



ISSN: 2456-0057

IJPNE 2019; 4(1): 764-766

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www.journalofsports.com

Received: 25-01-2018

Accepted: 29-02-2018

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A study on normal ocular flora of healthy population

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Abstract

Normal flora of eye differs in population based on geographical location and occupation. The present study aimed at determining normal flora of eye in healthy individuals. This was a cross sectional study carried out at Vinayaka Missions medical college and hospital. Conjunctival swabs were obtained from participants. All swabs collected from participants were subjected to standard microbiological techniques for the isolation of bacteria and fungi. A total of 120 swabs were collected from 120 participants (one swab from each eye). Overall 43 swabs were yielded growth and accounted for 35% of isolation rate. Gram positive cocci (83.72%) were isolated commonly. Gram negative bacilli was isolated only from 7 participants (16.28%). Staphylococcus aureus was found to be the predominant bacteria isolated and accounted for 27.91%. In this study, Staphylococcus aureus was found to be the most common ocular flora in healthy individuals. The higher culture positivity rate of Staphylococcus aureus probably reflects a more permissive environment. No fungi isolated in the present study.

Keywords: Conjunctiva, healthy population, staphylococcus aureus

Introduction

The conjunctiva is a thick translucent mucous membrane. Its palpebral portion lies over the posterior portion of the eyelids and is firmly attached to the tarsal plate, while the bulbar portion lies loosely over the anterior globe with firm adherence to the limbus. The conjunctiva has a layer of submucosal substantia propria that consists of a superficial adenoid portion containing mainly connective tissue [1].

The term "normal microbial flora" refers to population of microorganisms that dwell within the eyes of healthy individuals. These microorganisms play an important and specific role in maintaining health and normal conjunctival function. These bacteria, when disturbed, can promptly reestablish themselves [2].

Physiological mechanisms such as, tears in combination with eyelid action, mechanically flush the ocular surface to reduce an ever present bacterial load. Further, the tears contain immunoglobulins and components of the complement pathways namely lactoferrin, lysozymes and B-lysin that help killing microorganisms and decrease their adherence to the ocular surface [3].

The predominant microorganisms of conjunctiva are Staphylococcus epidermidis, Diphtheroids, Micrococcus sp. and Staphylococcus aureus. In addition, Streptococcus pyogenes, Streptococcus pneumoniae, Streptococcus Viridans, Moraxella Catarrhalis, Haemophilus Influenzae, Klebsiella sp., Escherichia coli, Pseudomonas species are occasionally found. Sometimes the conjunctivae remain sterile, but many people have normal microbial flora [4].

Under normal circumstances, normal flora plays a protective role in preventing colonization of pathogenic microorganisms by competing with them for nutrients and space. Despite the flora's defensive role, it can become pathogenic in situations such as, after a surgical procedure or when the immune system is compromised.

Normal flora of eye differs in population based on based on geographical location and occupation. To the best of our knowledge no study was done to determine the normal flora of eye in healthy individuals of the study region. Hence we aimed at determining normal flora of eye in healthy.

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Materials and Methods

This study was a cross sectional study carried out in the department of microbiology, Vinayaka missions medical college during the period of October 2018 to December 2018. A total of 120 patients attenders attending different OP departments of Vinayaka missions medical college and hospital were enrolled in the study.

Inclusion criteria: Patient attenders with the age group between 20-80 years.

Exclusion criteria: Red eye for any reason, conjunctival discharge, diabetic patients, patients on any type of topical medications and current or previous contact lens wear.

Before collecting swab from each patient, consent was obtained. All precautionary measures were taken to avoid contact with lid margin and eyelashes while taking the swab. Swabs collected from subjects were transported to microbiology laboratory. Collected swabs were inoculated on bacteriological media (blood agar and chocolate agar) and mycological media (Sabouraud dextrose agar). Inoculated bacteriological (37° C) and mycological media (25° C) were incubated for 48 hours and 2-4 weeks respectively and microbial colonies were identified after isolation as per standard microbiological procedures.

Results: A total of 120 swabs were collected from 120 participants (one swab from each eye). 73 were male and 47 were female participants. Out of 73 swabs collected from male patients 31 swabs yielded growth and growth was seen in 12 swabs out of 47 from female participants Overall 43 swabs were yielded growth and accounted for 35% isolation rate. Gram positive cocci (83.72%) were isolated commonly. Gram negative bacilli was isolated only from 7 participants (16.28%). *Staphylococcus aureus* was found to be the predominant bacteria isolated and accounted for 27.91%. (Table)

Table 1: Bacteriological profile of ocular flora (Table)

S. No	Bacteria	Number (%)
1.	<i>Staphylococcus aureus</i>	12(27.90%)
2.	CONS	8 (18.60%)
3.	Diphtheroids	8 (18.60%)
4.	<i>Streptococcus</i> species	6 (13.95%)
5.	Micrococci	2 (4.65%)
6.	<i>Pseudomonas</i> species	5 (11.63%)
7.	<i>Proteus</i>	2 (4.65%)

Cons: Coagulase negative Staphylococci

Discussion

In our study, isolation rate of bacteria from conjunctival swabs collected from healthy participants were found to be 35%. As per the study conducted by Nahar N *et al.* [4] in healthy individuals isolation rate was 38%, which is in agreement with the present study results.

But, our study results are not similar to the study conducted by Martin *et al.* [5] As per the study conducted by Martin *et al.*, isolation rate was 73%, which is very high compared to the present study result. Another study conducted by Karimsab and Razak [6] showed least isolation rate (24%).

In preceding studies, the old age of patients was found as a risk factor to have positive bacterial culture in the conjunctival sac before cataract surgeries. Furthermore, in one of the studies, patients with systemic risk factors, including diabetes mellitus, had a more chance to have positive bacterial

culture of the conjunctival sac before intraocular surgeries [7]. It was thought that normal ocular flora could be nonpathogenic or occasionally pathogenic. However, the pathogens of some bacterial endophthalmitis, bacterial corneal ulcers, blepharitis, conjunctivitis, and other ocular infection diseases turned out to consistent with conjunctival isolated bacteria, and the *S. epidermidis* has become the predisposing pathogen [8].

In our study, predominant bacteria isolated from conjunctival swabs was *Staphylococcus aureus* and accounted for 27.91%. As per Kalpana *et al.*, *Staphylococcus aureus* was found to be the predominant bacteria which is similar to the present study [9]. Davood Aghadoost, *et al.* found CONS to be the most common organism constituting the normal flora of the conjunctiva [10]. Suzanne reported that although *Staphylococcus* species were isolated most frequently from the conjunctiva of normal subjects, significantly more diphtheroids were isolated from those labeled as former contact lens wearer [11]. Akhter Jamal Khan studied the normal conjunctival flora in Karachi and obtained cultures from 800 patients. His results showed *Staphylococcus epidermidis* (57.7%) was the most common bacteria, followed by *Diphtheroids* Sp (26.6%) [12]. Shehla Rubab compared the indigenous microbial flora of the eye to that found in conjunctival and corneal infections at Al-Shifa trust hospital at Rawalpindi. She found out that in the control group of 700 eyes, the microorganism detected included *Staphylococcus epidermidis* in 57.7%, *Staphylococcus aureus* in 22.5%, *Streptococcus pneumoniae* in 8.3% and *Diphtheroids* in 3.3% of cases [13].

In the present study isolation rate of Gram negative bacteria was found to be 16%. *Pseudomonas aeruginosa* and *Proteus* were isolated. Other studies yielded the growth of various Gram negative bacteria such as *Moraxella*, *H. influenza*, *Klebsiella* and *E. coli*. No fungi was observed in the present study. As per Saxena and Go swami, fungi were isolated in 54 eyes (8.7%) of 43 persons (14.0%), with the lowest incidence in infants (0.32%) and the highest incidence in the middle aged (2.9%) and old persons (2.7%) [14].

In the present study, higher isolation rate of bacteria was observed from conjunctival swabs of male participants. This could be due to more involvement of outdoor activity by males compared females. It is important to mention that modification of ocular flora of a given population depends on seasonal variations, temperature, host age, environmental exposure, additional ocular trauma, surgical procedures and local or systemic immunosuppressant. Modifying the ocular flora alter the normal residing flora and promote the growth of strains with increased antimicrobial resistance and pathogenicity.

Conclusion

Staphylococcus aureus was found to be the most common ocular flora in healthy individuals. The higher culture positivity rate of *Staphylococcus aureus*, probably reflects a more permissive environment. No fungi isolated in the present study. A relationship may exist between resident normal flora and the etiology of ocular infections. Knowledge of normal flora of eye helps in initiating empirical antibiotic therapy in ocular infections.

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