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RESEARCH ARTICLE

A STUDY OF MICROBIAL PROFILE AND VISUAL OUTCOME OF ENDOPHTHALMITIS AT TERTIARY EYE CARE CENTRE IN CENTRAL INDIA

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ABSTRACT

Background & objectives: The main objective of this study was to determine microbiological profile and its association with visual outcome. The present study was conducted in the department of ophthalmology at tertiary eye care centre in central India. **Methods:** The present study was a hospital based prospective observational and Interventional study conducted in the department of ophthalmology at tertiary eye care centre during the period from November 2018 to October 2020. After collection of aqueous or vitreous sample from all patients they received intravitreal antibiotics with or without vitrectomy and the management was based on microbiological analysis of the vitreous fluid. **Results:** Post operative endopthalmitis was found in 35 (45.5%) cases, post-traumatic endophthalmitis was in 31 (40.3%) cases and 11 (14.3%) cases of endogenous endophthalmitis. Males were predominant in all three types of endophthalmitis. There were 22 patients with only culture positive findings and 10 cases with both smear and culture positive finding. 24 culture samples were positive for bacteria and 8 were positive for fungi. Postoperative endopthalmitis was most common among all types. All Gram-positive bacteria were susceptible to vancomycin and all gram negative bacteria were Susceptibile to ceftazidime. Visual outcome of fungal endophthalmitis cases was poorer compared to bacterial endophthalmitis. Post-interventionv Best corrected visual acuity (BCVA) was better when the vitreous samples was negative in culture. **Interpretation & conclusions:** The outcome of infectious endophthalmitis and spectrum of infection in central India was similar to other parts of the country. Compared to bacterial endophthalmitis, the visual outcome of fungal endophthalmitis cases was poorer. Empirical use of standard intravitreal therapy is recommended while emphasizing on vitreous biopsy for culture and sensitivity whenever possible.

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INTRODUCTION

Endophthalmitis is sight threatening disease characterized by marked progressive inflammation of vitreous and /or aqueous humors usually due to an intraocular bacteria, fungal parasitic or rarely viral infection(1)(2)(3)(4). Endophthalmitis is a rare but severe form of ocular inflammation due to infection of the intraocular cavity that can lead to irreversible visual loss if not treated properly and timely. It can be classified as exogenous or endogenous based on the transmission route of the infectious source. The broad categories include postoperative endophthalmitis (acute – onset, chronic or delayed onset, conjunctival filtering bleb associated), posttraumatic endophthalmitis and endogenous endophthalmitis(5).

The micro-organism responsible for post-operative endophthalmitis (eg. Staphylococcus aureus, Staphylococcus epidermidis, Propionibacterium Acne) generally reside on eyelid margin and pre occular tear film. In case of post traumatic infectious endophthalmitis the organisms (i.e. Bacillus cereus, Pseudomonas, Klebsiella and fungi) are generally derived from environment. Most common causes of endogenous endophthalmitis are Streptococcus pneumoniae, Klebsiella pneumoniae, Staphylococcus viridans, Staphylococcus aureus, Escherichia coli, Candida albicans and Bacillus cereus (6). Documentation of microbial pathogens causing endophthalmitis is of the highest priority and their antimicrobial susceptibility is essential for better understanding and prompt management of endophthalmitis.

Cataract surgery is one of the most common eye operations performed worldwide, and acute post cataract endophthalmitis complicates this procedure in 0.1% of cases (7). In many developed countries post operative cases make up the majority of endophthalmitis and worldwide reported incidences ranging from 0.03% to 0.2% (1) Diagnosis of endophthalmitis is clinical and supported by cultures of the vitreous and /or aqueous or by blood cultures in some endogenous cases. Endogenous endophthalmitis [EE] accounts for approximately 2-8% of endophthalmitis(8) (9)(10). Intravitreal injection of antibiotics is the most important component of treatment; some case also benefit from surgical debridement of vitreous by vitrectomy (7). Identification of the causative infectious agent, investigations are necessary not only to determine the incidence of this condition but also to identify the sources of such infections, these are necessary to understand its epidemiology and to develop plan for the prevention of its occurrence (11). The purpose of study is to determine specific microbial pathogen responsible for development of various forms of endophthalmitis and also to compare visual.

MATERIALS AND METHODS

The present study was a hospital based prospective observational and Interventional study conducted in the department of ophthalmology at tertiary eye care centre during the period from November 2018 to October 2020. We studied microbiological profile along with visual outcome of endophthalmitis in 77 eyes of 77 patients who fulfilled the inclusion criteria over a period of 2 years. The study protocol was approved by the institutional review board and written informed consent was obtained from all patients. All patients had undergone complete eye examination under slit lamp biomicroscopy following collection of history and demographic details. Ultrasound B scan was done in eyes when media opacity (corneal oedema, anterior chamber exudates, vitreous exudates) precluded fundus view with indirect ophthalmoscope. Following complete pre-operative evaluation all patients were subjected to intravitreal antibiotics and some of them underwent parsplana vitrectomy with intraocular antibiotic. At the time of intravitreal injections and vitrectomy, undiluted aqueous and vitreous sample (0.2-0.5 ml) was collected from all cases. Vitreous sample was sent to microbiological laboratory immediately and processed within 30 min. Vitreous sample was used to make smears (Gram staining and KOH mount) and microscopic examination was done.

Vitreous sample was inoculated on culture media (5 % blood agar, chocolate agar, Robertson cooked meat broth and Sabouraud Dextrose Agar (SDA). All Medias were incubated at 37degree celsius except Sabouraud Dextrose Agar (SDA) that was held at 27degree celsius in incubator. Chocolate agar was incubated in 5 to 10 % CO2 in candle jar. Two sets of Sabouraud Dextrose Agar (SDA) were prepared and were incubated at room temperature and at 27degree Celsius respectively. Vitreous sample was also inoculated into thioglycolate broth and incubated at 37 degree C for anaerobes and microaerophilic organisms such as pseudomonas. Any bacterial growth was identified using conventional identification system and Fungal identification was based on colony characteristics and microscopic features. In case of no growth, all culture media were held for two weeks before declaring sample as sterile.

Culture was examined for 2 weeks in the case of aerobic and anaerobic organisms before reporting as negative. In case of fungal culture, the culture medium was observed for minimum 3 weeks. All bacterial isolates were tested for their susceptibly to a battery of antibiotics by Kirby bauer disc diffusion method. After collection of sample from all patients they received intravitreal Injection Vancomycin 1 mg i.e. 0.1 ml and Injection Ceftazidime 2 – 2.5 mg i.e.0.1 ml. Post-operative treatment of patients consisted of systemic and topical antibiotics. Patients with fungal infection were given intravitreal Amphotericin B (5µg i.e 0.1 ml.).

RESULTS

In present study out of 77 patients, maximum 36 (46.8%) patients were above 60 years of age. The mean age of patients was 51.61±22.18 years, with minimum age of 5 years and maximum 82 years. 51 (66.2%) were males and 26 (33.8%) were females. There were 11 (14.3%) patients with endogenous type with a mean age of 54.82 (SD: 21.7) years and range of 68 years, while in the post-traumatic type 31 (40.3%) patients were with a mean age of 34.94 (SD: 21.98) years and range of 68 years. In the post-operative endophthalmitis, there were 35 (45.5%) cases and the mean age was 65.37 (SD: 9.09) years and range of 41 years. There were maximum 35 (45.5%) cases of post-operative endophthalmitis, followed by 31 (40.3%) cases of post-traumatic endophthalmitis and 11 (14.3%) cases of endogenous endophthalmitis. We found that out of 42 cases with microscopic findings, 6 (14.3%) were endogenous, 17 (40.5%) were post-traumatic and 19 (45.2%) were post-operative.

There were 10 cases with only smear positive, out of which 3 (30%) were post-traumatic, while 7 (70%) were post-operative. There were 22 patients with only culture positive findings, out of them endogenous and post-operative were 5 (22.7%) cases each, while 12 (54.5%) were post-traumatic. There were 10 cases with both smear and culture positive finding, out of which 1 (10%) case was endogenous, 2 (20%) were post-traumatic and 7 (70%) were post-operative. Overall susceptibility pattern in our study showed that gram-positive bacteria were most susceptible to Vancomycin(100%) and fluoroquinolones such as Ciprofloxacin(75%), Gatifloxacin (75%). Gram negative bacteria were most susceptible to ceftazidime (100%) and amikacin(100%). In patients treated with intravitreal antibiotics, 13 (38.2%) had poor visual outcome, 17 (50%) had satisfactory, while 4 (11.8%) had good outcome.

Among patients treated with core vitrectomy + intravitreal antibiotics, 28 (65.1%) showed poor outcome, 13 (30.2%) showed satisfactory, while 2 (4.7%) showed good outcome. In the bacterial endophthalmitis type, the mean initial visual acuity in LogMAR was 2.33 (SD: 0.3) and range of 1.0, while the final visual acuity in LogMAR was 1.74 (SD: 0.68) and range of 2.5. The mean difference of VA was statistically significant as indicated by p-value < 0.0001. In the fungal type, the mean initial visual acuity was 2.58 (SD: 0.26) with range 0.5, while the final visual acuity in LogMAR was 1.87 (SD: 0.91) and range of 2.0. The mean difference of VA between two stages was statistically significant with a p-value of 0.023.

Table 1. Age and sex distribution according to type of endopthalmitis

Parameter	Type of Endophthalmitis		
	Endogenous (n=11)	Post-traumatic (n=31)	Post-operative (n=35)
Age	54.82 (SD 21.7)	34.94 (SD 21.98)	65.37 (SD 9.09)
Male	7 (63.6%)	24 (77.4%)	20 (57.1%)
Female	4 (36.4%)	7 (22.6%)	15 (42.9%)

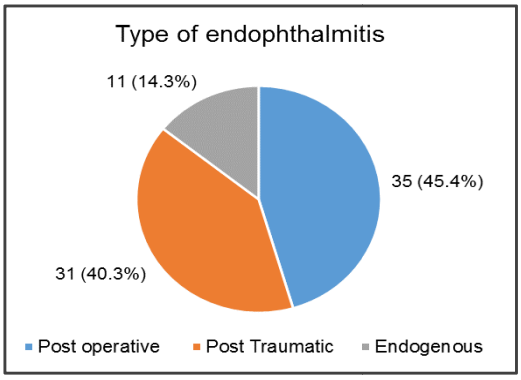

Figure 1: distribution according to type of endopthalmitis

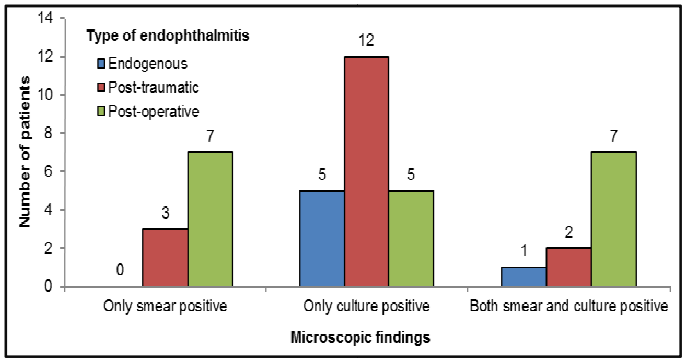

Figure 2: Column chart showing number of patients as per microscopic findings

Table 2. Number of patients with microscopic findings as per type of endophthalmitis

Type of endophthalmitis	Only smear positive	Only culture positive	Both smear and culture positive	Total
Endogenous	0	5 (22.7%)	1 (10%)	6 (14.3)
Post-traumatic	3 (30%)	12 (54.5%)	2 (20%)	17 (40.5)
Post-operative	7 (70%)	5 (22.7%)	7 (70%)	19 (45.2)
Total	10	22	10	42

Table 3. Distribution of microorganism in endophthalmitis

Micro-organism	Post-operative	Post-traumatic	Endogenous
Staphylococcus Epidermidis	3 (25.0%)	3 (21.4%)	-
Staphylococcus aureus	-	-	1 (16.7%)
Streptococcus pneumonia	-	-	1 (16.7%)
Candida sp.	3 (25.0%)	1 (7.1%)	1 (16.7%)
Pseudomonas sp.	2 (16.7%)	-	2 (33.3%)
Aspergilus flavus	2 (16.7%)	-	-
Aspergilus fumigatus	-	1 (7.1%)	-
Bacillus sp.	1 (8.3%)	4 (28.6%)	-
Propionibacterium acne	1 (8.3%)	1 (7.1%)	-
Escherichia coli	-	1 (7.1%)	1 (16.7%)
Clostridium perfringes	-	1 (7.1%)	-
Moraxella sp.	-	1 (7.1%)	-
Total	12	14	6

Table 4. Antibiotic susceptibility profile of bacterial isolates in different types of endophthalmitis

Type of endophthalmitis	Susceptible isolates/Total no. of isolates							
	Ak	Ca	Gf	Cf	Of	Mo	Va	Cz
Endogenous								
GN (n=3)	2/2	3/3	2/3	2/3	1/1	-	-	-
GP (n=2)	-	-	1/2	0/2	1/2	1/1	2/2	2/2
Post-traumatic								
GN (n=2)	2/2	2/2	1/2	1/1	1/2	-	-	-
GP (n=10)	-	-	7/9	8/10	7/9	1/3	10/10	9/9
Post-operative								
GN (n=2)	2/2	2/2	0/2	1/2	0/2	-	-	-
GP (n=5)	-	-	3/5	3/5	4/5	0/1	5/5	¾

(GP, Gram positive bacteria, GN, Gram negative bacteria; Ak, amikacin; Ca, ceftazidime; Gf, gatifloxacin; Cf, ciprofloxacin; Of, ofloxacin; Mo, moxifloxacin; Va, vancomycin; Cz, cefazolin)

Table 5. Visual outcomes after intervention

Visual Outcome	Intravitreal Antibiotics	Vitrectomy + Intravitreal antibiotics
Poor (<1/60)	13 (38.2%)	28 (65.1%)
Satisfactory(1/60- 6/60) 2/60 6/60)	17 (50.0%)	13 (30.2%)
Good (>6/60)	4 (11.8%)	2 (4.7%)
Total	34 (100%)	43 (100%)

Table 6. Descriptive statistics for initial and final visual acuity (in LogMAR) according to type of organism

Organism	Time	Mean	SD	Range
Bacteria (n=24)	Initial VA	2.33	0.3	1
	Final VA	1.74	0.68	2.5
	P-value*		< 0.0001 (S)	
Fungi (n=8)	Initial VA	2.58	0.26	0.5
	Final VA	1.87	0.91	2.0
	P-value*		0.023 (S)	

*Obtained using paired t-test, S: Significant; NS: Not significant

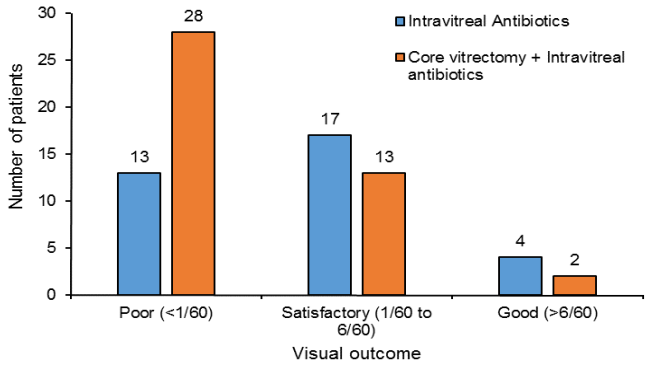

Figure 3. Column chart showing number of patients with visual outcome in two treatment

DISCUSSION

The main objective of this study was to determine microbiological profile and its association with visual outcome. In present study there were more males than females in all the groups. Other studies(12)(13)(14) also consistent with present study. While the male predominance in post-traumatic group could be due to greater chances of exposure of males to trauma due to outdoor activities, the reason for male preponderance in other two groups could possibly be due to early presentation to hospital and willing to take treatment or could be socio-economic. Young males are more actively involved in outdoor activities, the mean age of patients in post-traumatic group was lower than other two groups.

The culture was positive in 22 cases, direct microscopy was positive in 10 cases and both combined culture and direct microscopy was positive in 10 cases. No patients had received systemic antibiotics or intraocular antibiotics prior to presentation. There was extensive variation in culture positivity among clinically diagnosed cases. The Endophthalmitis Virectomy Study (EVS) (15)conducted in the United States reported 94 per cent Grampositive cocci and 6 per cent Gram-negative bacilli in post-operative endophthalmitis; the published Indian literature reported 10-54 per cent Gram-positive cocci, 26-42 per cent Gram-negative and 16-22 per cent fungal infection in post-operative endophthalmitis. In present study there was more involvement of bacteria than fungi in cases of endophthalmitis with high prevalence of gram positive bacteria.

Sharma S *et al*(16) found that almost equal involvement of bacteria and fungi in cases of post operative endophthalmitis with high prevalence of gram negative bacteria. In present study we considered intravitreal antibiotics against gram positive organisms (vancomycin) and gram negative organisms (ceftazidime) with or without vitrectomy and intravitreal corticosteroid in bacterial endophthalmitis. Intravitreal antifungal medication (amphotericin B) with vitrectomy is current standard of care in fungal endophthalmitis. In present study all gram positive bacteria were sensitive to vancomycin and all gram negative bacteria were sensitive to ceftazidime. Other studies(4)(17)(18)(19) have reported variable sensitivity of gram negative bacteria to ceftazidime. Visual outcomes in endophthalmitis was related to a number of factors, including presenting visual acuity and the promtness of appropriate therapy . In present study the treatment outcome of fungal endophthalmitis cases was poorer compared to bacterial endophthalmitis. Earlier studies(16)(20)(21)(22) have reported similar results.In present study post-intervention BCVA was better when the vitreous samples was negative in culture and the patients were treated as bacterial endophthalmitis and our result consistent with Jalali S *et al*(4). and Sharma S *et al*(16).

CONCLUSION

In present study endophthalmitis, Gram positive organisms Staphylococcus epidermidis is the most common isolate in culture. All gram positive microorganisms are sensitive to vancomycin and gram negative microorganisms are sensitive to ceftazidime. The treatment of choice in cases of established bacterial endophthalmitis is intravitreal injections of antibiotics . Compared to bacterial endophthalmitis, the visual outcome of fungal endophthalmitis cases was poorer. Patients who had better visual acuity at the time of presentation, final visual acuity was also better.

Conflict of interest: Nil

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