

# **Microbiological studies on ophthalmic bacterial infection among some Egyptian patients**

*A Thesis*

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(Microbiology and Immunology)

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# دراسات ميكروبيولوجية على العدوى البكتيرية فى العين بين بعض المرضى المصريين

رسالة مقدمه للحصول على درجة الماجستير فى العلوم الصيدلانية  
(الميكروبيولوجى و المناعة)

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## ***Dedication***

*This work is dedicated to*

***My Mother***

*I cannot say, and I will not say that she is dead,  
she is just away. All that I am or hope to be I  
owe to her, for her support and encouragements.*

***My father***

*For his everlasting sacrifices, support and  
advices.*

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## Contents

1. Introduction and the aim of work.....	1
2. Literature review.....	3
2.1. The Basics of eye anatomy.....	3
2.2. Signs and Symptoms of eye infection.....	6
2.3. Eye complication due to eye infection.....	6
2.3.1. Blepharitis.....	7
2.3.2. Conjunctivitis.....	8
2.3.3. Keratitis.....	10
2.3.4. Endophthalmitis.....	11
2.3.5. Dacryocystitis.....	11
2.3.6. Dacryoadenitis.....	12
2.3.7. Hordeolum.....	12
2.4. The main cause eye infection.....	13
2.4.1. <i>Staphylococcus aureus</i> .....	13
2.4.2. <i>Staphylococcus epidermidis</i> .....	14
2.4.3. <i>Streptococcus pneumoniae</i> .....	16
2.4.4. <i>Escherchia coli</i> .....	16
2.4.5. <i>Pseudomonas aeruginosa</i> .....	19
2.4.6. <i>Proteus mirabilis</i> .....	21
2.4.7. <i>Klebsiella pneumoniae</i> .....	21
2.4.8. <i>Neisseria gonorrhoeae</i> .....	22
2.4.9. <i>Chylamydia trachomatis</i> .....	24
2.5. Diagnosis of eye infection.....	25
2.6. Treatment of eye infection.....	27
2.6.1. Chloramphenicol.....	27
2.6.2. Gentamycin.....	28
2.6.3. Tobramycin.....	29
2.6.4. Ofloxacin.....	30
2.6.5. Fusidic acid.....	31
2.6.6. Other antibiotic used in treatment of eye infection.....	32

2.7. Host factor that permit increase eye bacterial infection....	34
2.8. Epidemiology of eye infection.....	36
2.9. Prevention of eye infection.....	38
3. Patients ; Materials and Methods.....	40
3.1. Patients.....	40
3.2. Materials .....	40
3.2.1. Media.....	40
3.2.1. Tests and reagent used in this study.....	43
3.2.2. Antimicrobial disks.....	45
3.3. Methods.....	46
3.3.1. Specimens.....	46
3.3.2. Isolation of causative bacteria.....	46
3.3.3. Identification of isolated pathogenic bacteria.....	47
3.3.3.1. Microscopical identification.....	47
3.3.3.2. Biochemical identification.....	48
3.3.4. Preservation of isolated bacteria.....	57
3.3.5. Antimicrobial susceptibility tests for isolated bacteria.....	58
3.3.6. Antimicrobial susceptibility test using pharmaceutical preparation products.....	64
3.3.7. Statistical methods .....	64
4. Results.....	66
5. Discussion.....	100
6. Conclusion.....	111
7. Summary.....	112
8. References.....	114
9. Arabic summary	

## List of abbreviations

Abbreviation	Full term
C	Chloramphenicol
CO <sub>2</sub>	Carbon dioxide
<i>Ch. Trachomatis</i>	<i>Chlamydia trachomatis</i>
<i>E. coli</i>	<i>Escherichia coli</i>
E.E.	Endogenous Endophthalmitis
EMB	Eosin methylene blue
FDA	Food and drug administration
G	Gentimycin
HPV	Human papilloma virus
HSV	Herpes simplex virus
I	Intermediate
IMVIC	Indole methyl red voges- proskauer citrate test
<i>K. pneumonia</i>	<i>Klebsiella pneumoniae</i>
LPS	Lipopolysaccharide
MIC	Minimum inhibitor concentration
mRNA	Messenger ribosomal nucleic acid
MSA	Mannitol salt agar
<i>N. gonorrhoeae</i>	<i>Neisseria gonorrhoeae</i>
<i>P. mirabilis</i>	<i>Proteus mirabilis</i>
<i>Ps. aeruginosa</i>	<i>Pseudomonas aeruginosa</i>
PIA	Polysaccharide intercellular adhesion
R	Resistant
S	Susceptible
<i>S. aureus</i>	<i>Staphylococcus aureus</i>
<i>S. epidermidis</i>	<i>Staphylococcus epidermidis</i>
<i>St. pneumonia</i>	<i>Streptococcus pneumoniae</i>
SD	Standard deviation
STI	Sexually transmitted infection
TSI	Triple sugar iron
US	United State
UV	Ultraviolet
VZV	Varicella zoster virus
V/V	Volum/ volum

List of Tables		
Table No.	Description	Page
Table (1)	Characteristics for identifying Gram positive bacteria	56
Table (2)	Characteristics for identifying Gram negative bacteria	57
Table (3)	Zone diameter standards for <i>S. auerus</i>	61
Table (4)	Zone diameter standards for <i>Staphylococcus epidermidis</i>	62
Table (5)	Zone diameter standards for <i>Streptococcus pneumoniae</i>	62
Table (6)	Zone diameter standards for <i>Escherichia coli</i>	63
Table (7)	Zone diameter standards for <i>Pseudomonas aeruginosa</i>	63
Table (8)	Distribution of the patients group in the study according to age and gender	67
Table (9)	Types of eye infections	68
Table (10)	Distribution of the positive cases according to gender	68
Table (11)	Distribution of the positive cases according to age	69
Table (12)	Distribution of positive cases according to the types of eye infections	69
Table (13)	A positive cases in relation to contact lenses	70
Table (14)	A positive cases in relation to Diabetic patient	70
Table (15)	A positive cases in relation to smoking	71



Table (16)	Types of bacteria isolated in the study	71
Table (17)	Types of Gram positive bacteria isolated in the present study	72
Table (18)	Type of Gram negative bacteria isolated in present study	73
Table (19)	Types of bacteria isolated from patients suffering from blepharitis	79
Table (20)	Types of bacteria isolated from patients suffering from conjunctivitis.	80
Table (21)	Types of bacteria isolated in the present study for patient suffer from keratitis	81
Table (22)	Types of bacteria isolated from patients suffering from dacryocystitis	82
Table (23)	Types of bacteria isolated from patients suffering from hordeolum	82
Table (24)	Types of bacterial isolates from contact lense wearers	83
Table (25)	Types of bacterial isolates from diabetic patients	84
Table (26)	Types of bacteria isolated from smoking patients	85
Table (27)	Antibiotic susceptibility pattern of <i>St. pneumoniae</i> isolates	87
Table (28)	Antibiotic susceptibility pattern of <i>S. aureus</i> isolates	88
Table (29)	Antibiotic susceptibility pattern of <i>S. epidermidis</i> isolates	89

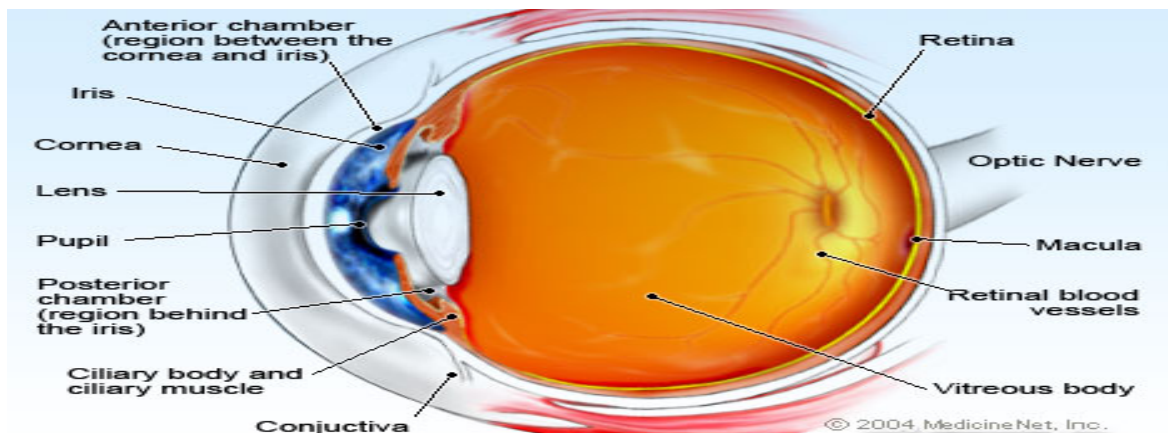
Table (30)	Antibiotic susceptibility pattern of <i>E. coli</i> isolates	90
Table (31)	Antibiotic susceptibility pattern of <i>Ps. aeruginosa</i> isolates	91
Table (32)	Number of sensitive strains to each antibiotic	92
Table (33)	Sensitivity test results to chloramphenicol in the market	94
Table (34)	Sensitivity test results to Fusidic acid in the market	95
Table (35)	Sensitivity test results to Gentamycin in the market	96
Table (36)	Sensitivity test results to Ofloxacin in the market	97
Table(37)	Sensitivity test results to Tobramycin in the market	98

List of Figures		
Figure No.	Description	Page
Figure (1)	Diagram show the anatomy of eye	3
Figure (2)	Types of bacteria isolated in the present study	73
Figure (3)	Biochemical identification of <i>Staphylococcus aureus</i>	74
Figure (4)	Biochemical identification of <i>Staphylococcus epidermidis</i>	75
Figure (5)	Biochemical identification of <i>Streptococcus pneumoniae</i> .	76
Figure (6)	Biochemical identification of <i>E. coli</i> .	77
Figure (7)	Biochemical identification of <i>Ps. aeruginose</i>	78
Figure (8)	Discs Diffusion Susceptibility test for the clinical isolate	86
Figure (9)	Sensitivity of antibiotics disks for each isolated bacteria	93

## 2. Literature Review

### 2.1. The Basics of Eye Anatomy

The eye is a complex optical system - very similar to a camera. Vision begins when light enters the eye through the cornea, a powerful focusing surface. From there, it travels through clear aqueous fluid, and passes through a small aperture called the pupil. As muscles in the iris relax or constrict, the pupil changes size to adjust the amount of light entering the eye. Light rays are focused through the lens, and proceed through a clear jelly-like substance in the center of the eye called vitreous, which gives it form and shape. When light rays finally land on the retina, the part of the eye similar to film in a camera, they form an upside-down image. The retina converts the image into an electrical impulse that travels along the optic nerve to the brain, where it is interpreted as an upright image as shown in figure (1) (Jennings, *et al.*, 2013).



**Figure 1: Diagram show the anatomy of eye (Jennings, *et al.*, 2013)**

**Cornea** is the anterior clear part of the eye. It is the first clear “window” through which the light enters the eye. The transparency of the cornea is important in order for vision to be clear. Though it has many functions, one of the most important is to bend (refract) light entering the eye toward the lens, which in turn additionally focuses the light to the retina. The cornea also has a protective function (**Bertucci, 2001**).

**Iris** is a thin circular disc that gives our eyes their “color” and acts like the diaphragm of a camera. It is perforated near its center by a circular aperture called the pupil. The pupil varies greatly in size under different levels of light (**Alexander, 1990**).

**Pupil** is the center opening or circular aperture of the iris that appears black when viewing one’s eyes. The pupil enlarges when a person is in dim light and constricts (gets smaller) in bright light. Pupil reflexes are checked by doctors to assess certain neurological conditions (**Scott, 2001**).

**Conjunctiva** is the thin transparent tissue overlying the sclera which continues over the posterior part of the upper and lower lids. Containing the most immunocytes of all the anterior eye structures, it serves as a protective layer against allergens and infective agents. The conjunctiva can be broken down into its three structurally separate parts: the palpebral conjunctiva lines the internal eyelids, the bulbar conjunctiva lines the sclera, and the fornix connects the latter two forming a cul-de-sac portion. An inflammation of the conjunctiva is called conjunctivitis (**Yetman and Coody, 1997**).

**Aqueous** is fluid that bathes structures in the anterior third of the eye. This fluid is derived from the blood vessels in the ciliary body processes and through a circulatory recycling process flows from the posterior chamber into the anterior chamber. Eventually it returns to the blood system draining out through structures including the Canal of Schlemm (**Bertucci, 2001**).

**Retina** is a thin multi-layered sensory tissue that lines the back of the eye. The retina contains two types of photoreceptors (neurons) called rods and cones. Visual information received by the photoreceptors is translated to neural signals by the nerves called ganglion cells. The rods are more abundant in the peripheral retina and work to detect light/dark changes as well as shape and movement. Cones detect color and distinguish fine detail which is why they are denser in the central retina, especially in the fovea (**Marren *et al.*, 2001** ).

**Optic Nerve** is the collective input of information from ganglion cells which are carrying information from the retinal photoreceptors. The optic nerve carries this information to the brain where the signals are interpreted allowing visual perception (**Komo, 2004**).

## **2.2. Signs and symptoms of eye infections**

Pain in the eye; a feeling that something is in the eye (foreign body sensation); increased sensitivity to light (photophobia); yellow, green, bloody, or watery discharge from the eye; increasing redness of the eye or eyelids; A grey or white sore on the colored part of the eye (iris) ; fever with no other cause and blurred or decreased vision ( **Jennings, *et al.*, 2013**).

## **2.3. Complications of eye infections**

There are two types of clinical forms of eye infections; internal and external. The external eye is susceptible to numerous infections and injuries because it is in direct contact with environmental elements. Some external eye disease carries the risk of causing vision loss. External clinical forms are blepharitis, conjunctivitis, keratitis, dacryocystitis, and dacryoadenitis. While internal clinical form is endophthalmitis. Hordeolum has internal and external feature; external hordeolum is infection of eyelash at root and cause swelling, while internal hordeolum is infection beneath the surface of middle of eyelid (**Hwang, 1996; Scott, 2001 and Jennings, *et al.*, 2013**).