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Prevalence of Group-A Streptococcal Infection Among School Children of Urban Community – A Cross Sectional Study

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Abstract

The most important gram positive cocci is *Streptococcus pyogenes* causing pyogenic infections, Group A beta hemolytic streptococci are the most frequently isolated pathogen in pharyngitis among school going children. The objective of the study was to find the prevalence of Group A Streptococcal infection among the Government Higher Primary School Children of an urban community. This cross sectional study was conducted in all the seven Government schools of Ramnagar under the catchment of urban health center of Belgaum city, Karnataka with a sample of 300. The findings showed that the prevalence of beta hemolytic was 30.7%. Majority of children belonged to 5-10 years age group and majority belonged to nuclear family. Children having more number of window in their house, cultured less beta hemolytic ($p < 0.001$). It was concluded that although the several risk factors have been identified, there is a need to do an in-depth study for each risk factor and also further epidemiological studies on these aspects are needed to support the findings of our study.

Key words: Group A streptococcus, tonsillitis, pharyngitis, school children, streptococcal pyogenes.

Introduction

Streptococci are gram positive cocci arranged in chains or pairs and are part of normal flora of humans and animals. Some of them are human pathogens. The most important of them is *Streptococcus pyogenes* causing pyogenic infections, with a characteristic tendency to spread, as opposed to staphylococcal lesions which are typically localized. It is also responsible for the nonsuppurative lesions, Acute Rheumatic Fever (ARF) and Glomerulonephritis (GN) which occur as sequelae to *S. pyogenes* infection.¹

The cause of acute throat infection, either pharyngitis or tonsillitis, in children between 5- 15 years is GABHS. The major health problem of developing world is RF and acute post-streptococcal glomeronephritis. RF mainly occurs in 1-3% of streptococcal throat infection of children living in poor condition. Colonization of the throat with GABHS may occur in 10%-20% of normal school aged children which are carriers and do not get actively infected nor are at risk of developing RF.² The common risk factors are tobacco, alcohol, diet and physical inactivity; hence the population prevalence levels of these factors can predict the future disease burden.³

616 million GAS pharyngitis cases are estimated every year around the world, epidemiological data are scarce from the developing countries. Asymptomatic carrier and prevalence of GAS pharyngitis among children are differing

from country to country (9% to 34.1%). Prevalence of GAS pharyngitis in India ranges from 4.2% to 13.7%, which are comparable to the rates reported from the developed countries. In different part of India the prevalence of asymptomatic carrier of GAS lie in the range of 11.2-34 %⁵. It is estimated that 0.3% and 3% during endemic and epidemic respectively develops into ARF and among them 60% may lead to damage of heart valves which lead to RHD. ARF/ RHD has been declined in many parts of the world, but still continues to be a major public health problem causing significant cardiovascular morbidity and mortality in India^{4,5}.

The rates of isolation and spread of GAS infection in closed and crowded communities may be much higher. Throat culture has always been considered the “gold standard” for diagnosing group A streptococci. The incubation period for streptococcal pharyngitis is short (2 to 5 days)⁶.

Researches pertinent to Group A Streptococcal infections are scarcely available in India, more especially in South India. No such community based study has been conducted. Only some hospital based study has been done. It has been shown that the incidence of the Streptococcal infection is higher among the less than 15 years population with poor socio-economic status. Hence, this study was done to know the prevalence of the GAS infection which will be useful for the programmers, planning and to control GAS infection.

Material and Methods

Study Area:

A Cross sectional study was conducted in all the seven Government schools of Ramnagar under the catchment of urban health center of Belgaum city, Karnataka for a period of nine months from January 2013 to September 2014.

Sample Size:

The sample size was calculated by taking prevalence of 25 and allowable error 5% by using formula: $N = \frac{4pq}{d^2}$, sample came to be 300.

Sampling Technique:

All the seven government schools of Ramnagar under the catchment of UHC were taken under the study and each school was considered as a cluster. Stratified Random Sampling Technique was used to select parts from each class and class was considered as a strata.

Inclusion Criteria:

- Children who are willing to participate in the study and present on the day of throat swab collection
- The students suffering from tonsillitis and pharyngitis were also included in the study.

Exclusion Criteria:

- The students who does not gave inform consent

Data Collection and laboratory investigation:

The data was collected by interview method using predesigned and pretested questionnaire from the children as well as their parents. Training on throat swab collection was organized for the investigator with guide ship of the research guide. The process of swab collection is mentioned below: Two throat swabs were collected from posterior pharyngeal wall using sterile cotton swab and sterile disposable tongue depressor. Care was taken to

avoid touching the tongue and buccal mucosa. Collected swab was carried to microbiology lab at room temperature within half an hour on the same day. Among two swab one was used for gram staining another for the culture. Throat swab was inoculated on blood agar media containing 5-7% defibrinated sheep blood and inoculated for 18-24 hours at 37° C under atmosphere containing 5-10% CO₂. After 18-24 hours colonies were identified.

Among this minute gray translucent beta hemolytic colonies were confirmed by Gram staining and then sub-cultured on sheep blood agar for isolation and was inoculated at 37° C for 18-24 hours.

After 18-24 hours Bacitracin sensitivity test with other antibiotics on sheep blood agar was done. If it shows sensitivity to bacitracin then it was considered as Streptococcal pyogens.

All the plates with β-hemolytic colonies were microbiologically processed and GAS was identified by conventional methods (colony morphology, hemolysis pattern, catalase test, Gram stain and morphological observation). Streptococcus pyogenes was further identified by observing its sensitive towards 0.04 units of becitracin disc tested on sheep blood agar.

Validity and Reliability of Research Tools and Data:

The pilot study was carried out among the students of government school of Ramnagar. The appropriate modifications were made based on the study.

Data Analysis:

Data entry and analysis was made by using SPSS software (SPSS 20.0 Version). Mean, proportion and percentage were calculated. Chi square test was applied for establishing association.

Ethical Considerations:

- Prior to data collection ethical clearance from Institutional Ethics Committee (IEC) of KLEU, JNMC was obtained for the study.
- Consent of respective school authority and parents, and assent from participants was obtained after explaining objectives as well as the methods of the study.

Results

Among the total 300 children of 5-15 years age, 47% were male and 64% were Hindu as shown below (table No. 1)

Eighty seven of 300 children had symptoms of sore-throat, running nose and cough where as 213 children were Asymptomatic. Of these 87 symptomatic children 39.1% grew beta-hemolytic in culture and all isolates were group A. 58 of 213 of asymptomatic children grew beta-hemolytic Streptococci and all were Group A.

The overall prevalence of GAS infection was estimated as 30.7%. Higher prevalence was found in 5-10 years of age, the prevalence percentage declined with increase in age. The prevalence was higher in girls as compared to boys.(Table no.2)

In this study, out of 92(30.7%) GAS isolated majority, 69(75%) were 5-10 age group and only 23(25%) were 11-15 age group. It shows as age increases GAS isolation decrease (P=0.310). Out of total GAS isolated 54.3% were female and 45.7% were male. Among the total isolated 66(71.7%) had nuclear family and 26(28.3%) had joint family, 63(68.5%) lived in slum area and rest lived in the urban area. Among the total isolates 52.1% belonged to

low, 37% belonged to medium and only 10.9% belonged to high socio-economic status the difference observed was statistically insignificant ($p=0.129$). (Table no:3)

The present study revealed that 58(30.2%) children had kacha/pucca i.e. semi-pucca house, 29(34.5%) had pucca house and 5(20.8%) had kacha house among 192, 84 and 24 total *S.pyogenes* isolated respectively ($p=0.428$).

In our study it was observed that prevalence of streptococcal infection among who had only one window was found 56(62.2%), and 28(20.9%), 4(6.9%), 4(25%), 1(0%) among who had two, three, four, five and six respectively. The difference observed was statistically significant ($p<0.001$).

Discussion

Group A beta hemolytic streptococci carriage is an important public health issue as the infection which often leads to post streptococcal sequelae and individuals colonized with BHS infection serve as a source for spread of infection to other individuals in the community.

The overall prevalence of beta-hemolytic Streptococci among the throat swabs of the children was 30.7% which was less than those which were isolated in the various studies conducted in the various part of country.^{7,8,9} A report from Chennai however was different where BHS isolated was high (53.5%).⁵ Our study result was similar to the study conducted in other countries.^{10,11} The prevalence of BHS in the throat swabs of asymptomatic children was 39.1% which was similar to the study conducted in North India⁴ Chennai.⁹ The prevalence rate of BHS in other countries vary widely from as low as 9.2% to as high as 28.9% from children.^{12,11} Among the isolated BHS all were GAS (100%). R Gupta, D Vijaya and Menon T reported 73.3%, 86.36% and 59.09% of GAS among the total beta-hemolytic isolated respectively.^{8,13,14} The difference prevalence could be due to difference in climatic condition, socio-economic conditions and geographical regions.

In the present study, the highest prevalence of BHS was 32.4% in 5-10 age group followed by 26.4% in 11-15 age groups. The difference was statistically insignificant. The result was similar to the report of S.Kalpana et al and it was statistically significant.⁵ Dr. Farheen Fatima and KR Rjal reported maximum number of BHS in age group 6-10 years (33.5%) and 5-8 years (11.8%) respectively^{10,12}, Dumree SP et al and Owobu AC reported highest number of BHS in age group 9-12 years(12%, 49.6%) respectively.^{15,11} Among GAS isolated 75% were from 5-10 age groups.

In our study higher prevalence was found among female for BHS 31.4% the corresponding for male was 29.8% for BHS ($p=0.765$). R. Gupta (38.9%), Owobu AC (33.2%), Irfan Sevinc (2.46%) reported higher BHS rate among female which was statistically significant.^{8,11,6} Other study conducted in different part of the world shows high prevalence among female.^{12,16,15} Among the total GAS isolated 54.3% were female and 45.3% were male which was similar to the studies conducted in Nepal.^{12,16} It's may be due to parents give less care to girl child compared to boys child.

In the present study an attempt was made to assess the role of socio-economic status in the prevalence of streptococcal infection. The prevalence was higher among the children from the higher socio-economic group 47.6% and 32% from low socio-economic group ($p=0.129$). This could be due to the urbanization and negligence from parents towards children, their busy schedule and not receiving free health services. Owobu AC reported 40% of BHS isolated children's were from middle socio-economic group and the difference was insignificant ($P=0.82$).¹¹

In our study higher prevalence were found among urban slums for BHS 60.7%, the corresponding for urban area was 39.3%. Higher were seen among slum due to poor sanitation, overcrowding but the difference was statistically in significant ($p=0.65\%$). Dr. Farheen Fatima reported highest 37.5% of BHS among minority, and lowest 23.7% among urban.¹⁰ Majority of the participants were residing in urban slums and had kacha/pucca house. In the present study BHS isolated was more (62.2%) among the children who had one window in their house and less (0%) among those had five and six windows in their house ($P<0.001$). Similar result was seen in the study conducted in Chennai, the difference was statistically significant.⁵ It may be due to the improper ventilation in the house.

Eighty seven of 300 children had symptoms of sore-throat, running nose and cough where as 213 children were Asymptomatic. Of these 87 symptomatic children 34 (39.1) grew beta-hemolytic in culture and all isolates were group A. 58 of 213 of Asymptomatic children grew beta-hemolytic Streptococci and all were Group A. Menon T reported that among 80 symptomatic children 20% grew beta-hemolytic and among that 50% isolates were Group A, 19.5% of 230 Asymptomatic children grew beta-hemolytic and among them 40% were Group A and rest were other groups of Streptococci.¹⁷

In the present study BHS isolated was more (62.2%) among the children who had one window in their house and less (0%) among those had five and six windows in their house ($P<0.001$). Similar result was seen in the study conducted in Chennai, the difference was statistically significant ($p=0.041$).⁵ It may be due to the improper ventilation in the house.

The asymptomatic children who had positive sore throat and sensitive to these drugs are more dangerous to transmit resistant infection to other children in the community because they are the those who does not seek any symptom and don't receive any treatment.

Conclusion

Although the several risk factors have been identified, there is a need to do an in-depth study for each risk factor and also further epidemiological studies on these aspects are needed to support the findings of our study. This study highlights the regular screening and the importance of regular surveillance to keep the GAS in check and to control the development of non-supportive sequelae, by treating children with antibiotics.

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Table.No1: demographic profile of study subject

Variables		Number	Percentage
Age in years	5-10	213	71.0
	11-15	87	29.0
Sex	Male	141	47.0
	Female	159	53.0
Religion	Hindu	192	64.0
	Muslim	108	36.0
Area of residence	Urban area	118	39.3
	Urban slum	182	60.7
Types of family	Nuclear	213	71.0
	Joint	87	29.0
Types of house	Kacha	24	8.0
	Pucca	84	28.0
	Kacha/Pucca	192	64.0

Table.No.2: Distribution of children according to isolation of streptococci from throat

Streptococcal pyogenes isolation	Number	Percentage
Positive	92	30.7
Negative	208	69.3
Total	300	100

Table.No.3: Association of Socio-demographic characteristics with GAS

demographic characteristics	GAS (+ve)		P-Value
	No.	%	
AGE			
05-Oct	69	75	0.31
Nov-15	23	25	
SEX			
Male	42	45.7	0.756
Female	50	54.3	
Type of Family			
Nuclear	66	71.7	0.851
Joint	26	28.3	
Area of Residence			
Urban area	29	31.5	0.65
Urban Slum	63	68.5	
Socio-economic status			
High	10	10.9	0.129
Medium	34	37	
Low	48	52.1	