Bacteriological Study of Conjunctivitis

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ABSTRACT

Introduction: Clinical evaluation and microbiological analysis is valuable for specific treatment. This study was undertaken to study the pattern of presentation and determine the bacterial profile of conjunctivitis.

Material and Methods: This is a clinical and laboratory-based study carried out in the Departments of Ophthalmology and Microbiology at Karnataka Medical College Hospital, Hubli for period of two years. Clinical data and Conjunctival swabs collected from 100 patients with clinically diagnosed conjunctivitis, were analysed by standard methods.

Results: Greater incidence is seen among children with a male preponderance. In culture studies, normal flora were isolated in 4 of the cases while pathogenic bacteria were isolated in 53%. Gram stain examination yielded 25% results suggestive of bacterial infection. Wright's staining of chronic conjunctivitis cases indicates a probable bacterial aetiology in 5 cases. Coagulase-positive staphylococci and Klebsiella pneumoniae emerged as the first and second most common causative bacteria of conjunctivitis. Ciprofloxacin emerged as the most effective drug.

Conclusion: This study provides to the ophthalmologist a working knowledge of the causal microbes, their common presentation, clinical course and antibiotic sensitivity pattern. This helps in effectively managing bacterial conjunctivitis.

Keywords: Conjunctivitis, clinical presentation, risk factors, bacteria, microbiological profile, Gram stain, culture-sensitivity, antibiotics

INTRODUCTION

Conjunctiva is a thin, translucent membrane lining the anterior part of the sclera and inside of the eyelids. It has 2 parts, bulbar and palpebral. The bulbar portion begins at the edge of the cornea and covers the visible part of the sclera; the palpebral part lines the inside of the eyelids. Inflammation or infection of the conjunctiva is known as conjunctivitis and is characterized by dilatation of the conjunctival vessels, resulting in hyperemia and edema of the conjunctiva, typically with associated discharge.[1,2] The incidence of conjunctivitis varies. It was 4.6% in primary school children in a centre in Delhi[2] and 3.27 per cent was reported from Patiala city.[3] The incidence of acute bacterial conjunctivitis ranges from 18.3%- 57% of all acute conjunctivitis in the United States.[4] Conjunctivitis is classified based on cause, like viral, bacterial, fungal, parasitic, toxic, chlamydial, chemical, and other allergic agents. Viral aetiologies are more common than bacterial, and incidence of viral conjunctivitis increases in the late fall and early spring. The aetiology often can be distinguished on clinical grounds. In keratoconjunctivitis, an associated corneal involvement is present. Fitch et al stated that viral conjunctivitis is found mostly in the summer, and bacterial conjunctivitis in winter and spring.[5] Bacterial conjunctivitis can be contracted directly from infected individuals or can result from abnormal proliferation of the native conjunctival flora.[6] Most causes of conjunctivitis are benign, with a self-limited process; however, depending on the immune status of the patient and the aetiology, conjunctivitis can progress to increasingly severe and sight-threatening infections. Chronic conjunctivitis is usually a source of frustration to both the patient and the ophthalmologist. The role of the emergency physician is to separate the conditions requiring more vigorous treatment and referral from those that can be handled satisfactorily in the emergency department. The standard of care for conjunctivitis, regardless of causative agent, continues to be antibiotics prescribed empirically. Topical antibiotics reduces the time of bacterial conjunctivitis, decrease transmissibility and quicken recovery while allowing earlier return to school or work.[7] The emergence of antibiotic resistant strains has made it imperative for the practitioner to be familiar with the clinical spectrum of conjunctivitis, the microbial agents responsible for it and the antimicrobial agents to combat it. Conjunctivitis with adequate treatment usually heals completely. Rarely complications like corneal marginal infiltrates, ulcers and cicatricial involvement of the lids, eyelashes and lacrimal passage may contribute to the morbidity and probable blindness. It is important to differentiate conjunctivitis from other sight-threatening eye diseases that have similar clinical presentation and to make appropriate decisions about further testing, treatment, or referral. An algorithmic approach using a focused ocular history along with a penlight eye examination may be helpful in diagnosis and treatment. Because conjunctivitis and many other ocular diseases can present as “red eye,” the differential diagnosis of red eye and knowledge about the typical features of each disease in this category are important.[4-7] Hence the diagnosis and treatment of conjunctivitis is important and with the view mentioned above, the present study was undertaken to assess and evaluate the bacterial flora in conjunctivitis.

MATERIAL AND METHODS

Clinical and laboratory-based descriptive study carried out in the Departments of Ophthalmology and Microbiology at Karnataka Medical College Hospital, Hubli for the period of two years. Total 100 patients with clinically diagnosed conjunctivitis were selected for the study. Clinical data and Conjunctival swabs collected by standard method Ethical Clearance taken from ethical committee of the institution and Informed consent was obtained from all patients or their guardians at the time of enrolment in the study. The scheme of work done in the present study is as selection of cases, history taking, examination of

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the case and investigations. A total of 100 clinically diagnosed cases of conjunctivitis have been selected at random among patients attending out-patient services of Department of Ophthalmology, Karnataka Medical College Hospital, Hubli, Karnataka for period of two years. Selection for the study was done irrespective of age, sex, occupation, and socio-economic status. Duration of less than 15 days was considered acute conjunctivitis and more than 30 days was considered chronic conjunctivitis. Cases with history of previous medication for similar complaints in the immediate past and trachoma and allergic conjunctivitis cases were excluded from the present study. A standard questionnaire is completed for each patient to evaluate the following- demographic factors, medical history, occupational and allergic histories, past and family histories, characteristics of the patient's ocular complaints, any previous diagnostic studies undertaken, the clinical diagnosis and treatment. All examinations were carried out by the same examiner. A complete external examination of each eye including lids, conjunctiva, cornea, preauricular and submandibular lymph nodes, slit lamp bio-microscopy of the anterior segment, application of Fluorescein to the ocular surface and Schirmer's test where needed. Condition of the lids is noted for any evidence of oedema, blepharitis, mucous crusts, madarosis, tylosis, trichiasis, ectropion, etc. Conjunctiva is examined for evidence of congestion, chemosis, ulceration, petechial haemorrhages, membrane formation, papillae, follicles, nodules, scarring, discoloration etc. Cornea is examined for any evidence of marginal keratitis, infiltration, ulceration, vascularization, etc. Lacrimal passage patency testing was done only in chronic conjunctivitis cases, where needed. Direct smear examination of conjunctival discharge/ scrapings by Gram stain and isolation by culture antibiotic sensitivity tests was undertaken. Wright's stain was done for chronic conjunctivitis cases. Conjunctival discharge from the site of maximal involvement in the more involved eye is collected using a flamed and cooled Kimura's platinum spatula or a sterile moistened applicator swab, avoiding contact with the lid margin and adjoining skin. The samples are immediately subjected for bacteriological studies. Direct smears are spread on glass slides and stained with Grams stain by which Gram positive and Gram negative organisms are differentiated. Wright's stain is done for cases of chronic conjunctivitis. The samples are first directly inoculated onto selective media like Blood agar, Chocolate agar and McConkey's medium. Bacteria are then identified on the basis of cultural characteristics and bio-chemical tests. The organisms isolated are then tested for antibiotic sensitivity against Ampicillin, Chloramphenicol, Ciprofloxacin, Co-trimoxazole, Erythromycin, Gentamicin, Norfloxacin, Penicillin and Tetracycline by the Kirby-Bauer method and the results are interpreted depending upon the diameter of the zone of inhibition.

Total No. of cases 80		
Bacterial species	**No. of positive culture**	**Percentage**
Coagulase positive staphylococci	31	38.75%
Klebsiella pneumoniae	9	11.25%
Pseudomonas aeruginosa	3	3.75%
Haemophilus species	1	1.25%
Diphtheroids	1	1.25%
Alkaligenes fecalis	2	2.50%
Non-fermentative Gram negative bacilli	1	1.25%
Paracolons	1	1.25%
Total	49	

Table-1: Bacterial isolates in acute conjunctivitis

Total No. of cases 20		
Bacterial species	**No. of positive cultures**	**Percentage**
Coagulase positive Staphylococci	4	20%
Coagulase negative Staphylococci	2	10%
Nisseria catarrhalis	1	5%
Klebsiella pneumonia	1	5%
Total	8	40%

Table-2: Bacterial isolates in chronic conjunctivitis

STATISTICAL ANALYSIS

SPSS version 21 was used for data analysis. Chi square test was used for comparison. Descriptive statistics like mean and percentage were also used.

RESULT

In the present study the highest incidence of conjunctivitis is seen in the younger age group i.e, 52% of cases are within 0-20 years (Table-1). The youngest patient is 4 days old and the oldest patient is 75 years. 4 cases of Ophthalmia neonatorum have been studied. A male preponderance is noted with 63 males and 37 females. Rural cases were more than urban cases probably because medical college hospital has a rural feeding population. Students, house-wives and agriculturists topped the list occupation wise. Conjunctivitis usually affects both eyes, either simultaneously or one after the other. In our study both eyes were affected in 84%. 55% of patients presented within four days of onset of complaints. A third of the cases reported within two days of onset of symptoms. Acute conjunctivitis was seen in 80% while chronic conjunctivitis in 20% (Table-2). Complications like subconjunctival haemorrhages were seen in 6% of the cases while superficial keratitis was seen in 4%. 30% of patients have a positive history of contact with persons having similar complaints. All the cases presented with red eyes. 62% had pricking or foreign body sensation while 26% had watering, 48% had discharge (mucoid, mucopurulent or purulent) and 5% had photophobia and defective vision

Total cases 20			
Cytology	**No. of cases with positive findings**	**Inference**	**Percentage**
Predominantly polymorphonuclear leucocytic response	4	Possible bacterial infection	25%
Predominantly lymphocytes	1	Viral infection	5%
Eosinophils	2	Allergic aetiology	10%

Table-3: Results of Wright's staining

each. In this study, conjunctival congestion is seen in all the cases, discharge in 76 cases, membrane formation in 03 cases, superficial corneal infiltrates in 04 cases, enlarged preauricular lymph nodes were palpated in 22 cases (10% were tender), lid oedema in 49 cases, matting of eyelashes in 38cases and preauricular lymphadenopathy in 22 cases. Bacteriological Investigations: All 100 patients underwent Gram stain and bacterial culture. The 20 cases of cases of chronic conjunctivitis underwent Wright's stain (Table-3). In the present study,57% of bacterial cultures yielded positive results while 25% of Gram stain was positive for bacterial infection. 20% of the Wright's stain showed predominant polymorphonuclear leucocytes, indicating a possible bacterial infection. The isolation of pathogenic bacteria is highest in elderly patients above 60 years (100%) and 88.88% in 51-60 years age group. Normal flora was seen in 04% while pathogenic bacteria was seen in 53%. Of the normal flora, two are Coagulase negative staphylococci, one is Neisseria catarrhalis and the other Diphtheroids. 61.25% of acute conjunctivitis cases yielded positive results in bacterial culture while 40% of chronic conjunctivitis were due to bacterial infections. All cases with purulent discharge are due to bacterial infection. Coagulase negative Staphylococci and Niesseria catarrhalis are considered to be normal commensals of the conjunctiva. Grams staining yielded gram positive cocci in 19%, gram negative cocci in 1% and gram negative bacilli in 5%. Rate of isolation of pathogens was 100% in cases with 5 to 6 days duration of disease and average of 60.6% when seen within first 4 days. In the present study, the organism with the highest sensitivity to antibiotics is Coagulase negative staphylococi 72.22% followed by Coagulase positive staphylococci with 48.88% sensitivity, Klebsiella pneumoniae with 36.66%, Pseudomonas, Diptheroids, Alkaligenes fecalis and non-fermenting Gram negative bacilli with 33.3% sensitivity each. Of the antibiotics used in the sensitivity studies, Ciprofloxacin emerged as the most effective drug with 69.42% effectively.

DISCUSSION

A September 2002 to October 2003 study of bacterial conjunctivitis by Okesola A O et al at Nigeria revealed Bacterial pathogens in 93.7% conjunctival samples. About one third were *Staphylococcus aureus, approx 10%* Coagulase-negative staphylococci, 22 (6.4%) *Pseudomonas aeruginosa,* 11(3.2%) *Escherichia coli*, 7(2.1%) Klebsiella species, 5(1.5%) *Streptococcus pneumoniae*, 4(1.2%) *Haemophilus influenzae*, 1(0.3%) *Proteus mirabilis,* and 1(0.3%) *Neisseria gonorrhoeae*. The maximum of conjunctivitis were found among infants and children (0-10years).[8] The rate of isolation of Coagulase positive staphylococcus is 35% in the present study. The rate in other studies varies from 8.0% to 72.5%.[9-12] In chronic conjunctivitis cases, the incidence of bacterial isolation was 25% in our study and comparable with 7% in a study by Peter A Rapoza et al,[13] 93% in a study by Sinha and Das[14] and 44% in a study by Blanco et al.[15] Antibiotic sensitivity results vary. In 1983 study by Mahajan V M, Coagulase positive staphylococci are most sensitive to chloramphenicol[16] whereas in the present study it was most sensitive to ciprofloxacin. In a 2002-2003 study by A. O. Okesola and A. O. Salako 67% of them were susceptible to ceftriaxone while only 39.2% were susceptible to chloramphenicol.[8]

Rose in 2007 systemically reviewed the literature on all aspects of the management of acute infective conjunctivitis undertaken. Acute infective conjunctivitis is a common presentation in primary healthcare. It is usually a mild condition and serious complications are rare. Clinical signs are a poor discriminator of bacterial and viral causes. Studies of treatment show that there is a high rate of clinical cure without any treatment. Treatment with topical antibiotics improves the rate of clinical recovery and this is more marked in the first 2-5 days after presentation, but less by 6-10 days. Studies comparing treatment with different antibiotics do not demonstrate that any one antibiotic is superior; the choice of antibiotic should be based on consideration of cost and bacterial resistance.[17] Rietveld et al measured the age-specific incidence of infectious conjunctivitis, described its management by Dutch general practitioners, and then compared these findings with the recommendations made in the guideline. They evaluated data from all patient contacts with 195 general practitioners from electronic medical records. They concluded that the management of infectious conjunctivitis by Dutch general practitioners was not in accordance with the recommendations of the consensus-based guideline published five years previously, despite its wide distribution.[18]

Bhat N et al conducted a questionnaire survey to assess the knowledge and prevalence of bacterial conjunctivitis among the dentist. They concluded that eye flu being an occupational hazard among dentists, personal ophthalmic prophylactic care is a must which helps in prevention of spread of infection to other patients and family members.[19] Al Wazzan et al assessed the prevalence of ocular injury and infection among dental personnel in Riyadh, Saudi Arabia. They assessed 204 dental personnel by the way of a questionnaire and observed that the response rate was 81%. Dentists and dental technicians had a similar prevalence of foreign bodies in their eyes during the period of one month. From the results, they concluded that protection of the eyes should be emphasised and practised at undergraduate level.[20] Ajayi et al determined the prevalence of ocular injury and the frequency of use of protective eye wear among the dental personnel of a teaching hospital. They structured a questionnaire and distributed it to dental personnel of Teaching Hospital working in the dental clinic and laboratory within a period of one month. They observed that ninety questionnaires out of 105 questionnaires were returned filled giving a response rate of 90.5%. 36.7% of the dental personnel were regular wearers of protective eye wear. 28.9% of males and 42.3% of females were regular wearers. From the results, they concluded that the frequency of using protective eye wear among the dental personnel of Teaching hospital was low.[21] Burr et al examined the associations between clinical signs of follicular trachoma (TF) and ocular colonization with four pathogens commonly found in the nasopharnyx, three years after the initiation of mass azithromycin distribution. From the above results, they concluded that clinical signs of TF can persist in communities even when ocular C. trachomatis infection has been controlled through mass azithromycin distribution. In these settings, TF may be associated with ocular colonization with bacteria commonly carried in the nasopharnyx.[22] Petrovay et al determine the prevalence of C. trachomatis, to describe the distribution of serovars among patients with conjunctivitis and to characterize the relationship between the prevalence and

patient demographics such as age and gender. They concluded that comparative genotyping of C. trachomatis in ocular and genital specimens might give more detailed epidemiological information about the aetiology of the disease.[23]

CONCLUSION

Bacteriological investigations done for a hundred clinically diagnosed cases of conjunctivitis gave the following conclusions-usually bilateral involvement with greater incidence among children, males and rural residents. The fact that 33% of patients reported within 2 days of onset, establishes the fact that conjunctivitis hinders daily activities. Gram stain examination yielded 25% results suggestive of bacterial infection. Coagulase positive staphylococci are the commonest isolate in both acute and chronic conjunctivitis cases. Klebsiella pneumoniae emerged as the second most common causative bacteria of conjunctivitis. Ciprofloxacin emerged as the most effective drug. Antibiotic therapy should be considered in cases of purulent or mucopurulent conjunctivitis and for patients. Thus, to conclude, bacteriological evaluation of conjunctivitis provides to the ophthalmologist a working knowledge of the causal microbes, their common presentations, clinical course and antibiotic sensitivity patterns along with confirming the clinical diagnosis. It also helps to avert the use of inappropriate medications and reduce the risk of drug resistant strains. To achieve this end, public awareness particularly of conjunctivitis, its cause, routes of spread and medical management should be sought.

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