TRANSMISSION OF STREPTOCOCCUS MUTANS FROM MOTHER TO CHILD

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INTRODUCTION

Dental caries remains a significant oral health problem worldwide for both children and adults. Dental caries is the result of interaction between microorganisms mainly Streptococcus mutans (S.mutans), teeth and fermentable carbohydrates. S.mutans is a facultative anaerobic Gram-positive cocci, sticks to the tooth surface, break down sugar for energy, lower the Ph and produce acidic environment, which causes demineralization of superficial structures of tooth i.e. enamel and dentin resulting in dental caries. It can be transmitted horizontally and vertically. According to the recent studies vertical mode of transmission is more common in preschool children than horizontal. Mainly the transferred genotypes are responsible for the transmission of caries from mothers to their children. There is genotypic diversity in population to population. No such relevant study has been conducted on local population so there is a need to know the main cariogenic genotypes of S.mutans and its transmission from mothers to their children in local population.

Key Words: Streptococcus mutans, mother to child transmission of caries

ABSTRACT

Dental caries is the most infectious and communicable dental disease of all age groups, which effects overall health of an individual. Childhood caries is a multifactorial dental disease and if left untreated it leads to discomfort, pain and lack of interest in routine activities and ultimately destroys tooth structure and early loss of tooth. Steptococcus mutans (S.mutans) is the main cariogenic microorganism. S.mutans breaks down sugar for energy and produces acidic environment, which causes demineralization of superficial structures of tooth i.e. enamel and dentin resulting in dental caries. It can be transmitted horizontally and vertically. According to the recent studies vertical mode of transmission is more common in preschool children than horizontal. Mainly the transferred genotypes are responsible for the transmission of caries from mothers to their children. There is genotypic diversity in population to population. No such relevant study has been conducted on local population so there is a need to know the main cariogenic genotypes of S.mutans and its transmission from mothers to their children in local population.

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pregnant mother. Microbiological studies have proved that children usually attain Streptococcus mutans from their mothers and both isolated strains have shown similar bacterial profiles with similar chromosomal or plasmid DNA patterns. This shows that mothers are the main source of transmission of dental caries to their children and the frequency of vertical transmission is more common in pregnant mothers.

According to some studies those children whose mothers Streptococcus mutans salivary count is high they get bacteria at younger ages than whose mother’s salivary count is low.

**Modes of Streptococcus mutans Transmission**

As the dental caries is a transmissible disease and Streptococcus mutans bacterium can be transmitted by both horizontally and vertically. Horizontal transmission is more common in siblings, children in same classroom, nursery or day care centers. It usually spreads through contaminated saliva, sputum, blood from one person to another one. Children in the same nursery school have reported to carry similar bacterial strains of Streptococcus mutans in their saliva.

On the other hand, vertical transmission is from parents to children. The term is restricted by some to genetic transmission and extended by others to include also transmission of infection from one generation to the next, by fluid as saliva, milk or through the placenta. In vertical transmission Streptococcus mutans spread mainly from mothers to their children.

It is important to highlight that maternal transmission of Streptococcus mutans rate is different in those children who spent about 10 h per day in nursery schools in Chinese children (45%) and American children (71%) than those attending day care nurseries. This conflict shows there is possibility in variation of transmission source, depending on behavior, the frequency of salivary contact between mother and child and a mother’s salivary Streptococcus mutans level and cultural and environmental conditions of the population studied. Exact method of vertical transmission is still debatable, but it is believed according to the literature that there may be close contact between mother and children by sharing of food and utensils.

**Pregnant Mothers as a Main Source of Vertical Transmission**

The tendency of dental caries transmission has been reported to be higher in those children whose mothers are pregnant and have carious teeth with high Streptococcus mutans count in their saliva.

Pregnancy leads to many temporary adaptive changes in the body, due to release of number of hormones as estrogen, progesterone, relaxin and gonadotropin. Pregnancy makes negative effects on oral health as nausea and vomiting because of neglect of tooth brushing so during this period the chances and risk of caries, gingival, periodontal and dental infections become higher than normal. The oral cavity is affected by such endocrine actions, and may present both transient and irreversible changes as well as modifications that are considered pathological.

**Window of Infectivity**

High salivary Streptococcus mutans level in pregnant mother might cause transmission through a number of daily saliva contacts between the child and the mother. The acquisition of Streptococcus mutans suggested to occur during a distinct age period: a “window of infectivity” between 19 and 31 months, in which the proportion of children with Streptococcus mutans increases from 25% to 75 %. Studies using genotypic and phenotypic methods strongly suggest that mother is the primary source of infection for children who carry Streptococcus mutans strains and saliva is the main tool for the transfer of strains.

**Colonization of Streptococcus mutans**

Once transmitted, Streptococcus mutans can colonize in the grooves of infants tongue. On the ages of one and two, bacteria start developing colonies on teeth that finally cause Childhood Caries (CC). Berkowitz et al (2003) reported in a study that mothers with high salivary Streptococcus mutans count, that is exceeded 105 colony-forming units (CFU) were about nine times more likely to pass the causative bacteria on to their children than mothers with low salivary Streptococcus mutans count. High caries prevalence has been shown in Pre-school children with high colonization of Streptococcus mutans than those children with low level of Streptococcus mutans. So at early age colonization with Streptococcus mutans is an important factor for the beginning of early caries. This time of colonization of microorganism is important to understand the caries risk factors as well as the correct time of preventive measures should be implemented.

Klein et al. (2004) studied the pattern of vertical transmission of Streptococcus mutans from mother to child, genotypic diversity and stability, in this study mother-child pair monitored over a 20-months period. The children harbored one to four distinct genotypes of
Genotypic diversity of *S. mutans*

It has implicated as a virulent factor, more important than bacterial count in causing dental caries. 14 distinct genotypes have identified from 88 isolates of *S. mutans* in saliva samples from young adults. Different genotypes of *S. mutans* have been detected at different age groups. Emanuelsson et al. (2003) found a maximum of seven genotypes in the study with young adults who had experienced dental caries in the past. Napimoga et al. (2004) also detected eight genotypes in carries-active subjects by using Arbitrary Primer Polymerase Chain Reaction. Though, according to studies it has been observed that children harbor only one to five different genotypes of *S. mutans*.15,25,37-39

Napimoga et al. (2004) study found reporting correlation between genotypic diversity in carries active and carries free children and have shown conflicting results. The findings of Pieralisi, et al. (2010) study showed a favorable relationship between carries activity and the genotypic diversity of *S. mutans*. On the other hand, Kreulen et al. (1997) detected a negative correlation between carries activity and genotypic diversity. While study by Lembo et al. (2000) have found noteworthy differences in the number of genotypes identified in carries-free and carries-active children.41

Polymerase Chain Reaction Method versus Culture Method

A review of literature Polymerase Chain Reaction and genotyping methods have been used for the detection of *S. mutans* genotypes.

Bacterial culture is the gold standard for the detection of *S. mutans* in saliva samples. Selective media as mitis-salivaris (MS) or MS-Bacitracin (MSB) agar have been used to study colony morphology for the detection of *S. mutans*. Disadvantages of culture are, time consuming, difficult and not easy to differentiate the microorganisms among other species. For the detection of *S. mutans* in saliva, direct microscopy, enzyme test, species-specific DNA probes, PCR and Enzyme Linked Immunosorbent assay (ELISA’s) cultivation. Polymerase Chain Reaction (PCR) methods have been reported to be more sensitive and specific for the detection of *S. mutans* than conventional cultural technique. By this method, low numbers of bacterial species with a detection limit of as few as 25-100 cells can be detected.

CONCLUSION

The aim of this study was to perform an evaluation of *S. mutans* in mother-child’s oral cavities, which included the pattern of vertical transmission from mother to child and its genotypic diversity, in (Peri-Urban area of Pakistani Population) up to 5 years old children saliva samples by PCR and genotype methods. Genotypes vary from population to population, and no related study has been done in Pakistan. In conclusion due to poor oral hygiene, low socio-economic status, low maternal education and hormonal changes, the chances of *S. mutans* genotypes transfer increases from pregnant mothers to their children rather than horizontal transmission. In short complete dental services and prevention of dental caries programs for pregnant women should be accessible so that, not only their own oral and general health is secured, but also their children’s carries risk is reduced.

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