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RESEARCH ARTICLE

Throat Carriage and Antibiogram Pattern Of Group A & Group G Beta Hemolytic Streptococci Among School Children In Mangalore

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Abstract

Streptococcal pharyngitis occurs most commonly among children between 5 & 15 years of age. Streptococcal pharyngeal infection not only causes acute illness but can also result in serious sequelae like Acute Rheumatic Fever (ARF) & Acute Glomerular Nephritis. (AGN) Pharyngeal carriage rates of Group A & G Streptococci among healthy school children varies with different geographical location and seasons. **Objectives:** The study aimed at assessing the throat carriage rate and antibiogram pattern of Group A & G Streptococci among school children in Mangalore. **Methods:** A total of 300 children aged between 5 -15 years were screened in various schools in Mangalore, over a period of one year. Throat swabs were collected and cultured using standard procedures, Beta haemolytic streptococci were identified & grouping was done using specific antisera. Antimicrobial susceptibility testing of the isolates was performed by Modified Kirby-Bauer disc diffusion method using CLSI guidelines. **Results:** A total of 33 (11%) Beta haemolytic streptococci were recovered from 300 children investigated. Of 33 beta hemolytic streptococcal isolates, GAS & GGS accounted for 15/33(45.45%) & 18/33 (54.54%) respectively. The carrier rate for GGS was 6% (18/300) and GAS 5% (15/300) of the screened children. All GAS & GGS isolates were sensitive to penicillin. **Conclusions:** The present study revealed that both GGS & GAS are the most predominant beta-haemolytic streptococcus among healthy school children. It is recommended to conduct regular screening of Streptococcal surveillance in schools, and maintain rational use of antibiotics to minimize streptococcal carriage/infections and resistance.

INTRODUCTION

Streptococcal pharyngitis, is the cause of 37% of sore throats among children and 5-15% in adults. Group A streptococcus (GAS) causes several suppurative and non suppurative infections. In addition to pharyngitis and skin infections, GAS are also the causative agent of post-streptococcal infection syndromes such as Acute Rheumatic Fever (ARF) & Acute Glomerular Nephritis (AGN) [Alan L, 2001, 1991]. Group G streptococcus (GGS) has also been associated with pharyngitis, although their exact role is uncertain. The clinical manifestations are not clinically different from GAS. Their association with rheumatic fever has been investigated but not definitely established, and their association with glomerulonephritis has been anecdotal. The various infections of GGS includes puerperal and neonatal infections, bacteremia, endocarditis, meningitis, arthritis, osteomyelitis, pneumonia,

toxic shock-like syndrome, and rhabdomyolysis[Alan L, 5th edition] . Pharyngeal carriage rates of Group A & G Streptococci among children varies with different geographical location and seasons. Penicillin is the first choice for treatment of pharyngeal and most other infections with this organism, Antimicrobial resistance among GAS is an emerging concern [Gupta et al, 1992].

Materials & Methods :

The study was a cross-sectional study carried out at the Department of Microbiology. K.M.C., Mangalore. The study included 300 children from the age group 5-15 years, studying in various schools in Mangalore, over a period of 1 year.

Inclusion Criteria: All school going children aged between 5-15 years. The children were selected at random from various schools in Mangalore.

Exclusion Criteria: - All children who were taking or had received antibiotics in the past 2 weeks of collection of throat swab.

Three swabs were collected from each child. One was used for Grams stain, the other for culture on to 5% sheep blood agar and the third for inoculation on to Robertson's Cooked Meat (RCM) broth. The culture plates were stabbed 3- 4 times to enhance hemolysis. The culture plates and RCM broth were incubated at 37^0C for 48 hours with 5% -10% Carbon dioxide. All β- hemolytic colonies were subjected to Gram's staining and catalase test. The β-hemolytic colonies, which showed gram positive cocci in chains and catalase negative, were identified based on susceptibility to Bacitracin & Trimethoprim-suphamethomethoxazole. Streptococcal grouping was carried out using Streptex kit for Lancefield Group A and Group G. Isolates which were sensitive for Bacitracin and resistant for Trimethoprim-suphamethomethoxazole were tested with Group A latex suspension and those which were Bactracin resistant were tested with Group G latex suspension.

Susceptibility of all the isolates of Group A streptococci to the antibiotics was tested by the disc diffusion methods of Kirby Bauer. The antibiotic discs were obtained from Hi Media Laboratories Private Limited Mumbai. After overnight incubation, the diameter of the inhibitory zone was measured. The zone size around each antimicrobial disc was interpreted as sensitive, intermediate or resistant according to CLSI criteria.

Results:

Table 1 shows the prevalence of GAS & GGS isolates in the throat cultures of the children of different age groups. The carriage rate of GAS was 3.5% in the 5-9 years age group; 5.3% in the 10-14years age group and 8.6% in >14years age group. The carriage rate of GGS was 4.3% in the 5-9 years age group; 6.0 % in the 10-14 years age group; 11.4 % in the >14years age group.

Table 2 : Shows the sex wise distribution of children included in the study. Of the 300 children 178 (59.3%) were boys and 122 (40.7%) were girls. The carrier state of GAS among boys and girls are 6.2% and 3.3% respectively. For GGS carrier rates were 6.2% among boys and 5.7% among girls.

Table 3 : Shows the isolation of GAS and GGS during the various seasons throughout the year. In accordance with the climate of Mangalore, the year was divided into 3 seasons - Summer (Feb –May); Monsoon (June-Sept) and Winter (Oct-Jan). The isolation rates for GAS was Nil, 4.3%, and 8.7% during summer, monsoon and winter respectively. Carriage rates of GGS were 1.2%, 4.3%, 10.3% during summer, monsoon and winter respectively.

Table 4 : Shows the antibiogram pattern of GAS & GGS isolates

15 GAS isolates was found to be sensitive to Ampicillin (A) (100%), Ciprofloxacin (Cf) (80%), Cefotaxime (Ce) (100%), Co-trimoxazole (Co) (6.7%) Cephalexin (Cp) (80%), Erythromycin (E) (100%), Penicillin (P) (100%) and Tetracycline (T) (86.7%). The 18 isolates of GGS was found to be sensitive to Ampicillin (100%), Ciprofloxacin (88.9%), Cefotaxime (100%), Co- trimoxazole (66.7%), Cephalexin (83.3%), Erythromycin (77.8%) Penicillin (100%), Tetracycline (100%).

Table 1: The prevalence of GAS & GGS isolates in the throat cultures of the children of different age groups

Age group in years	Total children	GAS isolates	GGS isolates
5 -9	115	4 (3.5)	5 (4.3%)

10- 14	150	8 (5.3 %)	9 (6.0%)
> 14	35	3 (8.6 %)	4 (11.4%)
Total	**300**	**15**	**18**

Table 2: Sex wise distribution of children included in the study

	Males	**Females**	**Total**
GAS isolates	11 (6.2%)	4 (3.3%)	15
GGS isolates	11 (6.2%)	7 (5.7%)	18
No. of Children	178 (59.3%)	122 (40.7%)	300

Table 3: Isolation of GAS & GGS during various seasons throughout the year.

Season	**Summer**	**Monsoon**	**Winter**	
No. of children	81	93	126	**300**
GAS isolates	0	4 (4.3%)	11 (8.7%)	**15**
GGS Isolates	1 (1.2%)	4 (4.3%)	13 (10.3%)	**18**

Table 4 : Antibiogram pattern of GAS & GGS isolates

Antibiotics	**A**		**Cf**		**Ce**		**Co**		**Cp**		**E**		**P**		**T**	
Results	**S**	**R**	**S**	**R**	**S**	**R**	**S**	**R**	**S**	**R**	**S**	**R**	**S**	**R**	**S**	**R**
GAS	15	0	12	3	15	0	1	14	12	13	15	0	15	0	13	2
GGS	18	0	16	2	18	0	12	6	15	3	14	4	18	0	18	0

Abbrevations : Ampicillin (A), Ciprofloxacin (Cf) , Cefotaxime (Ce) ,Co-trimoxazole(Co) Cephalexin (Cp) , Erythromycin (E) ,Penicillin (P) and Tetracycline (T)
Sensitive (S) Resistance (R)

Discussion:

In this study, we evaluated throat swabs from 300 school children aged 5-15 years. The prevalence of GAS in throat swabs of asymptomatic children was 5 % and that of GGS was 6%. This is in consistence with the various studies conducted in South India, which have also reported predominance of GGS over GAS[Navaneeth et al 2001, Shet A 2004]. In other countries prevalence of GAS varies from 2.5% to 15.8% from children. This could be related to the difference in the socioeconomic and climatic conditions [Gunn et al 1977]

Age has been reported to be an important factor in the microbiological etiology of pharyngitis. In our study the incidence of GAS was slightly higher in > 14 yrs age group. This finding is consistent with the results from various other studies [Gupta et al 1992]. In our study higher carriage rates were found among males than in females for GAS that is 6.2% and 3.3% respectively. The carriage rates for GGS were also higher in males than in females

that is 6.2% and 5.7% respectively. Isolation rates in different sex groups, other studies did not observe any significant change [Solhan et al 2001].

An attempt was made to see the seasonal variation in the incidence for throat carriage of Streptococci, among the children. The isolation of BHS both GAS and GGS showed a higher incidence in the monsoon (June-Sept) and during the winter season (Oct-Jan) with isolation rates 4.3% and 8.7% for Group A and 4.3% and 10.3% for Group G during monsoon and winter season. Similar isolation rates was also reported by others [Sobhan Nandi et al 2001, Grace Koshi 1977, Sarkar S et al 1988].

The antibiotic susceptibility of isolates of GAS and GGS to the following antibiotics. Ampicillin (A), Ciprofloxacin (Cf), Cefotaxim (Ce), Trimethoprin– sufamethoxazole (Co), Cephalexin (Cp), Erythromycin (E), Penicillin (P) and Tetracycline (T) by disc diffusion method of the Kirby Bauer. All our isolates of GAS and GGS were sensitive to Penicillin (100% sensitivity). Similar findings were also reported by previous studies [Istre GR et al 1981, Conan 1994, Finland M 1976]. No resistance to penicillin was seen in our study isolates, reinforcing the fact that penicillin resistance has not developed in this organism, despite the presence of resistance in other species of streptococci.

In-spite of more than 4 decades of use of penicillin in the treatment of GAS infection there has been no change in the susceptibility of GAS to penicillin. Infact there is no documented reports of any penicillin resistant strain reported till date. Probable reasons for this include the expression of beta-lactamases or low affinity PBP's (penicillin binding proteins) may somehow render Group A streptococci non-viable.Others includes the hypothesis that Group A streptococci may possess natural barriers to DNA uptake which may prevent acquisition of new resistant traits [Micheal A 1996]

Penicillin remains the drug of choice for the treatment of GAS infections. The low cost of penicillin, its relatively narrow s spectrum and its excellent safety record in individuals who are not penicillin allergic are added advantage. For penicillin-allergic individuals, the alternative therapies include macrolides, first generation cephalosporin's and clindamycin.

In our study, 100% of GAS isolates and 77.8% of GGS isolates were sensitive to erythromycin. Reports from India suggest erythromycin resistance rates among GAS strains vary between <1% and 17.9% [Solhan Namdi et al 2001] . In our study 80% of GAS and 83.3% of GGS were sensitive to Cephalexin (Cp). Little information is available about cephalosporin resistance in GAS and resistance to any of the commonly used oral cephalosporins has not been reported so far.

86.7% of GAS and 100% of GGS were sensitive to Tetracyclines. Reports on resistance to Tetracycline vary widely from 5% to 90% [S Warn et al 2005]. Tetracyclines are considered inappropriate for treatment of GAS infections.Sensitivity to ciprofloxacin was 80% for GAS and 88.9% for GGS isolates.

The lack of Group A streptococcal penicillin resistance should not be allowed to lull clinicians into a sense of complacency, instead one must keep in mind lesion learnt from other organisms. A prime example is Streptococcus pneumoniae, which had remained exquisitely sensitive to penicillin for decades until 1970s when the organism rapidly acquired resistance, and currently upto 30% pneumococcal strains are penicillin resistant

Conclusions :

The prevalence of GAS was 5% and GGS was 6% among the 300 school children included in this study. The highest prevalence was noted in the >14yrs age group (8.6%) for GAS and also for GGS (8.6%). The highest prevalence was seen in male for GAS (6.2%) and also for GGS (6.2%). The isolation rates for GAS and GGS was both found to be higher during the winter season 8.7% and 10.3% respectively. All the isolates of GAS and GGS were found to be sensitive to penicillin. Hence penicillin is still the drug of choice for streptococcal infections.

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