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Microbial Incidence In Acute Pharyngitis Using Throat Swab Analysis

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Abstract

Objective: The inflammatory response of mucous membranes in the oropharynx is acute pharyngitis, often due to infection by various microorganisms, including fungi, viruses, and bacteria. The study objective was to identify the spectrum of microorganisms responsible for acute pharyngitis by analysing throat swab specimens.

Methods: An observational cross-section was conducted at the ENT Department of Akbar Niazi Teaching Hospital between February and July 2023. The study comprised 100 patients diagnosed with acute pharyngitis. Throat swabs were aseptically collected from all patients and sent for culture. The microorganisms were identified using biochemical procedures, and their susceptibility to antimicrobic agents was determined using conventional techniques. SPSS v 25 was used for data analysis.

Results: Microorganisms were identified in 30 out of 100 specimens, with no growth observed in the remaining 70 specimens. The most commonly identified organism was Streptococcus pyogenes, found in 90% (n=27) of cases, subsequently Staphylococcus aureus at 60% (n=18) and Candida albicans at 13% (n=4). In 43.3% of cases, a solitary pathogen, Streptococcus pyogenes in 12 cases (92.3%) and Staphylococcus aureus in 1 (7.7%) were identified. The remaining 56.7% of culture reports indicated mixed infections.

Conclusion: It was found that Streptococcus pyogenes and Staphylococcus aureus were the primary causes of single infection, whereas Candida albicans, in conjunction with bacteria, were isolated in cases of mixed infections.

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Keywords: Microbiology; Pharyngitis; Streptococcus pyogenes.

Introduction

The inflammatory response of the mucous membrane in the oropharynx is acute pharyngitis, often due to infection by various microorganisms, including fungi, viruses, and bacteria. Less frequently observed etiologies encompass allergy and gastroesophageal disease.[1] It is the most common infection diagnosed at primary health clinics. Between 50–80% of these infections are of viral origin, with the frequently bacterial pathogen being Group A beta-hemolytic streptococcus (GABHS). GABHS is a Gram-positive found from 5% to 15% in adults and 20–30% in younger. Acute pharyngitis caused by other microorganisms include H. influenzae, Streptococcus pneumoniae, Staphylococcus spp., Mycoplasma pneumoniae, and Candida albicans.[2] Streptococcus pyogenes has an incubation period of 2 to 5 days. Infections caused by this organism typically resolve from 7 to 10 days but can lead to mild–severe conditions such as impetigo, pharyngitis, necrotizing fasciitis, and toxic shock syndrome.[3,4]

In developed countries, the incidence of Streptococcus pharyngitis has decreased because broad-spectrum antibiotics are used. However, about 6 hundred million cases of pharyngitis caused by GABHS occur every year in individuals over the age of 4 years. About 5 hundred and fifty thousand million cases are observed in underdeveloped countries.[5,6] From 20% to 30% of patients exhibit pharyngitis typical symptoms for further complicating diagnosis. Criteria of Centor's (fever ≥ 38°C, tonsil exudates or swelling, absence of cough, and palpable jugulo-digastric lymph node) are the standard indicators for bacterial pharyngitis.[7,8]

An exact diagnosis can be achieved through a culture of throat swab, which typically takes 2–3 days organisms isolated from specimens were by swabbing the tonsils and posterior wall of the pharynx. Confirmation of streptococcal pharyngitis is established by the occurrence of Streptococcus pyogenes, with additional assessment conducted using biochemical procedures like Gram stain and the Pyrrolidonyl acrylamide.[9] The sensitivity of 81% and specificity of 95% of throat swab cultures are demonstrated.[10] The study objective was to identify the spectrum of microorganisms responsible for acute pharyngitis through analysis of throat swab specimens.

Materials And Methods

Following approval from the hospital's ethics committee, this observational cross-sectional study was conducted at the ENT Department of Akbar Niazi Teaching Hospital between February and July 2023. The study included patients presenting with acute pharyngitis who visited the ENT outpatient department (OPD). 100 cases in total with ages ranging from 1 year to 60 years, and both genders were included in the study. WHO calculator of sample size was used, with a precision rate of 7% and a 95% confidence interval, at a significance level of 5%.[2] Patients were consecutively identified and enrolled after obtaining their consent. Patients presenting with post nasal drip (PND), rhinosinusitis, tonsillitis and unwilling to participate in the study were excluded.

Data from all included cases were collected and entered into a thoroughly described predesigned proforma. Specimens of throat were collected and administered through culture, microscopic examination, and antibiotic susceptibility testing. Gram staining was used for microscopic examination. The samples were cultured on both Blood and MacConkey agar plates. The sensitivity of antimicrobe was determined using disc diffusion.

The collected data was analyzed using SPSS v 25. Age was reported as mean ± SD. The isolated infection rate was presented as counts (frequency) and percentages. A chi-square was conducted for age analysis to determine the types of organisms involved. The probability p-value ≤ 0.05 was set as a significant level.

Results

In total, 100 individuals were enrolled in this study. The patients' ages varied from 1–54 years, the mean age was 16.5±6.2 years with 60% (n=60) being males and 40% (n=40) being females. 30% of samples in total tested positive on culture, while the remaining 70% were negative (Figure 1). Upon culture processing, Group A streptococci were the predominant organism, found in (n=15) cases. Additional organisms were Staphylococcus aureus found in (n=11) and Candida albicans in (n=4).

Among the 30 positive cases, 43.3% were single infections (n=13), with 92.3% (n=12) showing growth of Streptococcus pyogenes and 7.7% (n=1) showing Staphylococcus aureus. Mixed infections were observed in 56.7% (n=17). Among the cultures, Group A streptococci were 90% (n=27), subsequently, Staphylococcus aureus was 60% (n=18) and Candida albicans 13% (n=4) of sample isolates (Figure 2).

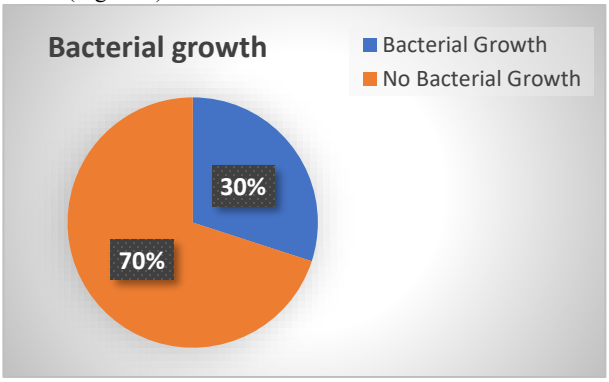

Figure 1: Bacterial growth distribution in samples

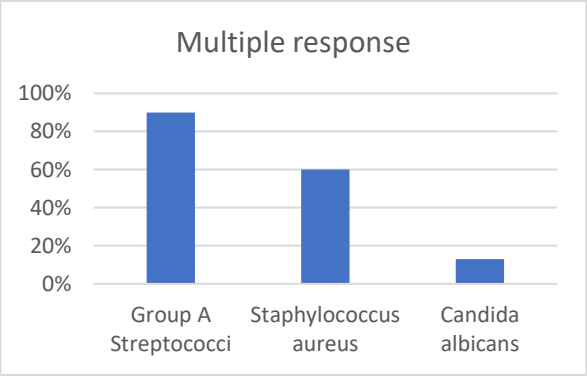

Figure 2: Types of bacteria found in sample isolates

We proceeded to analyze the organisms from throat swab cultures based on age (Table 1). Cultures from all age groups exhibited the existence of Streptococci, Staphylococcus aureus and Candida albicans, in addition to GABHS, were isolated from patients over 15 years of age.

In patients under the age of 15, Group A streptococci were detected in 10 cases. Only 4 patients in the 16–30 age category tested positive for bacterial cultures. Two patients tested positive for both Staphylococcus aureus and streptococci, the third was positive for Candida albicans and streptococci, and the fourth showed the existence of Staphylococcus aureus. Among individuals aged 31–45, six cases exhibited positive cultures; five cases presented with both streptococci and Staphylococcus aureus, and only one case showed Candida albicans and Staphylococcus aureus. Among individuals aged ≥ 45 years, seven cases exhibited positive cultures for both streptococci and Staphylococcus aureus, only one case showed Candida albicans, Staphylococcus aureus, and streptococci. The various organism's distribution based on age was deemed insignificant (0.154).

Table 1: Age-wise relation of pathogens

Ages (year)	Sample isolated			Total sample
	Streptococci	Staphylococcus aureus	Candida albicans	
1 - 15	10	0	0	10
16 - 30	2	3	1	4
31 – 45	5	5	1	6
≥ 45	8	7	1	10
Total	25	15	3	30

Discussion

In the present study, 10% of GABHS cases were detected in children under 15 years old. This finding is consistent with statistics reported in other countries, such as 11% in Turkey, 12% in Brazil, and 9.7% in Ethiopia.[11-13] Low incidence rates have been reported in India (2.8%) and Taiwan (4.1%).[14,15]

The results of this study indicate a throat swab positivity rate of 30%, which is consistent with a meta-analysis, where the positivity rate was 24%.[16] GABHS was the pathogen most frequently isolated, accounting for 22.7% across all age groups, and is comparable with this study incidence of 27%. The rate of positive results in this study aligns with the findings of a study done in Karachi, which reported a positivity rate of 25%.[17] In that study, 61% of individuals were aged below 15 years, and 3% were over 45 years, contrasting with this study where the infection rate was 33% in both under 15 and above 45 years age groups.

The quality of healthcare is constrained by economic factors in Pakistan. Hence, for common illnesses like sore throat is not routinely performed. In this study, we found that Centor's criteria and throat swabs were the most reliable methods for diagnosing pharyngitis caused by GABHS.[18]

Positivity rates for isolated pathogens vary in various studies conducted in various countries. In this study, microorganisms were detected in cultures in 30 cases. Among 13 cases, a single microorganism was isolated (43.3%), although the remaining 17 cases involved mixed pathogens (56.7%). In a study by Sayyahfar et al., GABHS was present in 30% of cases.[19] In Ba-Saddik et al study, the incidence of infection was 42%.[20] Which was higher compared to this study. Naik et al study revealed pathogens in 38% of cases, a low incidence (9%) of GABHS recorded,[21] compared to 27% in the present study. Pramod et al study found bacteria in 10% of cases.[22] The positivity rate of bacteria in cultures is decreasing over time, possibly due to antibiotic usage.

In this study, GABHS was the frequently isolated microorganism, accounting for 90% of all positive cultures, affecting individuals across all ages but entirely found in children. Conversely, the other two organisms, Candida albicans and Staphylococcus aureus were isolated in adult cases, this is consistent with the study by Ba-Saddik et al., where GAS was found in 89% of cases.[20]

Conclusions

This study concluded that most organism infection was caused by Staphylococcus aureus and Streptococcus pyogenes, while Candida albicans were isolated in mixed infections along with these bacteria.

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M.A.U, M.N.B, A.J, M.M, S.I, N.A - Experimentation/Study Conduction
M.A.U, M.N.B, A.J, M.M, S.I, N.A - Analysis/Interpretation/Discussion
M.A.U, M.N.B, A.J, M.M, S.I, N.A - Manuscript Writing
M.A.U, M.N.B, A.J, M.M, S.I, N.A - Critical Review

All authors approved the final version to be published & agreed to be accountable for all aspects of the work.