Pharmacological prophylaxis for endophthalmitis following cataract surgery: Practice pattern in training centres in Nigeria

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ABSTRACT

Background: Post-operative infective endophthalmitis is often caused by normal ocular flora. This informed the practice of pharmacological and non-pharmacological preventive measures such as using ocular sterilising agents and antibiotics.

Objective: This study aimed to determine the practice pattern for pharmacological prophylaxis against post-cataract surgery endophthalmitis in postgraduate ophthalmology training centres in Nigeria.

Methods: An online self-administered questionnaire was sent to consenting ophthalmologists who were key informants purposively selected from accredited ophthalmology training centres across Nigeria. Data was analysed using the IBM SPSS Statistics for Windows, version 26 (IBM Corp., Armonk, N.Y., USA). Information obtained included perioperative antibiotic use, intraoperative antibiotic use, and povidone-iodine use at surgery.

Results: A total of 39 training centres were recruited, of which 35 responded. Only one (2.9%) centre had a written endophthalmitis prophylaxis protocol. Fifteen (42.9%) respondents reported the routine use of preoperative topical antibiotics by all surgeons in their centres, while preoperative use of topical antibiotics was surgeon-dependent in the remaining 20 (57.1%) centres. The most common class of preoperative antibiotics in use was fourth-generation quinolones (46.7%). Intraoperative antibiotics routinely used were subconjunctival gentamicin in 34 (97.1%), intracameral antibiotics in 9 (25.7%), and 5% povidone-iodine in 30 (85.7%) centres. Postoperative use of topical antibiotics was routine in all centres.

Conclusion: Pharmacological endophthalmitis prophylaxis in Nigerian training institutions commonly involves the intraoperative use of 5% povidone-iodine and intraoperative antibiotics, in keeping with literature. The use of preoperative and postoperative topical antibiotics, though not strongly backed by evidence, is also common in many centres.

Key words: Pharmacological prophylaxis, Endophthalmitis, Cataract surgery, Practice pattern, Nigeria

INTRODUCTION

Endophthalmitis is a severe sight-threatening intraocular inflammation, often caused by the invasion of harmful organisms into the ocular tissues, resulting in tissue damage[1,2]. These microorganisms are usually from exogenous sources following intraocular surgery, or trauma and occasionally may be from a systemic infectious focus[1,3,4]. Endophthalmitis often results in severe and permanent vision loss if prompt and appropriate treatment is not administered[2]. Hence, clinicians often take active measures to prevent endophthalmitis when planning intraocular procedures. Cataract surgery, one of the most frequently performed intraocular procedures, is commonly taught and performed in all postgraduate ophthalmology training centres in Nigeria. It is expected that such training centres should have standard operating procedures for endophthalmitis prophylaxis before, during and after cataract surgery.

Vision loss from endophthalmitis may be potentiated by late presentation, lack of equipment for vitrectomy, virulence of the causative organism, or a combination of these factors[5]. This has potential socio-economic implications as vision-impaired individuals might experience a decline in their quality of life and productivity[6]. This adversely affects, not only their income-earning potentials but also their dependants and the larger society, all of which may contribute to impoverishment and impede the attainment of certain sustainable development goals[6,7]. This impact of endophthalmitis after cataract surgery necessitated several prophylactic practices as prevention is cheaper.

Pharmacological prophylaxis of endophthalmitis has been practised for many decades. The use of different concentrations of povidone-iodine, routes of antibiotic administration, and non-pharmacological approaches have been improved upon over the years. Management of endophthalmitis however remains challenging in Nigeria, hence it is more prudent to prevent than cure[8].

As more ophthalmologists are trained in Nigeria, a corresponding increase in cataract surgical coverage is expected under ideal situations. Likewise, the number of postoperative endophthalmitis cases may increase as cataract surgery rates increase. The prevention of

endophthalmitis is thus a critical aspect of ophthalmic care which every facility offering cataract care expectedly pays attention to[2]. However, there is a need for auditing and standardisation of practice as more evidence emerges in the literature. Studies have shown various effective pharmacological prophylactic approaches to post-operative endophthalmitis, including the use of 5% povidone iodine to disinfect the conjunctival sac, the use of intracameral quinolones and preservative-free cephalosporins[2]. Perioperative instillation of topical antibiotics appears controversial due to the reported insignificant lowering of post-operative endophthalmitis rates, compared to povidone iodine alone[9,10]. It is however reported to be widely used in Nigeria[11].

Guidelines and protocols in medical practice evolve as new evidence emerges in literature through research. Training centres are the hub of knowledge and skill improvement; hence they largely influence the prevalent practices in their locations or regions. In Nigeria, anecdotal reports from centres suggest variations in practice. Furthermore, different practices were found in a recent study among ophthalmologists surveyed at a national conference[11].

This study therefore sought to determine what pharmacological practices predominate in training centres in Nigeria in comparison to current evidence in the literature. The findings from this study will help individual trainers and trainees audit their practice and strengthen areas of weaknesses. This could pave the way for more efficient use of resources and further standardisation of clinical care.

MATERIALS AND METHODS

Study design: A web-based cross-sectional survey of ophthalmology training centres, using Google forms to collect information from one key informant per centre. Data was collected over four weeks with repeated reminder text messages and calls put through to the key informants during this period.

Study population: All ophthalmology residency training centres in Nigeria. For the purpose of this study, training centres were defined as all hospitals with partial or full accreditation of the West African College of Surgeons (WACS) or the National Postgraduate Medical College of Nigeria (NPMCN) to train ophthalmologists. There were 39 training centres with accreditation from one or both colleges. One consultant ophthalmologist having verbally reported high cataract surgery load was recruited per training centre as a key informant. Resident doctors in training and centres where two consecutive consultants declined participation were excluded from the study.

Sampling technique and procedure: A list of accredited training facilities was obtained from the Faculty Chairman and Secretary of WACS and NPMCN. A consultant ophthalmologist practising full-time in each centre was purposively identified and contacted for information on any anterior segment specialist in the centre or in the absence of that, a specialist with the highest cataract surgical volume in that centre. The individual identified as the key informant was contacted by a phone call for verbal consent and the study questionnaire was shared with them once consent was given. Two of the 39 key informants initially contacted declined participation and were replaced by contacting another person in the centre that routinely performs cataract surgery. Four key informants who had consented to participate did not fill out the survey form before the end of the study period, despite several reminders.

Ethical approval and consent: Ethical approval for the study was obtained from the University of Ibadan/ University College Hospital Ethical Review Committee (UI/EC/24/0295).

Data management and analysis: Data from filled forms was downloaded into a Microsoft Excel spreadsheet, cleaned, and then imported into the IBM SPSS Statistics for Windows, version 26 (IBM Corp., Armonk, N.Y., USA) for analysis. Data was stored in a password-secured laptop belonging to the Principal Investigator and in a password-protected external hard drive afterwards. Data was made available to all the co-investigators during and after the study. Participants' general characteristics are presented using frequencies and percentages.

RESULTS

The key informants of 35 of 39 eligible centres filled out the forms giving a response rate of 89.7%. All the centres were located in urban areas, 33 (94.3%) were government-owned, while two (5.7%) were missionary centres. There were 12 (34.3%) in the South- West and only one (2.9%) in the North-East. Table 1 details the distribution of the responding centres across the various geopolitical zones. Only one (2.9%) of the 35 facilities had a written endophthalmitis prophylaxis protocol.

Table 1: Proportion of respondents in each geopolitical region of Nigeria (n = 35)

Geopolitical zones	Frequency (n)	(%)
South-west	12	34.3
North-central	7	20.0
South-east	6	17.1
South-south	5	14.3
North-west	4	11.4
North-east	1	2.9
Total	35	100

Preoperative topical antibiotic use: Fifteen (42.9%) facilities use preoperative antibiotics routinely and the usual practice is to start instilling them 24 hours before surgery in all 15 facilities. Antibiotics used included fourth-generation fluoroquinolones (seven centres; 46.7%), cephalosporins (3; 20.0%), and chloramphenicol (2; 13.3%). Other preoperative antibiotics reported were aminoglycosides (1; 6.7%), penicillin (1; 6.7%), and "any broad-spectrum antibiotics" (1; 6.7%). The preoperative use of topical antibiotics was surgeon-dependent in the other 20 centres.

Intraoperative antibiotic use: Intraoperatively, nine centres (25.7%) use intracameral antibiotics with moxifloxacin routinely used by five (55.6%), cefuroxime by three (33.3%), and ceftriaxone by one (11.1%) of the facilities. Subconjunctival antibiotics are routinely used in 34 (97.1%) of the 35 facilities. Gentamicin is the most common antibiotic, used by 33 (97.1%) centres, while one (2.9%) centre routinely uses ceftazidime.

Postoperative antibiotic use: All 35 facilities use topical antibiotics postoperatively. Twenty-nine (82.9%) routinely use fluoroquinolones. Details of postoperative topical antibiotics use is displayed in Table 2.

Table 2: Postoperative antibiotics use across the training institutions (n = 35)

Variable	Frequency (n)	(100%)
Postoperative antibiotics use		
Yes	35	100.0
No	0	0.0
Type of antibiotics used		
Fluoroquinolones	29	82.9
Cephalosporins	5	14.3
Any broad-spectrum antibiotic	1	2.8
Duration of antibiotics use		
Four weeks	11	31.4
Six weeks	17	48.6
Eight weeks	5	14.3
Twelve weeks	2	5.7

Use of povidone iodine: Before the commencement of surgery, 5% povidone-iodine is routinely instilled into the conjunctival sac in 30 (85.7%) centres, while five (14.3%) centres do not use povidone-iodine. The duration of instillation (before rinsing with normal saline) varies from one minute in one (3.3%) centre to three minutes in 14 (46.7%), and five minutes in six (20%) centres. Nine (30%) centres have no standardized duration for povidone instillation as it was reported to be dependent on individual surgeons' preference.

DISCUSSION

This cross-sectional survey presents a snapshot of the pharmacological endophthalmitis prophylaxis practice pattern for cataract surgery in ophthalmology residency training centres in Nigeria. We had a response rate of about 90% from the training centres in the country. This survey reveals that the vast majority use 5% povidone-iodine on the conjunctival sac before surgery commences and use subconjunctival antibiotic injection at the end of surgery. In addition, the use of topical antibiotics post-operatively, for endophthalmitis prophylaxis, is routine in all centres.

Preoperative topical antibiotics use: Slightly less than half (43%) of the responding training institutions use preoperative topical antibiotics, mostly fluoroquinolones. A study by Garg *et al*[12] revealed that, across Asian institutions, preoperative prophylaxis antibiotics use was more common than in this study. In their study, the rate of use was 61.5% and 69.5% for low-risk and high-risk cataract cases, respectively. They had surveyed 26 eye institutions from 13 Asian countries with regard to perioperative, intraoperative, and postoperative antibiotic prophylaxis in cataract surgery. However, a study by Silas *et al*[11] here in Nigeria had a similar rate of preoperative prophylaxis antibiotics use as ours. They reported a 42.7% usage among the responding ophthalmologists. Their study was conducted among ophthalmologists attending the Ophthalmological Society of Nigeria conference; hence it was an individual practice survey and not institution practice as is ours, yet the results were similar. In these two studies, fluoroquinolones were the commonly used preoperative prophylactic antibiotics. It is noteworthy that current literature suggests that preoperative topical antibiotics do not reduce either intraoperative ocular surface bacterial count[13] or the risk of endophthalmitis[14,15]. The continuous use of preoperative antibiotics despite current evidence may not be unconnected to reluctance to a change of practice pattern by the surgeons, or the need for more published evidence to reaffirm its lack of benefits in endophthalmitis prevention.

Intraoperative antibiotics use: Two different meta-analyses on the safety and efficacy of intracameral antibiotics revealed that it was a safe and efficacious means of reducing the risk of postoperative endophthalmitis[16,17]. The meta-analysis by Kato *et al*[17], which included 51 eligible articles and over 6.8 million eyes reported that intracameral injection of vancomycin had the best preventive effect (odds ratio 0.03, 99.6% confidence interval 0.00–0.53) followed by intracameral injection of cefazoline, cefuroxime, and moxifloxacin. Both meta-analyses cited above concluded that a single agent intracameral injection of the studied antibiotics

prevented postoperative endophthalmitis. A study by Herrinton *et al*[15], comparing intracameral antibiotic injection with topical antibiotics only, revealed that intracameral antibiotic was more effective, with an odds ratio of 0.58, (CI: 0.38 – 0.91). In our survey, only a quarter of the institutions used intracameral antibiotics routinely, of which the most common antibiotic used was preservative-free moxifloxacin. Concerning subconjunctival antibiotics, however, all but one of the responding institutions do this routinely, with the most common antibiotic being gentamicin.

Postoperative antibiotics use: All our surveyed institutions use topical antibiotics postoperatively, with more than three-quarters of them routinely using topical fluoroquinolones. Even though postoperative topical antibiotics are routine following cataract surgeries, it has been suggested that with intracameral injection of antibiotics following phacoemulsification, topical antibiotics may not confer additional protection from postoperative endophthalmitis[13]. This practice needs further microbiological evaluation to justify its utility, especially with increasing antibiotic resistance[18]. A randomised clinical trial may shed more light on the need for topical postoperative antibiotics after intracameral injection of antibiotics. Also observed in this study is the varying duration of prophylactic use of antibiotics with some prescribing up to 12 weeks postoperatively. This points to a lack of standardisation and a need to develop written protocols for endophthalmitis prophylaxis across training centres in Nigeria.

Use of povidone iodine: The recommended guideline for povidone-iodine use in ophthalmic surgery includes the application of 10% povidone-iodine over periocular skin before draping and the instillation of 5% povidone-iodine into the conjunctival sac for at least 3 minutes before rinsing off[19]. Halachmi-Eyal *et al*[19] reported that the preoperative instillation of 5% povidone-iodine alone into the conjunctival sac had significant bactericidal effect. There was no significant additive effect by combining preoperative topical moxifloxacin 0.5% with 5% povidone iodine. The American Academy of Ophthalmology and the European Society of Cataract and Refractive Surgeons' recommendations regarding povidone-iodine use also suggested 5% povidone-iodine before surgery and noted a 3-minute duration for its application[20]. Our study revealed that most of the centres used povidone-iodine routinely as part of the antiseptic strategy in post-cataract surgery endophthalmitis prophylaxis. With the available evidence and recommendations on the use of povidone-iodine, it is surprising that 5 centres in our study cohort do not use povidone iodine routinely. It was also noticed in our study, that centres that routinely perform conjunctival sac instillation of povidone-iodine had a significantly varied duration of application ranging from one to five minutes, or even no specific duration of application in some centres.

One strength of this study is the fact that data was obtained from anterior segment consultants or ophthalmic surgeons with high cataract surgery turnover in each training centre. A potential limitation of this study was the reliance on self-reported data from the training centres, as it may be subject to inaccuracies in reporting or recall bias. Direct observation or a review of medical records may provide a more objective assessment of prophylaxis practices. Not asking for specific consumable availability such as povidone-iodine and thus not analysing for its effect on the practice pattern of endophthalmitis prophylaxis, maybe another potential limitation.

In conclusion, this study has shown the diversity in the pharmacological practice pattern of endophthalmitis prophylaxis for cataract surgery across postgraduate ophthalmology training centres in Nigeria. Conjunctival sac application of 5% povidone-iodine is a routine practice, while the intracameral antibiotic injection is not routine in most centres. The variation in practices suggests a need for national guidelines that align with global best practices, particularly advocating for the use of intracameral antibiotics, which have been shown to significantly reduce the incidence of postoperative endophthalmitis. Training programs should emphasize the importance of evidence-based prophylaxis to ensure consistent and effective patient care.

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