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Common Pathogenic Organisms Found in External Eye Infections among Residents of Abuja, Nigeria

***Esenwah E.C.[1]; Ojogbane G.E.[2]; Azuamah Y. C.[1]; Ezinne N.[2] ; Ikoro N.C.[1]; Daniel-Nwosu E.M.[1]; Ahuama O.C.[3]; Kio F.[4]**

[1]Department of Optometry, Federal University of Technology, Owerri, Nigeria
[2]Department of Optometry, Madonna University, Elele, Nigeria
[3]Department of Optometry, Abia State University, Uturu, Nigeria
[4]Department of Optometry, Faculty of Life Sciences, University of Benin, Benin City, Nigeria
*Corresponding author: esenwahemma_eye@yahoo.com

ABSTRACT

This study was carried out to determine the common microorganisms present in external eye infections of residents of Abuja, Nigeria. A total of 250 patients, of both genders and of all age groups with external eye infections, who attended the University of Abuja Teaching Hospital, Abuja, were the subjects. The isolated pathogens seen among the subjects included Staphylococcus aureus (38.4%), Escherichia Coli (16.4%), Staphylococcus epidermidis (14%), Escherichia faecalis (8%), Aspergillum (1.6%) and Klebsiella species (0.4%). In 21.2% of the subjects, no microorganism was found. Conjunctivitis was the most prevalent of the eye infections accounting for 58.4%, followed by blepharitis, 13.6%; corneal ulcer, 10.4%; hordeolum, 8.8% and keratitis,8.8%. Public education and enlightenmentcampaigns on the need for proper personal hygiene and prevention against communicable diseases are recommended.

Keywords:
Eye; Infections; Pathogens; Microorganism

INTRODUCTION

External eye or ocular infections occur when microorganisms such as bacteria, fungi, viruses and protozoans invade any part of the eyeball or surrounding tissues. These include the transparent front surface called the cornea, and the thin moist membrane lining the outer eyeball and inner eyelids called the conjunctiva.Some microorganisms are free living and perform useful activities that benefit human, animal and plant lives. Nevertheless, some microorganisms still have the ability to cause diseases. Members of this group are called pathogens[1]. External eye infections are among the causes of visual disability in developing countries, due primarily, to poor management. Empirical evidence suggest that external eye infections account for a good proportion of eye diseases in Nigeria.Hence, the need for adequate, proper,effective and satisfactory treatment, especially with the use of the right/correct medications sensitive to the causative agent(s). To achieve this, it is important to isolate and identify the causative microorganisms involved in the pathogenesis of these ocular infections, and thereafter conduct a sensitivity test.

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There are several laboratory techniques for the clinical diagnosis of ocular infections based on microbiological tests of ocular samples. Some of these techniques involve the classic isolations of these microorganisms and identifying them by microbiological analysis which requires significant resources and timing. However, the advent of mass spectrometry approach has dramatically changed the face of microbiological analysis.Some of the advantages of mass spectrometry analysis include the lack of need for culture, isolation of the microorganisms, and the ability to identify the microorganisms without lengthy wait for their growth[2].

The eye may be infected from external sources or through intraocular invasion of microorganisms carried by the blood stream. Indeed, any part of the eye can be infected by microbes from the environment. They can form transient flora or invade the tissues and cause infection[3]. Some microbial agents do establish themselves as residents in the human body. These microbes are the normal body flora and they do not induce any overt disease. Although, practically every conjunctival sac has been reportedto exhibit some flora, bacteria cultured from these sacshave been reported to be similar to those found in the upper respiratory tract and skin, with majority being gram positive, which are most commonly,*Staphylococcus spp* and *Corynebacterium spp*. On the other hand, the eyelid margins and conjunctival sacs of healthy subjects can also contain gram-negative pathogens[4].

Nevertheless, infections occur when microbes overwhelm the host defense mechanisms[5]. Not all infections result in clinical infections and consequently, display any symptoms. Such an infection is considered as subclinical[1]. The term virulence is used to describe the degree of pathogenicity of an organism. It is mainly dependent on the invasiveness and/or the ability of the organisms to produce toxins while the communicability of an organism refers to its capacity to spread[1].

MATERIALS AND METHODS

This research is a clinical study carried out at the University of Abuja Teaching Hospital (UATH), Abuja, Nigeria. A total of 250 subjects, who were all patients of UATH, comprising both genders and of all ages, with external eye infections from October, 2013 to January, 2014, were examined by these researchers.Instruments used for data collection included a structured questionnaire, sterile swab-sticks, pen torches, ophthalmoscopes, microscopes, culture plates, slit lamps, blood agar, MacConkey agar, CLED (cystine electrolyte deficient) agar and nutrient agar.

Swab(s) from the infected eye(s) of each subject was/were collected with sterile swab-stick(s) and then taken to the laboratory for testing. In the laboratory, normal saline was dropped on the swab stick, sealed and shaken; then a drop of the suspension was poured on a clean slide, covered with a cover slip and viewed under the microscope. Transparent clusters of cells indicating the presence of fungi and bacterial cells were seen. The samples were then streaked on MacConkey, blood and CLED agar and incubated for 24hours. After the 24hours incubation, the plate was observed for any microscopic attribute of colonial morphology (colour, shape, size, opacity or transparency, elevation and odour). Gram staining was done using a smear flooded with crystal violet, and rinsed after 60 seconds. Logol's iodine was then added and rinsed after 60 seconds. It was then decolorized rapidly with

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acetone for 1 second and rinsed immediately. Safranine was then added and rinsed after 2 minutes and then viewed microscopically with x100 objective lens to differentiate the Gram-positive andthe Gram-negativebacteria. Biochemical tests that included oxidase test, urease test and indole test were also carried out to identify specific microorganisms present.

RESULTS

Out of a total of 250 patients with external eye infections that made up the sample population, males accounted for 45.2%, while femalesaccounted for 54.8%. The age distribution of the subjects as shown in Table 1 revealed that the age groups, 31-40 years and 41-50years,had the highest frequency of 26.8% and 25.6%, respectively. The subjects below 10 years and those above 60 years showed the least frequency of 2.8% and 3.2%, respectively.

The isolated pathogens seen among the subjects include *Staphylococcus aureus*(38.4%), *Escherichia Coli* (16.4%), *Staphylococcus epidermidis*(14%), *Escherichia faecalis*(8%), *Aspergillum* (1.6%) and *Klebsiella species* (0.4%).No microorganism was found in 21.2% of the subjects,See table 2.

Table 3 shows the frequency distribution of the various infections seen in the eyes of the patients. Conjunctivitis was the most prevalent, accounting for 58.4%; followed by blepharitis, 13.6%; corneal ulcer, 10.4%; hordeolum, 8.8% and keratitis,8.8%.

Table 4 showed the age group of subjects with the various eye infections while the gender distribution of the infections is shown in Table 5. The different pathogens causing each eye disease is shown in Table 6.

DISCUSSION

Of the 250 samples tested in the laboratory, *staphylococcus aureus*accounted for the highest (38.4%) infection. This was followed by *E. coli* (16.4%)and *S. epidemidis*(14.0%), all three accounting for 68.8% of the eye infections. Esenwah,[6] in his study carried out in Owerri, situated in the rain forest belt of Southern Nigeria, found that *Staphylococcus* and *E. coli* species jointly accounted for 60.7% of external eye infections.This marginal increase of 8.1% in Abuja, may be due to its location in the savanna and grassland belt of Northern Nigeria. The weather here is dry, dusty and humid. In addition, the indigenes are predominantly peasant agro and livestock farmers, as against the indigenes of Owerri who are predominantly traders and civil servants.

While *Staphylococcus* bacteria are present on the skin without causing serious complications, the bacteria can sometime enter soft tissues as a result of cut or broken skin and cause major problems. It can enter the eye through several means, e.g., through expired and/orinfected eye makeup. Poor eyelid hygiene and excessive amounts of oil from ocular glands due to stress or hormonal changes can also introduce bacteria into the eye. A staph infection in the eye can cause conjunctivitis, blepharitis, keratitis, corneal ulcer and hordeolum, all of which were seen among the subjects in this study.

Conjunctivitis (58.4%) was the most prevalent eye disease resulting from these infections. In another study[7] carried out in Lagos, Nigeria, 50.3% of conjunctivitis cases was as a result of *staphylococcus* species. *E. coli* infection was implicated in corneal infection. It was also implicated in ophthalmianeonatorum. *E.coli* is

rarely found in the normal flora of the conjunctiva but they are great cause for worry in cases of trauma, ocular surgery, immune compromised state and systemic infections. Other pathogens isolated in this study included*Klebsiellaspp*(0.4%) and *Aspergillum*(1.6%).Other studies[8-12]on external eye infections have revealed other pathogens such as *Pseudomonas spp.*, *N. gonorrhoeae*, *Streptococcocusfaecalis*, *Proteus morabilis*, *fusariumspp* and *aspergillusfumigatus.*

Proper hand washing and personal hygiene are very important in preventing ocular infections as many of the subjects interviewed, admitted to not washing their hands with soap and water regularly, especially, after using the toilet or coming into contact with infected persons. When people shake hands with others who might be infected, they inadvertently rub their hands on their eye afterwards, thereby, infecting themselves.

Similarly, nosocomial infections are common as people visit friends and loved ones inclinics, hospitals and destitute homes, where they get contaminated either directly or indirectly by touching railings, door knobs,towels and/or other objects contaminated by the infected persons. When they rub their eyes in response to an itch, their eyes get infected. Thus, people should be well educated on the need for proper hygiene as this is a panacea for the prevention of external eye infections, nay, eye diseases that could lead to severe visual impairment and possibly, blindness.

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TABLES

Table 1: Age distribution of subjects

Age group	f	%
0-10	7	2.8
11-20	34	13.6
21-30	44	17.6
31-40	67	26.8
41-50	64	25.6
51-60	26	10.4
Above 60	8	3.2
Total	250	100

Table 2: Frequency distribution of isolated pathogens

Pathogen	Frequency	%
Staph. Aureus	96	38.4
E. coli	41	16.4
Staph. Epidermidis	35	14.0
E. faecalis	20	8.0
Aspergillusspp	4	1.6

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Klebsiellaspp	1	0.4
No isolate	53	21.2
Total	250	100

Table 3: Frequency distribution of infectious eye diseases

Disease	**Frequency**	**%**
Conjunctivitis	146	58.4
Blepharitis	34	13. 6
Cornea ulcer	26	10.4
Hordeolum	22	8.8
Keratitis	22	8.8
Total	250	100

Table 4: Age distribution of infectious eye diseases

Age group	**Blepharitis**		**Conjunctivitis**		**Cornea ulcer**		**Hordeolum**		**Keratitis**	
	F	**%**	**f**	**%**	**f**	**%**	**f**	**%**	**f**	**%**
0-10	4	1.6	3	1.2	0	0	0	0	0	0
11-20	6	2.4	23	9.2	2	0.8	2	0.8	1	0.4
21-30	10	4.0	19	7.6	2	0.8	5	2.0	8	3.2
31-40	6	2.4	40	16.0	6	2.4	9	3.6	6	2.4
41-50	6	2.4	39	15.6	13	5.2	2	0.8	4	1.6
51-60	1	0.4	16	6.4	3	1.2	4	1.6	2	0.8
Above 60	1	0.4	6	2.4	0	0	0	0	1	0.4
Total	36	13.6	146	58.4	26	10.4	22	8.8	22	8.8

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Table 5: Gender distribution of infectious eye diseases

Diseases	**Males**		**Females**	
	f	**%**	**f**	**%**
Blepharitis	18	7.2	16	6.4
Conjunctivitis	62	24.8	84	33.6
Cornea ulcer	9	3.6	17	6.8
Hordeolum	14	5.6	8	3.2
Keratitis	10	4.0	12	4.8
Total	113	45.2	137	54.8

Table 6: Distribution of eye infections according to pathogen

Disease	***S. epidermidis***	***S. aureus***	***E. coli***	***E. faecalis***	***Fungal***	***Klebsiella***	**No isolate**
Blepharitis	8(3.2%)	12(4.8%)	9(3.6%)	4(1.6%)	0(0%)	0(0%)	1(0.4%)
Conjunctivitis	18(7.2%)	58(23.2%)	16(6.4%)	6(2.4%)	0(0%)	0(0%)	48(19.2%)
Cornea ulcer	3(1.2%)	11(4.4%)	3(1.2%)	4(1.6%)	4(1.6%)	0(0%)	1(0.4%)
Hordeolum	4(1.6%)	8(3.2%)	6(2.4%)	2(0.8%)	0(0%)	0(0%)	2(0.8%)
Keratitis	2(0.8%)	7(2.8%)	7(2.8%)	4(1.6%)	0(0%)	1(0.4%)	1(0.4%)
Total	35(14%)	96(38.4%)	41(16.4%)	20(8.0%)	4(1.6%)	1(0.4%)	53(21.2%)