Bacterial Contamination of Contact Lenses Among Some Female Students and Employee of College of Education-Ibn Al-Haitham, University of Baghdad

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Abstract

During the last few years, an increase in utilization of contact lenses (both cosmetic and correction of refractive errors lenses) was noticed among young females, with an increase in eye infections. The present invocation was carried out to demonstrate the percentage of bacterial contamination of both the preservation fluid and lens containers. Fifty-two contact lenses users among female students and em1ployees of college of Education-Ibn Al- Haitham were surveyed. Data were obtained on methods of usage and results of microbial examination. The following points were reached. 1- Gram-negative bacteria were the most common ones, especially *Pseudomonas aeroginosa* with 38.9% of the total isolates. 2- Results of sensitivity tests for antibiotics revealed that ofloxacin, ciprofloxacin, chloramphenicol, gentamycin and tobramycin were effective against isolated bacteria from containers and preservative fluids of content lenses. 3- Improper and non hygienic measures were employed especially in connection with keeping the preservative fluid and the containers tidy.

Introduction

Contact lens wear has been associated with an increased risk of corneal infection and / or inflammation (1, 2). In recent years, an increase in ocular pathologies related to soft contact lens has been

observed (3). According to Food & Drug Administration survey in 2006, about 80 million people worldwide now wear contact lenses. In the United States, about 33 million people wear contact lenses (4).

Contact lenses alter corneal anatomy and physiology (5). Hydrogel lenses have the capacity to create significant hypoxia, hypercapnia, and tissue acidosis in the cornea (6). Depending on the polymer, hydration, and design, contact lenses can increase, or kind of polymer used decrease epithelial and conjunctival edema. Surface epithelial changes include edema, microcyst formation, decreased sensation, changes in junctional adherence between cells, and pannus formation stromal and endothelial changes also have been documented with long -term contact lenses wear (7). Many studies found changes to the variety of normal conjunctival flora present during lenses wear (8) and other study reported a decrease in gram - positive normal bacterial flora and an increase in nonpathogenic gram-negative species (9). Many studies have shown that contact lenses provided a scaffold for microbial pathogens and increase their presence on the ocular surface by adhering to the polymer matrix and the epithelial surface (10). Pathogens such as *Acanthamoeba* , *Pseudomonas, Serratia, E . coli) Haemophilus influenza, Streptococcus, Staphylococcus* and others bacteria in particular are capable of adhering to contact lenses causing bacterial keratitis (11, 12,13,14,15,16)

The wetting and soaking solutions and contact lens cases of eye clinical patient commonly were contaminated with gram-negative bacteria during their use (13). Improved hygienic practice and the use of contaminated solutions have been reported to be involved in the etiology of bacterial keratitis among contact lens wearers (1 7).

The present study was aimed for the following objectives:

a- To study the rate of bacterial contamination of contact lenses, wetting and soaking solutions.

b- The susceptibility of bacterial isolates to antimicrobial agents. C- Determination of the most prevalent contaminant bacteria.

d- Estimation of the relationship between the bacterial genera contamination with eye inflammation.

e- Determination the most commercial contact lens use by student and staff, It was the first study in Iraq about this problem.

Materials and Methods

Subjects: Fifty two female users from College of Education, Ibn Al-Haitham College (student and staff) were included in this investigation. Three samples were taken from each user from different manufactures,left and right lenses, container, and 4-_ preservative solutions.

Culture Technique and Microbiological Identification

One drop each of the contact lens solutions was inoculated directly from the container onto blood agar, Neutrient agar, Mannitol agar, MacConkey agar and the inoculums were streaked over the surface of the agar. Conventional laboratory procedures for isolation and identification of enteric microorganisms were used according to the Baily and Scott's manual 2002 (18) and API 20 E system.

Antimicrobial Agent susceptibility testing

All isolates were subjected for their response to antimicrobial agents according to the WHO Manual in 1991 (19).

Antimicrobial discs (Bioanalyse) used were ciprotloxacin (5μg)chloramphanicol (30 μg) , ampicillin (10 μg) , trimethoprim (5 μg). tetracycline (30 μg) , tobramycin (10 μg), ofloxacin (5 μg) , gentamycin (10 μg), cephalothin (30 μg), cefotaxime (30 μg) and cephaloxin(30 μg).

Case histories: fifty two female users with contact lens wearers were asked to report their:

Name , sex , age , martial status , occupation , type of lens wear (therapeutic or cosmetic), price of lens, manufacturers, use (before or

after make up), eye inflammation, eye redness, doctor's visit, any treatment. '

Results and Discussion

The wearing of contact lenses is not without some risk of corneal infection and inflammation (20). Trauma may arise through lens insertion or removal, deposits or debris entrapment, hypoxia, or toxic reactions to preservatives solution (21), This report describes a study of expanded contact lens wear in small population.

Case histories:

The two storage cases belonging to subjects who wear therapeutic contact lenses were sterile, but all other users for therapeutic and cosmetic soft lenses were contaminated. All 52 users were female. 88.5% of female used cosmetic color lenses, where. other researchers reported that 63% of 72% lens wearers were female (9).Not much work we were able to find that refer to age of wearers, time worn in hour, and age of lens, In the previous study reported the mean age of current wearer was 27.0±9.9 years and the time worn was 7.8 ±2.6 hours . This was approximately close to with our study. 84.6% of users buy such lenses and lens accessories from commercial shops these mean lenses and solutions were without proper preservation.

M any type of cheap price of color contact lenses contribute to the use by young students Table (1).were available .

Most users complained of red eye during contact lens use. Previous report explained these symptoms may be either of long- standing or sudden onsets (22). 38.45% of users complain of red eye mostly showed the presence of *Pseudomonas aeroginosa* and 40.3% of users complain with red eye, headache and secretion have *Serratia spp., Proteus,spp.,.E.coli* , *Citrubacter freundii* and *Staphylococcus aureus* Table (2).Bacterial infection associated with contact lens wear can be established within the corneal epithelium without initially producing an ulcer. A wide range of both gram- positive and gram- negative

organisms can be involved (23). Other survey established the incidence of protozoa, bacteria, and fungi, contact lens case contamination in 101 asymptolnatic daily wear cosmetic contact lens, wearers from a domiciliary contact lens practice (24). Most of users lack adequate information concerning instructions of use and warning notes about hand wash, make- up use, container dryness, washing lenses and washing container in each use. The frequency of complications in contact lens wearers was generally the result of poor hygiene in 66% of the cases (12). Only 8 cases of lenses wearer visited the ophthalmologist for inflammation and numbers of cases were advised by a pharmacist.

Storage case and preservative solutions contaminants:

Bacterial keratitis, mostly due to Gram- negative bacteria, is associated with poor lens hygiene, overnight wear, and contaminated lens care solutions (25). The present study revealed a wide variety of microorganisms found in contact lens storage cases and preservative solution Table (2). Of the 52 contact lens wearers studied (including left and right case and preservative solution) 83.97% were contaminated (Table (3). Gram negative bacteria being isolated from all cases except in one case with *Staphylococcus aureus*. *Pseudomonas aerogenosa* was found to be the most prevalent organism isolated, which represented (38.9%) of isolates. Where's *Citrohacter freundii* represented (16%), *Proteus mirabilis* (10.7%), *E. coli* (9.2%), *Serratia marcescens* (9.2%), *Proteus vulgaris* (4.6%), *Acinetobacter* (3.8%), *Enterobacter clerogenes* (93.8%) and *Pseudomonas putida* (1.5%) Table (3) Fig. (1). Other studies Reported *P. aeroginosa* to be one of the most common lens care solution contaminant (26). Recent report indicated that *P. aeroginosa* elastase A and or/ protease IV contribute to the ocular virulence of this organism (27).

Antimicrobial agent susceptibility testing:

The appropriate antibiotics for bacterial conjunctivitis and bacterial keratitis are ciprofloxacin, gentamicin, tobramycin, trimethoprim, cefamandol and ofloxacin are recommended (28). Otloxacin was the most effective (87.35%) against most Gram-negative isolates followed by ciprofloxacin (84.6%), chloramphenicol (81.2%) gentamycin (72%), tobramycin (63%). Other antimicrobial agents were less effective than 50% Table (4) Fig. (2). Gral11-positive isolate, *S. aureus* was sensitive for ciprofloxacin, gentamycin and ofloxacin. Another local study showed that ciprofloxacin and norfloxacin were highly effective agent for almost all bacterial isolates in suppurative keratitis (29).

Preservative solutions:

Five different types of commercially available contact lens solutions were tested.

These solutions Table (5) are recommended for use with rigid gas-permeable and soft contact lenses. Only Xpressions within the top 10 most popular contact lens solutions. When lense solutions from 52 users were coffered gram negative bacteria were common Table (2). 60.8% of the multipurpose solutions were contaminated. Previous study showed the presence of *Serratia* and *Pseudomonas spp.* .In ocular products after only a few uses, and persisted in these solutions for prolonged periods (13). Other study suggested, microorganisms in the lens storage cases must either be survivors of ineffective disinfection or were introduced during removal of the lens from the case several hours prior to culturing (9). All solution contains disinfectant such as polyhexanide, borate solution, polyhexamethylene biguanides and benzalkonium chloride. In addition most solutions contained additives such as poloxamer as a cleaning agent, hyromellose as a moisture and sodium phosphate, and sodium chloride as a pH balanced solution. Table (6) showed the commercially contact lenses available for users. Due to available different sources of soft lenses in local shops this

refers to the different polymer uses in 'these lenses. Freshlook and X pressions manufacture are among the 15 most popular contact lenses. Other lenses type distinguishes without complete lenses information in the instruction. Other research suggested the polymer matrix of these lenses is apparently suited for adherence of *Pseudomonas* organisms (21).

In conclusion,P. aeruginosa was found to be the most predominant isolates among other Grain-negative bacteria. High level of effect is noted with the use of ofloxacine, ciprofloxacin, chloramphenicol and gentamycin.Most bacterial isolates refer to hand-fecal contamination , associated with poor lens hygiene and contaminated lens care solutions. In general such users fail to absorb the instructions for contact lenses uses.

Users need to be educated about the need for proper eye care, contact lens care

regimens, and appropriate follow-up visits (such notes mainly reported in most contact lenses research).

Most researchers advise the following :

1-Regular scrubbing of contact lens case in order to disrupt biofilms.

2- Frequent air dry of contact lenses case between uses.

3-If hydrogen peroxide disinfection is preferred use a two step system.

4- Replace contact lens case regularly.

5-Always washing hand thoroughly with a mild soap prior to handling lenses.

6- Always handle the same lens first to avoid accidentally switching lenses.

7- Clean,. rinse and disinfect lenses as recommended after every use.

8- Use fresh storage solution each time to store lenses. Never reuse the same solution.

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Table (1) Subject Details

Contact lens wearers (52)	Sex ♀%	Age (yr)*		Time worn(week)**	Occupation			Status		Type of lens	
					S. %		St.%	M%	Si.%	C.%	T.%
	100	24.1±5.7		3.0±1.5	25		75	9.6	90.4	88.5	11.5
	Eye affected	Shopping		Age of lens (month)*	Instructions of use with makeup %			More than one person use the same lenses		Change solution container (month)	
		Co%	P%		b.	a.	w.				
	LR	84.6	15.4	9.4±7.5	63.5	30.8	5.7	20 cases		6.1±5.5	
	Clinical symptoms										
	20 case – red eye 21 case – red eye, headache, secretion 4 case - red eye , lachrymal 7 case – asymptomatic										

* Not more than 6 hours/day
LR Left & Right eye ; m. mean ± standard deviation ; St. student ; S. Staff ; P. private ;
Co. commercial ; b. before ; a. after ; w. without; T. Therapeutic; C. Cosmetic; Si. Single, M. Married

Table (2) Type and Number of isolates

Bacterial isolates	***Pseudomonas aeroginosa***	***Pseudomonas putida***	***Proteus mirabilis***	***Proteus vulgaris***	*E. coli*	***Acinetobacer***
Subjects number	19	1	5	2	5	2
Bacterial isolates	*Citrobacter freundii*	*Enterobacter aerogenes*	*Serratia marcescens*	*Staphylococcus aureus*	Negative growth	
Subjects number	8	2	5	1	2	
Total	52					

Table (3) Bacterial isolates from all cases (number and percentages)

Bacterial isolates	**No. of isolates**	**Percentage %**
Pseudomonas aeroginosa	51	38.9
Pseudomonas putida	2	1.5
Proteus mirabilis	14	10.7
Proteus vulgaris	6	4.6
Serratia marcescens	12	9.2
Escherichia coli	12	9.2
Enterobacter aerogenes	5	3.8
Citrobacter freundii	21	16
Acinetobacter	5	3.8
Staphylococcus aureus	3	2.3
*Total no. isolates	131	83.97
No. of sample without growth	25	16.03

*the no. of isolation refers to left & right container and preservative solution

Table (4) Antibiotic susceptibility patterns of Gram-negative bacterial isolates**

Antimicrobial agents	Pseudomonas spp.(53)*	Proteus spp.(20)	Serratia marcescens(12)	E. coli (12)	Enterobacter (5)	Citrobacter freundii(21)	Acinetobacter (5)
Ampicillin	11.3(6)	15(3)	0 (0)	0	40(2)	52.4(11)	0(0)
Cephalexin	24.5(13)	25(5)	25(3)	33.3(4)	100(5)	52.4(11)	40(2)
Cephalothin	11.3(6)	25(5)	0 (0)	66.7(8)	0(0)	52.4(11)	0(0)
Cefotaxime	11.3(6)	15(3)	0 (0)	0(0)	40(2)	14.3(3)	0(0)
Chloramphenicol	67.9(36)	80(16)	100(12)	100(12)	60(3)	61.9(13)	100(5)
Ciprofloxacin	94.3(50)	90(18)	75(9)	33.3(4)	100(5)	100(21)	100(5)
Gentamycin	60.4(32)	85(17)	100(12)	100(12)	60(3)	100(21)	0(0)
Ofloxacin	100(53)	60(12)	75(9)	100(12)	100(5)	76.2(16)	100(5)
Tetracycline	11.3(6)	15(3)	0(0)	0(0)	60(3)	0(0)	40(2)
Tobramycin	81.1(43)	75(15)	35(3)	75(9)	60(3)	85.7(18)	40(2)
Trimethoprim	11.3(6)	35(7)	50(6)	0(0)	40(2)	23.8(5)	0(0)

*Total number of bacterial isolates

**Percentage of sensitivity isolates from total genus number

Table (5) Preservative contents and type of contact lens solutions available

Solution	Manufacturer	Solution recommendation (s)	Constituent(s)	Lens types
AQUA Soft	Stericon Pharm \UK	M.P.	Polyhexanide ,poloxamer, hypromellose, sodium phosphate buffer	CSCL
Hypa Oppia	Bescon\ Korea	M.P.	*	RGP
Wett	China	M.P.	Sodium chloride, benzyl konium chloride, Edetate sodium, Boric acid, sodium borate	CSCL, RGP
Best buys	China	M.P.	Sodium chloride, benzyl konium chloride, Edetate sodium, Boric acid, sodium borate	CSCL, RGP
Xpressions	CE	M.P	20%polyhexamethylene biguanide, poloxamer 407, Edetate disoidium	CSCL, RGP

CSCL Color Soft Contact Lense
RGP Rigid Gas Permeable
M.P Multipurpose solution (wetting, soaking, disinfecting, rinsing, storing)
* Without constituents in leaflet label

Table (6) Contact lenses that were available for users

Lens	Lens type	Manufacturer	Material	Water content	Diameter mm	Center thickness mm
Xpressions	CSCL	CE	58% Polymer 2-Hema	42%	8.6	
Xpressions	M.L	CE	45%Polymacon	55%	8.6	0.04
Freshlook	CSCL M.L	Ciba Vision\ Wesley Jessen	45%Polymer 2-Hema	38%	8.6	
*Xones	CSCL	China				
*Aryam	CSCL	China				
*Rain bow blends	CSCL	Korea	62% polymaconimmersed			

CSCL Color Soft Contact Lenses
M.L Medical Lens
* Without any information in the instruction

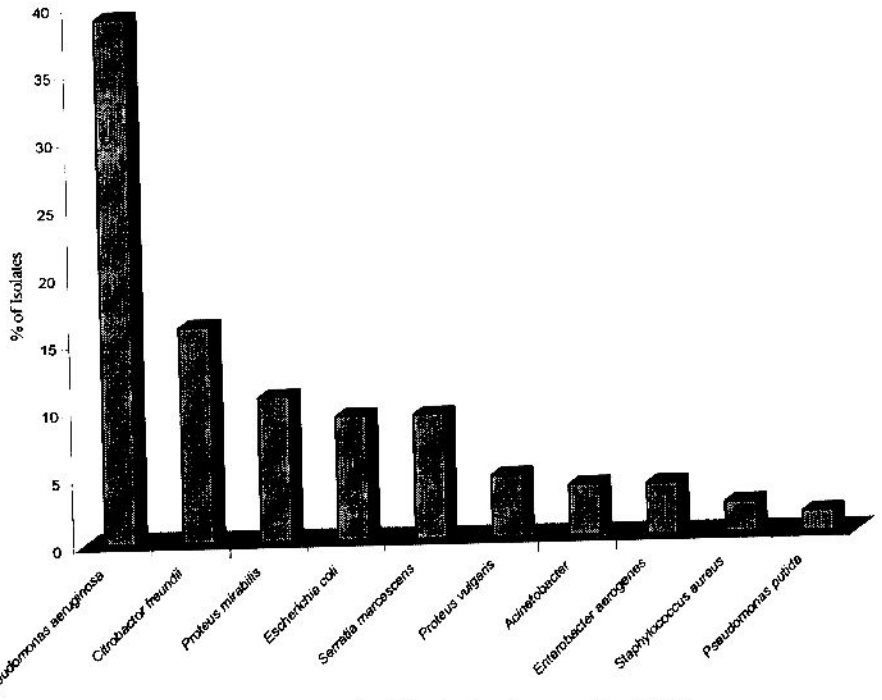

Fig. (1) Percentage of Bacterial isolates from all cases

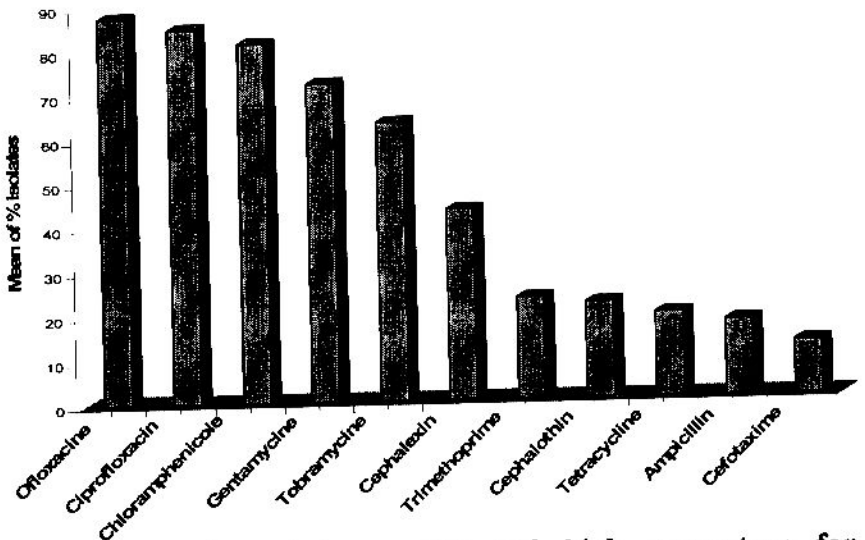

Fig. (2) Comparison between low and high percentage for antimicrobial agent sensitivity of Gram negative bacterial genera isolated.

التلوث البكتيري للعدسات التجميلية اللاصقة لدى طالبات ومنتسبات

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الخلاصة

لوحظ في السنوات الأخيرة ازدياد استعمال العدسات اللاصقة الطبية والتجميلية من الشابات مما أدى إلى حدوث إصابات في العين ، لذا توجهت الدراسة الحالية لتحديد نسبة التلوث البكتيري لمحتوى سوائل الحفظ وحاويات العدسات. أخذت 52 عينة من مستخدمي العدسات اللاصقة من طالبات ومنتسبات كلية التربية- ابن الهيثم. وبعد الحصول على المعلومات الخاصة بطريقة الاستعمال من كل مستخدم، واستنادا إلى النتائج الخاصة بالفحص الميكروبي تبين ما يأتي:- (1) البكتريا السالبة لصبغة كرام هي الأكثر شيوعا ولاسيما بكتريا *Pseudomonas aeroginosa* وبنسبة38.9% من مجموع العزلات. (2) أثبتت نتائج اختبار الحساسية للمضادات الحيوية، إن ofloxacin ، ciprofloxacin ، chloramphenicol ، gentamycin ، tobramycin هي الأكفأ في التأثير ضد البكتريا المعزولة من حاويات وسوائل حفظ العدسات اللاصقة المستعملة. (3) عدم إتباع الطرائق الصحية والصحيحة في استعمال العدسات اللاصقة ومنها المحافظة على نظافة الحاوية وسائل العدسة.