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Original Article

Microbiology Section

Prevalence of Group A *Streptococcal* Carriage Rate in Asymptomatic Children

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ABSTRACT

Introduction: *Streptococcus pyogenes* is a Gram positive cocci causing respiratory infections commonly in children. Throat carriers are children in whom the organism is isolated from throat swab specimens in the absence of symptoms. This study was conducted in the institution to screen children for the detection of pharyngeal carriage rate of Group A *Streptococci* (GAS) and to compare the efficiency of two different methods for the diagnosis of *S.pyogenes*.

Aim: To study the prevalence of Group A *Streptococcal* carriage rate in throat swabs of children.

Materials and Methods: This is a prospective study conducted from March 2018-June 2018 (4 months) on 100 asymptomatic children attending the Pedodontics OPD of a self financing Dental College and Hospital. Two throat swabs were collected for bacteriological culture and rapid strip testing for detection of *S.pyogenes* was done.

Results: Out of 100, 64 children (64%) were found to be in the age group between 6-10 years. Fourteen (14%) of the children showed growth of *Streptococcus pyogenes* on culture and 18 of them (18%) were positive by the rapid test method. Rapid test strips were found to be 85.7% sensitive and 93% specific for the detection of GAS carriage.

Conclusion: Determination of carrier rate is important though there are no recommended guidelines for aggressive treatment of carriers. Throat culture remains the gold standard investigation for isolation of *Streptococcus pyogenes*, but Rapid antigen detection kits have proved to be valuable as a point of care test for rapid diagnosis.

Keywords: Antigen, Culture, Specimens, *Streptococcus pyogenes*, Swab

INTRODUCTION

Streptococcus pyogenes are classified under Group A of Lancefield classification based on the carbohydrate antigens in the cell wall of the bacteria. They are Gram positive cocci in chains causing suppurative and non-suppurative infections in humans. Suppurative infections include respiratory manifestations such as pharyngitis and skin and soft tissue infections, namely impetigo, cellulitis and necrotising fascitis. Group A *Streptococcus* is the most common aetiology for pharyngitis in children and presents with erythema of the pharyngeal mucosa with a purulent exudate. *Streptococcal* throat carriage is defined as the recovery of *Streptococcus pyogenes* from the nasopharynx or oropharynx without any evidence of acute infection [1].

GAS is found as frequent colonisers in the throat of asymptomatic children and the pharyngeal carriage rate depends on factors such as the geographical location and season of the year. Several studies have recorded a carriage rate of 15-20% in asymptomatic children [2].

Pharyngitis due to *S. pyogenes* in school-aged children has been linked with the aetiopathogenesis of Rheumatic Fever (RF) and Rheumatic Heart Disease (RHD). Primary prevention is based on the accurate diagnosis of sore throat by active screening using throat swab samples and treatment of pharyngitis with oral antimicrobial agents [3].

This study was undertaken to determine the prevalence of pharyngeal carriage rate of GAS and to compare the efficiency of two different methods for the diagnosis of *S.pyogenes*.

MATERIALS AND METHODS

This is a prospective study conducted from March 2018 -June 2018, for a period of four months on 100 asymptomatic children attending the Pedodontics OPD of a self financing Dental College Hospital. Ethical clearance was sought from Institutional Review Board vide no:MADC/IRB-XX/2018/347. Two throat swabs were collected by swabbing the posterior pharynx, soft palate and tonsils with commercially obtained sterile cotton tipped swabs and transported immediately to the Microbiology laboratory. One swab was plated onto 5% Sheep blood agar and incubated for 18-24 hours in the presence of 5% CO_2 in a candle jar at 35°C. Petriplates were examined the next day for the presence of colonies morphologically resembling GAS.

Gray white translucent colonies that showed a wide zone of beta haemolysis when viewed against back light were subjected to catalase testing and a Gram's stain. Catalase test was done with appropriate positive and negative controls and colonies that showed a negative catalase reaction, were chosen for Gram staining which showed Gram positive cocci in long chains. Beta haemolytic colonies that were catalase negative and appeared as Gram positive cocci in long chains were subcultured on a 5% sheep blood agar plate and two antibiotic disks, Bacitracin (0.04 U) and Cotrimoxazole (23.75/1.25 µg) were placed and incubated in a candle jar in the presence of 5% CO_2 at 37°C for 18-24 hours. Bacitracin (0.04 U) sensitivity and cotrimoxazole (23.75/1.25 µg) resistance confirmed the presence of *Streptococcus pyogenes* in culture [4,5].

The other swab was used for direct antigen detection using the Strep A Rapid Test Strips procured from Clarity Diagnostics, Boca Raton, Florida 33487. The Clarity Strep A Rapid Test is a chromatographic immunoassay for the qualitative detection of Strep A antigen from throat swab specimens. Manufacturer's instructions were followed as provided in the kit insert and the test was carried out using appropriate positive and negative kit controls.

RESULTS

Throat swabs were collected from 100 asymptomatic children aged 1-15 years attending the OPD. Sixty four of the children (64%) were found to be in the age group between 6-10 years [Table/Fig-1]. Among the children included in the study 47 were males (47%)

and 53 were females (53%) [Table/Fig-2]. Fourteen children (14%) showed growth of *Streptococcus pyogenes* on culture [Table/Fig-3,4], bacitracin and Cotrimoxazole susceptibility is showing in [Table/Fig-5]. Eighteen of them (18%) were positive by the rapid test method [Table/Fig-6].

Age in years	Male	Female	Total	Percentage %
1-5	11	15	26	26
6-10	29	35	64	64
11-15	7	3	10	10

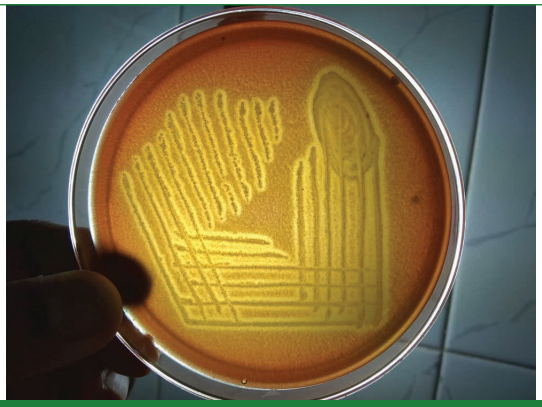
[Table/Fig-1]: Age wise distribution (n=100).

Gender	Number	Percentage
Males	47	47
Females	53	53

[Table/Fig-2]: Gender distribution (n=100).

Rapid Test	Culture		Total
	Positive	Negative	
Positive	12	6	18
Negative	2	80	82
Total	14	86	100

[Table/Fig-3]: Comparative Evaluation of Rapid Test with Culture for Detection of Streptococcus Pyogenes.
Sensitivity=85.7%
Specificity=93%

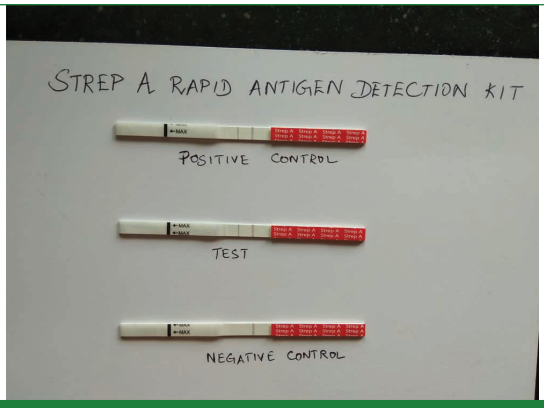


[Table/Fig-4]: Beta haemolysis around *Streptococcus pyogenes* colonies.

[Table/Fig-5]: Bacitracin and Cotrimoxazole susceptibility testing.

DISCUSSION

This was a prospective study conducted to determine the prevalence of Group A *Streptococcal* throat carriage in 100 asymptomatic children. It was observed that 64 of the enrolled children (64%) were between the ages of 6-10 years [Table/Fig-1], and 53 of them were females (53%) [Table/Fig-2]. The mean age of the study group was 7.43 years. In a similar study conducted by Vijaya D et al., in India, the mean age group of the study population was found to be 10.6 years [6]. Nayiga I et al., conducted a study to determine the prevalence of Group A *Streptococcal* throat carriage in children, in



[Table/Fig-6]: Rapid antigen detection strips for *Strep A*.

which 59% of the enrolled population were females, similar to ours [3]. The asymptomatic carriage of GAS in the population of school-aged children is an event subject to frequent change. Colonized children can eliminate GAS, remain carriers, or develop an infectious disease [7].

The prevalence of Group A *Streptococcal* throat carriage in children in this study was found to be 14% by bacteriological culture. (14/100) [Table/Fig-3]. In a short communication study by Ozturk CE et al., [2] the prevalence of GAS was reported as 25.9% in asymptomatic school children, whereas a very low prevalence of 1.9% was reported in the study by Vijaya D et al., which was attributed to the fact that the children enrolled in the study lived in a village which was away from the city and less populated [6].

Throat culture for detection of GAS should be collected properly using a sterile swab from both tonsillar pillars. Throat culture was taken as the gold standard investigation in present study. A rapid diagnostic kit for latex agglutination or enzyme immunoassay of throat swabs was found to be a useful adjunct to throat culture as they are mostly 95% or more specific, less cumbersome and yield quicker results compared to the gold standard investigation, bacterial culture [8]. Accordingly the two methods to detect *Streptococcus pyogenes*, i.e., bacterial culture and rapid test were performed simultaneously in this study and the results were compared.

Fourteen (14%) were positive for *Streptococcus pyogenes* by bacteriological culture [Table/Fig-4,5] and 18 (18%) of them were positive by Rapid antigen testing using the *Strep A* Rapid antigen test strips [Table/Fig-6]. On a comparative evaluation of rapid test with culture for the diagnosis of GAS throat carriers it was observed that the rapid antigen test was 85.7% sensitive and 93% specific [Table/Fig-3]. The low sensitivity of the rapid test could be attributed to the lower antigen levels in carriers thus stressing the need for a throat culture atleast in RADT negative cases, despite the turn around time of 24-48 hours [9].

Therefore, it was concluded from the results of this study that RADT can be used as an alternative to throat culture in resource limited settings to provide quicker results but at the same time, bacterial culture will always remain the gold standard

LIMITATION

1. Molecular diagnosis was not done as part of this study due to financial constraints.

2. Patients were not followed up after the initial throat culture as they were asymptomatic and had come to the Pedodontics OPD for dental treatment, and so it was difficult to follow up the children.

CONCLUSION

The present study has proved that though throat culture remains the gold standard investigation for isolation of *Streptococcus pyogenes*, Rapid antigen detection kits have shown good sensitivity and specificity and proved to be valuable as a point of care test for rapid diagnosis of Group A *Streptococcal* infections. Hence in

resource limited settings Rapid antigen detection test kits can be used as a good alternative to culture.

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