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MICROBIAL KERATITIS: PREDISPOSING FACTORS AND CULTURE GROWTH PATTERN

Ophthalmology

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ABSTRACT

Background:
Microbial keratitis is a sight threatening ocular infection mainly caused by bacteria and fungus. Effective management of microbial keratitis can be done by knowing the predisposing factors and identification of organisms.

Materials and Methods:
The study was done on 200 patients having infective keratitis in one year duration at tertiary care hospital. After detailed history and examination, all cases of infective keratitis underwent corneal scraping. The samples were subjected to standard microbiologic processing. Detailed clinical history and investigation was kept in record.

Results:
Mean age of study was 35+/- 11.6 years. Male: female ratio was 1.5:1. Out of 200 cases 128(64%) cases had culture positive keratitis. Streptococci pneumoniae was most common bacterial and fusarium species were most common fungal organism identified.

Conclusion:
Spectrum of microbial keratitis varies with geographical location influenced by the local climate and risk factors. The most common predisposing factor responsible for microbial keratitis is Trauma.

KEYWORDS

Microbial keratitis, Bacterial keratitis, Fungal keratitis.

INTRODUCTION

Infective keratitis (Microbial keratitis) is infection of the cornea caused by a wide spectrum of microbial agents and should be considered a medical emergency.[1] Blindness due to microbial keratitis is an emergency as a principle reason for visual inability and that is a silent epidemic happening unnoticed around the world. With the overall decline in causes of blindness like trachoma, onchocerciasis and leprosy, the World Health Organization (WHO) has perceived that corneal blindness due to microbial keratitis is emerging as a principal reason for visual inability and that it is a "silent epidemic" happening unnoticed around the world.[2]

According to WHO visual impairment and blindness global estimates, 285 million (4.25%) people are affected by visual impairment and out of them 246 million (86%) people have low vision and 39 million (14%) people are blind. Out of them, corneal opacities are responsible for 4% of total blindness in world.[3] The etiological and epidemiological features of infective keratitis. depend on host factors, geographical location and the climate. Several risk factors like age, sex, immune status and socio-economic background determine the pathogenesis of infective keratitis.[4] Microbial keratitis is a common, potentially sight threatening ocular infection that may be caused by bacteria, fungi or viruses. However, predisposing factors such as trauma, contact lens wear, dry eye, glaucoma, epithelial defect, systemic disease and immunosuppressant may alter the defence mechanisms of the outer eye and permit bacteria to invade the cornea. [5, 6]

The objective of this study is to identify predisposing factors and microbiological profile of microbial keratitis to treat and prevent corneal blindness.

METHODS

The study was done on 200 patients having keratitis in one year duration from 2016 to 2017 in the Department of Ophthalmology. All the patients having microbial keratitis attending ophthalmology OPD & IPD were included in the study. The samples were subjected to standard microbiologic processing. Detailed clinical history and investigation was kept in record.

Cases who were severely debilitated, non-compliant to treatment,HIV positive, extremes of age from less than 1 yrs & more than 80yrs were excluded.

A total 200 patients with corneal ulceration were analyzed. Detailed history taking include duration of symptoms, predisposing factors, history of trauma, traumatic agents, associated ocular conditions, other systemic disease, treatment received prior to presentation, visual acuity at the time of presentation and all clinical findings were collected. Slit lamp biomicroscopic examination was done. After ocular examination, 4% lignocaine without preservative was instilled and then corneal scraping was taken under aseptic conditions from each ulcer. The material scraped from the leading age and the base of each ulcer was initially directly inoculated into the surface of solid media such as blood agar, chocolate agar and sabouraud agar in a raw of C-shaped streaks and then 10% potassium hydroxide wet mount was prepared and gram staining was done.

RESULTS

Mean age was 35+/- 11.6 years. Male: female ratio was 1.5:1. Out of 200 cases 128(64%) cases had culture positive keratitis. Among the 128 cases, 72 (54%) cases were between the age group of 21 to 50 years.

The potential predisposing factors identified in patients are shown in table-1. Out of total 128 cases 68(53%) had history of trauma, among them 34(50%) were fungal and 26(35.2%) had bacterial keratitis. 26(38.2%) cases had trauma with vegetative material and 16 cases (23.5%) had trauma with wooden stick and 20 cases (29.4%) had history of fall of some foreign body.(Table-1 and 2)

Table 1: Predisposing factor associated with corneal Ulcers

Predisposing factors	Bacterial	Fungal	Mixed [Bacterial + fungal]	Total [%]
Trauma	26	34	8	68[53.1]
Lagophthalmos	4	2	0	6[4.6]
Contact lens	12	4	0	16[12.5]
Dry eye	4	2	0	6[4.6]
Steroid	6	14	0	20[15.6]
Not known	10	2	0	12[9.3]
Total	62[48.4%]	58[45.3%]	8[6.2%]	128

Table 2: Type of Traumatic agents associated with corneal ulcers

Nature of injury	Bacterial	Fungal	Bacterial + fungal	Total
Vegetative material	4	20	2	26
Wooden stick	6	8	2	16
Objects –dust, stone, metal piece, Insect, Ash and powder	10	6	4	20
Finger nail, hand	6	0	0	6
Total	26	34	8	68

Out of 128 cases 62 cases had bacterial infection, 58 cases had fungal infection and 8 cases had mixed bacterial and fungal infection. Pathogens were isolated from the 128 eyes shown in table-3.

Table 3: Organisms isolated in patients with microbial keratitis

Isolated bacteria	No.	%
Staphylococcus Aureus	6	9.6
Staphylococcus Epidermidis	9	14.5
Streptococcus Pneumoniae	26	41.9
Pseudomonas Aeruginosa	17	27.4
Klebsiella	2	3.2
Acinobacter	2	3.2
Isolated fungus	**No**	**%**
Fusarium species	26	44.8
Aspergillus species	21	36.2
Candida	7	12
Other	4	6.8

66 % of cases of fungal keratitis had Hypopyon at first presentation. Out of total fungal keratitis patients 84% patients had thick and cheesy Hypopyon. 48 % of bacterial keratitis had hypopyon first presentation.

DISCUSSION

Microbial keratitis is infection of the cornea produced by replicating microorganisms. Microbial keratitis from either bacterial or fungal infection exists in all geographic regions of the world.[7] in present study, the incidence of culture-proven microbial keratitis was observed to be 64%. A similar rate of incidence was reported in Madurai (68.4%)[8] and in South Africa (65%3 to 68%4), whereas in Nepal (80%)[9], it was reported to be higher. In contrast, very low recovery rate was reported in Taiwan (40%).[10] A review of literature shows that the reported culture-positivity ranges from 34.52% to 82% and was influenced by previous empirical treatment with antimicrobials before referral, use of topical anesthetic agents,[11] and corneal scrapes. In addition to these factors, the use of transporting media instead of direct inoculation for recovery of microbial pathogens is still in controversy.[12] Therefore, these factors may have false-negative culture results.

The proportion of fungal and bacterial keratitis in this study accounted for 45.3% and 48.4%, respectively, and this proportion is nearly equal. Similarly, Srinivasan et al. reported equal proportion of fungal (32%) and bacterial (32.3%) corneal infection in Madurai.[8] In tropical countries like South Florida (35%),[13] the incidence of fungal keratitis was reported to be up to 40%. In temperate countries like United States,[14] the proportion of fungi causing suppurative keratitis is very low, whereas bacteria were responsible for larger proportion of corneal ulceration in these temperate regions. Areas where the climate is warm and humid, especially near the equator, appear to have more cases of fungal keratitis, and in all of these areas filamentous fungi are the dominant fungal corneal pathogen. Thus, the temperature and humidity have a major role in determining the microorganisms found in the environment. The most commonly isolated fungal pathogen in present study, Fusarium species, is similar to the pattern of fungal pathogens reported from tropical areas of South Florida,[13] Ghana,[15] and Singapore,[16] whereas in the temperate regions of subtropical countries of Nepal,[17] Aspergillus species were found to be predominant. In more temperate climates, fungal corneal ulcers are more frequently associated with Candida species than filamentous fungi. This difference in the prevalence of fungal pathogens may be explained by differences in climate and the environment. There was no climatic influence in the prevalence of bacterial pathogens causing corneal ulcers, whereas geographic variation was seen. Streptococcus pneumoniae was found to be the predominant bacterial species isolated in this study. Similarly, Streptococcus pneumoniae was reported to be the predominant bacterial pathogen in Madurai[8] . Pseudomonas spp. were identified as the most common bacterial species in the studies of Hong Kong,[18]. A predominance of Staphylococcus spp. has been reported in Hyderabad.[19] These reports show that there is distinct pattern of geographical variation in the prevalence of bacterial pathogens.

On a global level, predisposing risk factors for microbial keratitis vary tremendously between developing and developed countries.[7] Corneal trauma is the leading cause for microbial keratitis in South India.[7,8],Similarly, in this study, a history of recent injury to cornea (53.1%) was identified as the principal predisposing factor for the development of corneal ulcers. The incidence of microbial keratitis due to corneal injury was reported to be higher in India (65.4% in South India;[8] and 55% in North India[20]) and Nepal (52.8%),whereas in the United States (8.33% in Philadephia), it was reported to be infrequent. This difference in the pattern of risk factors is due to the variation in the occupation profile of the patients who live in those regions. Agricultural-related works are common in developing countries, whereas nonagricultural jobs are predominant in developed nations.

The use of contact lenses as the cause for microbial keratitis was 12.5% in this study, and most of these were found to be of gram-negative bacterial etiology, mainly Pseudomonas aerugionsa. The increased incidence of Pseudomonas infection in contact lens wearers by formation of slimy biofilm on contact lenses due to poor lens hygiene was well described.[7] Prolonged use of topical corticosteroids predisposing to corneal ulcers(15.6%), of which fungal infection was more frequent (70%) than bacterial (30%) The use of topical corticosteriods can create localised immunosuppression and prevent neutrophil migration in response to chemotatic factors released during microbial infection.[21] They appear to activate and increase the virulence of fungi by suppressing host immune response, and impairment in opsonisation predisposes to infection with encapsulated bacteria, including S. pneumonia.

CONCLUSION

It is concluded in the study that microbial keratitis is common cause of corneal blindness and it is more common in male with low socioeconomic status working in outdoor occupation. Trauma is most common predisposing factor responsible for microbial keratitis. The proper diagnosis and management can be done by knowing the demographic factor, predisposing factor and microbiological pattern of microorganism responsible for microbial keratitis.

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