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A Study of Group A Streptococcal Pharyngitis among School Children (3–15-Year) of Urban Community

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Abstract: Group A Beta Haemolytic Streptococcal (GABHS) is the most important gram positive cocci that is very frequently isolated pathogen in pharyngitis and causing pyogenic infections among school going children and which is linked to the etiopathogenesis of its sequel acute rheumatic fever and rheumatic heart disease that have a worldwide distribution and pose an important health problem. The Present study is intended to find out the prevalence of Group A beta haemolytic streptococci (GABHS) related pharyngitis among children of an urban community, and in case of culture being positive its clinical outcome and its relationship to the clinical symptoms, and the antibiotic sensitivity pattern of GABHS among children aged 3–15 years, presenting with symptoms of sore throat at Dr VRK Teaching HOSPITAL & Research Centre, a teaching tertiary care hospital, at Aziznagar, Telangana. It was a cross sectional, retrospective hospital based study conducted from April 2016 to March 2017, during this one year period a total of 225 children were examined. Throat swabs were collected from children with acute pharyngitis (sore throat and fever) and acute respiratory infection from the paediatric outpatient clinic of the hospital. Demographic and clinical data were recorded. The collected throat swabs were processed as per the standard microbiological techniques to isolate GABHS. The disc diffusion method was used for antimicrobial susceptibility testing. Females were 52.88% and males accounted for 47.12% of 225 children with pharyngitis. The majority of children belonged to 6-10 years age group (54.22 %) GABHS pharyngitis was found more among females and in the age group of 6-10 years. The presenting symptom in most of the cases was pain in the throat with Cough and with the presence of exudates as specific sign in most of the cases of GABHS. The findings showed the prevalence of (26%) of GABHS isolation among the children. All isolates of GABHS were(100%) susceptible to penicillin and Vancomycin and (76.27%) sensitive to Clindamycin and tetracycline, the highest resistance was shown to Amoxicillin. As there is a direct correlation between the incidence of Group A beta-haemolytic streptococci and the symptomatic paediatric patients presenting with sore throat and fever, the current findings underscore the need to increase awareness about appropriate throat examination and treatment of sore throat among primary care physicians and also this study highlights the importance of regular screening and regular surveillance to keep the GABHS in check and to control the development of non-supportive sequel, by treating children judiciously with appropriate antibiotics.

Keywords: Sore Throat, Gabhs, Penicillin.

INTRODUCTION

Streptococci are gram positive cocci arranged in chains or pairs and are part of normal flora of humans and animals. The most important of them is Streptococcus pyogenes a human pathogen causing pyogenic infections, with a characteristic tendency to spread, as opposed to staphylococcal lesions which are typically localized.

Group A beta haemolytic streptococcus (GABHS) a Gram positive spherical bacterium is the essential and frequently encountered human pathogen all over the world especially among children between

3-15 years which is a great burden on school-aged children[1] causing a broad spectrum of diseases ranging from uncomplicated pharyngitis and pyoderma to invasive, life-threatening immunological complications such as acute rheumatic fever (ARF), rheumatic heart disease (RHD), post streptococcal glomerulonephritis (PSGN), toxic shock syndrome (TSS) and necrotizing fasciitis[2,3].

GABHS are normal inhabitants of the oropharynx and skin. Colonization of the throat with GABHS may occur in 10-20% of normal school aged children. These children are carriers and do not get infected nor are at risk of developing RF [4] but serve as a reservoir for pathogen.

Group a beta-haemolytic streptococcus is a common cause of acute pharyngotonsillitis accounting for 10–30% of episodes in children and 5–10% in adults [5].

Globally, it is estimated that about 600 million cases of symptomatic GABHS pharyngitis occur annually among people aged over 5 years and over 550 million of these occur in less developed countries. The greatest global burden of GABHS disease is due to RHD which follows GABHS pharyngitis, where 15 million cases and 349,000 deaths occur worldwide annually. Ninety-five percent of the disease burden from RHD is in low and middle income countries where it continues to have a significant impact on the health of children and young adults. There are 2.4 million affected children between 5 and 14 years of age in developing countries [6-8]. RF and Acute Glomerular Nephritis are major health problems in the developing world. The incidence of RF declined in industrialized countries, since the 1950's and now has an annual prevalence of 0.5 cases per 1,00,000 children. In developing countries it remains an endemic disease with annual incidence ranging from 100 to 200 per 1, 00,000 school children and is a major cause of cardio-vascular mortality. RF is reported to occur in 1-3 percent of streptococcal throat infections of children living in underprivileged conditions [9].

OBJECTIVES

The main aim was to determine the prevalence, antimicrobial susceptibility pattern and clinical predictors of GABHS among children with pharyngitis.

MATERIALS & METHODS

Two hundred twenty five children seeking care at the paediatric outpatient clinic of the Dr VRK Teaching HOSPITAL & Research Centre, a teaching tertiary care hospital, at Aziznagar, for pharyngitis (sore throat and fever)& acute respiratory infection, were included in this cross sectional, retrospective study conducted from April 2016 to March 2017 (one year)

Inclusion criteria

- Male and female children aged 3–15 years
- Child with at least one of the following symptoms were only included:

Exclusion criteria

- Documented antibiotic use during last three days
- Documented use of intramuscular benzathine penicillin G during last 28 days
- Presence of ear discharge or impetigo at the time of examination
- History of previous rheumatic fever or rheumatic heart disease
- Presence of any other infection requiring antibiotics
- Presence of any other known severe illness requiring hospitalization; EXCEPT: malnutrition or tuberculosis;
- Physician's diagnosis of wheezing, bronchitis, or pneumonia
- Parent's or guardian's consent not available

The identification of each child and other information like demographic variables , medical history like - the duration of illness before their visit, related symptoms like sore throat, running nose, cough, swollen neck glands, general aches, rash, gastrointestinal discomfort, history of a temperature, history of recurrent attacks of tonsillitis, episodes per year and multiple treatment courses and signs like tonsillar swelling, tonsillar exudates, tender anterior cervical lymph node, a rash typical of scarlet fever, abnormal tympanic membrane, and lung findings, laboratory investigations were all recorded.

SAMPLE COLLECTION & PROCESSING

With the sterile cotton swab applicator, two samples were collected from the patient's posterior pharynx and tonsillar surfaces by rubbing vigorously avoiding the surrounding tissues. One of the swab is used for direct smear preparation by Gram staining and the other swab was put into Amies transport medium and transported to the Clinical Microbiology Laboratory within 2 hours and were inoculated onto 5% sheep's blood agar plates and incubated for 24 h at 37 °C in a candle jar, which can provide an atmosphere of 5% CO2. Culture plates negative for β-haemolytic colonies were incubated for additional 24 hours to allow the growth of slow growers. Beta-haemolytic streptococci isolates were phenotypically identified by standard microbiological techniques : which include β-haemolytic activity on sheep's blood agar, small colony morphology, Gram stain revealing Gram positive cocci,negative catalase test, susceptibility to 0.04-U Bacitracin disc(Isolates with a zone of inhibited growth around the Bacitracin disc of >15 mm diameter were considered potential GAS).

Presumptive identification of a strain as a Group a Streptococcus was also made on the basis of production of the enzyme L-pyrrolidonyl-beta-naphthylamide (PYRase test). Among the beta-haemolytic Streptococci isolated from the throat culture, only Group An isolates produce PYRase and hence PY Rase test was also conducted in the samples

GAS identification by Latex agglutination test

The presumptive identification was further confirmed by latex agglutination tests containing group a specific antisera (Commercially available)

Antibiotic susceptibility testing

Antimicrobial susceptibility testing was done by using the disc diffusion method according to criteria set by Clinical Laboratory and Standard Institute (CLSI).

The antibiotic discs were selected based on prescription pattern and recommendations from CLSI. The following antimicrobial discs with respective concentration were tested for Susceptibility.

Penicillin (10 unit), Ceftriaxone (30 µg),Chlor amphenicol (30 µg), Amoxicillin (25 µg), Erythromycin (15 µg), Clindamycin (2 µg), Tetracycline (30 µg) Clarithromycin (15 µg), Azithromycin (15 µg) and Vancomycin (30 µg). Zone of inhibition diameters were interpreted as per CLSI guidelines

RESULTS

A total of, 225 children between ages of 3 to15 years with pharyngitis & acute respiratory infection, seeking care at the paediatric outpatient clinic of the Dr VRK HOSPITAL, a teaching tertiary care hospital, at Aziznagar, were enrolled from from April 2016 to March 2017 (one year). Among them, 106 (47.7%) were males and 119 (52.3%) were female children. The prevalence was higher in girls as compared to boys (Table 1).

In this study, the subjects were divided into three groups based on their age into : 3 to 5 years- in which there were 48 children and the majority were in the 6-10 age group -122 and the rest 11 to15 age group in which there were 55 (Table 2)

Among the 3 to 5 years age group in which there were 48 children ,males were 11 and females were 37; in the 6-10 age group out of total 122, males were 55 and females were 67; and in 11 to15 age group in which there were total 55, males were 40 and females were 15; (Table 3)

In the present study, out of the 225 samples collected and processed, Group A β-haemolytic streptococci was isolated in 59 samples, as identified by standard microbiological techniques and the specific identification tests such as Bacitracin sensitivity test, PYRase test and latex agglutination test (Table 4).

Streptococcus pyogenes was isolated in 59/225 (26.21%)patients, out of which 30 (50.85%)were from the age group 6-10 years; between 11-15 years age 17 (28.81%) and from the age group 3-5 years 12 (20.34%)(Table 5).

The antimicrobial drug susceptibility profile which was done by the modified Kirby – Bauer disc diffusion method on Mueller Hinton agar (MHA) under standard conditions in accordance to latest CLSI guidelines revealed that all GABHS isolates (59) were not only 100% sensitive to Penicillin G and Vancomycin but also showed variable resistance to certain other antibiotics that were tested (Table 6)

Table-1: Showing Sex distribution

Sl.no	SEX	No.of cases	Percent
1	Males	106	47.12%
2	Females	119	52.88%

Table-2: Showing Age distribution

Sl.no	AGE	No.of cases	Percent
1	3 – 05 yrs	48	21.33%
2	06 - 10 yrs	122	54.22%
3	11 -15 yrs	55	24.45%

Table-3: Distribution of Males & Females

Sl.no	Age	Total No. of cases (225)	Male	Female
1	03 – 05 yrs	48(21.33%)	11 (4.89%)	37 (16.44%)
2	06 - 10 yrs	122(54.22%)	55 (24.45%)	67 (29.77%)
3	11 -15 yrs	55(24.45%)	40 (17.78%)	15 (06.67%)

Table-4: Showing GABHS ISOLATION

Sl.no	Total No. of cases	Gabhs Isolated	Sterile
1	225	59(26%)	166(74%)

Table-5: Showing distribution of GABHS among male and females

Sl. no	Age	Total no.of cases(225)	Gabhs isolated (59)		Total
			Male	Female	
1	03– 05 yrs	48	04	08	12
2	06 - 10 yrs	122	10	20	30
3	11 -15 yrs	55	07	10	17
TOTAL			21(9.33%)	38(16.88%)	59(26.21%)

DISCUSSION

In our study Prevalence of group A streptococcal infection were more in females (16.88%) in comparison to males ((9.33%), which has similar findings with the study conducted by Gupta R *et al.* [14].

In studies conducted by Moses *et al.* [19] and Giir E *et al.*[17] males outnumbered females. No male-female disparity in the prevalence rate of group a streptococcal infection was shown in other studies conducted by Madha S *et al.* [20] and Rijal K R *et al.* [21].

As per our study there was a higher prevalence of Streptococcus pyogenes in the age group between 6-10 years. This has Similarity to other studies conducted by Lin MH *et al.* **[**27] and Gupta R *et al.* [14]. Davies HD *et al.* **[**28] and Gunnarssu RK *et al.* [29]. Farheen Fatima *et al.* [30] and KR Rijal *et al.* [21] also reported maximum number of BHS in age group 6-10 years (33.5%).

As per our study isolation of GABHS from among the studied subjects was 59(26%).This is similar to with the previous studies conducted by Sanjeeb Sharma *et al.* [15], Basili A *et al.*[16], Giir E *et al.* [17], Gupta R *et al.* [14] Nirmal Kushwaha *et al.*[18] which showed overall prevalence of GABHS ranging from 17 to 25%.

But other studies conducted in the various parts of our country by Gupta R *et al.* [14], Muthusamy D *et al.* 22, Lloyd C.A *et al.* [23], the overall prevalence of beta-haemolytic Streptococci among the throat swabs of the children was less than those which were isolated in our study.

In some other studies from Chennai by Kalpana S *et al.* [24] (53.5%), by Sugumari Chandrasegaran *et al.* [25] at Madurai (78%), Lakshmana Gowda Krishnappa *et al.* [26] (83.6%), reported a high isolation of β-haemolytic streptococcus in the symptomatic school children.

The prevalence rate of BHS in developing countries varies widely from 9.2% to as high as 28.9%. Prevalence of GABHS pharyngitis in India ranges from 4.2% to 23.7%, which are comparable to the rates reported from the developed countries.

The difference prevalence rates could be due to difference in climatic condition, socio-economic conditions and geographical regions.

In this study it was found that all the isolates of Streptococcus pyogenes were 100% susceptible to penicillin & Vancomycin followed by clindamycin, tetracycline (76.27%), ceftriaxone (59.3%), Chloramphenicol (42.37%), Erythromycin, Azithromycin and Clarithromycin (32.2%) least sensitivity to Amoxicillin (13.56%) This result is in accordance with study conducted by Rijal KR *et al.* [21], Metin Dogan *et al.* [31], Shet *et al.* [32], Haczynski J *et al.* [33] and Capoor MR *et al.* [34] respectively. However, it is important to know that sometimes antibiotic susceptibility pattern may vary with different GABHS strains, geographic area and immunity profile of the study population [35].

CONCLUSION

As there is a direct correlation between prevalence of Group A beta haemolytic streptococcal and symptomatic paediatric patients presenting with sore throat and fever, this study highlights the importance of regular screening and the regular surveillance to keep GABHS in check and to control the development of non-supportive sequel, by treating children early with appropriate antibiotics by routine culture and sensitivity and also highlights upcoming drug resistance to the commonly used antibiotics which may be due to injudicious and excessive use of antibiotic therapy without following proper antibiotic policy.

The prevalence of rheumatic heart disease (RHD) has declined in the western hemisphere but continues to be an important cause of cardiovascular morbidity in India According to a survey by the Indian Council of Medical Research the prevalence rate in school age children is 5.3 per 1000. The pattern of severe juvenile RHD characteristically noted in India, the expense of chronic drug therapy, repeated hospitalization and high surgical costs make its prevention and control a major public health priority. Control of RHD entails the prevention of rheumatic fever (RF) and its antecedent streptococcal pharyngitis.

While an improved socio-economic situation, with alleviation of overcrowding and improvement of nutrition being the major factors contributing to the decline of streptococcal pharyngitis and its sequelae (RF and RHD), developing countries need to depend on anti-streptococcal drugs such as penicillin for interim programmes of prevention.

Prophylaxis may be primary (prevention of the first attack of RF) or secondary (prevention of the recrudescence of RF). Primary prophylaxis aims at the prompt treatment of streptococcal pharyngitis with penicillin so that RF does not occur. Secondary prophylaxis consists of regular long term (preferably lifelong) periodic administration of benzathine penicillin to persons who have RHD or have had an attack of RF.

As methods for streptococcal control programme have now become cost effective, such programmes should be incorporated into any prevention methods for control of RF and RHD, and children below 11 years may require a special attention regarding prevention of streptococcal infection.

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