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Prevalence of *Streptococcus mutans* serotype k among young and older children

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Abstract:
Dental caries is a prevalent childhood disease, with *Streptococcus mutans* contributing significantly to its development. Therefore, it is of interest to compare the prevalence of *S. mutans* serotype k among children younger than 5 years and those aged 5-15 years with dental caries. The presence or absence of serotype k was assessed in both age groups and its distribution was compared to identify age-related differences. Among the major *S. mutans* serotypes (c, e, f and k), serotype c is predominantly reported, whereas serotype k remains relatively understudied in children. The findings provided insights into the age-specific distribution of serotype k and its potential association with childhood dental caries.

Keywords: *Streptococcus mutans*, serotype k, ECC, PCR

Background:
Dental cavities are one of the chronic diseases presented in younger age group especially in children all over the world, among the infectious agents *Streptococcus mutans* is one of the primary microbes because of its acidogenicity, aciduricity and biofilm-forming capabilities **[1]**. While serotype c is the most commonly isolated variant, so importance of serotype k is noticed in children affected with systemic disease **[2]**. *Streptococcus mutans* serotype k is noted because of genes and structure and however, serotype k present with modified rhamnose- glucose polysaccharide RGP structure **[3]**. Because of its distinct structure other than serotype c is commonly affecting systemic circulation result in endocarditis, hemorrhagic stroke **[4]**. Functional interpretations include its tolerance toward acidity biofilm presentation and synthesis of glucans. Notably, the *rgpF* gene, similar to serotype k strains and its gene stability **[5].** Various author proved that Serotype of *Streptococcus mutans* as biomarker in pre-school children **[6].** Therefore it is of interest to compare the serotype at early age and planned preventive measure for oral and systemic disease.

Materials and Methodology:
An observational study was conducted at TMDC & RC after obtaining approval from the Institutional Ethics Committee and written informed consent from the parents or guardians of all participants. The study aimed to identify and compare the prevalence of *Streptococcus mutans* serotype k in children younger than 5 years and those aged 5-15 years with dental caries. The objectives were to determine the presence or absence of serotype k in each age group and compare its prevalence between the groups. Pediatric participants with clinically diagnosed dental caries were divided into Group I (<5 years) and Group II (5-15 years). Children with systemic illnesses, syndromes, malnutrition, recent antibiotic or antimicrobial mouth-rinse use (within the previous 4 weeks), or insufficient plaque/saliva samples were excluded. Plaque or saliva samples were collected aseptically from the buccal surfaces of primary or permanent molars, transferred to microcentrifuge tubes containing phosphate-buffered saline (PBS) and stored at −20°C until analysis. Genomic DNA was extracted using either the manual extraction method or a spin-column kit according to the reference protocol and DNA purity and concentration were assessed by spectrophotometry. Polymerase chain reaction (PCR) was performed to detect *S. mutans* serotype k using serotype-specific primers targeting the *gluA* gene or related surface protein genes (Forward: 5′-ATTGCGAAAAACAAGGGTCA-3′; Reverse: 5′-CATCTTTGATATTAGCTCT-3′). PCR amplification was carried out with an initial denaturation at 95°C for 5 minutes, followed by 30-35 cycles of denaturation at 94°C for 30 seconds, annealing at 55°C for 45 seconds, extension at 72°C for 1 minute and a final extension at 72°C for 7 minutes.

Results:
A total of 34 children with dental caries were included in the study and equally allocated into two age groups: Group I (<5 years, n = 17) and Group II (5-15 years, n = 17). All plaque/saliva samples were received at the genomic laboratory in good condition on 14 February 2026. Genomic DNA was successfully extracted from all 34 samples, yielding a DNA extraction success rate of 100%. Agarose gel electrophoresis demonstrated clear and distinct DNA bands in every sample, confirming adequate DNA quality for subsequent polymerase chain reaction (PCR) analysis. Serotype-specific PCR was performed to detect *Streptococcus mutans* serotype k using the designated primer sequences described in the methodology. Although the internal control confirmed the presence of *S. mutans* DNA, no serotype k-specific amplification products were detected in any of the samples. Consequently, none of the 17 children in Group I and none of the 17 children in Group II tested positive for serotype k, resulting in an overall prevalence of 0% in both age groups. As no positive cases were identified, there was no statistically significant difference between the two groups (p = 1.000). These findings indicate that *Streptococcus mutans* serotype k was not prevalent among children with dental caries in the studied cohort. The detailed distribution of the study findings is presented in **Table 1.**

Table 1: Summary of the study findings

Parameter	Finding
Total children examined	34
DNA extraction success	100%
Serotype k detected	0 cases

Overall prevalence	0%
Intergroup difference	Not significant (p = 1.000)
Conclusion	*Streptococcus mutans* serotype k was not prevalent in the studied cohort

Discussion:

The present study showed a complete absence of *Streptococcus mutans* serotype k among children with dental caries in both age groups (<5 years and 5-15 years), indicating that this serotype is not prevalent in the studied pediatric population. Although *S. mutans* is the principal etiological agent of dental caries and comprises four major serotypes (c, e, f and k), serotype c predominates globally, whereas serotype k is reported infrequently and exhibits considerable geographic variation. The absence of serotype k in the present study is consistent with the findings of Carletto-Körber *et al.* (2015) **[5]**, who reported that serotype k is a rare genotype among individuals with dental caries. Rao and Austin (2014) **[7]** reported a relatively higher frequency of serotypes e and k among South Indian children with dental caries, highlighting regional differences in the distribution of *S. mutans* serotypes. However, research demonstrated that serotype k remained infrequently detected among children aged 6-12 years in Puducherry, even after probiotic supplementation, supporting the notion that this serotype occurs at a low prevalence in most pediatric populations. These contrasting findings emphasize that the distribution of *S. mutans* serotypes is influenced by geographic location, ethnicity, environmental factors and microbial ecology **[8]**. Although serotype k appears to play a limited role in the development of dental caries, its clinical significance extends beyond the oral cavity. Mazurel *et al.* **[9]** successfully sequenced the complete genome of serotype k and identified unique genetic characteristics, including reduced glucose side-chain expression and enhanced acid tolerance, which may contribute to its biological behavior. Nakano (2011) **[10]** further highlighted the potential association of serotype k with systemic diseases, particularly infective endocarditis, owing to its collagen-binding properties and increased ability to invade vascular tissues. More recently, Otsugu *et al.* (2022) **[11]** reported that collagen-binding protein (CBP)-positive *S. mutans* strains, including serotype k, were associated with increased systemic risk in both children and their mothers, suggesting that even low-prevalence serotypes may possess greater pathogenic potential than the more common cariogenic strains. Furthermore, a recent meta-analysis by Mazurel *et al.* (2025) **[9]** reaffirmed the strong association between *S. mutans* and dental caries but also showed that serotype c accounts for the vast majority of isolates, whereas serotype k contributes only minimally to the overall disease burden. The findings of the present study therefore support the growing body of evidence that serotype k is uncommon among children with dental caries, particularly within Asian populations. Nevertheless, because of its reported association with systemic infections, the absence of serotype k in the present cohort should not diminish its clinical relevance. Future multicenter studies involving larger sample sizes, diverse geographic populations and advanced molecular techniques such as whole-genome sequencing are warranted to clarify the epidemiology, virulence characteristics and systemic implications of *S. mutans* serotype k.

Conclusion:

Streptococcus mutans is the primary etiological agent of dental caries, but serotype k was not detected in the present study. The findings support the predominance of serotype c in South Asian children, while serotype k appears to be rare. Further epidemiological and molecular studies are needed to define the role of serotype k and assess its potential as a biomarker for systemic disease.

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