Pharyngeal carriage of group A streptococci in school children in Chennai

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Background & objectives: Asymptomatic pharyngeal carriage of group A streptococci (GAS) in children may lead to spread of respiratory infections in the community. Data on healthy GAS carriers in the community are therefore important. We carried out this preliminary study to screen the school children from various parts of Chennai city, south India to detect pharyngeal carriage of GAS.

Methods: Throat swabs were collected from 1173 school children aged 5 to 17 yr from different locations in Chennai. The isolates of beta haemolytic streptococci were serogrouped by agglutination tests using specific antisera.

Results: Beta haemolytic streptococci were isolated from 16.3 per cent of 1102 asymptomatic children. 71 children of the study group had untreated tonsillitis positive for beta haemolytic streptococci. The percentage of asymptomatic GAS carriers was 8.4 per cent.

Interpretation & conclusion: The high carriage rate of beta haemolytic streptococci seen in children poses a threat to the community and should be checked. Regular screening needs to be done in various parts of the country.

Key words Carriage - Chennai - pharynx - streptococci

Group A streptococci (GAS) are bacterial pathogens that produce suppurative and non-suppurative infections in humans. The suppurative infections involve mucous membranes, tonsils and deeper tissues and include pharyngitis, pyoderma, erysipelas, cellulitis, necrotizing fasciitis, toxic streptococcal syndrome, scarlet fever, sepsis, pneumonia and meningitis. Acute rheumatic fever (ARF) is a delayed non-suppurative sequel to GAS pharyngitis and is a major cause of acquired heart disease in children, particularly in developing countries. Other important sequelae are post-
streptococcal glomerulonephritis (PSGN) that may occur after throat or skin infections, and certain brain disorders such as paediatric autoimmune neuropsychiatric disorders associated with streptococcal infections (PANDAS).1,2

Children are major reservoirs of GAS and are most susceptible to its suppurative and non-suppurative complications. Streptococcal carriage has been defined as the recovery of GAS from the nasopharynx or oropharynx in the absence of any evidence of acute infection.3,4 GAS colonization of the upper respiratory tract of children play an important role in the spread of infection in the household and in community settings such as schools, day care centres and orphanages. There is not much information on the screening of children for carriage of GAS in India. When screened and appropriately treated with antibiotics, pharyngeal carriers can be prevented from spreading respiratory infections in the community. This in turn would reduce the incidence of life-threatening post-infectious sequelae. Data on the prevalence of healthy GAS carriers in the community may provide useful information about the origin and spread of this infectious agent. A preliminary study was therefore carried out to assess the burden of GAS among asymptomatic school children in different areas of Chennai city, south India.

Table. Distribution of beta haemolytic streptococci isolates from throats of asymptomatic and symptomatic school children

<table>
<thead>
<tr>
<th>Zone</th>
<th>Number of samples collected (1173)</th>
<th>Beta haemolytic streptococci isolated (251)</th>
<th>Distribution of beta haemolytic streptococci</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Asymptomatic</td>
<td>Tonsillitis</td>
<td>C</td>
</tr>
<tr>
<td>Central</td>
<td>378</td>
<td>22</td>
<td>38</td>
</tr>
<tr>
<td>East</td>
<td>182</td>
<td>23</td>
<td>19</td>
</tr>
<tr>
<td>West</td>
<td>181</td>
<td>4</td>
<td>53</td>
</tr>
<tr>
<td>North</td>
<td>191</td>
<td>7</td>
<td>36</td>
</tr>
<tr>
<td>South</td>
<td>170</td>
<td>15</td>
<td>34</td>
</tr>
<tr>
<td>Total number</td>
<td>1102</td>
<td>71</td>
<td>180</td>
</tr>
</tbody>
</table>

C, carrier; T, tonsillitis

Material & Methods

The study included 1173 children of age 5-17 yr, attending government schools in five different locations of Chennai city representing north, south, east, west and central zones. The schools in a particular zone were selected such that children attending the school were from different residential areas of that zone. Two schools were selected in a particular zone when children from a single school did not represent the entire zone. The total number of children screened from each zone was as follows: 400 from the central zone, 198 from the north zone, 205 from the east zone, 185 from the south zone, and 185 from the west zone. Throat swabs were taken from all the children. The entire study was carried out from February to November 2004. Children screened were between standards I to XII and were selected at random. The children were segregated into asymptomatic (1102-uninfected pharynx) and symptomatic (71-with tonsillitis) study groups. The throat swab sample was collected by swabbing the tonsillar and posterior pharyngeal areas; the sample was transferred immediately onto filter paper and transported to the laboratory, where it was inoculated onto 5 per cent sheep blood agar and incubated in a carbon dioxide incubator (3-5% CO₂). Beta haemolytic colonies of Gram-positive cocci in chains that were catalase-negative and bacitracin (0.04U) sensitive
were serogrouped using specific antisera (Bio-Rad, France) with antigens prepared by the micronitrous acid extraction procedure. Children with positive throat culture were referred to a local physician for treatment.

Results

Of the 1173 children screened, beta haemolytic streptococci were isolated from 251 (21.4%) (Table). Of these, 180 (71.7%) were from asymptomatic pharyngeal carriers, and 71 (28.3%) were from children presenting with symptoms of tonsillitis; 51.7 per cent (93 of 180) of the isolates from asymptomatic carrier were GAS, 18.3 per cent (33 of 180) were group C streptococci (GCS) and 30 per cent (54 of 180) were group G streptococci (GGS). Of the 71 isolates from children with tonsillitis, 66 were GAS and 5 were GCS. No GGS were isolated from tonsillitis cases. The percentage of isolation of Streptococcus pyogenes (GAS) from throats of symptomatic and asymptomatic school children in this study was 13.6 per cent. The percentage of asymptomatic GAS carriers was 8.4 per cent (93 of 1102).

The highest percentage of isolation of GAS (carrier and tonsillitis isolates) was from the east zone (17.07%), followed by the west zone (16.21%) (Table). Children from the east zone were residing in the fishing hamlets on the east coast. However, the highest percentage of carrier GAS strains alone was isolated from the west zone (15.4%, 28/181). The overall percentage of isolation of GCS ranged from 0.97 to 7.5 per cent and that of GGS ranged from 2.4 to 7.5 per cent in all the schools studied.

Discussion

In an earlier study conducted in the district of Vellore, the carriage rate of GAS was 2.3 per cent. In a survey from Orathur, a village in Tamil Nadu, 7.8 per cent carriage rate has been reported. Other studies have reported carrier rates between 2.5 to 14.3 per cent. The carriage status of group A streptococci alone (8.4%) in Chennai seems to be on the higher side. In Chennai, the high population density (approximately 4.2 million), water scarcity, hot and humid climatic conditions are factors operating for most of the year and could contribute to the spread of infection. The schools that were included in this study were government aided or charity run schools; most of the children attending the schools belonged to lower socio-economic classes and lived in nearby slums. Overcrowding in classrooms was a common observation in all the schools with the number of children per class ranging from 41 to 62.

GAS isolated from carriers may cause active throat infection. Carriers of GAS are an important source of infection and represent a pool from which other children and adults acquire their infections. Asymptomatic spread of S. pyogenes has also been reported in families. In a study in Cleveland, it was observed that if the index family member had clinical symptoms, GAS spread was recorded 25 per cent of the time, and if he was a carrier, infection to other family members occurred 9 per cent of the time. This spread also happens in the community and could be prevented by regular screening of carriers and their appropriate treatment. Drug regimens for carriers have been described and use of macrolides (erythromycin, clarithromycin and azithromycin), clindamycin, and rifampin has been recommended as they are capable of penetrating the intracellular bacterial niche when compared to the beta-lactam antibiotics that concentrate in the extracellular space. GAS has also been demonstrated in tonsillar epithelial cells in carriers suggesting a reservoir status with the potential to cause reinfections.

Another concern is the carriage rate of GCS and GGS in the throat. The GCS namely S. equi, S. dysgalactiae subsp. dysgalactiae, and S. dysgalactiae subsp. equisimilis are essentially found in animals. The GGS such as S. canis is a pathogen in dogs. Though primarily animal pathogens, these are being increasingly reported in cases of exudative pharyngitis, deep infections and septicaemia in
humans. Group G has also been reported to cause glomerulonephritis. The results of our preliminary study highlights the importance of regular surveillance programmes to keep GAS infections and carriage in check. Children found to be carriers could be adequately treated with antibiotics. This would further facilitate control of development of the non-suppurative sequelae such as acute rheumatic fever, PSGN and PANDAS, which are debilitating and difficult to treat.

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References


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