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POSTCATARACT SURGERY ENDOPHTHALMITIS IN A GHANAIAN POPULATION:
INCIDENCE, RISK FACTORS AND VISUAL OUTCOME AFTER TREATMENT

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POSTCATARACT SURGERY ENDOPHTHALMITIS IN A GHANAIAN POPULATION: INCIDENCE, RISK FACTORS AND VISUAL OUTCOME AFTER TREATMENT

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ABSTRACT

Background: Post-operative endophthalmitis (POE) is a serious sight threatening complication after cataract surgery. There are no published data on the incidence and outcome of treatment of this condition in West Africa.

Objective: To estimate the incidence, risk factors and visual outcome of endophthalmitis post-cataract surgery in a Ghanaian population.

Design: A retrospective interventional case series.

Setting: Eye clinic, Korle-Bu Teaching Hospital, Accra.

Subjects: All patients who had undergone cataract surgery or secondary intraocular lens implantation in Korle Bu Teaching Hospital between February 2011 and January 2014.

Main outcome Measure: Proportion of patients who developed endophthalmitis.

Results: Six of 1032(0.58%) patients (4 males) had presumed endophthalmitis. Their median age was 34years, median time of onset of endophthalmitis was 17 days and the median follow up was 371.5 days. Four (0.39%) patients had acute POE and 2(0.19%) delayed POE. The incidence of culture proven acute POE and delayed POE were 2/1032(0.19%) and 1/1032(0.097%), respectively.

Post-operative complications requiring a second surgical procedure was associated with increased risk of acute POE ($p<0.0001$) and posterior capsular rupture was associated with increased risk of delayed POE ($p<0.0001$). Three of 6(50%) patients with POE achieved a visual acuity of 6/9, one patient had visual acuity of hand motion and the other had acuity of non-perception of light at the last follow up visit.

Conclusion: The incidences of acute and delayed POE were 0.39% and 0.19%, respectively. Intraoperative and Post-operative complications of cataract

surgery were associated with a higher risk of endophthalmitis in this population.

INTRODUCTION

Cataract is the leading cause of blindness (presenting visual acuity worse than 3/60 in the better eye) worldwide and accounted for 51% of global blindness in 2010.(1) Blindness from cataract is more prevalent in low or lower middle income countries.(1-3) Cataract accounts for about 50% of blindness among adults 40years and above in Ghana and Nigeria.(4, 5) Cataract surgery is one of the most common ophthalmic procedures performed in Ghana and the number of surgeries is expected to increase due to the enhanced move to tackle the country's backlog of cataract, the ageing population, and increasing number of ophthalmologists available to perform large volume surgeries with improvement on visual outcomes. (3, 6) The cataract surgical rate i.e. the number of cataract operations per million population per year, for Ghana was 519 in 2006 and increased to 913 in 2011. (3, 6)

Post-operative endophthalmitis (POE) is a serious, sight threatening complication of cataract surgery. The reported incidence of acute onset POE is varied and ranges from 0.01% to 0.55%.(7,12) The variability in the incidence of POE may be related to differences in perioperative prophylaxis, socioeconomic status, race, surgical technique, surgeon volume or methodological differences between studies.(7, 8, 10, 12-14) About one-third of patients who develop endophthalmitis end up with non-functional vision.(9, 12) In addition, the treatment of endophthalmitis results in a direct medical cost to the patient and the health system.(9, 12, 15-17) Visual outcome after treatment of endophthalmitis in West Africa may be poorer due to limited resources, including vitreoretinal services.

The incidence of endophthalmitis after cataract surgery in Ghana is unknown. The aim of this study was to determine the incidence, risk factors and visual outcome of treatment of endophthalmitis after cataract surgery in Korle-Bu Teaching Hospital, a tertiary eye hospital.

MATERIALS AND METHODS

This is a retrospective case series of patients who underwent cataract surgery or secondary IOL implantation at the Korle-Bu Teaching Hospital, Accra, Ghana, from February 2011 to January 2014. The study adhered to the tenets of the declaration of Helsinki.

The demographic, clinical and surgical data were extracted from the medical records of patients who underwent cataract surgery at the eye unit and included age, sex, preoperative diagnosis, operated eye, type of procedure performed, type of IOL implanted and its position in the eye, intraoperative complications, antibiotic prophylaxis and Post-operative complication requiring second surgical procedure other than endophthalmitis. Additional data recorded for patients who developed endophthalmitis included: medical history, Post-operative medications, time interval from cataract surgery to diagnosis of endophthalmitis, duration of symptoms, visual acuity prior to onset of endophthalmitis, visual acuity at presentation, diagnostic procedure, Initial microscopy and culture results, treatment, complications, final visual acuity, and duration of follow up.

Acute onset POE was defined as endophthalmitis that occurred within 6 weeks of cataract surgery. (18) Delayed onset POE was defined as endophthalmitis

occurring after 6 weeks of cataract surgery. A presumptive diagnosis of endophthalmitis (presumed endophthalmitis) after cataract surgery was made if a patient reported with the following clinical features: pain or blurred vision with or without hypopyon and vitritis supported by ultrasonographic evidence of inflammation in the vitreous cavity. (14) Paediatric age group was defined as patients less than 16 years of age. A case of proven infective endophthalmitis was one that had culture positive result with or without a positive gram stain.

Patients who developed endophthalmitis not related to cataract surgery or secondary IOL implantation and those who had surgery elsewhere were excluded from the study.

INTERVENTION

During the period under study, the routine prophylaxis employed during cataract surgery in Korle-Bu Teaching Hospital involved perioperative cleaning of eyelids with 10% povidone iodine and instillation of Guttae (gtt) chloramphenicol 0.3%, and Subconjunctival injection of gentamicin 20mg and dexamethasone 2mg, followed by gtt chloramphenicol 0.3% at the end of surgery. Extracapsular cataract surgery (ECCE) and manual small incision cataract surgery (SICS) were the main procedures performed for adult cataract. Intracapsular cataract extraction was performed in patients with dislocated or subluxated crystalline lens. In the paediatric age group, lens aspiration with or without primary posterior capsulotomy and anterior vitrectomy were the procedures performed depending on the age of the child. Polymethylmethacrylate (PMMA) lens was the only IOL implanted in both the paediatric and adult age group after cataract extraction.

The initial interventions done for the affected eye of patients with presumed

endophthalmitis were vitreous tap using 25 gauge needle, injection of intravitreal vancomycin 1mg/0.1ml and ceftazidime 2.25mg/0.1ml or 0.4mg/0.1ml of amikacin, subconjunctival injection of vancomycin 12.5mg/0.5ml and ceftazidime 25mg/0.5ml. The affected eyes were then treated with the following eye drops: vancomycin 5% 1 hourly (hrly), ceftazidime 5% 1 hrly, prednisolone acetate 1% 4 hrly, and cyclopentolate 1% twice daily. Raised intraocular pressure was controlled with oral acetazolamide, timolol 0.5%, betaxolol 0.5%, and brimonidine tartrate 0.15% eye drops either as single agent or in combination. Treatment regimen was reviewed based on response to treatment and on culture results. IOL explantation and anterior vitrectomy was done in patients nonresponsive to treatment.

The vitreous specimen was inoculated on chocolate agar, blood agar and Sabouraud agar and on two microscope slides. These were then submitted to the microbiology laboratory for microscopy, culture and sensitivity analysis.

Statistical analysis: Data was captured using Microsoft office excel 2013 and analysed using Statistical Package for Social Scientist (SPSS) version 17.0. Data was summarized using frequency tables and figures as appropriate. Snellen visual acuity was converted to the logarithm of minimum angle of resolution (LogMAR) and the median and the 95% confidence interval (CI) for the median interquartile range (IQR) was computed. Continuous data was compared using Wilcoxon test (paired data) and categorical data was compared using chi square. The following variables were tested to determine their effect on the incidence of POE: age category, surgical technique, posterior capsular rupture or vitreous loss, anterior chamber/posterior chamber IOL, and Postoperative complications requiring a second surgical procedure including wound gape with iris prolapse, retained lens cortical

matter and displaced IOL. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 1032 patients had cataract surgery or secondary IOL implantation during the study period. Six (0.58%) (95%CI 0.2-1.3) developed Post-operative endophthalmitis (POE) with age range of 4- 66 years, median

34years and four (66.7%) were males. The Demographic and clinical characteristics of the patients undergoing cataract surgery or secondary IOL implantation are summarized in Table1. The indications for surgery included: 817 uncomplicated cataracts, 133 congenital or developmental cataracts, 32 traumatic cataracts, 18 complicated cataracts, 21 subluxated cataract of which 5 were due to trauma, and 11 with aphakia.

Table 1

Baseline characteristics of patients undergoing cataract surgery or secondary intraocular lens implantation in Korle Bu Teaching Hospital

Variable	Overall	ECCE	SICS	LA	ICCE	2 ND IOL
Number of Eyes (%)	1032(100)	447(43.3)	407(39.4)	149(14.4)	18(1.7)	11(1.1)
Age						
X ± SD,	54.5+25.3	63.1+15.5	63.9+14.7	3.7+3.1	49.4+12.8	57+16.8
CI (years)	52.9-56.0	61.7-64.6	62.5-65.3	3.2-4.2	43-55.7	45.7-68.3
Gender: No. (%)						
Male	499(48.4)	206(20.0)	192(18.6)	81(7.8)	15(1.5)	5(0.5)
Female	533(51.6)	241(23.3)	215(20.8)	68(6.6)	3(0.3)	6(0.6)
Operated Eye (%):						
Right	515(49.9)	228(22.1)	205(19.8)	66(6.4)	11(1.1)	5(0.5)
Left	517(50.1)	219(21.2)	202(19.6)	83(8.0)	7(0.7)	6(0.6)
IOL position (%):						
Posterior chamber	941(91.2)	437(42.3)	397(38.5)	105(10.2)	0	2(0.2)
Anterior chamber	41(4.0)	7(0.7)	9(0.9)	0	16(1.5)	9(0.9)
None	50(4.8)	3(0.3)	1(0.1)	44(4.2)	2(0.2)	0
Intra-operative complication						
PC rent & vitreous loss	11(1.1)	6(0.6)	5(0.5)	0	0	0
ECH	1(0.1)	0	0	0	1(0.1)	0
Post-operative complication						
Iris Prolapse	13(1.3)	7(0.7)	5(0.5)	1(0.1)	0	0
Retained Lens Matter	3(0.3)	1(0.1)	2(0.2)	0	0	0
Displaced IOL	3(0.3)	0	3(0.3)	0	0	0

2ND = Secondary, CI= confidence interval, ECH= expulsive choroidal haemorrhage, ECCE= extracapsular cataract extraction, ICCE= intracapsular cataract extraction, IOL=intraocular lens, L=left, LA=lens aspiration, PC=posterior capsule, SICS>manual small incision cataract surgery, SD= standard deviation, X= mean

The median time of onset of endophthalmitis after cataract surgery was 17 days (range, 2150 days): 11.5 days (range, 2-18 days) in acute onset POE and 130 days (range 111-150 days) in delayed onset POE. Four (0.39%) (95%CI, 0.1-1.0) patients had

acute onset (POE) and 2(0.19%) (95%CI, 0.02-0.70%) delayed onset POE.

Three (0.29%) (95% CI, 0.06- 0.84 %) out of the 6 cases of endophthalmitis were culture proven: 2were acute onset POE (0.19%) (95% CI, 0.02- 0.69 %) and 1 was delayed POE (0.097 %) (95% CI, 0.09-0.29). The type

of procedure and the incidence of endophthalmitis are summarized in Table 2.

Table 2
Type of procedure and the incidence of endophthalmitis after cataract surgery in Korle Bu Teaching Hospital

Procedure	Number	Incidence of endophthalmitis, No.(%), CI	
		<i>Acute</i>	<i>Delayed</i>
ECCE	447	2(0.4)(0.04-1.53)	1(0.2) (0.03-1.2)
SICS	407	0	1(0.2) (0.02-1.5)
LA	149	2(1.3) (0.15-4.7)	0
ICCE	18	0	0
Secondary IOL	11	0	0
Total, No. (%) CI	1032	4(0.39) (0.11-1.0)	2(0.19) 0.02-0.7)

CI= confidence interval, ECCE= extracapsular cataract extraction, ICCE= intracapsular cataract extraction, IOL=intraocular lens, LA=lens aspiration, MD=median, PC=posterior capsule, SICS>manual small incision cataract surgery, SD= standard deviation

Figure 1

Anterior segment Slit lamp photograph of a 27yr old male with delayed POE caused by aspergillus spp. A. Anterior chamber IOL, peripheral anterior synechia superiorly, fibrinous membrane behind IOL. B. photograph after anterior chamber IOL explantation and anterior vitrectomy showing multiple whitish yellow exudates in the vitreous cavity. C. Whitish exudate and hyphema in the anterior chamber D. corneal scarring and phthisis bulbi at 6months follow up visit

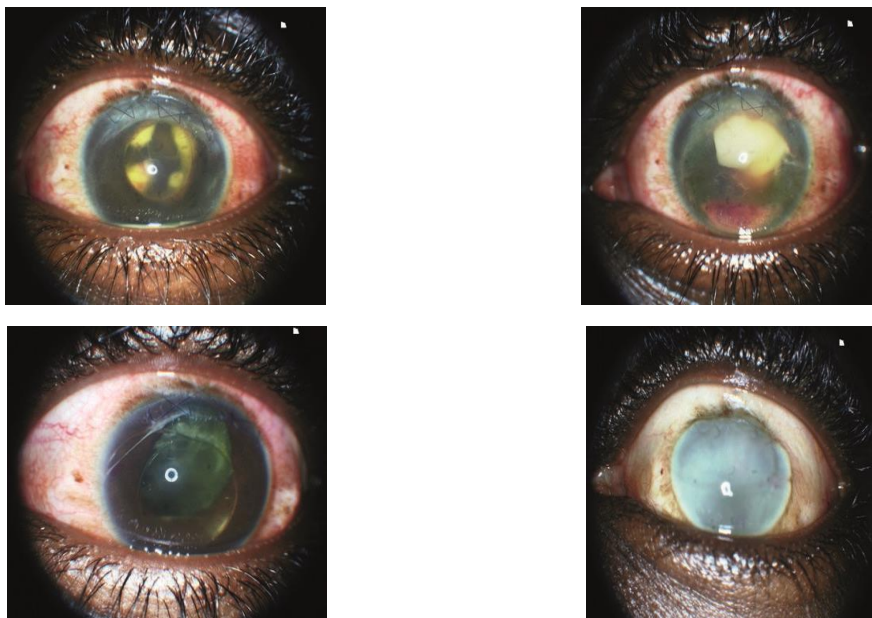


Table 3
Effect of various factors on the incidence of endophthalmitis after cataract surgery in Korle Bu Teaching Hospital

Variable	Incidence of Acute POE (%)	Chi square statistic	P value	Incidence of delayed POE (%)	Chi square statistic	P value
Age Category	2/155(1.29)	3.85	0.050	0/155	0.35	0.552
Pediatric Adult	2/877(0.23)			2/877(0.23)		
Surgical Technique		5.81	0.44		0.42	0.994
ECCE	2/447(0.4)			1/447(0.2)		
SICS	0/407			1/407(0.2)		
LA	2/149(1.3)			0/149		
ICCE	0/18			0/18		
Secondary IOL	0/11			0/11		
Vitreous loss	0/11	0.04	0.835	1/11(9.1)	45.50	<0.0001
Yes no	4/1021(0.39)			1/1021(0.1)		
IOL POSITION		0.39	0.822		11.16	0.0038
Posterior chamber	4/941(0.4)			1/941(0.1)		
Anterior chamber	0/41			1/41(2.4)		
None	0/50			0/50		
Iris Prolapse Yes no	1/13(76.9)	18.18	<0.0001	0/13	0.02	0.873
	3/1019(2.9)			2/1019(0.19)		
Retained lens matter Yes no	0/3	0.01	0.914	0/3	0.01	0.939
	4/1029(0.39)			2/1029(0.19)		
Displaced IOL Yes no	0/3	0.01	0.914	0/3	0.01	0.939
	4/1025(0.39)			2/1029(0.19)		

ECCE= extracapsular cataract extraction, ICCE= intracapsular cataract extraction, IOL=intraocular lens, LA=lens aspiration, SICS>manual small incision cataract surgery

The effects of various factors on the incidence of endophthalmitis after cataract surgery are summarized in Table 3. Post-operative complication requiring second surgical procedure was associated with increased risk of acute onset POE ($p<0.0001$) and posterior capsular rupture/vitreous loss ($p<0.0001$) and anterior chamber IOL implantation ($P=0.004$) were associated with increased risk of delayed onset POE. All 4 adult patients who presented with endophthalmitis complained of loss of vision after cataract surgery whilst one child complained of photophobia and the other child was detected on routine Post-operative follow up visit. The median duration of symptoms was 5.5 days (range, 1-30days): 2.5days (1-12) in acute onset POE and 18.5 days (range, 7-30 days) in delayed onset POE. Two (adults) of the 4 patients who

presented with acute onset POE had hypopyon and the remaining 2 (children) had poor red reflex and vitritis precluding visualization of their retina. One of the 2 patients who presented with delayed onset POE had hypopyon and the other had pupillary fibrinous membrane.

Three patients with culture proven POE demonstrated the following organisms from their vitreous specimen: Staphylococcus epidermidis and Acinetobacter spp in the group with acute POE and Aspergillus spp from the patient with delayed POE. Figure 1. shows the anterior segment photographs of the right eye of a 27 year old male who developed delayed onset POE caused by Aspergillus spp. Initial vitreous tap yielded negative cultures and the patient did not respond to intravitreal injection of ceftazidime and vancomycin, and topical

drops of vancomycin, ceftazidime, prednisolone acetate 1% and cyclopentolate 1%. The patient had removal of the anterior chamber intraocular lens and anterior vitrectomy. A second culture of the vitreous

specimen yielded *Aspergillus* spp. Table 4 summarizes the demographic, clinical and microbiological characteristics of the 6 patients who developed endophthalmitis after cataract surgery.

Table 4
Demographic, clinical characteristics and microbiologic of 6 patients with endophthalmitis after cataract surgery in Korle Bu Teaching Hospital

Affected eye	Age(y) , Sex	Duration of symptoms After surgery	Organism cultured	Snellen Visual acuity			Final visit (days)
				Prior	presenting	Final	
<i>Acute</i>							
LEFT	4, M	18	Negative	FFL	HM	HM	131
LEFT	4, M	7	Dry tap	FFL	HM	6/48	90
LEFT	41, M	16	<i>Acinetobacter</i> spp	6/6	CF1m	6/9	115
RIGHT	62, F	2	<i>S. epidermidis</i>	6/9	HM	6/9	612
<i>Delayed</i>							
LEFT	27, M	150	<i>Aspergillus</i> spp	6/6	HM	NPL	790
RIGHT	66, F	115	Negative	6/9	6/36	6/9	690

Cf1m= counting finger at 1 metre, FFL= fixates and follows light, HM= hand motion, NPL= non perception of light, S= staphylococcus, spp=species

The median duration of follow up was 371.5 days (range, 90-760 days). Three out of the 6(50%) eyes that developed POE achieved visual acuity of 6/9 whilst one patient each had visual acuity of 6/48, hand motion and non-perception of light respectively at the final follow up visit. The median BCVA in LogMAR prior to onset of endophthalmitis, 0.18 (IQR, 0.0-2.0) (Snellen equivalent 6/9) was comparable to the median BCVA at the final follow up visit, 0.18 (IQR, 0.18-1.4) (Snellen equivalent 6/9). However, there was a significant difference between the median BCVA at presentation of endophthalmitis, 3.0, (IQR, 1.7-3.0) (Snellen equivalent, hand motion) and the median BCVA at the final follow up visit 0.18 (Snellen equivalent 6/9) (IQR, 0.18-1.4) (Wilcoxon test, P=0.03).

DISCUSSION

In this retrospective study, the incidence of presumed and culture proven acute onset POE in this Ghanaian population are 0.39% and 0.19%, respectively. The incidence of acute onset POE in this study is higher than previous reports of same from India (0.05%), Singapore (0.07%) and United States of America (USA) (0.12%). (9, 10, 14) The higher incidence of acute onset POE in this study may be due to the following reasons: lack of use of intracameral antibiotics, surgical technique, low surgical volume, intraocular lens type, complications of surgery, socioeconomic status and other unknown factors. The endophthalmitis study group of the European Society of cataract and Refractive Surgeons (ESCRS), (8) Shorstein et al, (7) Wood et al, (13) and

van der Merwe et al, (12) all found the use of intracameral antibiotics (cefuroxime) to be associated with significantly lower incidence of acute onset POE. The ESCRS study group reported that the incidence of acute onset POE among their group of patients who were given intracameral cefuroxime was 0.049% compared to 0.345% among those who did not receive same.(8) Shorstein et al in the USA reported the incidence of acute onset POE of 0.313% and 0.014% among their patients who did not receive intracameral antibiotics compared to those who received same.(7) van der Merwe et al in South Africa also reported that the incidence of acute POE declined from 0.55% to 0.08% with the introduction of intracameral cefuroxime.(12) Sharma et al however, did not find a significant difference in the incidence of acute onset POE among patients who were given intracameral cefuroxime(0.108%) compared to patients who did not receive the drug (0.155%),(p=0.57).(19)

Acute onset POE occurred in only patients who had ECCE and lens aspiration in this study. The incidence of acute POE after ECCE in this study (0.4%) is comparable to the findings of Montan et al (20) and Kodjikian et al (21) but higher than that reported by Lalitha (9) and Wong et al (14) for their group of patients who had ECCE. The following factors have also been found to influence the risk of acute onset POE: Incision location(14),surgical technique(9, 14, 21) suture use(8, 14, 22), IOL material(8, 14, 21, 22),low surgical volume,(10, 22) surgical complications(8, 9, 12, 14) and low socioeconomic status.(10)Intraoperative complications of posterior capsular rupture and vitreous loss and Post-operative complications of wound gape with Iris prolapse that required a second procedure were associated with higher incidence of POE in the present study.

The incidence of delayed onset POE of 0.017% reported by Al-Mezaine is much

lower than that observed in the present study (23). The difference in incidence may be because AlMezaine et al reported on only culture proven cases or may have occurred by chance because of the rarity of delayed onset POE and the relatively limited number of cataract surgeries performed in this study. *Aspergillus* spp was the organism isolated in a patient with delayed onset POE in this study. *Propionibacterium acne* is the most frequent organism cultured in delayed onset POE followed by fungi.(23-25) In their report on fungal endophthalmitis in India, Chakrabarti et al found *Aspergillus* spp as the predominant fungi isolated post-cataract surgery.(26)

Four out of 6 (67%) eyes which developed endophthalmitis in this series achieved a visual acuity better than 6/60 at the final follow-up visit. However, the other 2(33%) eyes which also developed endophthalmitis were blind at the final follow up visits, a finding that corroborates findings from other studies.(9, 12) POE caused by fungi have been found to be associated with unfavourable visual outcome. (23, 26) *Aspergillus* spp was isolated in one of our patients with delayed onset POE and the affected eye had visual acuity of non-perception of light and phthisis bulbi at the final follow up visit.

STRENGTHS AND LIMITATIONS

The limitations of this study include its retrospective design. In addition, antibiotic sensitivity results could not be presented because the microbiology laboratory considered the isolated organisms as commensals. . However, despite the limited number studied, this is the first study to determine the incidence and risk factors associated with POE after cataract surgery in a Ghanaian population.

CONCLUSION

The incidence of endophthalmitis post-cataract surgery without the use of intracameral antibiotics in this study was high. The incidence of acute onset and delayed onset POE were 0.39% and 0.19%, respectively. Intraoperative and Post-operative complications of cataract surgery were associated with a higher risk of endophthalmitis. A prospective study is required to determine the true incidence of endophthalmitis after cataract surgery and the effect of intracameral antibiotic use on the incidence of endophthalmitis in the Ghanaian population.

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