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MICROBIAL CONTAMINATION OF CONTACT LENSES AND ADHERENCE TO LENS CARE GUIDELINES AMONG NOSOCOMIAL ENVIRONMENT

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Abstract: **A contact lens (CL) can act as a vector for microorganisms to adhere to and transfer to the ocular surface. A contaminated contact lens case can act as a reservoir for microorganisms that could potentially compromise contact lens wear and lead to sight threatening adverse events. The study aims to evaluate, define, and control the microbial contamination of contact lenses and to assess the following of guidelines by the lenses wearers and its effect on lenses contamination.**

Methods: A set of 100 microbiological swab samples from the lenses collected from volunteers suspected with contact with microbial contamination. The samples processed in the microbiology laboratory by streak plate method to isolate microbial contamination.

Results: 23 positive case are found in three different hospitals, all were detected with positive cultures. Women are more than males. A 52.17% of all positive cases were Pseudomonas aeruginosa, 26.08% were Staph.aureus, and 21.73% were Klebsiella.

Conclusions: Using of non-sterile hands and leaving the lenses susceptible to pollution without coverage, has a significant impact in the cause of infection of the eye. Therefore, care and awareness using sterile hands and follow the guidelines for lenses to avoid any infection.

Keywords: **Contact lenses, Bacterial infection, Nosocomial environment.**

1. INTRODUCTION

Contact lenses are a popular choice for many people who require vision correction, because they afford flexibility and convenience. Different lenses are available to treat myopia (nearsightedness), hyperopia (farsightedness), astigmatism (blurred vision due to the shape of the cornea), and presbyopia (inability to see close up). The US Food and Drug Administration (FDA) not only regulates contact lenses as medical devices but also wants to ensure that people use them safely and effectively, because they are used by people without professional medical assistance. [1]

A contact lens (CL) can act as a vector for microorganisms to adhere to and transfer to the ocular surface. Commensal microorganisms that uneventfully cohabitate on lid margins and conjunctivae and potential pathogens that are found transiently on the ocular surface can inoculate CLs in vivo. In the presence of reduced tissue resistance, these resident microorganisms or transient pathogens can invade and colonize the cornea or conjunctiva to produce inflammation or infection. [2] With increasing use of soft contact lenses the incidence of contact lens induced infections is also increasing. [3]

A contaminated contact lens case can act as a reservoir for microorganisms that could potentially compromise contact lens wear and lead to sight threatening adverse events. The rate, level and profile of microbial contamination in lens cases, compliance and other risk factors associated with lens case contamination, and the challenges currently faced in this field are discussed. The rate of lens case contamination is commonly over 50%. [4]

2. METHODOLOGY

A set of 100 microbiological samples collected randomly from different patients both males and females in three different hospitals by taking the sample from the patient's lens with using sterile cotton steak. we applied the streak culture technique and gram staining as follow:

- **Culturing technique:** we used a streak culture technique.

1. Sterilize the inoculating loop in the bunsen burner by putting the loop into the flame until it is red hot. Allow it to cool.
2. Pick an isolated colony from the agar plate culture and spread it over the first quadrant (approximately 1/4 of the plate) using close parallel streaks or Insert your loop into the tube/culture bottle and remove some inoculum. You don't need a huge chunk.
3. Immediately streak the inoculating loop very gently over a quarter of the plate using a back and forth motion.
4. Flame the loop again and allow it to cool. Going back to the edge of area 1 that you just streaked, extend the streaks into the second quarter of the plate.
5. Flame the loop again and allow it to cool. Going back to the area that you just streaked (area 2), extend the streaks into the third quarter of the plate.
6. Flame the loop again and allow it to cool. Going back to the area that you just streaked (area 3), extend the streaks into the center fourth of the plate.
7. Flame your loop once more.

- **Gram staining:** first of all, we prepared the slide smear by, Fixing material on slide with heat. After the slide is heat fixed, allow it to cool to the touch before applying stain, After that:

1. Flood air-dried, heat-fixed smear of cells for 1 minute with crystal violet staining reagent.
2. Wash slide in a gentle and indirect stream of tap water for 2 seconds.
3. Flood slide with the mordant: Gram's iodine. Wait 1 minute.
4. Wash slide in a gentle and indirect stream of tap water for 2 seconds.
5. Flood slide with decolorizing agent (Acetone-alcohol decolorizer). Wait 10-15 seconds or add drop by drop to slide until decolorizing agent running from the slide runs clear.
6. Flood slide with counterstain, safranin. Wait 30 seconds to 1 minute.
7. Wash slide in a gentile and indirect stream of tap water until no color appears in the effluent and then blot dry with absorbent paper.
8. Observe the results of the staining procedure under oil immersion (100x) using a Bright field microscope.

3. RESULTS

100 samples were collected by sterile cotton swab. A sample from each patient's lens in three hospitals and for each sample we applied the culturing by using (CLED agar and MacConkey agar) and gram staining for each sample separately.

Through our observation to the result We found some of the samples we had tested Were positive and others negative.

The total positive cases of the infection occurred in 23 cases, Of these, 38 from hospital (A), 33 from hospital (B), and 29 from hospital (C). 9 (23.68%) of 38 patients from hospital (A), 6 (18.18%) of 33 patients from hospital (B), and 8 (27.5) of 29 patients from hospital (C), all were detected with positive cultures and we noticed that women infected8 are more than males. The most bacteria have been detected is *Pseudomonas aeruginosa, Klebsiella, and Staph.aureus.*

Table 1:					
	Pseudomonas aeruginosa	*Klebsiella*	*Staph.aureus*	Non-infected (Clear patients)	Total
Male	4	2	2	27	35
Female	8	3	4	50	65
Total	12	5	6	77	100

The positive results we have found based on our tests are as follows:

Table 2:			
Organism	*Pseudomonas aeruginosa*	*Klebsiella*	*Staph.aureus*
MacConkey agar	-ve	+ve	-ve
CLED agar	+ve	+ve	+ve

- ***Culturing method showed:***

- The result on MacConkey agar and CLED agar (Image 1)..

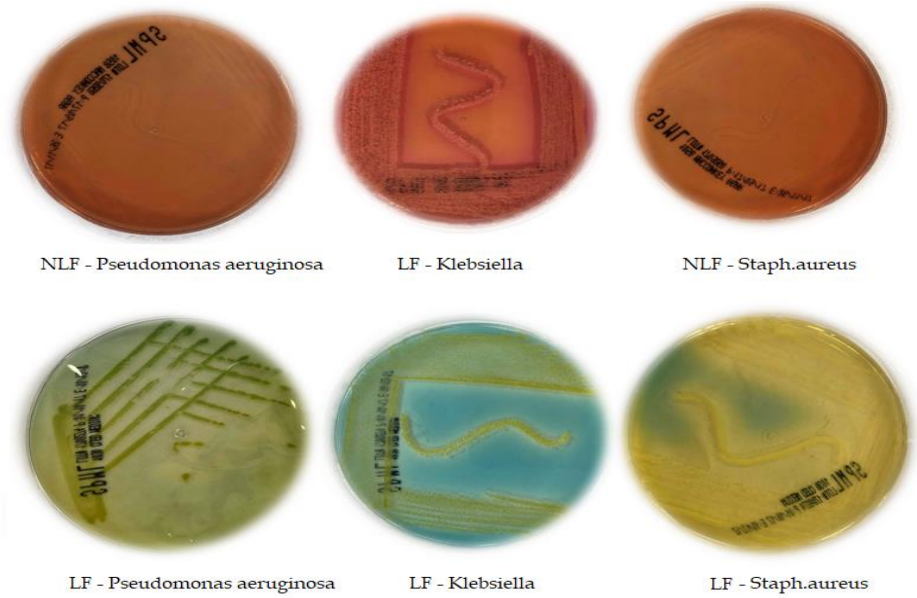

Image 1

- ***Gram staining Showed:***

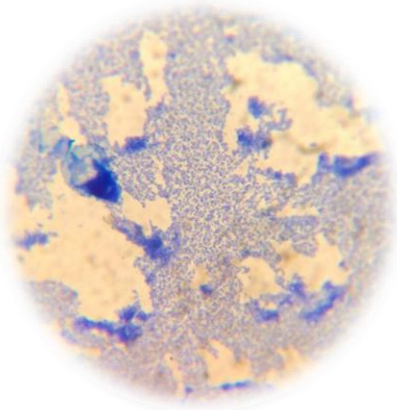

Image 2: staphylococcus aureus under the microscope.

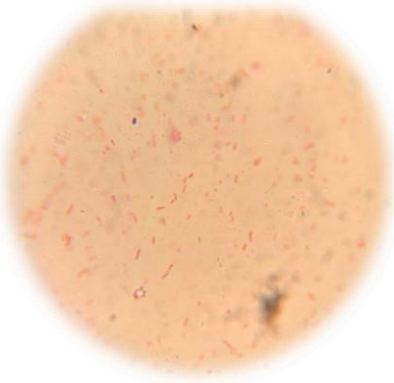

Image 3: P.aeruginosa under the microscope.

4. DISCUSSION

Lens handling greatly increases the incidence of lens contamination, and the ocular surface has a tremendous ability to destroy organisms. However, even when removed aseptically from the eye, more than half of lenses are found to harbor microorganisms, almost exclusively bacteria. Coagulase-negative *Staphylococci* are most commonly cultured from worn lenses; however, approximately 10% of lenses harbor Gram-negative and highly pathogenic species, even in asymptomatic subjects. In storage cases, the incidence of positive microbial bioburden is also typically greater than 50%. All types of care solutions can become contaminated, including up to 30% of preserved products. [5]

A total of 23 articles were identified that represent 70 individual cases. All 8 of the pre-2006 case reports originated from the United States and the United Kingdom, whereas from 2006 onwards, only 2 of the 15 reports came from these locations. Over-the-counter supply accounted for 73% (51/70) of cases, whereas 17% (12/70) were borrowed or shared lenses and 6% (4/70) lenses were obtained through the Internet. Nearly, three quarters of patients (30/42, 71%) waited longer than 48 hours after the onset of symptoms before seeking medical attention; 10 patients waited longer than a week, and 5 longer than a month. Microbial keratitis (MK) was reported in 43 (61%) patients, with permanent damage occurring in 72% (31/43) of patients followed to conclusion. Known risk factors associated for MK were present in all cases irrespective of whether the patients developed MK. [6]

Out of the 50 samples processed, 14 (28.0%) Staphylococcus aureus strains and 10 (20.0%) Pseudomonas aeruginosa strains were obtained among other organisms. Staph. aureus and Pseudomonas aeruginosa were selected for the study due to their high occurrence in ocular infections and their apparently high resistance to most commonly used eye drops and drugs. Pseudomonas aeruginosa for instance, has been severally reported to thrive in commonly used disinfectants. Contact lens solutions also have disinfecting effects. Staphylococcus aureus strains adhered in decreasing order to lotrafilcon B (55.36 ± 4.7), polymacon (46.4 ± 8.4), methafilcon A (46.4 ± 8.4) and omafilcon A (25.0 ± 6.4). There was no significant difference in the individual adhesion strength values for each strain to all four contact lenses sampled ($P > 0.05$) Table 1. Hence, by implication, Staph.aureus strains adhered most to lotrafilcon B contact lens and least to omafilcon A (Table 1). Whereas the attachment of the strains to lotrafilcon B was strong, that to omafilcon A was weak. Attachment strengths to polymacon and methafilcon however, were either weak or strong. As in the case of Staphylococcus aureus, Pseudomonas aeruginosa strains recorded decreasing attachment strengths from lotrafilcon B (37.5 ± 8.2), polymacon (28.6 ± 6.3), methafilcon A (26.8 ± 5.5) and omafilcon A (23.2 ± 5.5). There was also no statistical significant difference in the individual strain attachment strengths to the four sampled lenses ($P > 0.05$) Table 2. The attachment strengths of Pseudomonas aeruginosa strains however to the sampled lenses were obviously much lower compared to those of Staph. aureus strains to the same lenses. [7]

P. aeruginosa and S. epidermidis 9142 exhibited greater adhesion capabilities to the extended wear silicone-hydrogel lenses than to the daily wear silicone- and conventional hydrogel lenses ($p < 0.05$). No statistical differences were found between the adhesion extent of these strains to galyfilcon A and etafilcon A. The biofilm negative strain of S. epidermidis adhered in larger extents to the silicone-hydrogel lenses than to the conventional hydrogel ($p < 0.05$), but in much lower amounts than the biofilm-positive strain. The water contact angle measurements revealed that the extended wear silicone-hydrogel lenses are hydrophobic, whereas the daily wear silicone- and conventional hydrogel lenses are hydrophilic. [8]

Our study showed that based on what we found from the patients in the three different hospitals: lenses are one of the most important reasons that can cause infection of the eye, and this is the result of what we have tested from the lenses of patients. We found several types of bacteria causing the infection and this is due to misuse of patients to lenses incorrectly. The results of people who follow the correct methods of wearing lenses and ways of keeping lenses, are less likely to get any infection.

5. CONCLUSION

Our study results showed that using of non-sterile hands and leaving the lenses susceptible to pollution without coverage, has a significant impact in the cause of infection of the eye. Therefore, care and awareness using sterile hands and follow the guidelines for lenses to avoid any infection.

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