Prevalence of *Streptococcus mutans* in public and private pre-school children

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**Abstract:** Dental infections such as tooth decay and periodontal disease, the most common bacterial infection in humans is a non-life threatening one and their frequency has minimized their significance in overall human health. Children who experience colonization by mutans streptococci early in life are at greater risk of developing dental caries than those who are colonized later. In this background, children (n=100) attending a public (Corporation; n=50) and private (Matriculation; n=50) school were screened for *Streptococcus mutans* in their saliva. While 68% (34/50) of the students attending the public school were found to harbor *S. mutans* in their oral cavity, only 18% (9/50) of the children attending to a financially affluent private school were mutans positive. Children with low salivary pH were caries positive with low saliva secretion. This study suggests the possible influence of economic status of children on their oral carriage of pathogens such as *S. mutans* and clinical consequences that includes dental caries. Strategies to prevent dental carriage of *S. mutans* in children includes, educating the parents on the importance oral hygiene, dietary discipline with special reference to sugary foods and periodical oral examination.

**Key words:** *Streptococcus mutans*; Children; Dental Caries; Socio-economic difference; Saliva

**Introduction**

Dental caries is a global pandemic disease that can be serious and may even be life-threatening. It is a unique multifactorial infectious disease (Dye et al., 2015). Dental caries is a localized infection that can lead to the destruction of hard dental tissue. Often, the causal organism may undergo horizontal transfer in the community making this a public health burden (Davey and Rogers, 1984; Berkowitz and Jones, 1985). Socio-economic disparities in the community often...
play a critical predisposing role in children with poor being more vulnerable to dental caries due
to malnourishment and deficient oral hygiene practices (Azevedo et al., 2005; Vargas and Ronzio,
2006). More than one third of children in the lower socio-economic group belonging to 2-9 years
have untreated decayed primary teeth (de Silva-Sanigorski et al., 2010). Among many oral
microbial pathogens, several studies have shown a direct relationship between dental caries and
Streptococcus mutans (Davey and Rogers, 1984).

Even though saliva is an important component of digestive and innate immune system, it also
provides nutrition for the causal organisms of dental caries. Decayed tooth is an important source
of dental caries causal pathogen. Streptococcus mutans is one of the major oral bacterium
commonly found in decayed tooth. Among the genus streptococcus, Streptococcus mutans is the
first mutants streptococci to colonize infants shortly after their first tooth erupt and was the only
mutans streptococci found to be isolated from caries in infants (Costalonga, and Herzberg 2014).
It is possible to have cavity-free child, provided appropriate preventive measures are applied in
time. Among the general population, children belonging to 2-5 years of age are of special interest
as controlling the level of Streptococcus mutans in them are often reported beneficial to protect
the upcoming dentition from the cariogenic ability of these organisms. Constant change in
population structure in a community warrants continued monitoring of etiological agents of
diseases that have public health importance. In this study, we report the comparative prevalence of
Streptococcus mutans between preschool children attending a public and private school.

Materials and Methods
This study includes a comparative analysis on the prevalence of Streptococcus mutans among 100
pre-school children attending Corporation (public) and a Matriculation (private) school in
Chennai, Tamil Nadu.

Sample
Saliva sample was collected from the children with verbal consent from the school authorities on
clarifying the sampling process being non-invasive and the data not used for commercial purposes
nor any personal identifier collected except the age of the subject. The saliva samples were
collected from the children between 10.00am - 11.30am before lunch (after > 2 hours of
breakfast) to limit food ingestion and control this variable that can alter the salivary
physiochemical properties as well as microbial load.

Salivary flow rate and pH
The secretion of whole mixed saliva was measured. After collecting, it was transferred to the
laboratory in a refrigerated condition. Amount of saliva secreted from each child was quantified.
Children with dental caries had a tendency of low amounts of saliva than the children without
caries. After using the saliva sample for bacterial isolation, the pH was measured and recorded.
**Streptococcus mutans** isolation

*S. mutans* from the saliva samples was isolated using mutans specific Mitis Salivarius Bacitracin Agar (Gold et al., 1973). Using a sterile cotton swab, the sample was inoculated on the selective agar and the plates were incubated at 37°C in a candle jar for 48 hours. *S. mutans* was further characterized using standard morphological and biochemical tests (CDC, 2017). Antibiotic sensitivity of the *S. mutans* isolated from the saliva samples for penicillin, erythromycin, amoxicillin, bacitracin and vancomycin was tested using standard disc diffusion technique (Bauer et al., 1959).

**Results**

This study screened pre-school children for the prevalence of *Streptococcus mutans* and its relationship with caries, salivary buffering capacity, and salivary flow rate. Antibiotic sensitivity pattern of the isolates were also determined.

Table 1. Incidence of *Streptococcus mutans* in the pre-school children saliva

<table>
<thead>
<tr>
<th>S.No.</th>
<th>School</th>
<th>No. of samples tested</th>
<th><em>S. mutans</em> positive</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Public (Corporation) school</td>
<td>50</td>
<td>34</td>
<td>68%</td>
</tr>
<tr>
<td>2.</td>
<td>Private (matriculation) school</td>
<td>50</td>
<td>9</td>
<td>18%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>100</td>
<td>43</td>
<td>43%</td>
</tr>
</tbody>
</table>

Fig 1. Pre-school children saliva pH profile

**Saliva pH**

- Acidic saliva (14%)
- Saliva with neutral pH (37%)
- Basic saliva (49%)
Among the school children screened in this study, 43/100 (43%) were found to carry *S. mutans* in their oral cavity based on the bacterial recovery from saliva (*Table 1*). Children attending the matriculation (private) school had relatively low incidence of *S. mutans* (9/50; 18%) in their saliva compared to those attending the corporation (public) school (34/50; 68%). When the saliva samples were tested for their pH status, 49% of children had saliva with low pH, 37% at normal pH range and 14% of the children had saliva with basic pH (*Fig 1*). The children with low pH saliva had caries in their tooth.

**Table 2. Antibiotic sensitivity pattern of *Streptococcus mutans* isolates from saliva**

<table>
<thead>
<tr>
<th>S.No</th>
<th>School</th>
<th>No. of <em>S. mutans</em> isolates</th>
<th>Antibiotics sensitivity profile</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Erythromycin</td>
</tr>
<tr>
<td>1.</td>
<td>Public school</td>
<td>34</td>
<td>Sensitive</td>
</tr>
<tr>
<td>2.</td>
<td>Private school</td>
<td>9</td>
<td>Sensitive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>43</td>
</tr>
</tbody>
</table>

All *S. mutans* saliva isolates were found to be sensitive to the antibiotics tested viz. penicillin, amoxicillin, erythromycin and vancomycin (*Table 2*).

**Discussion**

Pre-school children (n=100) attending public and private school were screened for the presence of *S. mutans*, the known causal organism for dental caries. The age group of the children sampled in this study was 2-5 years. As anticipated, higher incidence of the bacterium was recorded in children from the corporation (public) school (68%) compared to matriculation (private school) (18%). In India, economic affluence influences the students’ choice of school system. Low income people most often cannot afford to enroll their children in private schools and hence forced to select the public schools run by the Municipal Corporation and local government bodies. Poor children are the most vulnerable group of people for early childhood caries (ECC) especially in developing countries such as India (McDonald and Avery 2004). Gamboa *et al.* (2004) reported similar *S. mutans* prevalence profile in school children. They have reported that 62% of children sampled had come out positive for *S. mutans*.

One of the major predisposing factor for dental caries is the presence of acidogenic bacteria in the oral niche. In this study, 49% of the children had saliva with low pH accompanied by dental caries. This seems to have been complicated by low saliva flow rate and quantity compared to non-caries children. Higher incidence of *S. mutans* in this population is not surprising especially when corroborate with the salivary pH. Baker *et al.* (2016) in their exhaustive review article have summarized the uncanny abilities of *S. mutans*’s ability to survive, proliferate and colonize in acidic environment.
One comforting data in the present study is the antibiotic sensitivity profile of the saliva S. mutans isolates. All the S.mutans isolates were sensitive to most commonly used antibiotics such as penicillin, erythromycin, and amoxycillin. Similar observation was reported by Gamboa et al. (2004) which make it relatively simple to treat the infection and interrupt the possible transmission across the population and inturn the disease burden and clinical sequel.

**Conclusion**

The oral health is crucial for pre-school children at the age of 2-5. Instituting suitable preventive measures such as awareness campaign on oral hygiene, dietary regulation and periodic medical screening can control the level of cariogenic ability of microorganisms and in turn ensure their dental wellbeing.

**Bibliography**


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