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GROUP A BETA HEMOLYTIC STREPTOCOCCAL CARRIAGE AND ANTIBIOTIC SENSITIVITY AMONG SCHOOL GOING CHILDREN IN MARDAN, PAKISTAN

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ABSTRACT

Objective: To assess the carriage rate of Group A beta hemolytic streptococci (*Streptococcus Pyogenes*/ GABHS) among school children and find out their antibiotic sensitivity.

Methodology: This cross-sectional study was carried out on 200 healthy children residing in Mardan, while samples were processed at Department of Pathology, Combined Military Hospital (CMH) Mardan from June 2019 to September 2019. Asymptomatic children with age range from 5 to 15 years were enrolled in this study. After informed consent, throat swabs were taken under aseptic conditions and sent to laboratory for culture and sensitivity. The GABHS were identified by beta-hemolysis, colony morphology, gram staining, catalase reaction and sensitivity to bacitracin. Antibiotic susceptibility of beta hemolytic streptococci were found for Penicillin G, Ceftriaxone, Erythromycin, Co-amoxiclav, Ceftriaxone, Vancomycin, Azithromycin, Tetracycline and Cephalexin by Kirby disc diffusion method. SPSS v.20.0 was used as statistical tool.

Results: Out of 200 children, there were 97 (48.5%) male. The mean age was 9.71 ± 2.95 years. A total of 23 (11.5%) cultures were positive for GABHS. Among these 23 carriers, 10 were males and 13 were females. All were found sensitive to Vancomycin, Penicillin G and Azithromycin. Isolates were 95.6% sensitive to Clindamycin, Ceftriaxone and Co-amoxiclav (n=22). Sensitivity to Cephalexin, Erythromycin and Tetracycline were 78.3% (n=18), 69.5% (n=16) and 65.2% (n=15), respectively.

Conclusion: GABHS carriage is common among asymptomatic school going children. GABHS cultured from these children are highly sensitive to Penicillin G, Vancomycin, Azithromycin, Co-amoxiclav, Clindamycin and Ceftriaxone.

Key Words: Antibiotic Sensitivity; Group A beta hemolytic streptococcus (GABHS); Culture; Children.

INTRODUCTION

The oropharynx/throat has species of *Staphylococcus*, *Streptococcus*, *Haemophilus*, *Neisseria* and various strains of anaerobic bacteria as normal flora.^{1,2} Many individuals also carry *Streptococcus Pneumonie*, *Streptococcus Pyogenes* etc. in oropharynx which are not part of microbial flora in majority of population.^{1,2} Group A beta hemolytic streptococcus (*Streptococcus Pyogenes*/ GABHS) is the most common bacterial microorganism responsible for pharyngitis and tonsillitis in children.³ Streptococcal pharyngitis is often termed as 'StreptThroat'. This microorganism is responsible for many human infections including pharyngitis, tonsillitis, impetigo, necrotizing fasciitis and streptococcal toxic shock syndrome.⁴ It is also linked to some serious non suppurative sequelae of streptococcal pharyngitis, including rheumatic heart disease, poststreptococcal glomerulonephritis and pediatric autoimmune neuropsychiatric disorders (PANDAS).⁴

People can carry GABHS in their throat for months after resolution of infection (pharyngitis) or may harbor GABHS asymptotically without any clinical symptoms.⁵ Carrier of streptococcus is defined as an individual who has confirmed presence of GABHS in his throat without any usual clinical symptoms of 'Strept Throat'.⁶ In 5-15 % cases, individuals become carriers of GABHS.⁷

Carrier state of *Streptococcus Pyogenes*/ GABHS was first coined in 1945 by Hartley et al.⁸ It was observed during an outbreak of GABHS. Many individuals harbored the organism in their throat with absence of clinical signs and symptoms.^{1,9} The GABHS carriers are considered non-infectious and the colonized streptococci are reportedly less virulent. So, if a patient's throat swab is positive and is asymptomatic, treatment is generally not recommended but studies show that carriers can be infectious and transmit infections to others.^{9,10} Eradication of carrier state is also recommended in cases, such as community outbreak of acute rheumatic fever and post-streptococcal glomerulonephritis, family

history of acute rheumatic fever, recurrent pharyngitis without cough or congestion, excessive patient or family anxiety about GABHS and multiple documented GABHS pharyngitis episodes within a family over many weeks despite therapy.^{11,12}

Carrier rate of *Streptococcus Pyogenes*/GABHS has been reported to vary from 5-15% among children.⁷ However, in high income countries, carrier rate was 8.4 to 12.9%.¹³ Prevalence is highest in children older than 3 years, with peak incidence between 5 to 15 years of age.¹⁴ In this context, this study was carried out to find the frequency of streptococcal carriers and antibiotic sensitivity among school going aged children in Mardan.

METHODOLOGY

The study was carried out after the approval from hospital ethics and review board, in Mardan from June 2019 to September 2019, while sample were processed in Department of Pathology, Combined Military Hospital, Mardan-Pakistan. Sample size was calculated with the help of online Epitool software, taking prevalence of GABHS carrier as 15% of children.⁷ Sample size came out to be 196, however 4 cases were added to cater for any laboratory or sampling error, making total sample size to be 200. Healthy school going children residing in Mardan city, aged from 5 to 15 years, were enrolled from various parts of Mardan city. Children with the recent history of tonsillectomy, respiratory tract infection, and use of antibiotics were excluded from the study. Ten different colonies were selected and from them different blocks and streets were selected. From each street, two or three houses were chosen randomly which housed children following the inclusion criteria. Informed consent was taken from all the guardians of the children, after describing the purpose of study and the procedure of taking swab.

Throat swab was taken under strict aseptic conditions. In the laboratory, swab material was cultured on blood agar plates and incubated in 5% CO₂ at 37°C for 48 hours. Group A beta hemolytic streptococci was identified by beta-hemolysis, colony morphology, gram staining, catalase reaction and sensitivity

to bacitracin. Antibiotic susceptibility was checked for Penicillin G, Ceftriaxone, Erythromycin, Co-amoxiclav, Ceftriaxone, Vancomycin, Azithromycin, Tetracycline and Cephalexin by disc diffusion method.

All the data were entered and analyzed with the help of Statistical Package for Social sciences (SPSS) version 20. Frequencies and percentages were calculated for categorical variables.

RESULTS

Out of 200 children, there were 97 (48.5%) males. The mean age was 9.71±2.95 years. A total of 23 [(11.5%) (10 males and 13 females)] cultures were positive for GABHS. Age distribution of cases and the results of positive throat culture confirming carrier state is shown in table 1.

Table 1: Age wise distribution of normal children and carriers of Group A beta hemolytic streptococcus (GABHS)

Age (Years)	Normal Children	Carrier	Total
5	11 (5.5%)	0	11 (5.5%)
6	21 (10.5%)	2 (1%)	23 (11.5%)
7	19 (9.5%)	3 (1.5%)	22 (11%)
8	20 (10%)	1 (0.5%)	21 (10.5%)
9	23 (11.5%)	3 (1.5%)	26 (13%)
10	16 (8%)	3 (1.5%)	19 (9.5%)
11	19 (9.5%)	3 (1.5%)	22 (11%)
12	9 (4.5%)	3 (1.5%)	12 (6%)
13	11 (5.5%)	3 (1.5%)	14 (7%)
14	15 (7.5%)	1 (0.5%)	16 (8%)
15	13 (6.5%)	1 (0.5%)	14 (7%)
TOTAL	177 (88.5%)	23 (11.5%)	200 (100%)

Table 2: Antibiotic sensitivity of Group A beta hemolytic streptococcus (GABHS)

Antibiotic	Sensitive	Percentage
Vancomycin	23	100%
Penicillin G	23	100%
Azithromycin	23	100%
Clindamycin	22	95.6%
Ceftriaxone	22	95.6%
Co-Amoxiclav	22	95.6%
Amoxycilin	20	86.9%
Cephalexin	18	78.3%
Erythromycin	16	69.5%
Tetracycline	15	65.2%

In the present study, GABHS was found to have 100% sensitivity to Vancomycin, Penicillin G and Azithromycin. Isolates were 95.6% (n=22) sensitive to Clindamycin, Ceftriaxone and Co-amoxiclav. Sensitivity to Cephalexin, Erythromycin and Tetracycline was relatively low as shown in table 2.

DISCUSSION

According to the present study, a fairly high percentage of children were GABHS carriers. This rate was higher than that of Singh et al, who showed 4.6% carriers of GABHS in Uttar Pradesh, India.¹⁵ GABHS carrier rate shown by Llyod et al and Muthusamy et al was 8.4% and 5.09% respectively, which is also lower than our study.^{16,17} Similarly, GABHS carrier rate was reported to be 12.8% among school aged children in Yemen,

10.8% in Nepal, 12.2% in Ethiopia and 12% in Iran.^{18,19,20} These rates are somewhat similar to the rates reported in our study. GABHS carrier rate in Kerman region of Iran, however, was reported to be much higher than our study, i.e., 28.5%, which can be attributed to the particular age range of the study (11 to 15 years), which is on the higher side of the age bracket of possibly affected children.²¹

In present study, GABHS carriage was found to be more common in females than males, which is in accordance with the study of Othman et al and Nayiga et al.^{14, 22} However, Abd El-Ghany et al and Blair et al showed equal prevalence among males and females.^{23, 24}

In the present study, beta hemolytic streptococci were 100% sensitive to Vancomycin, penicillin G and azithromycin. Rijal al showed 100% sensitivity of Penicillin G and Amoxicillin, 93% sensitivity of Azithromycin and 62.2% sensitivity of Erythromycin against GABHS.²⁵ These results are almost similar to that of our study and other studies.^{16,17,19} GABHS have developed resistance against Erythromycin and Tetracyclines to various extent according to different researchers.^{9,25} However, Nabipour et al showed developing resistance to Penicillin in Kerman-Iran, because of excessive use of Penicillins.²¹

CONCLUSION

GABHS carriage is common among asymptomatic school going children. GABHS cultured from these children are highly sensitive to Penicillin G, Vancomycin, Azithromycin, Co-amoxiclav, Clindamycin and Ceftriaxone.

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Author's Contribution

SA conceived the idea, made plan for the study, collected data and wrote initial manuscript. MAK and SAK helped in providing technical support, collection and interpretation of data and correction of the draft. HBUS helped in the analysis of the data, critical review and finalization of the manuscript. Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Conflict of Interest

Authors declared no conflict of interest

Grant Support and Financial Disclosure

None

Data Sharing Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.