organism using the standard microbiological manual technique.

All positive cultures were tested for antibiotic susceptibility using Kirby-Bauer disc diffusion technique. 0.5 Mac Farland solution of growth was prepared and Muller Hinton Agar medium was used for antibiotic susceptibility testing procedure. The following antibiotics disc (Oxford Ltd., England) were used; ciprofloxacin, chloramphenicol, erythromycin, gentamicin and cefuroxime. The Clinical Laboratory Standards Institute (CLSI) guidelines for performance of standard antibiotics susceptibility testing was used<sup>10</sup>.

### Results

A total of 95 eyes of 95 patients were analysed. Five eyes of five patients were found to have incomplete data and were therefore not



analysed. The patients were between the ages of 18-85 years with a mean age of 58.11± 12.3 years. Fifty were males (52.8%) and 45 were females (47.4%), with a male to female ratio of 1.1:1. Positive bacterial cultures were found in 31 (32.6%) of the patients and negative cultures were found in 64 (67.4%) of the patients (Table 1). In 28 (90.3%) of the patients the bacteria cultured were gram positive while in 3 (9.7%) the bacteria were gram negative rods. Coagulase-negative *Staphylococcus* (CONS) represent 51.9% of the gram positive isolates and 45.2% of all bacterial isolates in this study.

The commonest bacterial isolate was *Staphylococcus epidermidis*, isolated in 14 (45.2%) patients followed by *Staphylococcus aureus* in 13 (41.9 %). Other isolates were

*Klebsiella pneumonia* in 3 (9.7%) patients and *Corynebacterium diphtheriae* in 1(3.2%) patients as shown in figure 1. Positive cultures were found in 21 males (67.7%) and 10 females (32.3%) as shown in table 2 and this was found to be statistically significant ( $\chi^2 = 4.214$ ,  $p= 0.033$ ). Age and positive culture was not found to be statistically significant ( $\chi^2 = 8.320$ ,  $p = 0.126$ ).

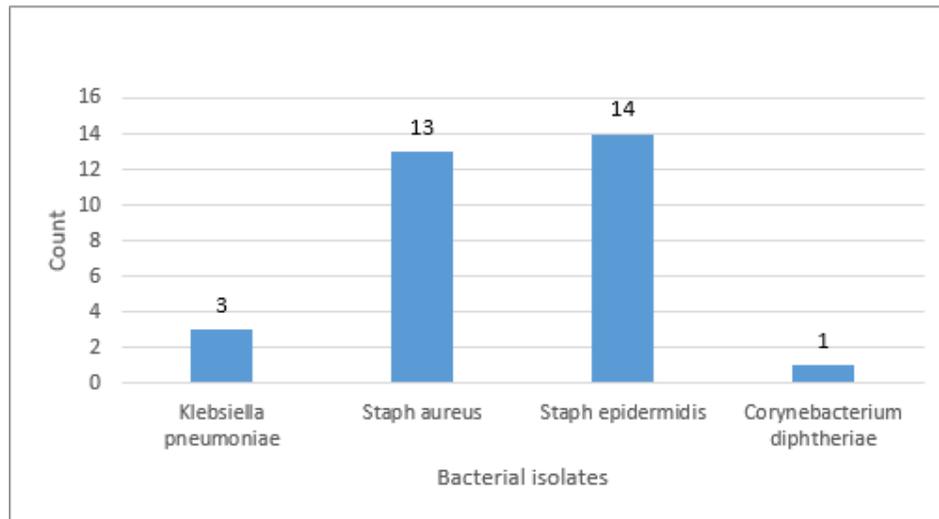
Antibiotic sensitivity was done using ciprofloxacin 10ug, erythromycin 5ug, chloramphenicol 30ug, gentamicin 10ug and cefuroxime 30ug discs. Ciprofloxacin was the most sensitive (93.3%) antibiotics tested followed by chloramphenicol (87.5%), then gentamicin (76%). The most resistant antibiotic was cefuroxime (53.6%).

**Table 1: Distribution of culture yield among the patients**

Culture yield	Frequency	
Positive	31	32.6
Negative	64	67.4
Total	95	100.0

**Table 2: Relationship between sex and culture yield of the patients**

Sex	Positive Culture
Male	21 (67.7%)
Female	10 (32.3%)
Total	31 (100%)



**Figure 1: Distribution of bacterial isolates of the patients**

### Discussion

The normal flora of the eye plays an important role in maintaining ocular homeostasis by various mechanism. They comprise of mainly bacteria which do not cause infection in normal condition, but can be a main source of infection after ocular surgery, trauma or in immune compromised. The range of these microorganisms vary with age, sex and geographical distribution. Therefore, it is very important for the ophthalmologist to know the ocular normal flora before giving prophylactic antibiotics and treating infection<sup>11</sup>.

Eye surgeons use several pre and post-operative methods to prevent the occurrence of endophthalmitis, the most common of which is the administration of topical antibiotic drops at regular interval<sup>12</sup>. The use of antibiotic prophylaxis pre and postoperatively in reducing the risk of endophthalmitis remains controversial. There are no standard guidelines on the type of antibiotics to be used in this setting. Knowing the organism found most frequently in the ocular flora and their antibiotic sensitivity may provide a better guide in choosing an antibiotic for prophylaxis of post-operative endophthalmitis.

In this study out of 95 eyes 52.8% were males and 47.4% females, which is similar to

Kurthika and Suresh<sup>13</sup> who reported out of 100 patients 54% were males and 46% were females. In the study conducted by Belur R Keshav et al.<sup>13</sup> males were 33.9% while females were 66.1%.

Positive bacterial cultures were seen in 31 (32.6%) eyes in this study. In a study by Reza et al.<sup>9</sup> the percentage isolation of bacteria was found to be 52.4%. Kurthika and Suresh<sup>13</sup> in a study of normal bacterial flora of the conjunctiva in patients undergoing cataract surgery in a rural teaching hospital in RR district in India, found bacterial isolate in 58% of their patients, while Belur R Keshav et al.<sup>14</sup> the percentage of isolates was 48.3%. These differences in percentage of bacterial isolate may be due to the age of the patients studied or geographic locations of the patients.

In a study by Ansari MR, Madani H and Ghaderi E<sup>15</sup> 52.4% had positive cultures in the eyes out of which 79 eyes (88.8%) had coagulase-negative *Staphylococcus* (CONS) and eighty-two cases (95.3%). Another study by Khoraza and Thompson<sup>16</sup> carried out in normal conjunctiva of 1122 patients found 64% *staphylococci*, 36% *Diphtheroids*, 3-4%  $\alpha$ H *Streptococci*.

Fernandez-Rubio E<sup>17</sup> found higher prevalence of CONS in 88.3%, *Diphtheroids* in 58.1%, *Propionibacteria* in 31%, *Streptococci* in 23.1%,

*Staphylococcus aureus* 10.2%. As is seen in most studies, the commonest flora isolated was coagulase negative *staphylococcus*. In this study, the commonest bacterial isolate was *Staphylococcus epidermidis*, isolated in 14 (45.2%) patients followed by *Staphylococcus aureus* 13 (41.9 %). Other isolates were *Klebsiella pneumonia* in 3 (9.7%) and *Corynebacterium diphtheriae* in 1(3.2%) patients.

All the above studies show that occurrence of CONS is the predominant flora of conjunctiva. The fact that they are the common resident flora of skin and mucus membrane and are acquired in conjunctiva from the adjacent eyelid or from hand also explained their predominant presence.

Studies on frequency of sterile Conjunctival sac has shown marked disparity among different studies. Chang<sup>18</sup> in a study on bacterial flora of normal conjunctiva, reported 9%, while Matuura<sup>19</sup> reported 2.5% of sterile conjunctiva. Other studies reported higher percentage of sterile conjunctiva. Debnath<sup>20</sup> reported 30% in a study on effect of preoperative antibiotics on bacterial colony counts of the conjunctival sac, while Smith<sup>21</sup> studying bacteriology of the healthy conjunctiva reported 47% respectively. Starr MB, LallyJM<sup>22</sup>and Bachrach et al.<sup>23</sup> also reported 24% and 33% respectively. In this study we found 67.4% of patients with sterile conjunctiva. This is of particular concern to the ophthalmologist when planning surgery, since sterility at the time of surgery presumably decreases the frequency of postoperative infections. It has been shown that with aggressive preoperative preparation, consisting of broad-spectrum topical antibiotics, skin and conjunctival application of diluted povidone-iodine solution, the percentage of sterile conjunctival sacs can be increased to 83%<sup>24</sup>.

Ciproflaxacin was the most sensitive (93.3%) antibiotic tested followed by chloramphenicol (87.5%), then gentamicin (76%) in our study. AF Mahmud-Ajeigbe et al<sup>7</sup>. in a study on bacterial flora in pre cataract surgery patients in a Northern Nigerian

hospital found the bacterial isolates were sensitive to ciprofloxacin and tobramycin. Belur R Keshav and Somansu Basu<sup>12</sup> ciprofloxacin, gentamycin, vancomycin and chloramphenicol were found to be most effective. GB Gadzama, BH Askira and BZ Ali<sup>25</sup> in Nguru found over 90% of bacterial isolates were sensitive to ciprofloxacin.

The most resistant antibiotic was cefuroxime (53.6%) in this study while Omotoye<sup>26</sup> in Ife found a 61.3% resistance to chloramphenicol. Ajeigbe et al<sup>7</sup> reported 32.7% resistance to tetracycline and 11% resistance to chloramphenicol.

### Conclusion

The commonest bacterial isolate was *Staphylococcus epidermidis*, followed by *Staphylococcus aureus*. Ciprofloxacin was the most sensitive antibiotic tested followed by chloramphenicol. Instillation of antibiotics into the conjunctival sac to make it sterile prior to surgery can prevent post-operative infection by the normal bacterial flora of conjunctiva.

### References

1. Abdull MM, Sivasubramanian S, Murthy GVS, Gilbert C, Abubakar T, Ezelum C, et al. Causes of blindness and Visual Impairment in Nigeria: The Nigeria National Blindness and Visual Impairment Survey. *Investigative Ophthalmology & Visual* 2009, Vol 50, 4114-4120
2. Rosenfeld SI, Bradford CA, Bobrow JC. Basic and Clinical Science Course- Section 11 Lens and Catatract. In: Rosenfeld SI, Johns KJ, editors. San Francisco: *American Academy of Ophthalmology*; 2004. P. 176
3. Adio AO. Surgical uptake in an ophthalmologically underserved state in Nigeria: A preliminary Report. *J Surg Sci* 2008; 1:24-8
4. Suto C, Morinaga M, Yagi T, Tsuji C, Toshida H. Conjunctival sac bacterial flora



- isolated prior to cataract surgery. *Infect Drug Resist* 2012; 5:37-41
5. Mahmud-Ajeigbe AF, Oladigbolu KK, Giwa FJ, Abah ER, Rafindadi AL, Olayinka AT, Pam VA. Bacterial flora in precataract surgery patients in a Northern Nigerian Hospital. *Niger J Surg Res* 2016; 17:5-9
  6. Results of the Endophthalmitis Vitrectomy Study. A randomized trial of immediate vitrectomy and of intravenous antibiotics for the treatment of postoperative bacterial endophthalmitis. Endophthalmitis Vitrectomy Study Group. *Arch Ophthalmol*.1995; 113(12):1479-1496
  7. Aaberg TM Jr, Flynn HW Jr, Schiffmann J, Newton J. Nosocomial acute-onset postoperative endophthalmitis survey. A 10year review of incidence and outcomes. *Ophthalmology*. 1998; 105(6):1004-1010
  8. Kanski JJ. Clinical Ophthalmology-A systematic Approach. Elsevier Butterworth-Heinemann 2007: pg 354
  9. Reza M, Madani H, Ghaderic E. Conjunctival bacterial flora and antibiotic resistance pattern in patients undergoing cataract surgery. *Pak J Med Sci*. 2008; 24:581-5
  10. National Committee for Clinical Laboratory Standards. 1999. Performance standards for antimicrobial susceptibility testing. NCCLS approved standard M100-S9. National Committee for Clinical Laboratory Standards, Wayne, PA.
  11. Sthapit PR, Tuladhar NR, (2014) Conjunctival Flora of Normal Human Eye. *JSM Ophthalmol* 2(2): 1021.
  12. Ciulla td, Starr mb, Masker sm. Bacterial endophthalmitis prophylaxis for cataract surgery: an evidence based update. *Ophthalmology* 2002; 109:13-26.
  13. Karthika. N, Neelima. A, Suresh Ramchandran. A study of normal bacterial flora of the conjunctiva in patients undergoing cataract surgery in a rural teaching hospital in R. R. district: *Journal of Scientific and Innovative Research* 2014; 3 (2): 164-167
  14. Belur R Keshav, Somansu Basu. Normal conjunctival flora and their antibiotic sensitivity in Omanis undergoing cataract surgery. *Oman j of ophthalmology* 2012;5(1):16-18.
  15. Ansari MR, Madani H, Ghaderi E. Conjunctival bacterial flora and antibiotic resistance pattern in patients undergoing cataract surgery. *Pak J Med Sci*. 2008; 24: 581-585.
  16. Khorazo D, Thompson R. The bacterial flora of the normal conjunctiva. *Am J Ophthalmol*. 1935; 18: 1114-1116.
  17. Fernández-Rubio E, Urcelay JL, Cuesta-Rodriguez T. The antibiotic resistance pattern of conjunctival bacteria: a key for designing a cataract surgery prophylaxis. *Eye (Lond)*. 2009; 23: 1321-1328.
  18. Chang HL. Bacterial flora of the normal conjunctiva. *Chin Med J*. 1957; 75: 233-235.
  19. Matuura H. Anaerobes in the bacterial flora of the conjunctival sac. *Jpn J Ophthalmol*. 1971; 15: 116-124.
  20. Debnath Sc. Effect of preoperative antibiotics on bacterial colony counts of the conjunctival sac. *J Ocular Surg*. 1985; 4: 122-124.
  21. Smith CH. Bacteriology of the healthy conjunctiva. *Br J Ophthalmol*. 1954; 38: 719-726.
  22. Starr MB, Lally JM. Antimicrobial prophylaxis for ophthalmic surgery. *Surv Ophthalmol*. 1995; 39: 485-501.
  23. Bachrach U, Gurevitch J, Landau J, Birnbaum D. The flora of the normal conjunctiva of healthy people in Israel. *Acta Med Orient*. 1953; 12: 10- 13.
  24. Isenberg SJ, Apt L, Yoshimori R, Khwarg S. Chemical preparation of the eye in ophthalmic surgery. IV. Comparison of povidone-iodine on the conjunctiva with a



- prophylactic antibiotic. *Arch Ophthalmol* 1985; 103: 1340-2.
25. GB Gadzama, B H Askira, B Z Ali. Sensitivity pattern of bacterial isolates from purulent conjunctivitis in Nguru, Northeast, Nigeria. *BOMJ*, Vol. 5, No. 1, January-June 2008 PP 1-3.
26. Omotoye OJ. Conjunctival bacterial colonization of cataract patients in OAUTHC Ile-Ife. Fellowship dissertation for the National Postgraduate Medical College Nigeria: 2010

---

**Cite this Article as:** Musa ZY, Askira BH, Waziri MA, Zailani SB, Ali KB. Conjunctival Bacterial Normal Flora and Antibiotic Sensitivity in Patients Undergoing Cataract Surgery in Maiduguri. **Bo Med J** 2019;16(2): **Source of Support:** Nil, **Conflict of Interest:** None declared

---

