

Contact lens – related microbial keratitis in Egypt: 5y epidemiological study

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与隐形眼镜相关的感染性角膜炎-埃及5年流行病学研究

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摘要

目的:研究埃及 Tanta 大学医院与隐形眼镜相关的感染性角膜炎患者的不同流行病学特点,评估这类疾病各方面的特点,以提高患者对这类疾病的认识,找出可行的解决方案。

方法:选取我院 2009-01/2013-12 期间在眼科门诊就诊的所有角膜炎患者仔细检查,并对所有与隐形眼镜相关的感染性角膜炎患者进一步检查和调查。

结果:本研究期间,总共 108496 位有不同主诉的患者中,1463 例(1.3%)患有不同形式的角膜炎,其中 151 例(0.1%)为隐形眼镜相关感染性角膜炎。结果发现患有隐形眼镜相关感染性角膜炎常见的年龄群<30 岁,大多数是学生(64%),家庭人数多且较为拥挤,农村居民高于城市居民,患者采用户外水源及污水处理不卫生。从病史分析发现:隐形眼镜相关感染性角膜炎通常为彻夜使用,储存或者配戴不卫生,或者隐形眼镜来源不安全,例如化妆品商店和理发店。结膜囊微生物培养结果提示阳性率 92%,阴性率 8%。大多数培养阳性的病例是由细菌和真菌混合感染引起,共 53 例(38.1%),单纯细菌感染 43 例(30.9%),真菌 31 例(22.3%),阿米巴 12 例(8.6%)。

结论:与隐形眼镜相关的感染性角膜炎常见于学生群体,与农村生活、户外供水、不卫生的污水处理等危险因素有关。彻夜配戴、储存或配戴不卫生及隐形眼镜来源不安全都可增加隐形眼镜相关感染性角膜炎的发病率。

关键词:隐形眼镜;角膜溃疡;感染性角膜炎

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Abstract

• **AIM:** To study the different epidemiological features of

patients with contact lens – related microbial keratitis (CLRMK) in Tanta University Hospital in Egypt in order to assess different aspects of that problem, improve patients' awareness and in a trial to find practical solutions.

• **METHODS:** All cases with keratitis attending the Outpatient Clinic of Ophthalmology Department at Tanta University Hospital during a period of 5y starting from the first of January 2009 to the end of December 2013 were selected and carefully examined and cases with CLRMK were further examined and investigated.

• **RESULTS:** Out of total 108 496 attendants during this period with different complaints, there were 1463 (1.3%) cases suffering from different forms of keratitis and 151 (0.1%) with CLRMK. Results revealed that CLRMK is common in age group <30y, more in students (49%), families with large number and large crowding index, rural than urban residence, patients with outdoor water sources and insanitary sewage disposal. From history taking, it was found that CLRMK was more common with overnight use, insanitary storage cases or solutions and unsafe sources like shops of cosmetics and hair dressers. Cultural results were positive in 92% and negative in 8% of cases. The positive culture results were mixed infection (bacterial and fungal) in most of cases (53, 35.1%), bacterial only (43, 28.5%), fungal only (31, 20.5%) and acathamebic in 12 (8%) of cases.

• **CONCLUSION:** CLRMK is more frequent in students, rural areas, in outdoor water supply, insanitary sewage disposal. Overnight use, insanitary storage cases or solutions and unsafe sources were associated with increased incidence of CLRMK.

• **KEYWORDS:** contact lens; corneal ulcer; microbial keratitis

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INTRODUCTION

Contact lens – related microbial keratitis (CLRMK) is a vision – threatening condition present in most of the developing and developed countries due to many factors like poor socioeconomic standard, bad hygiene, unavailability of specific antimicrobial agents and ignorance. Other problems like difficulties in its clinical and laboratory diagnosis and treatment are also incriminated^[1, 2]

CLRMK is an important cause of corneal morbidity, scarring and blindness caused by microbial invasion through corneal epithelium and destruction of the corneal tissue. The corneal pathogens can be divided into fungi, bacteria, viral and protozoa (acanthameba)^[2-4].

Healthy cornea can be rarely infected and invaded by microorganisms and commonly predisposed by trauma that produces corneal abrasion and discontinuity of corneal epithelium^[4,5].

The process of CLRMK probably arises as a result of the interaction between the invasive ability and toxicity of the offending organism on one side and host factors like local or systemic causes and immunity on the other side. The invasive ability of the offending organism is aided by certain properties such as its capacity to adhere to the cells and to produce enzymes and toxins that destroy the host cells and impede the host immunity^[6,7].

Identification of the pathogenic organism is performed corneal scrapes or biopsy then microscopic staining and examination and by their cultural results. Other methods for organism identification depending on the types of enzymes produced, immune-diffusion, electrophoresis and ELISA tests. Confocal microscopy also plays a role in diagnosis of CLRMK and detection of the involved pathogens^[6-11].

SUBJECTS AND METHODS

The study was conducted from the first of January 2009 to the end of December 2013 at the Outpatient Clinic of Ophthalmology Department in Tanta University Hospital. Ethical committee approval was obtained and privacy of the patients was confidentially kept.

A total number of 108496 patients with different ophthalmological complaints were examined during that period. All patients with keratitis were selected and carefully examined with focusing on some clinical sings like: 1) thick area of keratitis (area with dense infiltration and elevated above the surface of the cornea commonly found in cases of fungal keratitis); 2) hypopyon "coagulum or fluid" with or without level; 3) immune rings; 4) satellite lesions; 5) stromal infiltrate with feathery edge; 6) healing usually with dense leucoma with or without large solitary blood vessel; 7) areas of epithelial defect and stromal infiltration.

Patients with keratitis represented 1463 cases during the period of the study. CLRMK was found in 151 cases. These cases were included in the study and fully examined and investigated.

A questionnaire form was designed and filled for each case included in the study including socio-demographic data about the age, sex, occupation, family size, crowding index (family members/number of rooms), residence, source of water supply whether indoor or outdoor and sewage disposal systems whether pipes system or conservancy system.

During history taking, some risk factors such as overnight use, insanitary storage cases or solutions, unsafe sources like shops of cosmetics or hair dressers, recent drug intake (prolonged antibiotics and local or systemic corticosteroids),

Table 1 Age and sex distribution among CLRMK n(%)

Ages (a)	CLRMK		
	Male	Female	Total
<30	18 (11.9)	92 (60.9)	110 (72.8)
30-50	0 (0)	38 (25.2)	38 (25.2)
>50	0 (0)	3 (2)	3 (2)
Total	18 (11.9)	133 (88.1)	151 (100)

Table 2 Occupations among CLRMK n(%)

Occupation	CLRMK
Professional & semi-professional	7 (4.6)
Skilled workers	10 (6.6)
Unskilled workers	18 (11.9)
House wives	42 (27.8)
Students	74 (49)
Total	151 (100)

corneal trauma whether organic or non organic, systemic diseases (diabetes mellitus, tuberculosis and cancer), ocular surgery, local eye diseases such as glaucoma and the time of onset of complaints till examination were asked and identified. All cases of CLRMK were examined by the slit-lamp using direct, oblique, scleral scatter, and retro-illumination techniques. Corneal staining with fluorescein was done. Ocular ultrasonography was done routinely for every case of CLRMK to assess the posterior segment and detect its involvement that will alter the approach of treatment. Culture and sensitivity test was done in every case using storage cases solutions or the contact lens itself besides corneal swabs or biopsy to identify the pathogenic microorganism and then treated accordingly. Before the culture results were obtained empirical treatment was started depending on the clinical sings detected in every case.

RESULTS

The total number of 108496 patients attended the Outpatient Clinic of Ophthalmology Department in Tanta University during the period in which the study was conducted. We received 1463 cases with different forms of keratitis and 151 cases of CLRMK; all of them related to soft contact lenses (none of them related to rigid gas permeable contact lenses).

Age and Sex The mean age for cases of CLRMK was 31 ± 2.28y. Table 1 shows that females were more affected. They were 133 cases accounting for 88.1% while males represented 18 cases accounting for 11.9%. 72.8% of cases of CLRMK were <30y while 25.2% of cases were at the age group of 30-50y, and 2% only were >50y.

Socio-demographic Indicators

Occupation As shown in Table 2, students represented the majority of cases (74 cases) and accounted for 49%. Housewives came second with 42 cases representing 27.8%. Professionals and semi-professionals were the least affected where only 7 cases (4.6%) were found.

Family size More than half of cases of CLRMK were of large family size (>6 persons) where they represented 87 cases

Table 3 Family size and crowding index among CLRMK

Parameters	CLRMK	n(%)
Family size		
<4	8 (5.3)	
4-6	56 (37.1)	
>6	87 (57.6)	
Crowding index		
<2	53 (35.1)	
>2	98 (64.9)	

(57.6%). While the percentage of cases with small family size (< 4 persons) was 5.3% (8 cases).

Crowding index Totally 64.9% of cases with CLRMK lived in overcrowded houses with crowding index >2 (Table 3).

Residence, water supply and sewage disposal systems

Rural residents represented more than half of cases. They constituted 89 cases and accounted for 58.9% of cases. Outdoor water supply represented more than two thirds (68.9%) of the houses of CLRMK cases. In cases of CLRMK, only 22.5% of patients had pipes system of sewage disposal in their houses (Table 4).

Time Between the Onset of Complaints and Examination

It was found that among CLRMK cases, 61.6% of cases (93 cases) came within the first week from the onset of complaints while 58 cases (38.4%) came for ocular examination after the first week.

Laboratory results

The positive culture results were obtained in 92% of cases. This high chance of positive results was attributed to the good laboratory work done by highly qualified persons, well - equipped labs and the multiple specimens can be obtained from cases (contact lens itself, lens solution, lens cases and corneal specimens). These positive results were mixed infection (bacterial and fungal) in most of cases (53 cases accounting for 35.1%), bacteria only (43 cases accounting for 28.5%), fungi only (31 cases accounting for 20.5%) and acathameba in 12 cases accounting for 8% of cases. The positive bacterial cultures showed many types of Gram positive bacteria like staph aureus, staph epidermides, pneumococci constituting 63% of positive bacterial cultures (27 of 43 cases) and Gram negative bacteria like pseudomonas aerugenosa. The positive fungal cultures revealed many isolates. Aspergillus species constituted the majority of cases with positive cultures and the least frequent species was Candida albicans. Negative cultures occurred in 8% of cases (Table 5).

RiskFactors

Table 6 showed that overnight use was the most frequent risk factor for CLRMK (91.4%). Unsafe sources like shops of cosmetics and hair dressers came second most common risk factor (78.1%). Insanitary storage cases and solutions as a risk factor were encountered in (48.3%). Other risk factors included corneal trauma (43%), systemic diseases (14.6%) and recent drug intake (11.3%) were identified during history taking.

Table 4 Residence, water supply and sewage disposal systems among CLRMK

Parameters	CLRMK	n(%)
Residence		
Rural	89 (58.9)	
Urban	62 (41.1)	
Water source		
Indoor	47 (31.1)	
Outdoor	104 (68.9)	
Sewage disposal		
Pipes	34 (22.5)	
Conservancy system	117 (77.5)	

Table 5 Culture results in CLRMK

Culture result	CLRMK	n(%)
Mixed (bacteria & fungi)	53 (35.1)	
Bacteria	43 (28.5)	
Fungi	31 (20.5)	
Acanthameba	12 (8)	
Negative	12 (8)	
Total	151 (100)	

Table 6 Risk factors among CLRMK

Risk factors	CLRMK	n(%)
Overnight use	138 (91.4)	
Unsafe sources	118 (78.1)	
Insanitary storage case & solutions	73 (48.3)	
Corneal trauma	65 (43)	
Systemic diseases	22(14.6)	
Recent drug intake	17(11.3)	

Complications of CLRMK

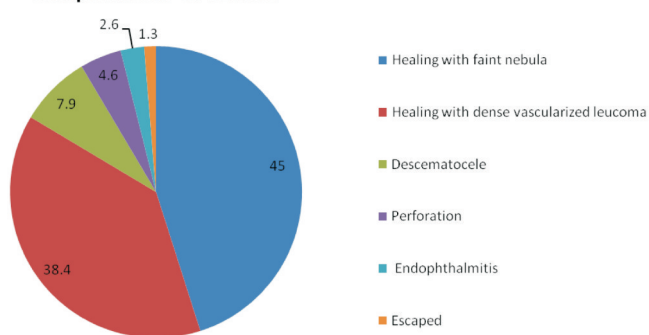


Figure 1 Fate and complications of CLRMK.

Fate and Complications

Among the CLRMK cases, 68 cases (45%) showed healing with faint nebulae, 58 cases (38.4%) showed healing with dense vascularized leucoma, 12 cases with descematocele (7.9%), 7 cases (4.6%) with perforation, 4 cases (2.6%) ended by endophthalmitis and 2 cases lost in follow-up without completing treatment (1.3%) (Figure 1).

DISCUSSION

CLRMK is considered a major problem in the developing countries all over the world and is responsible for significant

visual loss among contact lens users. This problem is more pronounced in these countries due to the presence of its favoring risk factors ignorance, bad hygiene and insanitary environment. CLRMK represents a major entity of corneal infections which is responsible for over 10 millions of blind people all over the world as reported by the world health organization^[12,13].

Age and Sex In the present study, more than three quarters of cases were females. They were 133 cases accounting for 88.1% where males represented 18 cases accounting for 11.9%. These results were consistent with those reported by Verhelst *et al*^[14] in Belgium 2005 where they reported that females were more affected than males (1.5:1).

We reported that 72.8% of cases of CLRMK were <30y while 25.2% of cases were at the age group of 30–50y and 2% only were >50y. Similar results were reported by other studies^[14–16].

Females are more affected because they use soft contact lenses more than males either for cosmetic or refractive purposes and so exposed to different risk factors that favor the development of CLRMK.

Socio-demographic Indicators In this study, students and housewives represented the majority of cases (116 cases) and accounted for 76.8%. Professionals and semi-professionals were the least affected where only 7 cases (4.6%) were reported.

Students and housewives represented the majority of cases because they represent the main number among contact lens users and they are exposed to different risk factors. This is similar to what was reported by Bharathi *et al*^[17] where they reported that students constituted 82.86% of cases.

This study reported that cases of CLRMK belonged to large families (4–6 persons in 37.1% and more than 6 persons in 57.6%), with a high crowding index (64.9% of cases with crowding index >2) and more than one half (in 58.9%) of them were rural. These were explained by the unsound health behavior and lack of health awareness especially in those living in over-crowded houses with bad sanitation. These factors facilitated infections especially with morbid corneas. These findings were in agreement with other studies which reported that fungal and microbial keratitis associated with low socio-economic status and rural residence^[18–20].

As regards water sources, the outdoor water supply accounted for 68.9% of houses of our CLRMK cases. Concerning sewage disposal, more than three quarters of houses of CLRMK (77.5%) were by conservancy system.

In conclusion, it was revealed that cases of CLRMK lived in a deteriorated insanitary environment. Outdoor water and insanitary sewage disposal systems could affect personal hygiene and self care with poor sanitation of houses together with spread of flies and insects that transmit organisms easily to healthy or unhealthy corneas. Similar results were reported in many studies^[17–19].

Laboratory Findings It was found that 92% of our patients were culture positive, while 8% were culture negative in spite

of their typical clinical findings and their improvement with anti-microbial therapy. These may be explained by some organisms present in deep stroma and so could not be obtained if superficial scraping was done or if scraping was obtained only from one area. These findings were in consistence with Rautaraya *et al*^[21] who reported that 25.4% of their patients showed negative fungal growth in spite of their typical clinical findings for microbial keratitis.

The positive cultural results in our study revealed that mixed infection (bacterial and fungal) constituted most of cases (53 cases accounting for 35.1%). Bacterial isolates alone were found in 43 cases accounting for 28.5%. Fungi were isolated alone in 31 cases accounting for 20.5% and acanthameba was found in 12 cases accounting for 8% of cases.

For the type of fungus isolated, it was found that *Aspergillus* species were the most common while *Candida* species was the least. These results were in agreement with Rautaraya *et al*^[21] in India who demonstrated that *Aspergillus* species constituted the majority (27.9%) of fungal growth in their study. Other study in Mumbai, India demonstrated that *Aspergillus* species occurred in 17.6%^[22]. Gopinathan *et al*^[18] reported in his study that *Aspergillus* species were isolated in 28.9% of cases. These findings may be explained by the wide spread of *Aspergillus* species in the environment specially spores which can survive hot and dry weather for long time.

A study was done from September 1999 to September 2002 by Bharathi *et al*^[17] and others in India demonstrated 3295 cases of suspected infectious keratitis; from which 35 cases (1.06%) were contact lens related. Cultural results were positive in all cases of their study and bacterial isolates were only found. *Pseudomonas aeruginosa* was the most common pathogen.

Verhelst *et al*^[14] conducted a study from 1997 to 2003, 107 cases with contact lens related infective corneal ulceration were examined in the eight Belgian university hospitals. Females to males ratio was 1.5:1. Microbiological cultures were done in 101 of the cases. Culture results were positive in 90 cases, including 2 cases of fungal keratitis and 16 acanthamoebic infections. Eleven of the cultures (10.9%) showed no growth. Bacterial growth was the most common isolates forming 77.2% of cases mainly *Pseudomonas aeruginosa*.

We reported that the most prevalent risk factors were overnight use (91.4%), unsafe sources (78.1%), insanitary storage case and solutions (48.3%). The least frequent risk factors were systemic disease (14.6%) and recent drug intake (11.3%). In consistence with our findings, similar results were obtained in other studies^[23–25].

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