



Knowledge about Prescribing Antibiotics as Prophylaxis in Patients with Open Globe Injury: A Survey in Iranian Ophthalmologists

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Received: March 08, 2023

Revised: March 23, 2023

Accepted: April 03, 2023

ABSTRACT

Objective: This study aimed to evaluate the Iranian ophthalmologists' knowledge of prescribing prophylactic antibiotics to patients with open globe injury (OGI) in Iran.

Methods: In this cross-sectional study, we utilized a questionnaire to evaluate the ophthalmologists' knowledge about prescribing antibiotics as prophylaxis. This survey was conducted in Tehran and its suburbs. The questionnaire included demographic information as well as ophthalmologists' knowledge levels. Cronbach's alpha was used to determine its validity and reliability. The obtained data were analyzed using SPSS 24.0.

Results: Of 192 subjects, 111 (35 women, 76 men) were included. About 65 (58.6%) specialists and 45 (41.4%) subspecialists with different orientations completed the questionnaires. The total knowledge score was 13.04 ± 2.96 . The following are the results of ophthalmologists' responses to questions regarding the cornea/scleral injury (1.09 ± 1.72), prophylactic antibiotics administration (2.79 ± 1.11), the infectious agents in eye surgeries (3.21 ± 1.49), diagnosis and treatment (2.84 ± 0.944), and the effects of ocular antibiotics as well as their proper dosage (2.96 ± 2.35). There was no significant relationship between some demographic information such as sex, working hours, workplace, and the number of studied articles ($p > 0.05$). In addition, ophthalmologists with less work experience had significantly higher levels of knowledge than those with more work experience.

Conclusion: The findings indicated that the majority of ophthalmologists had a basic knowledge of prescribing prophylactic antibiotics in OGI.

Keywords: Knowledge; Ophthalmologist; Prophylaxis; Open globe injury; Antibiotics.

Please cite this paper as:

Shahriari M, Sistanizad M, Foruzani Haghighi M, Mohammadnezhad G, Esmaily H. Knowledge about Prescribing Antibiotics as Prophylaxis in Patients with Open Globe Injury: A Survey in Iranian Ophthalmologists. *Bull Emerg Trauma*. 2023;11(2):96-101. doi: 10.30476/BEAT.2023.98269.1425.

Introduction

Open globe injury (OGI) is a full-thickness wound around the eye wall caused by an external force. OGI affects approximately 3 out of every 100,000 people worldwide [1]. OGI accounts for 19% to 58.3% of all ocular trauma cases and is more prevalent in children than adults [2-4]. OGI is a devastating ocular condition that necessitates immediate medical intervention, as it can lead to severe complications such as post-traumatic endophthalmitis (PTE) [5]. Infectious endophthalmitis is an inflammatory disorder. It is one of the most frequent complications of OGI that can lead to blindness [6-8]. PTE is most frequently caused by *Bacillus* species, while multi-bacterial PTE is caused by gram-positive species such as *Staphylococcus epidermidis* and *Streptococci* [9, 10]. The incidence rate of PTE reduces by surgical repair and preventive administration of intravitreal antibiotics [11, 12]. Prophylactic administration of antibiotics decreases the risk of PTE during primary repair from OGI by reducing the number of microorganisms in the infected district [13, 14].

In patients with OGI, intraocular antibiotics were shown to minimize the risk of endophthalmitis. On the other hand, prescribing intraocular prophylactic antibiotics may increase the risk of microbial resistance and retinal damage [3, 15]. However, due to the lack of general guidelines for recommending the most appropriate type and method of antibiotic administration, there is no consensus among ophthalmologists about the routine administration of intravitreal antibiotics [6, 8, 16].

The ophthalmologists' knowledge of the bacterial spectrum in PTE can help them to select the proper antibiotic to prevent endophthalmitis. Due to the high prevalence of PTE and its irreversible complications, and despite the administration of antibiotics and rapid surgical interventions, we decided to use a validated survey to assess the ophthalmologists' knowledge of antibiotics and their preventive strategies against OGI. We also aimed to evaluate the relationship between the Iranian ophthalmologists' knowledge and their demographic information.

Materials and Methods

This cross-sectional study was conducted by utilizing a self-administered questionnaire entitled "Evaluation of ophthalmologists' knowledge about antibiotics prescription as prophylaxis in patients with OGI." in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) [17]. This study was carried out in Tehran and its suburbs.

The inclusion criteria were all ophthalmologists and members of the Iranian Society of Ophthalmologists. Furthermore, the exclusion criteria were the unwillingness of the ophthalmologists to declare the requested information. The number of the

required statistical population was estimated using Cochran's formula. Then, 111 individuals were randomly selected from 1800 Iranian registered ophthalmologists.

The ophthalmologists were evaluated by designing a questionnaire and distributing it to the respondents to complete it. The first section of the questionnaire dealt with the background information of the ophthalmologists, including age, sex, educational level, year of receiving the most recent degree, city of activity (workplace), type of practice center, number of hours of daily practice, number of articles they read each month and whether or not eye trauma patients refer to the ophthalmologist's office, number of eye trauma patients per month, whether or not they prescribe medications to treat patients.

The second section aimed to investigate the ophthalmologists' knowledge of antibiotics administration such as prophylaxis in patients with OGI. It included 16 items. The content validity of the questionnaire was examined by 15 ophthalmology practitioners and modified according to their recommendations. The reliability of test scores was defined using Cronbach's alpha. Cronbach's alpha coefficient was assumed to be above 0.69, however, the tools were found to be unreliable.

Considering that the survey was conducted by Iranian academics, it was probable that due to selection bias, ophthalmologists were excluded from the study. On the other hand, there were items in the questionnaire that the participant might not remember accurately, which could cause a recall bias in the results.

Statistical Analysis

The data were analyzed using SPSS software, version 24.0 (SPSS Inc., Chicago, IL, USA). The qualitative data were expressed as mean±SD. Data normality was assessed using the Kolmogorov-Smirnov test. When the normality assumption was met, the studied groups were compared using the T-Test and ANOVA; otherwise, the Mann-Whitney U test and Kruskal-Wallis tests were used. The linear regression model was also utilized to assess the association between the total knowledge score and the parametric variables. In reporting, the STROBE was followed. A *p-value*<0.05 was considered statistically significant.

Results

A total of 102 ophthalmologists were personally interviewed, and 111 participants agreed to participate in the study and answered the questionnaire completely. The mean age of the participants was 43.67±9.61, with an age range of 30-67 years. According to the findings of the survey, the ophthalmologists read an average of 3.49±4.88 articles per month. The average monthly referral for eye trauma to ophthalmologists was 6.61±6.81.

The participants worked an average of 7.31±2.41 hours per day. The demographic characteristics of the participants were shown in Table 1.

The category with the highest frequency of correct responses was “types of correct diagnosis and treatment in trauma-related eye infection”, while “type of infectious agents in diverse types of eye trauma” had the lowest frequency of correct responses. The total number indicated that ophthalmologists had a moderate level of knowledge of OGI (Table 2).

The findings regarding the association between the demographic characteristics of ophthalmologists and their knowledge about prescribing antibiotics for prevention in patients with OGI indicated that there was a negative correlation between knowledge and age (Pearson Correlation=-0.241, *p*=0.011), meaning that younger ophthalmologists had more knowledge of OGI antibiotic prophylaxis.

The mean work experience of the participants was 12.12±7.46. There was a significant negative correlation between the ophthalmologists’ knowledge and their work experience (Pearson Correlation=-0.224, *p*=0.019). These results indicated that the ophthalmologists’ knowledge decreased

with increasing work experience. The participants’ average number of studied articles was 3.49±4.88, and there was no significant association between their level of knowledge and the number of articles they studied per month (*p*=0.582). The average number of ocular trauma referrals to the studied ophthalmologists per month was 6.61±6.81. There was a significant relationship between ophthalmologists’ knowledge level and the number of referrals (Pearson Correlation=0.260, *p*=0.006). The participants worked an average of 7.31±2.41 hours per day. The relationship between the average knowledge level and the typical working hours of ophthalmologists was not statistically significant (*p*=0.405). In the group of ophthalmologists who had experienced patients with ocular trauma, the average knowledge score was 13.37±3.01; while, in the group without such patients, it was 11.87±3.01 (*p*=0.049). The average knowledge score in the group that prescribes prophylactic antibiotics was 13.71±2.73, and in the group that does not, it was 11.67±3.03 (*p*=0.001). Table 3 summarized the ophthalmologists’ knowledge scores by different age groups, sex, workplace, specialization, prophylactic antibiotic prescription, and experience with ocular trauma in their practice.

Table 1. Demographic characteristics of the participants.

Demographic Variable	N (%)		
Age	30-39	45 (40.6%)	
	40-49	35 (31.5%)	
	50-59	22 (19.8%)	
	>60	9 (8.1%)	
Sex	Man	76 (68.5%)	
	Woman	35 (31.5%)	
Educational level	Specialist	65 (58.6%)	
	Fellowship	Cornea	24 (21.6%)
		Vitreous and retina	13 (11.7%)
		Oculoplastic	5 (4.5%)
		Strabismus	2 (1.8%)
		Glaucoma	2 (1.8%)
city of activity (workplace)	Tehran	50 (45%)	
	Miscellaneous	61 (55%)	
Dealing with eye trauma in routine practice	Yes	93 (83.8%)	
	No	18 (16.2%)	
Prescribing prophylactic antibiotics before referring patients	Yes	79 (71.2%)	
	No	32 (28.8%)	
Dealing with eye trauma in routine practice	Yes	82 (73.9%)	
	No, referring these cases to another practitioner	29 (26.1%)	

Table 2. The results of the knowledge assessment

Knowledge Field	Score (Mean±SD)
Types of cornea/scleral injury (with or without vitreous prolapse, with or without a foreign body inside the eye)	1.09±1.72
Administration of prophylactic antibiotics in PTE	2.79±1.11
Type of infectious agents in various types of eye trauma	3.21±1.49
Types of correct diagnosis and treatment (local, IV, and oral) in trauma-related eye infections	2.84±0.944
Range of effects of ocular antibiotics and prescribing the proper dose	2.96±2.35
Total	13.04±2.96

*SD: standard deviation; PTE: post-traumatic endophthalmitis; IV: intravenous

Table 3. Relationship between demography and knowledge score.

Demographic Variable (N, %)		Score (Mean±SD)	p-value	
Age	30-39 (44, 39.6)	13.87±3.75	0.002 ^a	
	40-49 (35, 31.5)	13.24±2.98		
	50-59 (21, 18.9)	12.59±2.88		
	>60 (11, 9.9)	11.99±3.02		
Sex	Man (76, 68.5)	13.00±2.78	0.754 ^b	
	Woman (35, 31.5)	13.19±3.05		
Education level	Specialist (69, 62.2)	10.80±3.53	0.035 ^c	
	Fellowship and sub-specialty	Cornea (21, 18.9)		13.91±2.65
		Vitreous & Retina (12, 10.8)		13.72±4.41
		Oculoplastic (5, 4.5)		10.54±3.76
		Strabismus (2, 1.8)		12.54±2.60
		Glaucoma (2, 1.8)		12.51±3.25
Address	Tehran (49, 44.1)	12.83±3.28	0.347 ^d	
	Others (62, 55.9)	13.36±2.68		
Dealing with Ocular Trauma in Routine Practice	Yes (93, 83.8)	13.44±3.01	0.06 ^b	
	No, referring these cases to another practitioner (18, 16.2)	12.11±2.65		
Prescribing Prophylactic Antibiotics	Yes (79, 71.2)	13.71±2.73	0.001 ^b	
	No (32, 28.8)	11.67±3.03		

^aKruskal-Wallis tests; ^bOne-way analysis of variance; ^cIndependent sample T-test; ^dMann-Whitney U test

Discussion

In this study, we evaluated Iranian ophthalmologists' knowledge of prescribing antibiotics such as prophylaxis in patients with OGI. In Iran, there hasn't been much research on different groups of ophthalmologists, both academic and non-academic. The present study was the first to be conducted on the knowledge of ophthalmologists in this field. The mean of knowledge score for ophthalmologists in this study was 13.04±2.96 out of 20. The findings of this study generally indicated that ophthalmologists had a moderate level of knowledge in prescribing antibiotics as prophylaxis in OGI patients. Furthermore, the results revealed that the ophthalmologists' knowledge did not have a significant relationship with some demographic characteristics such as sex, working hours, and workplace location. In addition, as the level of education and the number of patients with ocular trauma increase, the ophthalmologists' knowledge also improves.

In 2008, the National Institute for Health and Care Excellence (NICE) published guidelines on the use of prophylactic antibiotics in surgical site infections. These guidelines were updated in 2020. According to these guidelines, NICE recommended avoiding antibiotics prophylaxis in class one of the surgical wounds, particularly in surgical sites without the use of prostheses or implants [18]. In the United Kingdom, 809 members of the Royal College of Ophthalmologists conducted a study on the administration method of antibiotics after surgery. The prescription of topical antibiotics was high among UK ophthalmologists and contradicted NICE recommendations and guidelines. The findings indicated that the lack of knowledge of ophthalmologists about NICE guidelines was one

of the primary causes of the improper prescription of antibiotics [19]. The ophthalmologists should be aware of NICE guidelines and culture-based tests to detect antibiotic resistance to lessen the consequences of antibiotic resistance, side effects, and the cost of unnecessary prescriptions. In the present study, there was a statistically significant difference between the ophthalmologists' knowledge levels who prescribed prophylactic antibiotics and those who did not.

Lou *et al.* developed a questionnaire to assess how ophthalmologists prescribe intraocular antibiotics as prophylaxis after OGI. According to the evaluation results, only 20.9% of the 153 ophthalmologists who answered the questionnaire prescribed antibiotics instantly after OGI. The most popular antibiotics among ophthalmologists were cephalosporins (53.8%), vancomycin (42.6%), fluoroquinolones (24.3%), and aminoglycosides (13.4%). Moreover, only 21.9% of ophthalmologists preferred a combination of antibiotics. The majority of ophthalmologists believed that gram-positive cocci were the leading cause of PTE pathogenesis, while bacillus species were the most common PTE-associated microorganism [9, 20].

In the present study, the effects of postgraduate courses such as specialty, fellowship, and subspecialty on the degree of ophthalmologists' knowledge were investigated. The findings demonstrated that different study courses, such as specialization, fellowship, and subspecialty influenced the ophthalmologists' knowledge ($p < 0.05$). The difference between the knowledge of specialists and subspecialists was significant, while the knowledge of specialists was higher than those of oculoplastic fellowships. The evidence in the medical sciences showed that general practitioners

and specialists differed in their knowledge, care practices, and clinical outcomes for a wide range of diseases [21]. The subspecialties and fellowships had more knowledge in comparison to the general ophthalmologists. The majority of specialists' knowledge stemmed from several sources, including the limited scope of their field of study, spending more time on training, and better access to the latest information [21-23].

Experience in prescribing antibiotic prophylaxis by ophthalmologists was another focus of our study. The majority of the participants (73.9%) stated that they had experienced dealing with ocular trauma in their daily practice. The results of the current study indicated that knowledge and experience in ophthalmologists were negatively correlated, with novice ophthalmologists having higher knowledge than experienced ophthalmologists. In the latest study, Baenninger *et al.* investigated the knowledge of 100 ophthalmologists about minimal keratoconus knowledge (MKK) in Switzerland. The participants' average age was 52 years. The results showed that per 10 years of employment in private jobs, MKK decreased by 8.1%. Only 24% of specialists accurately defined keratoconus, 9% remembered all risk factors, 5% remembered all symptoms, and 20% remembered all treatments [24].

One of the most important steps in reducing antibiotic resistance was to implement an antibiotic stewardship program [25, 26]. Simultaneous implementation of an antibiotic stewardship program and infection prevention and control program, as well as limiting antibiotic resistance and drug side effects, might lead to the ideal treatment of infections, reduce treatment failure, increase health care quality, and ultimately reduce hospital expenses [27]. Due to the importance of the disease, the educational system should make the necessary plans to enhance the ophthalmologists' knowledge about prescribing antibiotics in the appropriate circumstances.

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Therefore, arranging supplementary courses in the form of workshops as well as preparing and distributing educational booklets on the effectiveness of antibiotics can be beneficial.

Conclusion

The findings of the present study indicated that the majority of ophthalmologists had a basic knowledge of prescribing prophylactic antibiotics in OGI.

Declaration

Ethical approval and consent to participate: Protocol of this study was approved by Shahid Beheshti University of Medical Sciences ethics committee. (Ethics code: IR.SBMU.PHARMACY.REC.1398.195)

Consent for publication: All the authors who participated in the study are informed about the publication of the study and declare their consent for its publication.

Conflict of Interest: The authors declare that they have no conflict of interest.

Funding: This research received no external funding.

Authors' Contributions: Conception and Design: M.Sh. and H.E. Acquisition of Data: M.S., M.F.H. and G.M. Analysis and Interpretation of Data: G.M., M.S., M.F.H., and H.E. Drafting the article: M.Sh., G.M., and H.E. Revising It for Intellectual Content: H.E. and M.Sh. All authors reviewed and approved the final manuscript.

Acknowledgment: Not applicable.

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