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Original Research Article

Bacterial Keratitis in Contact Lens Wearers in Khartoum

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Abstract: ***Background:*** In both industrialized and developing nations, contact lenses have become a popular substitute for eyeglasses. However, unpleasant reactions can develop during contact lens usage in some cases, and a variety of microorganisms—including bacteria, fungus, and free-living amoebae—may cause a variety of eye infections. The goal of this study was to identify contaminated bacteria from contact Wearers. ***Method:*** With the use of sterilized cotton swabs, samples were taken from eye lens solution bottles and cultivated directly on solid medium. All samples were inoculated onto blood agar and MacConkey's agar and cultured at 37°C for 24-48 hours. Cultures were declared negative if no growth was detected after 48 hours. On the basis of culture diagnosis by growing on medium and completing biochemical tests, bacteria were identified using Gram's staining. A structured interview questionnaire was used to collect data, which included demographic data as well as risk variables. For data input and analysis of the patient demographic information, the Statistical Package for Social Sciences application (SPSS Inc., Chicago, IL, USA) version 20 was used. Simple descriptive statistics were used to assess the results of the culture, biochemical test, gram stain, and demographic data. Every two variables were compared using the Chi-square test. A statistically significant p value was less than 0.05. ***Result:*** A total of 150 samples were taken from an aqueous solution of contact lenses in order to isolate microorganisms. Bacteria were isolated from 84 samples in an aqueous solution, whereas 66 samples were found to be growth negative. Pseudomonas aeurogenosa was the most often isolated bacterium, with 39 (46 %), Stapylococcus epidermidis 27 (32%), Staphylococcus aureus 12 (14 %), and Escherichia coli 6 (7%), respectively. ***Conclusion:*** The research demonstrates a range of bacteria in the contact lens solution under evaluation, with pseudomonas bacteria being the most frequent. In addition, users who shared contact lenses had more isolated bacteria encounters. The most preventive factor was found to be high compliance with lens care practices, whereas inadequate compliance with hand washing before wearing lenses was associated to a high contamination rate.

Keywords: Bacterial Keratitis**;** Contact lens**;** Khartoum; Sudan.

INTRODUCTION

Contact lenses are a useful optical device for treating severe refractive errors and some chronic conditions. Only if contact lenses are constructed of well-chosen materials, suitably shaped, and well fitted can they be worn for many years without causing difficulties. The ocular consequences vary from minor discomfort to potentially blinding corneal ulcers and possibly blindness (Review 2017). Microbial keratitis (MK) is a group of ocular infectious illnesses that damage the cornea and are caused by bacteria, fungi, and protozoa. It can result in ocular morbidity and impairment (Ezisi *et al*. 2018)**.** Microbial keratitis is a rare but serious consequence of contact lens usage that affects around 5 out of

every 10,000 people. With such a vast number of CL users globally, uncommon illnesses with high morbidity have important public health implications(Stapleton *et al*. 2008). Bacterial keratitis (BK) is a devastating ophthalmic condition that is responsible for the majority of corneal blindness(MARINOVA *et al*. 2021). Bacterial keratitis can affect any part of the cornea, but infections that affect the central or paracentral cornea are particularly dangerous. Even if the infectious organism is effectively removed, scarring in this site has the potential to cause significant vision loss (Lin *et al*. 2019). As a consequence, keratitis is regarded as an ocular emergency that need prompt and effective antimicrobial therapy to avoid irreversible loss of vision (Bartimote, Foster, and Watson 2020). Bacterial contamination can be caused by the usage of glasses on a regular basis and the difficulty of disinfecting the whole surface(Anjani, Purwanta, and Rochmanti 2021). On two levels, contact lens-associated microbial keratitis presents a diagnostic challenge for optometrists. It's common for the line between sterile inflammation and microbial infection to get blurred (Carnt *et al*. 2017).Contact lens use is a significant risk factor for developing eye disorders, notably infectious keratitis. Contact lens usage is thought to be responsible for 25 to 30 % of corneal ulcers (Bôas *et al*. 2018).Overnight and extended days of usage, poor hand, lens, and storage case cleanliness, youth, male gender, smoking, and Internet purchasing are all established risk factors for microbial keratitis with all daily use lenses (Stapleton *et al*. 2017). It has been proposed that ocular surface microbiota have a role in the regulation of local ocular homeostasis and defensive protection against diseases such as microbial keratitis (Keratitis *et al*., 2021). Staphylococcus aureus, Pseudomonas aeruginosa, coagulase negative Staphylococcus, Streptococcus spp., and Enterobacteriaceae are the most prevalent causal agents in bacterial keratitis. P. aeruginosa is the most often identified microorganism from corneal scrapings in situations involving contact lens usage (Hilliam, Kaye, and Winstanley 2020).

MATERIALS AND METHODS

The Department of Microbiology at Al Yarmouk University College-Khartoum conducted a descriptive retrospective laboratory research from October to December 2020**.** Aqueous solution for glasses, cleaning behavior, and bacteria on aqueous solution were the determining factors. A total of 150 aqueous solutions were chosen from a population of 245 glasses wearers by Al Yarmouk University College students using simple random selection. Sterilized cotton swabs soaked with sterile distilled water were used to collect samplesThe cotton swab was rinsed to the inner lens of the spectacles, including the area that contacted the nose, and then streaked into the blood Agar and MacConkey Agar and incubated at 37° C for 24 hours. Isolates that grown on blood Agar and MacConkey Agar were analyzed macroscopically and microscopically to discriminate between Gram positive and Gram negative bacteria after a 24-hour incubation period at 37° C.

All colonies on Agar medium that indicated Gram positive bacteria growth would be biochemically examined using the Catalase test for Staphylococcus spp., the Coagulase test for S. aureus, the Mannitol salt agar (MSA) for Staphylococci species, and the DNase agar for Staphylococci species. The Oxidase test (Cytochrome oxidase test) for Pseudomonas, Neisseria, Vibrio, Brucella, and Pasteurella species, and the Indole test for most strains of E. coli, P. vulgaris, P. rettgeri, M. morganii, and Providencia species,Urease test for Proteus strains and Y. enterocolitica, Citrate utilization test for enterobacteria, Kilegler Iron Agar (KIA) to distinguish lactose fermenting members of the family Enterobacteriaceae (e.g. Escherichia coli) from lactose-intolerant members (e.g. Shigella dysenteriae), and Motility tests employ semisolid nutrition broth media to detect motile microorganisms.

DATA COLLECTION TOOL AND ANALYSIS

Data collection through close ended questionnaire; the required information include: age, reasons of using eye lenses, the quality of eye lenses, washing of hand before wearing the lenses. The Statistical Package for Social Sciences application (SPSS Inc., Chicago, IL, USA) version 20 was used to enter data and analyze the profile of the sample. To examine microbiological laboratory findings as well as demographic data, extremely simple descriptive statistics were utilized. The Chi-square test was used to compare any two variables. Statistically, a p value of less than 0.05 was declared acceptable.

Ethical consideration

Permission to conduct this study was acquired by the College of Medical Laboratory Science, the National University Administration, and medical students who wear contact lenses gave their informed consent before participating in the study.

RESULTS

The current investigation comprised a total of 150 samples from contact lens aqueous solutions. Eighty four specimens had bacteria isolated from their aqueous solutions, whereas sixty six samples had no growth (table 1). Pseudomonas aeurogenosa was the most often isolated bacteria, accounting for (39 %) of all isolates, followed by Staphlycoccus aureus (32 %), Staphlycoccus aureus (12 %), and E.coli 6 % (table 2). In this study, users who washed their hands with detergent soap before wearing contact lenses were found to have one isolated kind of bacteria 83

(55.3%), whereas users who did not wash their hands were found to have a different kind of bacterial growth 67 (44.7%)(table 1).

The research population was partitioned into two age categories (18-22) and (23-26). The study found a link between age and the most isolated bacteria, with a p value of (0.000) (table 2).The majority of eye lenses (145%) were used for aesthetic purposes, while 5 (3.3%) were used for medicinal purposes. The study found a link between lens usage and the majority of identified bacteria, with a p value of (0.002) (table 1). The study indicated that there is a link between the quality of lenses and most identified bacteria, with a p value of 0.001. The majority of eye lenses were original 141 (94%) while the remainders were counterfeit 9 (6%) (Table 2).

Table-1: Lens original, hand washing, indication for use and age group in association to microbial culture result

Variables	Characteristic	Culture result			P value
		Growth	No growth	Total	
Does lens original	Yes	84	57	141	
	No	0	9	9	0.001
	Total	84	66	150	
Hand washing	Yes	17	66	84	
	No	67	0	67	0.001
	Total	84	66	150	
Indication for use	Cosmetic issue	79	66	145	
	Medical issue	5	0	5	0.052
	Total	84	66	150	
Age group (Years)	18-22	84	2	86	
	23-26	0	64	64	0.000
	Total	84	66	150	

Table-2: Lens original, hand washing, indication for use and age group in association to microbial etiology

Variables	Characteristic	Bacterial etiology					Total	P. value
		P.aeruginosa	S.epidermidis	S. aureus	E.cloi	No growth		
Doeslens original	Yes	39	27	12	6	57	141	
	No	0	0	0	0	9	9	0.001
	Total	39	27	12	6	66	150	
Hand washing	Yes	0	0	11	6	66	83	
	No	39	27	1	0	0	67	0.001
	Total	39	27	12	6	66	150	
Indication for use	Cosmetic issue	34	27	12	6	66	145	
	Medical issue	5	0	0	0	0	5	0.004
	Total	39	27	12	6	66	150	

DISCUSSION

In impoverished nations, microbial keratitis and associated complications are common causes of ocular morbidity and blindness. Microbial keratitis is characterized by corneal inflammation, generally accompanied by stromal infiltration, and is recognized an ocular problem requiring immediate care. Keratitis can develop quickly, terminating in corneal damage and irreversible vision loss (Yu, Höfling-Lima, and Furtado 2016). Overall, bacterial keratitis was found in 84/56 % of the study population, which was greater than a survey in Australia that comprised 285 eligible instances of CL-related microbial keratitis out of 35914 participants (Stapleton *et al.* 2008).Our findings, on the other hand, were based on a study conducted in India, which indicated bacterial keratitis in 52 % of study subjects (104/200)(Gaikwad and Gaikwad 2014). This disparity might be attributable to our limited sample size or population discrepancies between developed and developing countries.

Regarding type and quality of contact lens our study stated that, wearers use original contact lens were more susceptible to bacterial contamination 56% of study subjects were shown microbial growth and Pvalue<0.05.This was in agreement with that of (Egan and Dyavaiah 2015) who reported that healthy contact lens wear and care awareness to the public is essential to minimize the microbial keratitis in contact lens wearers. This significant disparity between the two studies might be likely contributed to the study subjects that were not paying attention to the cleanliness of the lenses for lengthy periods of time.

High compliance with lens care procedures was deemed the most preventative factor, whereas low compliance with hand washing before wearing lenses was linked to a high contamination rate among research participants. The present study indicated that 67 out of 150 P value was less than 0.05. In a comparable published research in India, the rate of contamination was 100 and 93.75 % in individuals with poor and medium compliance to lens care procedures, respectively, as opposed to those with high compliance (43.75 %) (P<0.05) (Gaikwad and Gaikwad 2014).

Among our study subjects with a high bacterial contamination rate, the majority of eye lenses (145%) were used for cosmetic purposes, with 79 out of 150 showing bacterial growth with a P value of 0.052. This was in accordance with another research, which indicated that individuals wearing lenses for purely aesthetic purposes (88 %) had a higher risk of contamination, indicating negligence and lack of compliance on the part of the users when it related to lens care(Gaikwad and Gaikwad 2014).

In the current study, the most common age group associated with bacterial keratitis was under 25 years of age, with a P value of 0.05 for bacterial growth, and the most common bacterial isolate reported was P.aeruginosa, followed by S.epidermidis. This report was disagree with etiological study conducted in South Texas to assess the risk factors for infectious keratitis, which revealed that contact lens-associated corneal infection was most common in patients under the age of 40, whereas corneal ulcers caused by underlying corneal and ocular surface diseases were more common in patients over the age of 40*(Puig et al. 2*020). In addition, according to a survey done in Brazil, the most common age group was 60-69 years, followed by 70-79 years, 80-89 years, and 90 years(‘METHODS’ 2010).

Conflicts of Interest
Authors declare that there is no conflict of interest.

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