



## Isolation of Contaminating Bacteria from Aqueous Solution of Contact Eye Lenses

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### Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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### ABSTRACT

**Background:** Contact lenses have been widely used as an alternative to spectacles both in developed and non-developing countries. However, under certain circumstances, adverse responses can occur during contact lens wear and several microorganisms including bacteria, fungi, and free living amoebae—can cause several eye infections. This study was aimed to isolate contaminating bacteria from eye lenses solution.

**Methods:** The samples were collected from solution bottles of eye lenses with the help of sterile cotton tipped swabs that were pre- moistened with sterile normal saline, then sample directly cultured on solid media. All samples were inoculated on to *blood agar*, *MacConkey's agar* were incubated at 37°C for 24-48 h, Cultures were considered negative if no growth was detected within 48 hours of incubation. Bacterial culture obtained was identified using Gram's staining, on the basis of culture diagnosis by growing on media and performing biochemical test.

**Results:** A total of 150 samples from aqueous solution of contact eye lenses were used to isolate bacteria from it. Out of these samples 84 bacteria were isolated from aqueous solution while 66 were without growth. The most frequent isolated bacteria were *P.aeruginosa* 39(46%) followed by

*S. epidermidis* 27 (32%) then *S. aureus* 12 (14%) and *E. coli* 6(7%) respectively which is significant result (P-Value of 0.005).

**Conclusion:** The study revealed that contact lenses solution under investigation contains different types of bacteria and *pseudomonas* is more frequent bacteria. Furthermore the contact lenses with multiple use and users which not have difference types of bacteria growth.

**Keywords:** Isolation of contaminating bacteria; contact eye lenses; *pseudomonas*.

## 1. INTRODUCTION

Contact lenses have been widely used as an alternative to spectacles both in developed and non-developing countries [1]. With increasing use of soft contact lenses for cosmetic or therapeutic purposes the incidence of contact lens induced infections is also increasing. Lack of compliance and poor hygiene towards lens care is strongly associated with microbial contamination and has been proved to result in eye infections [2] (Szczołka-Flynn et al., 2010). However, under certain circumstances, adverse responses can occur during contact lens wear and several microorganisms--including bacteria, fungi, and free living amoebae--can cause several eye infections in wearers. Extended wear of contact lenses is the major risk factor of eye infections such as microbial keratitis, besides contaminated contact lens storage case, contaminated lens care solutions, and inaccurate contact lens handling [1].

Microbial keratitis is one of the serious complications of contact lens use and if not treated timely, may result in permanent visual damage to the cornea. In developed countries, the incidence of contact lens associated keratitis has been increased up to 30 per cent of all keratitis cases [3,4]. A major factor that may be responsible for the development of keratitis among contact lens users is the microbial contamination of their lens care system. The lens care system includes the ophthalmic solution, lens cases and lenses used by the contact lens wearer [5]. Furthermore, several reported cases of such ocular infections have been implicated to be due to lens care system contamination. This may be attributed to improper cleaning of the contact lenses as well as the presences of contamination in the other items of lens care system. Contamination of the lens cases or lens care solutions would most likely contaminate the contact lenses [5].

In study done in Brazil by Correa et al., [6], they used different types of eye lenses solution and

the bacteria mostly isolated *P.aeruginosa*. Another study done in china by Xiaojun et al., [7], the most isolated contaminated bacteria were *Serratia spp*. Study done in Egypt which showed that the most isolated organisms were *S. epidermidis* [8]. There is also study done by in India their sample size was 200 and the most frequently isolated contaminant was *S.aureus* [9].

The present study was planned to isolate contaminated bacteria from eye lenses contact solution in addition to determine the most contaminated bacteria in eye lenses solution.

## 2. MATERIALS AND METHODS

This is was a descriptive cross sectional study, carried out at Khartoum state in al-yarmouk College. From October to December 2020, the required information include: age, reasons of using eye lenses, the quality of eye lenses, washing of hand before wearing the lenses was collected by using questionnaire. Ethical Permission were obtained from College of Medical Laboratory Science, National University Administration, people who use eye lenses was informed by purpose of the study and they were agreed to be a part of study.

### 2.1 Laboratory Identification

#### 2.1.1 Sample collection

The samples were collected from solution bottles of eye lenses with the help of sterile cotton tipped swabs that were pre- moistened with sterile normal saline. The sample of lens care solution was directly cultured on solid media as a drop. All samples were inoculated onto blood agar, MacConkey's agar were incubated at 37°C for 24-48 h, Cultures were considered negative if no growth was detected within 48 hours of incubation. Bacterial culture obtained was identified using Gram's staining, on the basis of culture diagnosis by growing on media and performing biochemical tests including catalase, coagulase, and oxidase.

### 3. RESULTS

A total of 150 aqueous solutions of contact eye lenses samples used to isolate bacteria from it. Out of these samples 84 bacteria were isolated from aqueous solution while 66 were without growth (Table 1). The most frequently isolated bacteria was *P. aeurogenosa* 39 (46%) followed by *S. epidermidis* 27(32%) then *S.aureus* 12(14%) and *E.coli* 6(7%) respectively which is significant result (P. Value 0.005) (Table 2). In this study, the user which reported washing their hands without detergent soap before wearing the contact lenses was found 40 (51%) with one isolated type of bacteria and the user which not washing their was found

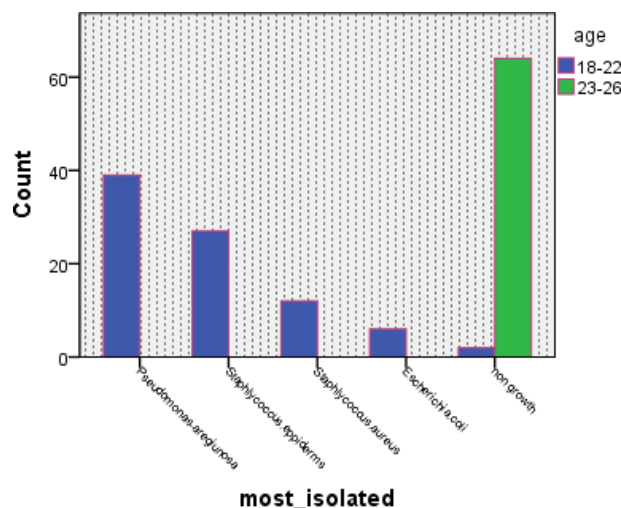
38(49%) to have different types of bacterial growth. In this study the age of study population was divided into two group (18-22) (23- 26), Study revealed a correlation between age and most isolated bacteria and the p value was (0.000) (Fig. 1) In this study most of eye lenses were used for cosmetic (96.7%) while (3.3%) used for medical purpose, the study revealed there is a correlation between uses of lenses and most isolated bacteria and the p value was (0.002) (Fig. 2) Most of eye lenses were original (94%) while the rest were fake (6%), the study revealed there is a correlation between the quality of lenses and most isolated bacteria and the p value was (0.001) (Fig. 3).

**Table 1. Distribution of isolated bacteria among study population**

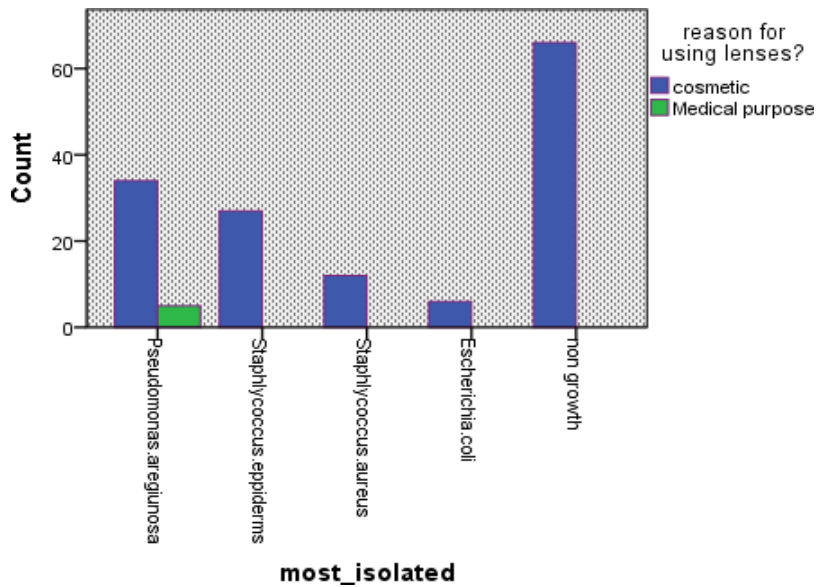
Number of sample	Number of non-isolated (%)	Number of isolated (%)	Total
150	66(44%)	84(56%)	150(100%)
Organism	Frequency (%)	<i>P.value</i>	
<i>Pseudomonas aeurogenosa</i>	39(46%)	<b>0.005</b>	
<i>S. epidermidis</i>	27(32%)		
<i>S. aureus</i>	12(14%)		
<i>E. coli</i>	6(7%)		

**Table 2. Frequency of isolated bacteria among study population**

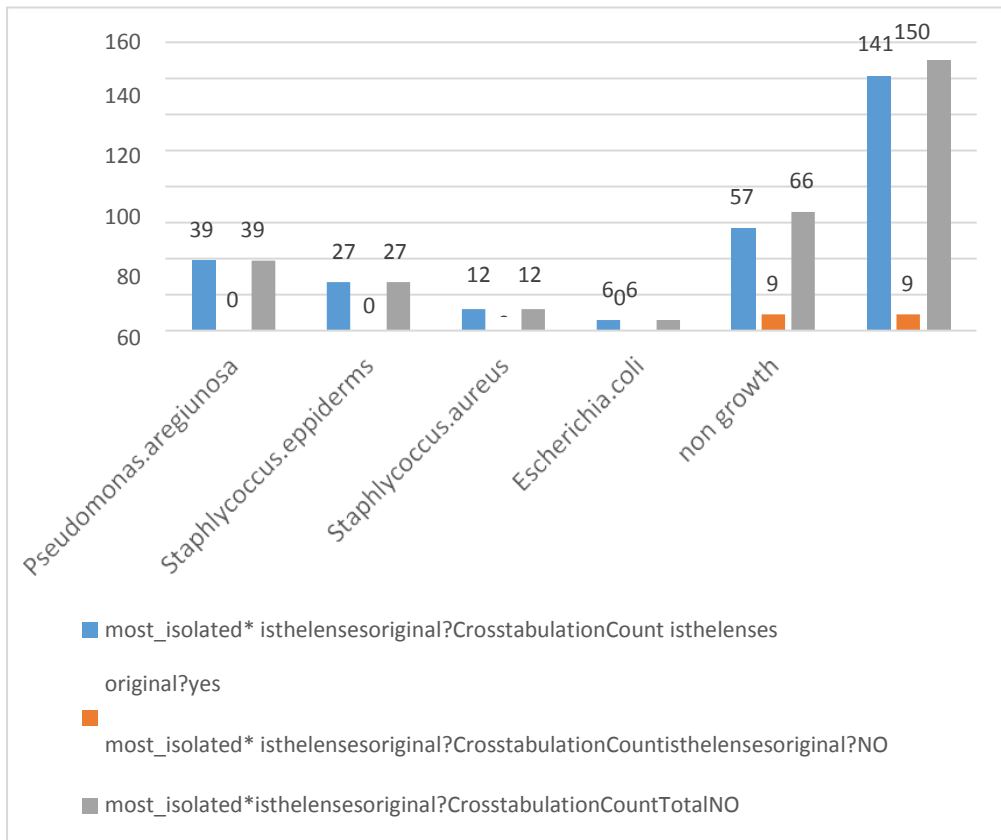
Number	Wash hands		Without wash	
	%	Number of Bacteria	%	Number of bacteria
Total	40(51%)	40	38(49%)	44
<i>p.value</i>	<b>0.006</b>	40(48%)	<b>0.004</b>	44(52%)



**Fig. 1. Correlation between age and most isolated bacteria.**The eye lenses users are categorized based on their age and analyzed against their cross pending culture result and the result demonstrated that none of the age group of 23 – 26 have shown growth on the surface plate



**Fig. 2. Correlation between uses of lenses and most isolated bacteria. In this study most of eye lenses were used for cosmetic (96.7%) while (3.3%) used for medical purpose, the study revealed there is a correlation between uses of lenses and most isolated bacteria and the p value was (0.002)**



**Fig. 3. correlation between the quality of lenses and most isolated bacteria. Most of eye lenses were original (94%) while the rest were fake (6%), the study revealed there is a correlation between the quality of lenses and most isolated bacteria and the p value was (0.001)**

#### 4. DISCUSSION

Contact lenses are widely use around world for cosmetic and medical propose, the solution that used to prevent lenses from drying and could be contaminated if the quality of solution was weak or if the technique of wearing the lenses was a wrong.

The microbiological profile of bacterial contaminant the contact eye lenses aqueous solution in this study showed that *P.aeurognosa* were the commonest pathogens, the study revealed there is a high incidence of contamination with bacteria in eye lenses solution specially among females how wear the eye lenses without was hang their hands and without wearing their lenses under aseptic technique.

The present study was similar to study done in Brazil by [6] they used different type of eye lenses solution and their most bacteria isolated was *P.aeurognosa* while disagree with study done in china by XiaojunHu et al., [7], the sample size were 107 and the most isolated contaminated bacteria were Serrita spp.

The present study disagrees with study done in Egypt by [8] the sample size was 50 and the most isolated organisms were *Staphylococcus epidermidis*. Also the present study disagree with study done by [9,10] in India their sample size was 200 and the most frequently isolated contaminant was *Staphylococcus aureus*.

#### 5. CONCLUSIONS

The study revealed that contact lenses solution under investigation contain difference type of bacteria and the pseudomonas bacteria is more frequent one further more the contact lenses which multiple use and also user swhich not washing.

So this study recommended that daily examine of the aqueous solution of contact eye lenses to detect in change in color or turbidity addition to prevent long wearing of contact eye lenses, washing Hands before wearing contact eye lenses, lastly the contact eye lenses is consider single use.

#### CONSENT

As per international standard or university standard, Participants' written consent has been collected and preserved by the author(s).

#### ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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