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INCIDENCE OF NASAL COLONIZATION WITH *PSEUDOMONAS* AND *STAPHYLOCOCCUS* IN CASES OF ACUTE AND CHRONIC SINUSITIS AND RELEVANCE OF CULTURE SENSITIVITY

ENT

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KEYWORDS

Pseudomonas, Staphylococcus, Acute and Chronic Sinusitis, Culture Sensitivity,MRSA

INTRODUCTION

Rhinosinusitis refers to an inflammatory condition involving the nasal sinuses. Acute rhinosinusitis—defined as sinusitis of less than 4 weeks' duration—constitutes the vast majority of sinusitis cases. Chronic sinusitis is characterized by symptoms of sinus inflammation lasting more than 12 weeks.[1]Sinusitis is a common condition, with between 24 and 31 million cases occurring in the United States annually.[2][3] Chronic sinusitis affects approximately 12.5% of people.[4]

Data on incidence of rhinosinusitis in India and the causative organisms for acute and chronic rhinosinusitis is still not definitive and consistent. Along with a shortage of exact microbiological flora, there are no clear guidelines on when to get a culture and sensitivity testing done in cases of rhinosinusitis.

OBJECTIVES

1. To see the incidence of *Pseudomonas* and *Staphylococcus* incases of Acute and Chronic Sinusitis.
2. To see the Relationship of *Pseudomonas* and *Staphylococcus* with severity of Acute and Chronic Sinusitis.
3. To suggest antibiotic of choice in management of Acute and Chronic Sinusitis.
4. To see the relevance of culture sensitivity in management of Acute and Chronic Sinusitis.

METHODS

STUDY DESIGN: The present study was a cross-sectional, prospective, observational study carried out in Barabanki District and Microbiology laboratory of our institute.

STUDY POPULATION: This included patients suffering from acute or chronic rhino-sinusitis in all socioeconomic status categories including both rural and urban population in Barabanki district.

SAMPLE SIZE: 127 patients were evaluated in the present study.

SELECTION CRITERIA:

INCLUSION CRITERIA

a. All the patients suffering from acute or chronic rhinosinusitis were taken up in the study. The diagnostic criteria were both clinical and radiological.

b. Clinically: Patients suffering from symptoms such as nasal obstruction due to congestion, nasal discharge, headache, decreased sensation of smell, fever, sore throat, halitosis, post nasal drip and cough that usually worsens at night and sinus tenderness were taken up for study. Symptoms were graded according to the SINO-NASAL OUTCOME TEST (SNOT-20) by Jay P. Piccirillo, M.D., Washington University School of Medicine, St. Louis, Missouri.

c. Radiologically: Classification system of Gliklich and Metson was used which is as follows -

Stage 0: Less than 2 mm mucosal thickening on any sinus wall
Stage I: Include all unilateral disease or anatomical abnormalities
Stage II: Bilateral disease limited to the ethmoid or maxillary sinuses
Stage III: Bilateral disease with involvement of at least one sphenoid or frontal sinus
Stage IV: Pansinusitis

X-Ray views – Both occipitomental (Water's view) and Occipito frontal views were obtained.

EXCLUSION CRITERIA

There were no exclusion criteria and all the patients suffering from rhino-sinusitis and fulfilling the above criteria and who consented were considered in the study.

DATA COLLECTION

After proper enrolment of subjects, information was noted in a preformed questionnaire which includes identification, demographic details, medical history, and physical examination.

SAMPLE COLLECTION

The standard method described was followed: -

- After washing hands and wearing sterile gloves, peel open the sterile culture swab and remove the swab stick from the sterile tube.
- The nasal vestibule was disinfected using betadine, and a sterile nasal speculum was used to avoid contamination of the swab by the microorganisms present in the nasal vestibule
- The swab was inserted approximately 2 cm into the nares in the region of middle meatus taking precautions of avoiding contamination from other sites. This is the preferred site as it is the confluence of opening of majority of the sinuses. The swab was then rotated against the nasal mucosa for 3 seconds. The swab was then removed and placed back into the transport tube which was sealed.
- A separate swab was used, and the procedure was repeated on the other naris.
- Specimens were transported to the laboratory immediately. The time between the collection of materials and the inoculation of the specimen did not exceed 30 minutes.

SAMPLE PROCESSING

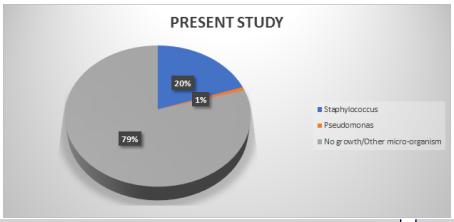
The culture of the bacteria was done bystreak plate culture followed by culture sensitivity testing using Kirby Bauer disc diffusion method.

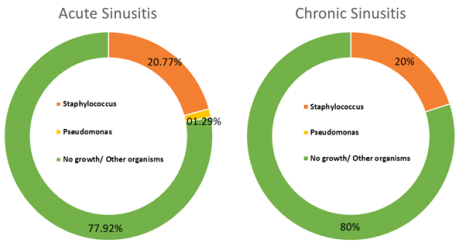
ETHICAL CONSIDERATION

The proposed study has been cleared by the institutional ethical committee.

OBSERVATIONS

Samples collected from 127 patients of rhinosinusitis comprised of 77 patients of acute rhinosinusitis and 50 patients of chronic rhinosinusitis. Out of 127 samples, 27 (21.25%) showed growth on culture media after 24 hours. Out of the samples which showed growth 10 were from patients of chronic rhinosinusitis while 17 were from patients of acute rhinosinusitis. Of the total culture positive samples, 25 (92.5%) were positive for *Staphylococcus aureus* making the overall percentage of staphylococcal rhinosinusitis 19.68% of total patients. 1 (3.7%) sample was positive for *Pseudomonas* making the overall percentage of *Pseudomonas* infection 0.78% of total patients. It was found that 22% (17/77) of the patients suffering from acute sinusitis showed a growth while 20% (10/50) of the patients of suffering from chronic sinusitis showed a growth on culture media, making the incidence of culture positive cases almost similar in both acute and chronic rhinosinusitis.

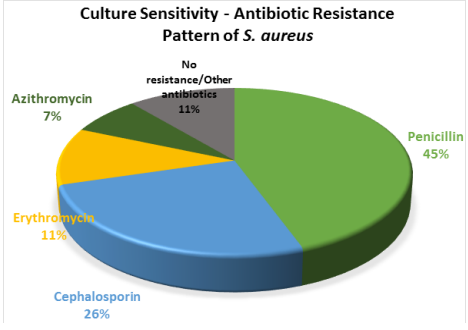




	Acute Sinusitis	Chronic Sinusitis	Total
Specimen	N = 77 (60.62%)	N = 50 (39.38%)	N = 127
Staphylococcus aureus	16 (20.77%)	10 (20%)	26
Pseudomonas	01 (1.29%)	00 (0%)	01
No growth after 24 hours/ Other micro-organisms	60 (77.92%)	40 (80%)	100

Antibiotic sensitivity testing was done by disc diffusion method. Antibiotics used were Doxycycline, Erythromycin, Rifampicin, Azithromycin, Cotrimoxazole, Clindamycin, Ampicillin- Sulbactam, Imipenem, Ciprofloxacin, Levofloxacin, Gentamicin, Tobramycin, Cefuroxime, Ceftriaxone, Cefoxitin, Vancomycin, Linezolid, Teicoplanin, Penicillin and Amoxycillin.

Out of the 26 isolates of *Staphylococcus aureus,* 12 samples (44.44%) were resistant to penicillin, 7 samples (25.92%) were resistant to cefoxitin, three samples (11.11%) were resistant to erythromycin, 2 samples (7.4%) were resistant to doxycycline as well as azithromycin.



DISCUSSION

The nose represent an important bacterial reservoir for endogenous infections, Nasal carriage is a major risk factor for *Staphylococcus aureus* infection, especially for methicillin-resistant strains (MRSA). Despite the different studies approaching the subject of Chronic Rhinosinusitis (CRS), we still do not have a clear understanding of the true pathogenic mechanisms and agents involved in this disease. Choosing the right antibiotic for Acute and chronic sinusitis has always been a dilemma as is the role of culture sensitivity.

Nicolas Y.Busaba, Noah S.Siegel, Salah D.Salmanconducted a study in chronic sinusitis which showed that 40% of patients (72/179) grew pathogenic aerobic bacteria, the most common was Staphylococcus aureus (18%) which is very similar to our study in which it was 20%

Bruce H. Hamory, Merle A. Sande, Austin Sydnor, Jr. Daniel L. Seale, Jack M. Gwaltney, Jr. in their study of 105 samples found 2% incidence of *Staphylococcus aureus* and 2% incidence of *Pseudomonas*.[5] The incidence of *Pseudomonas* is very similar to ours which was 1% but the incidence is far lower for *Staphylococcus aureus* than our series which was 20%

Valin Rujanavej, Ethan Soudry, Niaz Banaei, Ellen Jo Baron, Peter H. Hwang, Jayakar V. Nayakin their studies retrieved 10,387 positive intranasal culture samples, with *S. aureus* found in 800 (7.7%), and MRSA comprising 110 (1.06%) of this subset.[6] In their study also incidence of *Pseudomonas* is very similar to ours series which was 1% but the incidence is far lower for *Staphylococcus aureus* than our series which was 20% John Hsu, Donald C. Lanza, Dr. David W. Kennedy, found the most frequently isolated organisms were *Staphylococcus aureus* 20 (28%); *Pseudomonas aeruginosa*, 12 (17%) out of a total of 43 positive cultures.[7]In their study incidence of *Pseudomonas* is much higher than ours series which was 1% but the incidence of *Staphylococcus aureus* issimilar to our series which was 20%.

Todd T.Kingdom and Ron E.SwainJr showed in their study of 182 cultures that Staphylococcus aureus was isolated in 24% of cultures and Pseudomonas aeruginosa was isolated in 9% of cultures.[8] In their study incidence of *Pseudomonas* is much higher than ours series which was 1% but the incidence of *Staphylococcus aureus* is similar to our series which was 20%.

Karina Mantovani ; Andréia Alessandra Bisanha ; Ricardo Cassiano Demarco ; Edwin Tamashiro ; Roberto Martinez ; Wilma Terezinha Anselmo-Lima showed that Of the 62 samples studied, in 33 (53.2%) there was no growth of microorganisms; *Pseudomonas aeruginosa* was isolated in 8 samples (27.6%), *Staphylococcus aureus* and *Staphylococcus epidermidis* in 4 samples each (13.9%).[9]In their study incidence of *Pseudomonas* is much higher than ours series which was 1% and the incidence of *Staphylococcus aureus* is much lower than our series which was 20%.

In standard practice all the patients suffering from Acute sinusitis or Acute Exacerbations of Chronic Sinusitis are given

- Amoxicillin (500 mg) + Clavulanic Acid (125 mg) x BD x 7 days
- And supportive medicines

(Patients allergic to Ampicillin group are given Cefpodoxime (200 mg) + Clavulanic Acid (125 mg) x BD x & 7 days (a cephalosporin) along with supportive medicines). Sometimes Azithromycin or Erythromycin are also given.) As per the culture sensitivity report about 45% culture positive patients were resistant to Penicillin (first line antibiotic) and about 30% culture positive patients were resistant to cephalosporin (second line antibiotic), about 11% culture positive patients were resistant to Erythromycin and 7% culture positive patients were resistant Azithromycin, hence we found that it is important to do a culture sensitivity test in all cases of sinusitis before starting treatment of acute and chronic sinusitis to achieve early cure.

CONCLUSION

In the present study we conclude that

1. The overall incidence of *Staphylococcus aureus* and *Pseudomonas* in acute and chronic sinusitis is high (upto 21%), the former being more common.
2. It was found that 22% (17) of the patients suffering from acute sinusitis showed a growth while 20% (10) of the patients of suffering from chronic sinusitis showed a growth of *Staphylococcus aureus* on culture media.
3. The incidence of *Staphylococcus aureus* was quite high i.e. upto 21% in both acute and chronic sinusitis and hence can be correlated to severity. However, in our study, *Pseudomonas* could not be correlated with severity of either acute or chronic sinusitis. Further study with higher number of patients may establish the correlation.
4. Although the incidence of MR *Staphylococcus aureus* is quite low (5.51% of the total 127 patients), we found that it is important to do a culture sensitivity test in all cases of sinusitis before starting treatment of acute and chronic sinusitis to achieve early cure.

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