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Original Article

Microbiological patterns of endophthalmitis in a tertiary level hospital of Kathmandu, Nepal

Smita Shrestha[1], Anu Manandhar[1]
[1] Tilganga Institute of Ophthalmology, Gaushala, Kathmandu, Nepal

Abstract

Introduction: Endophthalmitis is a serious ocular infection that can result in blindness and therefore is a major ophthalmic concern.

The study was conducted to find out the microbial etiology in clinically diagnosed cases of endophthalmitis and to determine the antibacterial susceptibilities of bacterial isolates in vitro.

Materials and methods: A retrospective analysis was carried out of all patients presenting between15th January 2012 to 15th January 2013 with clinically diagnosed Endophthalmitis at Tilganga Institute of Ophthalmology (TIO). Intraocular specimens (aqueous or vitreous fluids) were collected from 102 patients. Along with intraocular aspirates, blood and urine specimens, chest X-ray from endogenous endophthalmitis and corneal scrapes from corneal ulcer leading to endophthalmitis were also collected. The intraocular specimens were then subjected to microbiological evaluation. Antibiotic susceptibility of isolates were determined for different ocular antibiotics using the Kirby-Bauer disk-diffusion test.

Results: Samples from 102 patients diagnosed with endophthalmitis underwent microbiological analysis, of which culture positive 34(33.33%).Out of 34, 29 (85.29%) had bacterial growth and the remaining 5 (14.70%) had fungal growth. Most of them (40.8%) were secondary to cataract surgery(postoperative). A total of 29 bacterial culture reports, 72.41% were gram-positive and 27.58% were gram-negative. Streptococcus pneumoniae (37.93%) was the most frequently isolated organism. The antimicrobial sensitivity for isolates was as follows: Ofloxacin—86.2%, Chloramphenicol—82.75%, Cefazolin- 82.7%, Gentamicin—75.8%, Ceftazidime-58.6%, Amikacin—55.17% and Vancomycin—51.7%.

Conclusion: The data highlights low culture positivity and a predominance of gram-positive bacteria as the major causes of infectious endophthalmitis, usually following cataract surgery. The most common isolate was Streptococcus pneumoniae. Ofloxacin and Chloramphenicol demonstrated greatest efficacy against these bacterial isolates.

Key words: Endophthalmitis, Intraocular specimens, Culture, Antibiotic susceptibility.

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Corresponding author
Dr. Smita Shrestha, MD
Tilganga Institute of Ophthalmology
Gaushala, Bagmati Bridge
Kathmandu, Nepal
Contact: 977 9851194444
E-mail: smitashrestha@hotmail.com

Introduction

Endophthalmitis is a serious ocular infection that can result in blindness and therefore is a major ophthalmic concern. Infectious endophthalmitis is confirmed by positive culture where as sterile endophthalmitis describes cases suspected of being infectious but with negative cultures.[3] Endophthalmitis is caused by the introduction of contaminating microorganisms following trauma, surgery, or hematogenous spread from a distant infection site.[3]

Infectious endophthalmitis can be classified according to how the infecting organism is introduced into the eye. (a) Exogenous endophthalmitis, in which the organism enters the eye from the external environment. (b) Endogenous endophthalmitis (EE) results from the blood borne spread of bacteria or fungi during generalized septicemia. Exogenous endophthalmitis can be further classified as (i) postoperative endophthalmitis, (ii) post traumatic endophthalmitis, (iii) bleb related endophthalmitis (BRE). Occasionally, exogenous endophthalmitis results from contagious spread of infectious microbes from the ocular adnexa, especially following infections on the cornea or sclera.[3]

The etiology and true incidence of endophthalmitis in Nepal are still unclear. Few series have been published on endophthalmitis.[2,18,16] The incidence and etiology of endophthalmitis is mainly based on American, European and Indian studies. This study may present to some extent the pattern of infective agents causing endophthalmitis in Nepal, since the patients included in this series are from different parts of the country. Hence, by knowing the causative organism which causes endophthalmitis, favorable visual prognosis can be obtained by using appropriate antibiotics.

Materials and methods

A retrospective analysis was performed of all the consecutive cases of endophthalmitis treated at Tilganga Institute of Ophthalmology (TIO) from 15th January 2012 to 15th January 2013. All cases of clinically diagnosed endophthalmitis, irrespective of prior treatment with oral, topical, intravenous or intravitreal antibiotics were included whereas patients who have undergone vitrectomy were excluded from the study.

The endophthalmitis was diagnosed on the basis of pain, decrease in visual acuity, anterior chamber cellular reaction and flare, hypopyon, vitreous exudates, loss of media clarity. All patients with endophthalmitis presenting to TIO underwent thorough evaluation and documentation which included: (1) Demographic profile, duration of symptoms, and use of medications; (2) The predisposing factors: ocular surgeries(cataract, trabeculectomy, penetrating keratoplasty, intravitreal injection and retinal surgeries), related ocular disease, history of trauma, systemic morbidity; (3) ocular examination findings (Snellen's visual acuity, presence of AC cells and flare, hypopyon, vitreous exudates and fundus visibility), ultrasonography (when fundus was not visible); and (4) microbiological workup which included direct microscopy and culture results with antibacterial susceptibilities.

The diagnosis of infectious endophthalmitis was confirmed by the demonstration of significant microbial growth on at least one culture of intraocular specimens .In cases of EE, along with intraocular specimen presence of the same infectious agents in cultures of blood or urine confirmed the diagnosis. By obtaining the same microbial pathogens in corneal scrape and intraocular aspirates confirmed endophthalmitis due to corneal infection. By using systematic approach and standard techniques, the microbiological diagnosis of endophthalmitis was confirmed. 0.1–0.2 ml of aqueous were aspirated through the peripheral clear corneal paracentesis using a 27-gauge needle on a 1 ml sterile tuberculin syringe. Vitreous specimen (0.2 ml) was obtained using a 26 or 23 -gauge needle or automated vitrector introduced through the pars plana (4.0 mm from the limbus if phakic, or 3.5 mm from the limbus if aphakic or pseudophakic). The aspirated intraocular fluids were immediately inoculated on blood agar, chocolate agar, Sabouraud's dextrose agar and nutrient agar for culture. Gram stain, Giemsa stain and 10% potassium hydroxide smear were also prepared. Within 15-30 minutes of their collection, the specimens were processed. Complete blood count, urine routine, blood culture, urine culture and chest x-ray was performed for all endogenous endophthalmitis cases with risk factor of recent hospitalization, diabetes mellitus, urinary tract infection,immunosuppressive state, intravenous drug abuse and indwelling catheters).

Kirby-Bauer disk-diffusion technique was used for the antibiotic susceptibility testing of the isolates. The antibiotic disks used were: vancomycin, cefazolin, ceftazidime, amikacin, ofloxacin, chloramphenicol, ciprofloxacin and amikacin.

Statistical analysis

Patient's data were collected and recorded as per Performa. The collected data was checked and coded manually and then entered into the computer for processing, analysis, interpretation and then computed using SPSS 16 window program. Percentage and proportions have been presented for categorical data.

Results

A total of 102 patients with endophthalmitis underwent microbiological analysis during the study period of one year and a single eye was infected in all the cases. Table 1 summarizes the causes of endophthalmitis. Out of 102 cases, Post-cataract endophthalmitis 40(40.8%) was the main cause for endophthalmitis followed by Post traumatic and endogenous endophthalmitis (27.45%). BRE and Post TPK and corneal ulcer accounted for 2.04%, 3.06% and 3.06% respectively.

Out of 102 cases, only 34 (33.33%) showed growth of organisms and 68(66.66%) cultures were sterile which is shown in Figure 1.

The growth patterns of organisms cultured from intraocular aspirates of patients with culture-proven endophthalmitis according to the types of endophthalmitis are presented in Table 2. Post-traumatic endophthalmitis included most no. of culture positive cases (37.03%).

Table 1: Causes of Endophthalmitis

Cause	No. of patients	Percentage
Post Cataract (acute) (chronic)	31 9	31.62 9.18
Post Traumatic	27	27.54
Endogenous	27	27.54
Others- Post TPK Corneal Ulcer	3 3	3.06 3.06
Associated with filtering blebs	2	2.04

Table 2: Distribution of culture positive cases in different types of Endophthalmitis

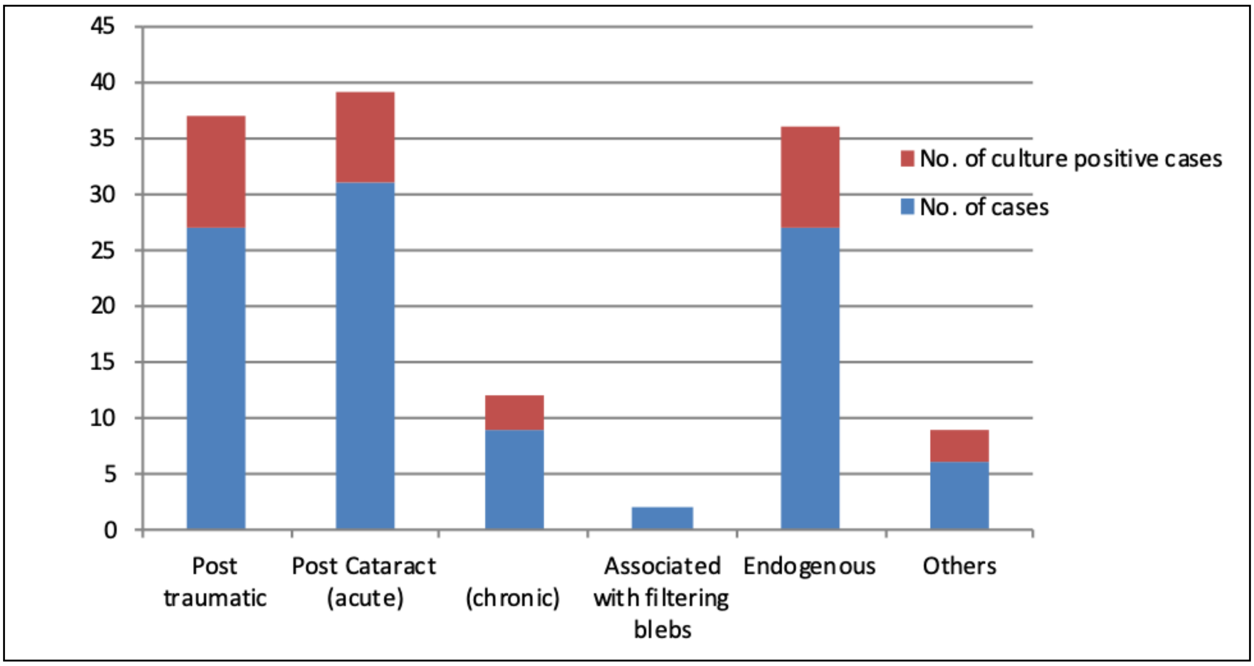

Table 3: Microorganism isolated from patients with infectious endophthalmitis

Description	No. of patients	Percentage
Bacteria	29	85.29
Fungus	5	14.70
Others	-	-

Microbial pathogens yield from eyes with infectious endophthalmitis are tabulated in Table 3. Among 34culture positive cases, 29 (85.29%) were bacteria and 5 (14.70%) were fungus. None of the culture showed mixed growth. Among 29 bacterial culture reports, 21 were gram positive, 8 were gram negative and none were mixed. Streptococcus pneumoniae was the main organism which caused endophthalmitis (37.93%) followed by Staphylococcus aureus (24.13%), P.aeruginosa (20.6%), Streptococcus viridian(6.89%) and Morexella, Klebsiella and H.influenza 3.44% each, which is shown in Figure 2.

Among 5 cases, Aspergillus was isolated in 2 cases, Candida in 1 case, Fusarium in 1 case and Cladosporium in 1 case**.**

Table 4: Types of Fungi

Types	Number	Percentage
Aspergillus	2	40
Candida	1	20
Fusarium	1	20
Cladosporium	1	20

The antibacterial susceptibilities of bacterial isolates cultured from eyes with endophthalmitis are presented in Table 5. In this study Gram positive bacteria was mostly sensitive to Ofloxacin (76.19%), followed by Chloramphenicol and Cefazolin (71.42%), Gentamicin (66.66%), Vancomycin and Ceftazidime (57.14 %) and Amikacin (52.38%). And similarly, gram negative bacteria were mostly sensitive to Chloramphenicol and Cefazolin (87.5%), followed by Gentamicin and Ofloxacin (66.66 %), Vancomycin and Ceftazidime (50 %) and Amikacin (33.33%). Resistant to the drugs were seen maximum with Amikacin, Vancomycin and then Ceftazidime.

Table 5: Antibacterial susceptibilities of bacterial isolates from intraocular aspirates from patients with infectious endophthalmitis.

Drugs	Sensitive	Partial Sensitive	Resistance
Vancomycin	15	4	10
Ofloxacin	25	3	1
Ceftazidime	17	3	9
Amikacin	16	2	11
Gentamicin	22	5	2
Chloramphenicol	24	4	1
Cefazolin	24	3	2

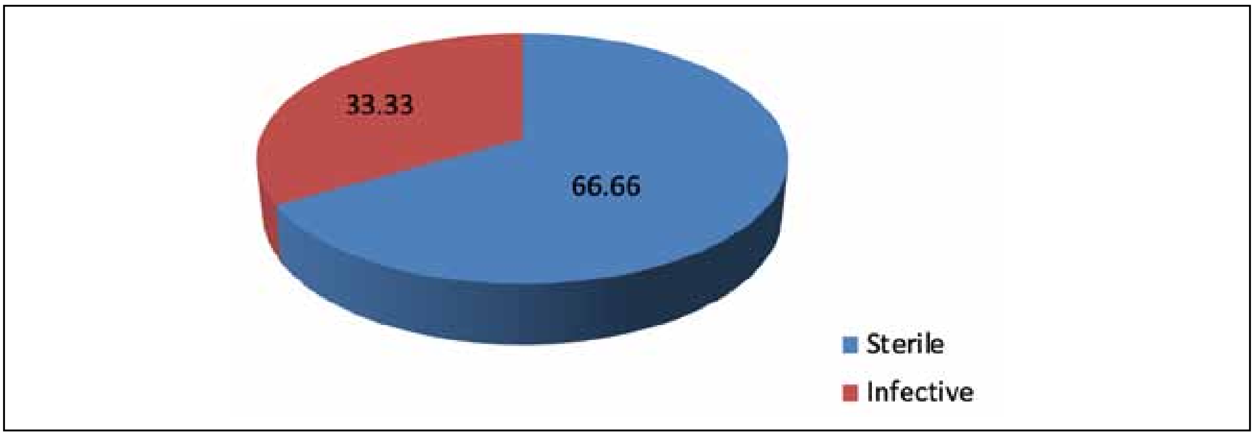

Figure 1: Distribution according to ocular culture report

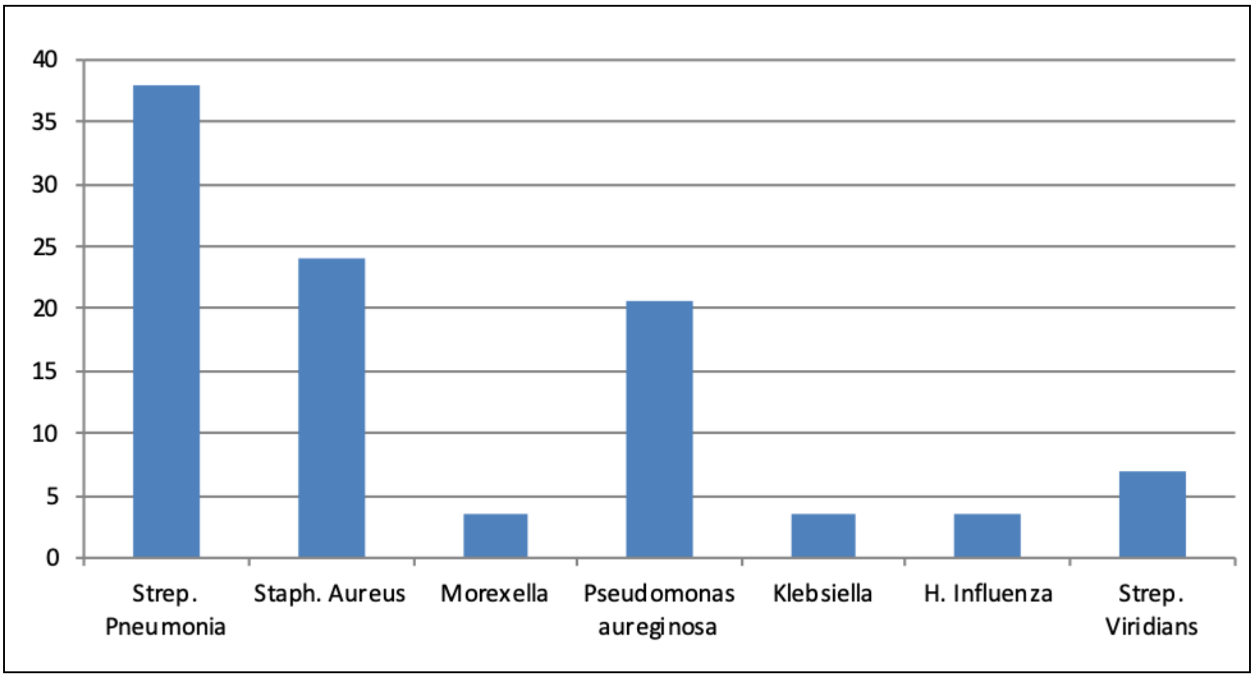

Figure 2: Types of bacteria

Discussion

A wide variety of microorganisms that enter the eye from the external environment or by hematogenous spread leads to endophthalmitis. Identifying the growth pattern of the organism is an important step in the management of infective endophthalmitis.

Each year, approximately 100,000 cataract operations are carried out in Nepal.[14]Post-cataract was the main cause of Endophthalmitis covering 40.8% of cases in this study. Post-Trauma and endogenous causes covered 27.54% equally, BRE 2.04% and others (post TPK and corneal ulcer) 6.12% of cases respectively.

The rate of growth of microbes depends on the method of specimen collection and inoculation, viable microbes load in the inoculum, previous medical therapy, and the microbiological laboratory environment. Out of 102 cases, 34 (33.33%) cases were culture positive and 68 (66.66%) were sterile. Our culture positivity is akin with similar studies, 38% (Anand et al,2000), 44.4% (Ramakrishna et al,2009) and 43.54%(Rodriguez et al,2001) Our culture positivity differs from that of EVS which proved 69% of the culture-positive. 42 % of the patients included in this study had been treated or operated elsewhere for infection; hence this could be the reason for low culture positivity in our study.

We found that bacteria (85.29%; 29 0f 34) was followed by fungi (14.7%; 5of 34) as the most common causative organisms, supported by different studies (Ramakrishna et al, 2009 and Puliafito et al,1982**)**.

Only 4 out of 102 cases showed bacteria in Gram and Giemsa stain. 3 out of 5 cases of fungal endophthalmitis showed evidence of fungus with 10 % KOH stain. 33% of the slides which showed abundance of polymorphonuclear cells were later on proved by culture study to have some microorganisms.

The spectrum of pathogenic bacteria causing a disease may gradually change over the period of time, so is in the case of microbiological flora of endophthalmitis (Ramakrishna et al, 2009).In this study, 71.41% of the bacteria were gram positive and 27.58% were gram negative bacteria.

Out of 40 cases of Post- cataract Endophthalmitis (40.8%), 11 cases (27.5%) were only found to be culture positive. In which gram positive was 45.45%, gram negative 45.4% and fungi 9.09%. The microorganisms mainly responsible for it were Staphylococcus aureus in 4 cases (36.3%), Pseudomonas aeruginosa in 3 cases (27.2%) and Streptococcus pneumonia, Moraxella, Candida and Klebsiella in 1 case each(9.09%).Hence, different studies revealed different results in post cataract endophthalmitis i.e. Staphylococcus aureus(Khan et al,2001),P. aeruginosa (Anand et al,2000),coagulase-negative staphylococci (Mollan et al, 2000; Lalwani et al,2005; Pathengay et al, 2012; Carrim et al, 2009; Chung Yee Chung et al, 2006).

Streptococcus pneumoniae (50%) was the most predominant organism for causing Post-traumatic Endophthalmitis in this study, followed by Streptococcus viridians (10%), H. influenza (10%), Pseudomonas (10%) and Streptococcus aureus (20%). Various similar studies showed Staphylococcus epidermidis and gram-negative organisms (Al-Omran et al, 2007), Bacillus(Anand et al,2000), Staphylococcus epidermidis and Pseudomonas aeruginosa (Vedantham et al, 2006), Gram negative bacilli (Ramakrishna et al,2009) as main causative organism for traumatic endophthalmitis.

Out of 102 cases only 2 cases of bleb related endophthalmitis (2.04%) were identified. And both were culture negative.

27 cases (33.33%) of Endogenous endophthalmitis were identified and only 9

cases (40.9%) were growth positive. In contrast to many of the published series, we isolated positive culture in a very low percentage. Most common isolates was Streptococcus pneumonia (4 cases; 44.4 %), Pseudomonas (2 cases; 22.22%), Staphylococcus aureus (1 case; 11.11%) and fungi Cladosporium and Aspergillus (1 case each; 11.11%). In this study, we were not able to find out the extra ocular infectious foci in all cases of endogenous endophthalmitis. Out of 27 cases, Urinary tract infection was found in 2 cases, Chest infection in one case .However, these cases were blood culture negative. Other 2 cases showed positive blood culture, although primary foci of infection could not be found. In a study by Shankar Khanal et al from Nepal describes a series of endogenous bacterial endophthalmitis de novo in onset, without any identifiable predisposing factors.[2]

Three cases having endophthalmitis after PK showed culture positive yielding Staphylococcus aureus, Aspergillus and Fusarium. This study includes only 3 cases of endophthalmitis secondary to keratitis. And all 3 were culture negative, in spite of corneal scraping culture being positive in 2 cases (Aspergillus and Streptococcus pneumonia) and 1 sterile.

This study showed Gram positive bacteria was mostly sensitive to Ofloxacin (76.19%), followed by Chloramphenicol and Cefazolin (71.42%), Gentamicin (66.66%), Vancomycin and Ceftazidime (57.14 %) and Amikacin (52.38%). And similarly, gram negative bacteria were mostly sensitive to Chloramphenicol and Cefazolin (87.5%), followed by Gentamicin and Ofloxacin (66.66 %), Vancomycin and Ceftazidime (50 %) and Amikacin (33.33%). Resistance to the drugs were seen maximum with Amikacin, Vancomycin and then Ceftazidime. In contrast to many studies, Vancomycin showed only 57.14 % of sensitivity whereas in other studies it showed 100% sensitivity (Benz et al, 2004; Anand et al, 2000; Rodriguez et al, 2001).

Conclusion

The data highlights low culture positivity and a predominance of gram-positive bacteria as the major causes of infectious endophthalmitis, usually following cataract surgery. Streptococcus pneumoniae was the most common organism. Ofloxacin and Chloramphenicol demonstrated greatest efficacy against these bacterial isolates.

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