A Prospective Microbiological Study on Suppurative Corneal Ulcer at a Tertiary Teaching Hospital in Bhavnagar, Gujarat, India

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Abstract- It is important to study the epidemiological features and predisposing factors of suppurative corneal ulcers. Subsequently, it is also important to find out its causative microbial agents and their antimicrobial sensitivity-resistance patterns in a particular climate and culture of a particular region of a country. This prospective study was carried out on patients suffering from suppurative corneal ulcer to know the particular bacterial and fungal (not viruses) prevalence as a causative microbial agent for these suppurative corneal ulcers at a particular region of Gujarat and the distribution this disease among the people of different age, sex and occupational group in this region.

It is a prospective study on 112 patients suffering from suppurative corneal ulcers. All the patients are examined thoroughly by ophthalmologist on slitlamp biomicroscope. After proper clinical examination of every patient and before any treatment was initiated, the samples were taken from all the clinically suspected suppurative corneal ulcers, using standard technique, by swabs and scrapings under strict aseptic condition. The scraping procedure was performed using Bard Parker blade, under magnification of slitlamp microscope or operating microscope, after instillation of 2% lignocaine without preservative. The specimen material was scraped from the edge and the base of the ulcers.

The swabs were directly inoculated on to the surface of solid medias, such as blood, Mac Conkey and Sabourad,s dextrose agar media. The scraping materials were used for preparation of smear for Gram stain and 10% KOH wet mount. The bacterial growths were identified by colony morphology, smear preparation from colony, followed by Gram stain and microscopy, followed by standard biochemical tests. The fungal growths were also identified by colony morphology, Gram stain for yeast and yeast like group of fungi and LPCB wet mount preparation for mycelial group of fungi. For diagnosis of fungi the help of biochemical and immunological tests was also taken.
Out of total 112 specimens of suppurative corneal ulcers, only 76 specimens were found to be culture positive in which bacteria were isolated more frequently than fungi. The coagulase negative staphylococcus (CONS) were the most frequently isolated bacteria and the genus Aspergilous were the most frequently isolated fungi. All the bacterial isolates, not the fungi, were passed through antibiotic sensitivity testing (ABST) by Kirby-Bauer disk diffusion method. The incidences of suppurative corneal ulcers were higher in males than females. Patients between 40 to 50 Years of age group were most affected. Ocular trauma, predisposing to suppurative corneal ulcer was identified as the major risk factor, compared to other predisposing factors.
The epidemiology, the predisposing factors, the causative microbial agents and their antimicrobial pattern of suppurative corneal ulcer vary geographically. The CONS and the Aspergillous spp. were the most frequent isolates from suppurative corneal ulcer in our institution. The incidences were higher among rural population, especially among labourers who were constantly exposed to different types of vegetative and non-vegetative traumatic matters.

Index Terms- Suppurative corneal ulcer, CONS, Aspergillous, Candida, ABST, Kirby-Bauer.

I. INTRODUCTION

Corneal blindness is the second most common cause of blindness after cataract (non-operated) among the people of developing countries like India, Bangladesh, Pakistan, etc.[1,2,3,7] The major cause of corneal blindness in developing countries is suppurative corneal ulcer, caused by trauma and other predisposing factors.[4] The avascular cornea is particularly susceptible to bacterial and fungal infection leading to suppurative corneal ulcer. Most of the patients have poor clinical outcome, if aggressive and appropriate therapy is not promptly initiated.[5] Because corneal infection by bacteria and fungi leading to suppurative corneal ulcer is an ocular emergency, where corneal infection rapidly progresses with the threat of vision loss and potential corneal perforation.[6] The reported incidences of suppurative corneal ulcer in India is near about 1130 per one million of population.[8]

Next to suppurative corneal ulcer, the other causes of corneal blindness in developing countries are trachoma, vit A deficiency, onchocerciasis, etc.[09] These were stood first before in previous decades, but their incidences are now in decline. These stood initially at 9.5%, but is now 7%.[10,11] Corneal ulcer due to non-infective causes leading to non-suppurative corneal ulcers are prevalent in developed countries like USA, UK, Australia, etc. Among these non-infective causes vascular, allergic, corneal dystrophies, bullous keratopathy, etc. are common.

Corneal blindness following suppurative corneal ulcer is caused by opacity, due to formation of dense scar tissue in cornea after healing.[12,13,14] Moreover, the dense scar tissue and opacity,

if does not cause total blindness, produces different grade of visual impairment, varying from mild to severe.[15] Suppurative corneal ulcer following infection may even lead to eneclution resulting loss of an eye. Therefore, suppurative corneal ulcer leading to different grade of visual impairment and blindness is a major public health problem in the developing world. In South East Asia an estimated 12 million cases of suppurative corneal ulcer occur in each year and among them an unknown proportion of cases progresses to different grade of visual impairment, total blindness, and loss of an eye.[16] This is more applicable among the rural population of developing countries those are often unable to access the appropriate treatment.[17]

Keratitis means inflammation of cornea. Infective keratitis means inflammation of cornea caused by infection due to any pathogenic microbial agent. When with this infection of cornea, there is production of pus, then this condition is called infective suppurative keratitis. Infective suppurative keratitis is always associated with corneal ulcer. So, suppurative corneal ulcer and infective suppurative keratitis are synonymous. The infection of cornea (infective keratitis) can be caused by bacteria, viruses, fungi, or parasites. Among these pathogens only bacteria, fungi, and parasites cause both the infection and production of pus.[18] Viruses can cause infection of cornea (infective keratitis) and ulcer, but do not produce pus. So, viral keratitis should not be included in this study of suppurative corneal ulcer. Suppurative corneal ulcer (infective suppurative keratitis) is caused only by corneal infection due to bacteria, fungi and acanthomoeba parasite.[19]

In normal eyes, there are many defense mechanisms that protect cornea from infections. These defense mechanisms of cornea are: a) intact superficial squamous layer of corneal epithelium, b) tight junctions between the squamous cells of this superficial layer of corneal epithelium, c) continuous secretion of tear from lacrimal glands, d) presence of different enzymes and immune substances such as lysozymes, lactoferrin, ceruloplasmin, Ig A, etc in the tear, e) continuous blinking action of eye lids, etc.[20] There is also a continuous balance between the intensity of defense mechanisms and the virulence of microorganisms trying to invade the cornea. If due to any reasons, these defense mechanisms are impaired and the pathogenic organisms are managed to colonize the cornea, then the suppurative infection of cornea leading to suppurative corneal ulcer is developed.[21]

Moreover, the incidences and the pattern of pathogenic microorganisms, responsible for suppurative corneal ulcer are influenced by geographical distribution, occupation of population and climatic factors.[20] The incidences and the pattern of pathogens responsible for suppurative corneal ulcer can also substantially be varied between population living in rural and city areas. People living in rural areas are mainly exposed to agricultural and different other types of manual works. So, they are more prone to suppurative corneal ulcer, caused by bacteria and /or fungi due to trauma by both vegetative and non-vegetative matters.

Ocular trauma is a far more common predisposing factor for infective suppurative corneal ulcer in developing countries. Whereas, pre-existing different ocular diseases and contact lens, but not trauma, are common risk factors for developing suppurative corneal ulcer in developed countries.[22] Although, bacteria or fungi as causative agent for suppurative corneal ulcer varies widely according to geographical area,[20] but the incidences of suppurative corneal ulcer caused by fungi have increased remarkably in recent years in different countries and /or at different region of a same country. This is due to the wide spread use of broad spectrum antibiotics and corticosteroids, increased use of contact lens, increased use of immuno suppressants for organ transplantation and anti-metabolites for cancer therapy, etc.

II. MATERIAL AND METHODS

A total of 112 patients who were suffering from clinically suspected suppurative corneal ulcer were included in this study, conducted in the microbiological department of Government Medical College at Bhavnagar. A standard request form was filled out for each patient, documenting all the socio-economic information and as well as all the clinical information, including mode of onset, duration of symptoms, predisposing (ocular) factors, associated systemic risk factors, and previous treatments, etc.

After filled up of request form and after taking extensive history, all the patients were examined carefully and extensively by standard clinical procedures by ophthalmologists. At first the visual acquity of each patient was measured and then all the patients were examined under slit lamp microscope. The size of each corneal ulcer was measured after staining with a sterile fluorescine paper strip, using a variable slit of slit lamp microscope and is recorded in millimetre. The picture of each corneal ulcer was also recorded with the help of a mobile slit lamp adapter and a camera.

In the similar way, the margin and the floor of each corneal ulcer, the size of stromal infiltration around the ulcer and the depth of each lesion were also recorded. Simultaneously, the thinning of cornea due to ulcer, any satellite lesion around the ulcer and any impacted foreign body in the ulcer were also observed. The presence or absence of any hypopyon with ulcers were also noted and recorded. Any associated other ocular conditions, predisposing to suppurative corneal ulcer, such as entropion, trichiosis, conjunctivitis, blepharitis, lagophthalmous, Bell, s palsy, dry eyes, acute or chronic dachrocystitis, use of contact lens, bullous keratopathy, corneal anesthesia or ocular leprosy, etc. were also noted. The history of use of topical medications, including topical corticosteroids, were also taken.

After a detailed history and clinical examination, the effected eye was cleaned with sterile normal saline to remove any exudates and necrotic tissues. Then, as samples two corneal swabs and two corneal scrapings were collected from each ulcer by an ophthalmologist with all aseptic precautions. Corneal swabs were taken by rubbing the ulcerated area of cornea with sterile cotton swabs without instillation of any local anesthetic agent. Before rubbing, the sterile cotton swabs should be soaked with sterile normal saline.[23,24]

Before taking any corneal scraping sample, the eye was next locally anesthetized by installing 2 to 3 drops of preservative free local anesthetic agent on the affected eye. 5 to7 minutes after instillation of local anesthetic agent, two corneal scraping samples were taken by an ophthalmologist using a sterile Bard-Parker no. 15 scalpel blade, under magnification of

slit lamp microscope. The scraping materials were obtained from the margin and the floor of each corneal ulcer. Great care was taken, not to touch the eye lashes and the skin of eye lids to avoid contamination.[23,24,25,26]

After taking samples in the form of swabs and scrapings, blood agar, chocolate agar, Mac- conkey agar media were inoculated from swabs for bacterial isolation, following the guide lines of CLSI (Clinical and Laboratory Standard Institute).[27] After inoculation all the cultured media plates were incubated at 37^0centigrade for maximum up to 48 hours. Chocolate agar plates were incubated in candle extinction jar for 5 to 10% CO^2. All the inoculated and incubated media plates were evaluated after 24 and 48 hours of inoculation for any growth of bacterial colony. If there is no growth of colony, then these inoculated plates were discarded after 48 hours.[23,24,25,26,28]

Bacterial cultures were considered positive, if the growth of same organism is demonstrated on two or more solid medias or there is semi confluent growth at the site of inoculation on one solid media associated with the identification of same organism with appropriate morphology and staining characteristics by Gram stain of direct corneal smear. All the bacterial isolates were identified by their colony morphology, preparation of smear from colony followed by Gram staining and microscopy, motility testing by hanging drop preparation, type of pigment production, and by the relevant biochemical tests in case of both Gram positive and Gram-negative organisms using CLSI guide lines.

All the bacterial isolates were tested for their antimicrobial sensitivity and resistance pattern by Kirby- Bauer disc diffusion technique against the commonly used ocular antibiotics according to CLSI recommended guide lines. The discs of antibiotic for sensitivity and resistance testing were obtained from Tulip (Micropress) Diagnostic (P) Ltd in our laboratory. The results of sensitivity-resistance tests of microorganisms to antibiotics were recorded as sensitive (S), intermediate (I), and resistant (R). Since till now, there is no available cut-off values for sensitivity-resistance tests against antimicrobial agents for corneal infections by Kirby-Bauer disc diffusion method, so the cut-off values applied for systemic bacterial infections were used according to the CLSI recommendation.[29]

The samples obtained by corneal scrapings were used for isolation of fungi. The first sample of corneal scraping was used for KOH (10%) wet mount preparation. For KOH wet mount preparation, the samples from corneal scraping was smeared on a slide and 1-2 drops of 10% KOH was put on this specimen. Next, the specimen mixed with KOH was covered with cover slip and incubated at room temperature for 5 to 10 minutes. Then, the specimen was examined under 40X objective for budding yeast, pseudohyphae, hyphae, etc. If in KOH wet mount preparation, by microscopy hyphe was found in corneal smear, but failed to grow in culture, still then the causative organism was reported as fungus.[30]

The second sample of corneal scraping was used for fungus culture. For fungus culture, one part of the second sample was spot inoculated on plain Sabouraud dextrose agar (SDA) media and another part was inoculated on SDA media with gentamycin and chloramphenicol antibiotic. Among these two medias, one was incubated at 25^0 centigrade and another was incubated at 37^0 centigrade. After incubation, the inoculated medias were observed daily for first 7 days and on alternate days for next 7 days as the fungi are slow growing. After 14 days all the inoculated plates for fungal isolation which had no growth, were discarded. Genus and species level identification of fungus was done by colony morphology, preparation of smear from colony followed by Gram stain and microscopy, wet mount preparation using LPCB, and different biochemical and immunological tests.[31,32,33,34]

The second corneal swab sample was inoculated on one non-nutrient agar media, enriched with E. coli and was examined daily for the presence of acanthomoeba spp. The inoculated media were discarded at the end of three weeks, if there is no signs of growth of this parasite.[35,36]

III. RESULTS

A total of 112 patients with the clinical diagnosis of suppurative corneal ulcer were enrolled in this present study. Among these total 112 patients, 65 (58.03%) patients were males and 47 (41.96%) patients were females. In both these male and female patients, suppurative corneal ulcers were prevalent most frequently in the age group between 40 to 60 years. The majority of patients were from rural areas. The number of patients coming from rural areas were 77 (68.75%) and from urban areas were 35 (31.25%). Majority of patients (81: 72.32% out of 112 pts) were manual workers, working in paddy fields in this region. Among these 112 patients, suffering from suppurative coneal ulcer 110 (98.21%) patients had unilateral affections and only 2 (1.78%) patients had affection on both eyes. Out of these total 112 patients, previous treatment was already taken by 87 (77.67%) patients before their first visit to us. Table 1.

Table-1;Demographic characteristics of Suppurative corneal ulcer in this present study.

Epidemiological factors	Number and percentage Total no- 112
Male	65 (58.03%)
Female	47 (41.96%)
Age <30yrs 30-40yrs 40-50yrs 50-60yrs >60yrs	09 (8.03%) 29 (25.89%) 48 (42.85%) 17 (15.17%) 09 (8.03%)
Rural	77 (68.75%)
Urban	35 (31.25%)
Occupation (Physical labour)	81 (72.32%)

Previous medications a)Antibiotics b)Antifungal c)Corticosteroids d)Local drugs	87 (77.6%) 71(63.39%) 10(08.29%) 03(02.67%) 03(02.67%)

A history of recent corneal injury was obtained from 83 (74.1%) patients (p>0.001). Among these injury groups, 31 (37.34% of 83) patients had corneal injury with vegetative matters, 17 (20.48% of 83) patients had animal injury. Other significant miscellaneous (35: 42.16% of83) injurious agents were sand, stone, wooden material, dirt, wire, flying insects, etc. Ocular diseases predisposing to suppurative corneal ulcer were present in 17 (15.17% of 112) patients. Among these predisposing ocular diseases chronic dacrocystitis, entropion and trichiosis were predominant. Within these 112 patients, a total of 9 (8.03% of 112) patients had history of type-2 diabetes mellitus. There were no specific history in 3 (2.67%) patients among these 112 patients, enrolled in this study. Table 2.

Table-2; Predisposing factors associated with suppurative corneal ulcers in this present study.

Predisposing factors	Number and percentage Total no- 112
Trauma a)Vegetative trauma b)Animal trauma c)Miscellaneous (sand, stone, wooden material, flying insect, metal wire)	83 (74.1%) 31 (27.67%) 17 (15.17%) 35 (31.25%)
Coexisting ocular diseases	17 (15.17%)
Coexisting systemic diseases	09 (8.03%)
No specific history	03 (2.67%)

In this present study, out of 112 corneal samples taken from clinically suspected suppurative corneal ulcer patients, cultures were positive in 76 (67.85%) samples and cultures were negative in 36 (32.14%) samples. Among these 76 culture positive samples, 42 (37.5% of 112) samples had produced pure bacterial growth, 28 (25% of 112) samples had pure fungal growth and 6 (5.35% of 112) samples had produced mixed bacterial and fungal growth. Hence, total bacterial isolates, out of these 76 culture positive samples were 48 (42+6=48) i.e.42.85% of total 112 samples and total fungal isolates, out of these 76 culture positive samples were 34 (28+6=34), i.e.30.35% of total 112 samples. Table 3.

Table-3;Rate of pure bacterial, pure fungal and mixed isolates in culture positive cases.

Samples	Number and percentages
Total samples	112 (100%)
Culture positive samples a) Pure bacterial growth b) Pure fungal growth c) Mixed (bacterial & fungal) growth	76 (67.85%) 42 (37.5%) 28 (25%) 06 (5.35%)
Culture negative samples	36 (32.14%)

Among these total 48 bacterial isolates, coagulase negative staphylococcus (CONS) were the most frequently isolated Gram positive bacterial organism (14: 12.50% of 112samples). Next to CONS, the second most frequently isolated Gram-positive bacteria were Staphylococcus aureus (9: 8.03% of 112 samples). The most frequently isolated Gram-negative bacteria were pseudomonas (12: 10.7% of 112 samples). The other isolated Gram negative bacteria were Klebsiella (08: 07.14% of 112 samples), E. coli (03: 02.67% of 112 samples) and Proteus (02: 01.78% of 112 samples). Table 4.

Table-4;Number of individual bacterial isolates and its percentage in this present study.

Name of bacteria	No. from pure growth	No. From mixed growth	Total no. & percentages (out of total 112 samples)
CONS	13	01	14 (12.50%)
S.aureus	08	01	09 (08.03%)
Pseudomonas	09	03	12 (10.71%)
Klebsiella	07	01	08 (07.14%)
E. coli	03	00	03 (02.67%)
Proteous	02	00	02 (01.78%)
Total	42	06	48 (42.85%)

Among these total 34 fungal isolates, the most common fungal isolate were Aspergillous (22: 19.64% of 112 samples).

The next common isolated fungus was Candida (12: 10.71% of 112 samples). Among the genus Aspergillus, the fumigatous sp. were 14 (12.50% of total 112 samples), the flavus sp. were 05 (04.46% of total 112 samples), and the niger sp. were 3 (02.67% of total 112 samples). Among the Candida genus, albican sp. were 09 (08.03% of total 112 samples) and nonalbicans sp. were 03 (02.67% of total 112 samples). No acanthomoeba parasite was isolated in this study. Table 5.

Table-5;Number of individual fungal isolates and its percentage in this present study.

Name of fungus	No. From pure growth	No. From mixed growth	Total no. & percentage (out of total 112 samples)
A.fumigatus	11	03	14 (12.50%)
A.Flavus	04	01	05 (04.46%)
A.Niger	03	00	03 (02.67%)
Total	18	04	
Total Aspergillous	18 + 04 = 22		22 (19.64%)
Candida Nonalbicans	08	01	09 (08.03%)
C.albicans	02	01	03 (02.67%)
Total	10	02	
Total Candida	10 + 02 = 12		12 (10.71%)
Total fungal growth	22 + 12 = 34		34 (30.35%)

All the bacterial isolates were undergone through antibiotic sensitivity testing by Kirby-Bauer disc diffusion method, following CLSI guide lines. The Gram-positive organisms were highly sensitive to meropenems, linezolide, vancomycin, 2nd generation quinolones, 4th generation cephalosporines and piperacilin-tezobactam. They are resistant to penicilin, ampicilin, amoxycilin, cloxacilin, 1st generation cephalosporines, 1st generation quinolones, cotrimoxazole, tetracycline, etc. The Gram-negative organisms were highly sensitive to tobramycin, kanamycin, meropenems, piperacilin-tezobactam, 2nd generation quinolones(levo/moxi/prulifloxacin) and 4th generation cephalosporines (cefepime and cefpirome) and 3rd generation cephalosporines (ceftriaxone-salbactam, ceftazidime, cefoperazone).

IV. DISCUSSION

At birth, the eyes are sterile. But, soon after birth the eyes are invaded by various microorganisms. The conjunctival sac and the lid margins of an eye harbour a variety of bacteria. The interior structures of an eye ball are sterile.[37] The microorganisms that are present normally as flora in conjunctival sac can be classified in two groups : a) the resident organisms which are constantly present in the eye and which if disrupted promptly re-establish themselves, b) the transient organisms which consist of non-pathogenic and potentially pathogenic organisms that inhabit the eye for short periods.[37] Almost any species of bacteria and fungi can invade the cornea, if the normal defence mechanisms of cornea are compromised. The present study describes the microbiological features of many culture proven cases of suppurative corneal ulcer, diagnosed at tertiary care hospital at Bhavnagar in Gujarat.

The suppurative corneal ulcers, caused by bacteria or fungi or both are rare in the absence of any predisposing factors. Until recently most cases of infective keratitis caused by bacteria or fungi or both are associated with ocular traumas or ocular surface diseases. But, the wide spread use of soft contact lenses has greatly increased the risk of infective keratitis, leading to suppurative corneal ulcers. It is estimated that the risk of suppurative keratitis is 10 to 15 times higher with the use of extended wear disposable contact lens.[38] However, in my present study there is no patient with the history of the use of contact lens.

In the present study, the most common predisposing risk factor, identified for the development of suppurative corneal ulcer, is ocular trauma. In my study, a history of corneal trauma associated with suppurative corneal ulcer is documented in 83 (74.1% of 112) patients. Among these trauma, 31 (27.67% of 112) patients have corneal injury with vegetative matter, 17 (15.17% of 112) patients have animal injury and 35 (31.25% of 112) patients acquired trauma by several other agents such as sand, stone, soil, wooden material, dirt, wire, flying insects, etc. Gopinath et al and many other researchers have found injury by vegetative material as the principal traumatic agent for the development of fungal keratitis.[39] Corneal injury caused with soil, sand, stone, animal material, etc. Leads to bacterial keratitis. In many other studies trauma is the far more common predisposing factor for suppurative corneal ulcer (both bacterial and fungal) in low income group of countries where it accounts for up to 77.5% of total cases.[39] The presence of organic substances within the wound represents a much higher risk than does the presence of non-organic substances.

After trauma, the positive history of co-existing ocular diseases such as dacrocystitis, entropion, trichiosis, chronic blepharitis, etc. represent the the second most common cause for suppurative corneal ulcer in this present study. Elderly people are more commonly effected by the co-existing ocular diseases, particularly those with rheumatoid disease. Trauma is more common in younger age group of patients those are engaged in any type of physical works in rural areas in low income group of countries.[40]

The age profile of patients, suffering from suppurative corneal ulcer, in this present study is comparable with previous other studies conducted by other researchers.[41,42,43] The biomodality in the patient,s age distribution can be attributed to corneal trauma in relatively younger age groups and predisposing coexisting ocular diseases in relatively older age groups. Suppurative corneal ulcers are rare in the absence of predisposing factors.

In many studies, it is found that suppurative corneal ulcers are commonly associated with contact lens related keratitis. Contact lens is now the major predisposing factor for suppurative corneal ulcer in The United States, Western Europe and many other developed countries and a major public health problem.[44,45] However, in my present study at Sir T. Hospital at Bhavnagar in Gujarat there is no patient with the history of contact lens use.

Male preponderance is noted in this present study. Out of 112 patients, selected for present study, the number of male patients are 63 (56.25%) and the number of female patients are 49 (43.75%). The number of patients coming from rural and urban area are 77 (68.75%) and 35 (31.25%) respectively. Both these sex and habitat differences are statistically significant. The reason behind this difference may be due to male, residing at rural area, are more exposed to field work.

The present study focuses on to the prevalence of bacterial, fungal and parasitic pathogens, causing suppurative corneal ulcers among the patients attending a tertiary care teaching hospital at the western part of India

A total of 112 samples which were obtained from patients, suffering from suppurative corneal ulcers, were analysed. Out of these 112 samples, 76 (67.85% of 112) samples had yielded growth for bacteria and/or fungus, i.e. cultures were positive. Pure bacterial growths were detected in 42 (37.5% of total 112 pts) cases and pure fungal growths were detected in 28 (25% of total 112 pts) cases. Mixed growths (both bacteria and fungus) were detected in 6 (5.35% of total 112 pts) cases. Taking the mixed growths into account, the total bacterial and fungal positive culture cases, out of total 112 samples, were 48 (42.85% of 112) and 34 (30.25% of 112) respectively.

As far as the bacterial and fungal causative agents were concerned in this study, bacteria were identified as the principal etiological agents for suppurative corneal ulcers. This is consistent with the findings of other studies, conducted at the different parts of the world. For examples, the bacterial keratitis have been reported to account for 32.3% of all cases of suppurative corneal ulcers from Madurai (South India),[46] 29.3% from Thiruchirapally (South India),[47] 35.6% from South Florida[48] and 25% from the south part of Ghana.[49] In marked contrast, a study performed in Nepal had documented the principal bacterial etiology of 63.2% among all the suppurative cotneal ulcers.[50] A high percentage of bacterial etiology in the study in Nepal may be due to corneal scraping performed before the use of topical antibiotic therapy.[47]

However, the fungus had been identified as the principal etiological agent for suppurative corneal ulcers by different researchers from the other part of India which was comparable to Shrinivasan et al,[08] Basak et al,[51] Bharathi et al,[01] Geethekumuri et al,[52] etc. and from other countries such as Japan,[53] Malaysia,[54] USA,[55] UK and from other developing and developed countries.

In this present study, the bacterial organisms isolated from suppurative corneal ulcers were Staphylococcus, Pseudomonas, Klebsiella, E. coli, and Proteus. Among the staphylococcus genus the coagulase negative staphylococci were the most common isolated organisms (14: 12.5% of total 112 samples). This is followed by Pseudomonas (12: 10.71% 0f total 112 samples), S.aureus (9: 8.03% of total 112samples), Klebsiella (08: 7.14% of total112 samples), E.coli (03: 2.67% of total 112 samples) and Proteus (02: 1.78% of total 112 samples). Currently, the indigenous bacteria such as CONS are increasingly being isolated from suppurative corneal ulcer and have become the principal bacterial pathogen responsible for suppurative corneal ulcer in our tertiary care teaching hospital. The same finding also have recently been observed by Vajpayee et al[40] in India and by several researchers in Europe [04]and United States.[56,57]

In this present study, the fungi isolated from suppurative corneal ulcer were Aspergillous and Candida. Among Aspergillous the most common isolated species was A. fumigatous (14: 12.50% of 112 samples) which is followed by A.flavus (05: 4.46% of 112 samples) and A. niger (03: 2.67% of 112 samples). Among Candida the most common isolated species were C non albicans (09: 8.03% of total 112 samples), followed by C.albicans (03: 2.67% of 112 samples).

In this study out of 112 patients, 34 (30.34% of 112) patients have positive fungal growth. This is less to reports from South India by Leck et al[47]and Bharti et al.[01] Our rate of incidences of positive fungal growth is also lesser to the study by Srinivasan et al [08] and much lesser to study by Basak et al.[51] However, it is similar to the study in Assam, Eastern India where the incidence of fungal keratitis is 32%.[58]

Worldwide fungal keratitis is a significant cause for ocular morbidity and blindness. The incidences of fungal keratitis vary with climate and it is more common in tropical regions. The contact lens wear increases the risk of fungal keratitis. Topical steroid use also associated with increased risk of fungal keratitis. Fungal keratitis often occurs following ocular trauma by vegetable matter. Thus, agricultural workers are at greater risk. So, fungal keratitis is more common in males than in females. In our present study, the fungal keratitis may be mainly due to trauma by vegetable matters. Because, in our patient series there is no history of contact lens use.

The present study is an attempt to explore the base line information about the principal microbial etiological agents, causing suppurative corneal ulcer and their sensitivity-resistance pattern to commonly used antimicrobial agents among the patients attending to Ophthalmology Department of Sir T. Hospital of Government Medical College at Bhavnagar in Gujarat. The facts and figures that have been reveled in this study are quite consistent with that of similar studies, conducted at different hospitals in this country and neighbouring countries by other researchers.

It indicates that microbial etiology of suppurative corneal ulcers has a particular geographical distribution with many predisposing factors that may contribute to it. The information about etiological agents and antibiogram that have been gathered in this study, can help the ophthalmologists of our hospital for proper management of cases. This information will also help

other ophthalmologist in managing their patients, especially those who are working at rural hospitals in this region and where microbiological laboratory facilities are lacking.

V. CONCLUSION

Suppurative corneal ulcer is an avoidable vision threatening disease. But, still it represents a considerable proportion of daily new OPD cases and creates a huge economic burden on the resources of national health services. The clinical presentation of bacterial and fungal corneal ulcer are often overlapping. So, confirmation by microbiological diagnosis is very essential in order to limit the ocular morbidity and to prevent the complications.

The present study is an attempt to to explore the base line information about the epidemiological factors, predisposing factors and major microbiological agents causing suppurative corneal ulcer among patients attending Ophthalmology Department of SiT. Hospital of Government Medical College at Bhavnagar in Gujarat. The facts and figures that have been revealed from this study are quite consistent with similar studies, done at home and in the neighbouring countries. This present study indicates that microbial etiology of suppurative corneal ulcer has a particular geographical distribution with many predisposing factors that may contribute to it.

In this study, male individuals residing at rural area are mainly suffering from the suppurative corneal ulcer following trauma as they are mainly exposed to different types of physical works, including agricultural works. Among these patients, majority are above 50 years.

In this study, the most common predisposing factor identified for the development of suppurative corneal ulcer is ocular trauma. Among these trauma, caused by vegetative matter is most prevalent. This is consistent with other studies which shows that trauma is the far more common predisposing factor for suppurative corneal ulcer in low income group of countries.

In this study bacteria are identified as the principal etiological agent than fungus for suppurative corneal ulcer. Out of 112 patients suffering from suppurative corneal ulcer, bacteria are identified in 48 patients. Among these bacteria CONS are the most prevalent causative microbial agents. Out of 112 patients, fungus is identified in 34 patients. Among these fungi Aspergillous is the most prevalent causative microbial agent.

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