International Journal of Otorhinolaryngology and Head and Neck Surgery
Kamble A et al. Int J Otorhinolaryngol Head Neck Surg. 2017 Jul;3(3):496-500
http://www.ijorl.com
pISSN 2454-5929 | eISSN 2454-5937

Original Research Article

DOI: http://dx.doi.org/10.18203/issn.2454-5929.ijohns20172711

Microbiological profile in chronic rhinosinusitis patients in a rural hospital of India

Ajay Kamble[1], Deepika Garg[2]*, Manish Puttewar[3], P. S. Nagpure[4]

[1]Assistant Professor, Department of ENT-HNS, GMC, Chandrapur, Maharashtra, India
[2]Assistant Professor, [3]Professor, [4]Professor & HOD, Department of ENT-HNS, MGIMS, Sevagram, Wardha, Maharashtra, India

Received: 01 June 2017
Revised: 13 June 2017
Accepted: 15 June 2017

***Correspondence:**
Dr. Deepika Garg,
E-mail: deepikagarg@mgims.ac.in

ABSTRACT

Background: Chronic rhinosinusitis is one of the most common health problem a detailed microbiological profile of which is necessary to guide its proper management. The aim of this study was to identify the microbial pattern present in chronic rhinosinusitis (CRS) patients undergoing functional endoscopic sinus surgery at a rural tertiary care hospital in India.
Methods: A prospective study was done in ENT department of MGIMS, Sewagram over a period of 2 years. A total of 94 patients were included in the study. They were clinically diagnosed to have chronic sinusitis and confirmation was done by CT imaging of paranasal sinuses. During FESS, sinus secretions were aspirated and were subjected to bacterial and fungal culture. Bacterial and Fungal pathogens were identified according to the standard protocol.
Results: In the 94 patients, the mean age was 33.44 years and Male female ratio was 1.08: 1. *Staphylococcus* was the commonest organism isolated in 54 cases (57.4%) followed by *Streptococcus pneumoniae* in 5 cases (5.3%), *Klebsiella* in 1 case (1.1%), *E.coli* in 1 case (1.1%) and *Pseudomonas aerogenosa* in 1 case (1.1%).Fungus (Aspergillus niger) was isolated in 2 patients (2.1%) and no pathogens were found in 30 (31.9%) patients.
Conclusions: In CRS bacterial etiology is the commonest.

Keywords: Chronic rhinosinusitis, Microbiology, Staphylococcus, Aspergillus, Functional endoscopic sinus surgery

INTRODUCTION

The term chronic rhinosinusitis (CRS) is defined as a group of disorders characterized by inflammation of the mucosa of nose & paranasal sinuses of at least 12 consecutive weeks duration.[1]

CRS is one of the most common health problem, with significant medical costs and severe impact on lower airway diseases and general health.[2,3]

According to The National Institute of Allergy and Infectious Diseases in India, chronic sinusitis affects nearly 134 million people, making it the country with the second largest number of sufferers in the world. Patients suffering from chronic sinusitis also often complain of lower workplace productivity and social embarrassment as well as an overall decline in self-confidence.

No one single treatment regimen exists for the management of CRS because of its heterogeneity. However, the principles involved in the treatment of CRS include identifying and treating the underlying causes. Goals of treatment are reduction of mucosal oedema, restoration of paranasal sinus ventilation and eradication of infectious pathogens. Giving antimicrobial therapy

empirically, not based on isolation and sensitivity of microorganism, is leading to increasing incidence of resistance in many organisms and making the management of these infections more complex. Detailed microbiological data is therefore essential in guiding the treatment of chronic sinusitis. The aim of this study was to isolate and identify the causative organism of chronic sinusitis in patients undergoing functional endoscopic sinus surgery. This also helps create local culture and antibiotic sensitivity data available to the hospital and nearby community which can be used for initial empiric management of chronic rhinosinusitis.

METHODS

Ninety-four patients of CRS attending Otorhinolaryngology & Head Neck Surgery OPD of MGIMS over a period of 2 years since 1st August 2010 to 31st September 2012 were included in the present study.

Inclusion criteria

Inclusion criteria were patients with history of running of nose for more than 12 weeks; age above 18 years; written informed consent of the patient to participate in the study along with routine surgical consent format of the hospital.

Exclusion criteria

Exclusion criteria were age less than 18 years; history of previous nasal or sinus surgery; acute rhinosinusitis; malignancies, diabetes, tuberculosis; pregnancy, lactation; patients who are not willing for participate in study.

This was a prospective randomized controlled study in which detailed history was taken from all cases along with recording of their symptoms:

Nasal discharge, nasal obstruction, headache, facial pain / pressure, post nasal drip, sneezing, epistaxis, sense of smell, sense of taste, mouth breathing, snoring, halitosis, pain in throat, cough, ear ache, ear fullness change of voice, fever.

This was followed by detailed ear, nose, and throat (ENT) examination. In nasal examination, anterior rhinoscopy, posterior rhinoscopy and paranasal sinus examination was carried out. Clinical diagnosis of chronic rhinosinusitis was arrived. X ray PNS water's view and nasal endoscopic examination was done apart from routine investigations (complete blood count, Urine examination).

CT scan was carried out to see the status of sinuses and scoring of disease was done by Lund & Mackay Scoring System. Only patients who were symptomatic or having evidence of disease on CT scan were planned for Functional Endoscopic Sinus Surgery (FESS) under general anaesthesia.

Specimen collection

When patients with chronic sinusitis underwent FESS, specimens were taken under endoscopic guidance from the middle meatus (after performing Uncinectomy) and from ethmoid sinus (after performing ethmoidectomy) using a sterile syringe for aspiration of the secretions. The specimens were sent, for Gram's staining, Aerobic, Anaerobic and Fungal Culture, to the laboratory within 4 hours of collection.

Bacterial culture

The specimen was inoculated on Chocolate agar, Blood agar and MacConkey agar. The Chocolate agar plates were incubated in 5-10% co2 in a co2 incubator at 37^0C for 24 – 48 hour. The Blood agar and MacConkey agar plates were incubated in bacteriological incubator at 37^0C for 24 hrs. The plates were checked for growth of bacteria and morphology of colony. Gram's staining was done to visualize the Bacterial morphology and Hanging drop test was done for motility.

Fungal culture

The specimen was inoculated on Sabouraud dextrose agar with chloramphenicol (to prevent contamination of the medium by bacteria), in a BOD (Bio-oxygen demand) incubator at 28^0C and examined for 7 to 10 days. Depending upon microscopic appearance and morphology of colony the isolate is identified.

Statistical evaluation

The data was entered in MS excel and analysis was performed using the MS excel and SPSS for windows, version 17.

RESULTS

The present study was carried out in 94 subjects with CRS in the Department of Otorhinolaryngology and Head Neck Surgery.

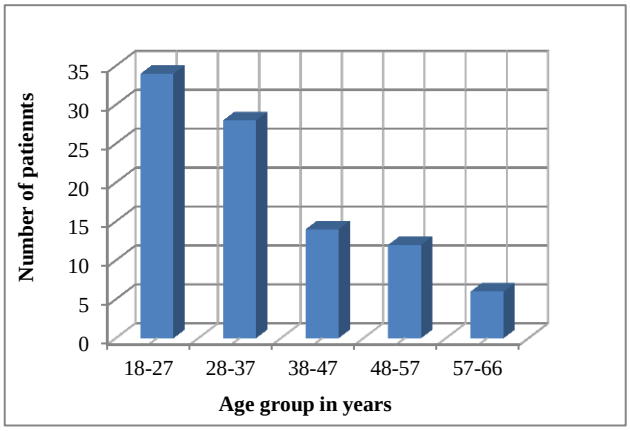

Figure 1: Age distribution of patients.

Age distribution

In our study, patients ranged from age 18 years to 64 years. The minimum age was 18 and maximum age was 64 years.

Maximum number of patients i.e. 34 (36.17%) were in the age group of 18-27 years, followed by 28 (29.78%) in age group of 28 to 37 years. There were 14 (14.89%) patients in the age group of 38-47 years followed by 12 (12.76%) patients in the age group of 48-57 years. There were 6 (6.38%) patients in the age group of 57-66 years. The mean age of the patients is 33.44 years.

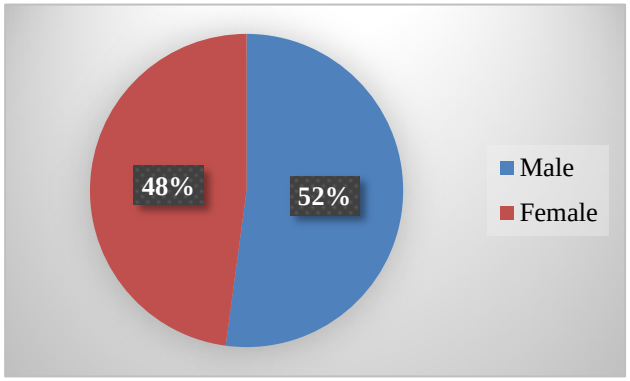

Figure 2: Sex distribution of patients.

Sex distribution

In the present study, 49 (52.1%) patients were males while 45 (47.8%) were female. There is slight male preponderance. Male female ratio in our study was 1.08: 1 (M: F ratio 1.08:1).

Microbiology of CRS (n =94)

In this study, Staphylococcus was the commonest organism isolated in 54 cases (57.4%). Among these 54 cases, oxacillin sensitive coagulase positive (OSCP) staphylococcus were present in 44 cases (81.4%), followed by oxacillin resistant coagulase positive (ORCP) Staphylococcus were present in 6 cases (11.1%), and oxacillin resistance coagulase negative (ORCN) Staphylococcus were present in 4 cases (7.4%).

Next common organism isolated was *Streptococcus pneumoniae* in 5 cases (5.3%).

Klebsiella was found in 1 (1.1%), *E. coli* in 1 (1.1%) and *Pseudomonas aerogenosa* in 1 (1.1%).

Fungus (*Aspergillus niger*) was isolated in 2 patients (2.1%). No pathogen was found in 30 (31.9%) patients (Table 1 and Figure 1).

Table 1: Microbiology of CRS (n =94).

Serial no.	Organism	No. of cases	Percentage
1	*Staphylococcus*	54	57.4%
	Sub- division of 54 cases of Staphylococcus		
	a) OSCP 44 81.4%		
	b) ORCP 6 11.1%		
	c) ORCN 4 7.4%		
2	*Streptococcus pneumoniae*	5	5.3%
3	*Klebsiella*	1	1.1%
4	*E. coli*	1	1.1%
5	*Fungus (Aspergillus niger)*	2	2.1%
6	*Pseudomonas aerogenosa*	1	1.1%
7	No pathogen	30	31.9%

DISCUSSION

CRS is one of the most frequent diseases encountered worldwide. Statistics from Centre for disease control indicate that 16.3% of the adult population is affected by this condition in United States and 5% to 15% population in Europe.[4] Because of its prevalence of 14 – 16%, almost 2 per cent of outpatient visits to primary care offices, speciality practices or emergency departments are due to complaints of rhinosinusitis.[1,5] The incidence of sinusitis has increased dramatically with the increasing incidence of asthma, allergies, & other upper respiratory tract infections.[6]

There is general agreement in the medical literature that bacteria are present within the paranasal sinuses in most patients with CRS. The maxillary antrum and the middle meatus are generally considered sterile (or at least not typically colonized with bacteria considered pathogenic) in normal populations.[7]

In patients with clinical and radiographic evidence of CRS, 50% to 90% demonstrate recoverable bacteria from the ethmoid or maxillary sinuses. In a study conducted by Jiang et al, patients undergoing surgery for CRS, 53.1% of the patients' maxillary sinuses and 34.5% of the patients' ethmoid sinuses contained bacteria.[8] Most of

these isolates were aerobic bacteria with a limited anaerobic recovery rate.

By examining only purulent secretions rather than mucosal swabs or tissue culture, Klossek et al found very interesting results wherein Secretions were positive for bacteria in 83.1% of cases of CRS, with the majority manifesting only anaerobic organisms, followed by mixed cultures and then strict anaerobes.[7]

Fungal presence may be relatively benign, colonising normal paranasal sinuses or forming saprophytic crusts but it may cause potentially life threatening invasive disease. In the past, allergic fungal rhinosinusitis, a subgroup of CRS, typically demonstrated high eosinophilic mucin production containing non-invasive fungal hyphae.[9] This fungal presence was thought to play an alternate role in the development of CRS, whereby it has been hypothesized that patients became sensitised by colonising fungi through a non-IgE mediated mechanism. This pathway would lead to a local eosinophilic chemotaxis, inflammation, and tissue damage causing nasal polyposis.[9]

Mortimore et al found in his study that *Streptococcus milleri* and *Haemophilus influenzae* were the commonest organisms isolated from sinus aspirates (44%), with a noticeable absence of *Streptococcus pneumoniae*.[10] Organisms cultured from intracranial, soft tissue or orbital empyemas were predominantly *Streptococcus milleri* (50%) and *Staphylococcus aureus* (25%) with an absence of *Haemophilus influenzae* and *Streptococcus pneumoniae*.

Table 2: Comparative study showing microbiology of CRS.

Author	Year	*Staphylo-coccus*	*Strepto-coccus*	*H.influ enzae*	*Klebsiella*	*E.coli*	*Pseudomonas*	*Aspergillus niger*
Biel et al[11]	1998	36%						
Nadel et al[12]	1998						16%	
Rombaux et al[15]	2002	35%	13%	2.7%				
Present study	2012	57.4%	5.3%		1.1%	1.1%	1.1%	2.1%

Biel et al examined the cultures of purulent secretions encountered at the time of surgery and identified bacterial isolates in 94% of the patients, with 19.5% of the patients having a polymicrobial infection, coagulase-negative *Staphylococcus* species were the most common isolates (36%), followed by *S. aureus* (25%).[11]

Nadel et al found a prevalence of 27% of gram-negative rods and a 16% prevalence of *Pseudomonas* species in patients with CRS.[12] Similar findings were reported by Bolger.[13]

Keech et al examined maxillary and ethmoid sinus specimens with the polymerase chain reaction (PCR) where out of 64 samples, 62% had aerobic bacteria evident on PCR analysis.[14]

In a study by Rombaux et al., 148 samples were studied.[15] Culture rate was 73.6%. Thirty nine samples remained sterile. In the 109 culture positive specimens, 135 bacterial isolates were recovered. The main results are: *Staphylococcus coagulase* negative: 31, *Staphylococcus aureus*: 22, *Streptococcus* sp: 20, *Haemophilus influenzae*: 4. [15]

The present study correlates with studies of Biel et al, Rombaux et al in which the most common organism isolated in CRS is staphylococcus.[11,15]

CONCLUSION

This study was carried out in patients of chronic rhinosinusitis (CRS) that presented in the Department of Otorhinolaryngology and Head Neck Surgery over a period of 2 years. Total 94 patients participated in the study with age ranging from 18 years (minimum) to 64 years (maximum). The mean age of the patients was 33.44 years. Staphylococcus was the commonest organism isolated in 54 cases (57.4%) followed by *Streptococcus pneumoniae* in 5 cases (5.3%), *Klebsiella* in 1 case (1.1%), E.coli in 1 case (1.1%) and *Pseudomonas aerogenosa* in 1 case (1.1%).Fungus (*Aspergillus niger*) was isolated in 2 patients (2.1%) and no pathogens were found in 30 (31.9%) patients.

Limitation

One of the limiting factors of this study is the fact that patients were started on antibiotics before they were taken for the surgery and this could affect the isolation of organisms from the biological fluid- specimen (pus) collected. Nevertheless this study gives us a important insight into the common organisms isolated in chronic rhinosinusitis from a particular geographic area in rural India. Also it stresses the need for more such type of studies at regular intervals and at various places across the country to establish data about common culprit organisms in chronic rhinosinusitis thus helping in their initial empiric management and at times definitive management where microbiological data are not always available.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Benninger MS, Ferguson BJ, Hadley JA, Hamilos DJ, Jacobs M, Kennedy DW, et al. Adult chronic rhinosinusitis: Definitions, diagnosis, epidemiology & pathophysiology. Otolaryngol Head Neck Surg. 2003;129:1-32.
2. Gliklich RE, Metson R.The health impact of chronic sinusitis in patients seeking otolaryngologic care. Otolaryngol Head Neck Surg. 1995;113(1):104-9.
3. Kaliner MA, Osguthorpe JD, Fireman P, Anon J, Georgitis J, Davis ML, et al. Sinusitis: bench to bedside. Current findings, future directions. Otolaryngol Head Neck Surg. 1997;116(6):1-20.
4. BlackwelI DL, Collins JG, Coles R. Summary health statistics for US adults: National Health Interview Survey. Vital Health Stat. 2002;10:205.
5. Schappert SM, Burt CW. Ambulatory care visits to physician offices, hospital outpatient departments, and emergency departments: United States, 2001-02. Vital Health Stat. 2006;13(159):1-66.
6. McCaig LF, Hughs JM. Trends in antimicrobial drug prescribing among office –based physician in the United States. J Am Med Assoc. 1995;273:214-9.
7. Klossek JM, Dubreuil L, Richet H, Richet B, Beutter P. Bacteriology of chronic purulent secretions in chronic rhinosinusitis. J Laryngol Otol 1998,112:1162–6.
8. Jiang RS, Jang JW, Hsu CY. Bacteriology of chronic sinusitis after amoxicillin-clavulanate potassium therapy. Otolaryngol Head Neck Surg. 2001;124:683–6.
9. Meltzer EO, Hamilos DL, Hadley JA, Lanza DC, Marple BF, Nicklas RA, et al. Rhinosinusitis: Establishing definitions for clinical research and patient care. Otolaryngol Head Neck Surg 2004;131(6):1-62.
10. Mortimore S, Wormald PJ. The Groote Schuur hospital classification of the orbital complications of sinusitis. J Laryngol Otol. 1997;111(8):719-23.
11. Biel MA, Brown CA, Levinson RM, Garvis GE, Paisner HM, Sigel ME, et al. Evaluation of the microbiology of chronic maxillary sinusitis. Ann Otol Rhinol Laryngol. 1998,107:942–5.
12. Nadel DM, Lanza DC, Kennedy DW. Endoscopically guided cultures in chronic sinusitis. Am J Rhinol. 1998;12:233–41.
13. Bolger WE, Butzin CA, Parsons DS. Paranasal sinus bony anatomic variations and mucosal abnormalities: CT analysis for endoscopic sinus surgery. Laryngoscope. 1991;101:56-64.
14. Keech DR, Ramadan H, Mathers P: Analysis of aerobic bacterial strains found in chronic rhinosinusitis using the polymerase chain reaction. Otolaryngol Head Neck Surg. 2000;123:363–7.
15. Rombaux P, Gigi J, Hamoir M, Eloy P, Bertrand B, Bacteriology of chronic sinusitis: the bulla ethmoidalis content. Rhinol. 2002;40(1):18-23.

Cite this article as: Kamble A, Garg D, Puttewar M, Nagpure PS. Microbiological profile in chronic rhinosinusitis patients in a rural hospital of India. Int J Otorhinolaryngol Head Neck Surg 2017;3:496-500.