TRANSMISSION OF STREPTOCOCCUS MU TANS AND DENTAL CARIES RISK IN CHILDREN

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TRANSMISSION OF *STREPTOCOCCUS MU TANS* AND DENTAL CARIES RISK IN CHILDREN

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ABSTRACT

The dental caries prevalence of Indonesian children is high. One factor causing dental caries is microorganisms in the oral cavity. *Streptococcus mutant (S mulans)* have been reported as a major cause of dental caries in human These bacteria are reported as non- indigenous bacteria in the oral cavity. Age at initial acquisition of 5' *mutant* is reported as a risk factor for dental caries in children. **Summary of Review:** Factors that influence the transmission are the amount of 5 *mulans* bacteria from the source of transmission, frequency of transmission, virulence and survival rate of the bacteria, and condusive oral conditions. The previous study reported that the younger the child acquired and colonized by *S mutant* the higher caries risk of the child. Die source of transmission which mainly reported is the mother as the closest person to the child. The Indonesian family is the extended family, where the mother is not the only child caregivers. The main infectious source is reported from the closest person to the child, such as the nanny, playmates or close relatives. Parenting and lifestyle are contributing factors of transmission. Prevention of caries in pre-school children can be started since die child in the womb. Dental care during pregnancy and postpartum is needed to reduce the possibility of transmission of *S mutant* in babies. **Conclusion:** This article suggests that knowledge regarding the acquisition and transmission of *S mulans* could lie the basis of a comprehensive effort to prevent dental caries in preschool children.

Key words: transmission, Streptococcus mutant, child, dental caries risk

INTRODUCTION

Dental caries is still a major health problem in many countries including Indonesia. Based on the data of Riskesda (2013)- the dental caries prevalence of children in Indonesia is high. The severe dental caries can impact the quality of life of children.[3] Reducing the dental caries is also an effort to improve the children's general health. One of dental caries factors is microorganisms in the oral cavity. *Streptococcus mutans (S mulans)* have been reported as a major cause of dental caries.

5 *mutans* bacteria are reported as non indigenous bacteria of the new bom infant oral cavity. Age at initial acquisition of *S mutans* is reported as a risk factor for dental caries in children. The high prevalence of dental caries in Indonesian children caused by many factors, one of the trigger factors is the age of initial acquisition of *S mulans*. The previous studies showed that the age of initial acquisition of *S mutans* in children at the area of Pucang Sewu Community Health Center Surabaya ranging in age 9.67 ± 2.25 months old"[1] and the children at the area of Simomulyo Surabaya in ranged of age 7.76 ± 0.96 months old'. Those age range was much earlier than previous studies in Hiroshima Japan where the age of the initial acquisition occurred in range of age 24.2 ± 12.3 months old[6], while in Brazil at 15.4 ± 2.12 months old.[1]

Many studies have reported the vertical transmission and mother became major source of transmission in children[7-12]. However, other studies indicate that transmission could also occured horizontally. The Indonesian family could be considered as the extended family. In the large family, mother usually is not the only child's caregiver. Previous studies have reported diat the other person could also be the source of transmission. °[17] The occurrence of *S mutans* transmission need for further study to determine who has the potential to become a source of transmission to the child. Efforts to prevent transmission have been conducted but still in the stages of delaying the transmission. The different condition of Indonesian family than family in other countries could be the reason of high caries risk on Indonesian children. It might due to the possibility of transmission is high. The knowledge of the transmission of *S mulans* need to be shared by all parties concerned particularly by parents, caregivers and dental health practitioners, as prevention of dental caries in children.

LITERATURE REVIEW

Dental caries is a teeth hard tissue disease caused by a combination of several factors (multiple factors) which arc oral microorganisms, substrate, host and time. Dental caries can affect all age groups, from children to the elderly. Dental caries in children occurs at ages under 6 years (71 months) can be categorized as Early Childhood caries (ECC), but when caries in children occurs before the age of 3 years categorized as Severe Early Childhood caries (S-ECC). The occurrence of ECC can be caused by several conditions such as the habit of bottle feeding prior night sleep (nursing bottle caries), the bad oral hygiene maintenance, and the age of initial acquisition and transmission of *S mutans*.

S mutans have been reported as the bacteria that cause caries. Initials acquisition and transmission of 5 *mutans* started the process of caries in children. Research of Kohler B.[13] showed that the younger a child acquired *S mutans* die higher caries risk of the child. Strategies for preventing or delaying the transmission of cariogenic bacteria has been recommended by The Center of Disease Control and Prevention (CDC) Atlanta, and is written as a policy of oral health of children's health care organizations.[11]

Initial acquisition of *Streptococcus mutans* *S mutans* is not

the bacteria that colonize the oral cavity in infancy. Initials acquisition of *S mutans* is when a person is infected by *S mutans* and permanently colonizes the oral cavity. Caulfield et al[15] reported period called "window of infectivily'' at the age of 19-31 months, which is a susceptible period of a child, is infected by *S mutans*. The next period was reported by Straelemans et al'" at the age of 6-12 years. Previous research[6] reported that children in Hiroshima daycare acquired 5 *mutans* at an average age of 24 months (2 years). Several studies conducted in Indonesia indicate die age of the initial acquisition of 5 *mutans* were younger. *• [5]

5 *mutans* can colonize the mucosal surface or die saliva, but it cannot survive long because of die dynamic salivary flow and the mucosal exfoliation. Research in Hiroshima Japan[6] showed that *S mutans* found in 20% children with 10 teeth erupted and in 40% children who have 12 teeth erupted. Citra Adinda et al[5] reported that the 5 *mutans* was only found in children who had erupted teeth. The results support the study that reported *S mutans* require non-shedding surface to colonize persistently.[17] However, in infants who have no tooth eiupted yet some researchers found *S mutans*.In infants using obturator reported could acquired 5 *mutans}*[a] Inidal acquisition of *S mutans* is associated with the risk of ECC in children.[21,21] The caries risk of children who positive *S mutans* detected at an early age is reported high.

Transmission of *Streptococcus mutans* Many studies have reported that mother is the main source of transmission of *S mutans* in children. *[12JIU5] De Soet et a l[20] reported that in a population that infants use the cleft palate obturator showed 38% transmission from mother at 21 mother-child pairs. Emanuelsson & Wang[26] reported on die Chinese population the source of transmission were 36% from mothers, 27% from the father, and one family shared identical strain S mutans between spouses. Li and Caufield[25] found 45% of maternal transmission of S mutans in Chinese population. The mother is not the only source of infection because Kozai et al[7] and Tedjosasongko, U. &
Kozai, K.[6] reported that the father and friend/ classmate in daycare can be a source transmission. Factors that affect the transmission arc the amount of S mutans of the source, frequency of transmission, virulence of the bacteria, the survival rate of the bacteria, and oral conditions.[17]

Vertical transmission

Vertical transmission is transmission occur from caregivers to children, including a mother and baby sitter. This is because they contact very intense. This is known by the pattern similarity of S *mutans* chromosomal DNA or plasmid in mothers and children. °-[27,28] A mother who had *S mutans* in her saliva greater than 105 CPU per mL, was reported to have risk to infect their child 58%, whereas if the modiers have 103 CFU per mL of saliva the transmission frequency down 6%.[17] Decreasing the amount of *S mutans* in the mother has been reported decreasing the possibility of transmission to children.

Mode of birth delivery also affects the risk of initial acquisition of *S mutans*. Babies were bom by Caesarean operation, reported acquired *Smutans* 11.7 months earlier than babies bom by normal delivery through vagina.[3"] Babies bom by normal delivery would be exposed to a wide variety of high intensity which may affect the pattern of acquisition of microbes. Babies born by Caesarean delivery birth in more sterile conditions, this increases the sensitivity of the baby against infection of *S mutans*.

Horizontal transmission

Horizontal transmission is the transmission of microbes between members in the same age group such as family members or classmates.[17] Research on daycare centers in Brazil[31], Hiroshima Japan[6], and in San Francisco[32] proved that transmission occurs horizontally among children in the daycare. Tedjosasongko.U. & Kozai,K.[6] studied 39 Japanese children in daycare and found 33% of mother transmission, 8% of father transmission and the evidence of horizontal transmission among playmates 58%. Horizontal transmission is also possible in the case of family members, a child have the same genotype of *S mutans* to the mother- father. '.^^Transmission between adult couples also found and supports the horizontal transmission pattern.

Streptococcus mutans tracing methods

Molecular methods that have been used to identify strains of *S mutans* such as (1) multilokus sequence typing[31]; (2) The chromosome DNA fingerprinting[35]; (3) pulsed-field gel electrophoresis (PFGE)[36,57]; (4) arbitrarily primed polymerase chain reaction (AP-PCR)[38,39]; (5) ribotyping[10] and (6) rRNA sequencing of the gene 16S.[1,M1] Technical pulsed-field gel electrophoresis (PFGE) is considered the "gold standard" for the study of the epidemiology of infectious pathogens.[15]

Transmission of *streptococcus mutans* and dental caries risk in children

Initials colonization by *S. mutans* is known as major risk factor for ECC and future dental caries. Alaluusua & Renkonen[46] conducted a longitudinal study colonization of *S. mutans* and dental caries in children age 2-4 years; children who positively acquired *S. mutans* at the age of 2 years old have active caries at the age of 4 years old (mean score DMFS was 10.6 in children who acquired *S mutans* older than 2 years of age, the mean DMFS score was 3.4 at age 4 ($p < 0.005$). Kohler et al[1'] also reported that 89% of children widi *S. mutans* colonization at the age of 2 years have carious lesions at the age of 4 years with an average value of 5.0 DMFS but only 25% children who are not infected with S. mutans at the age of 2 years experience dental caries in the age of 4 years with a mean value of 0.3 DMFS. Gindefjord et al[4'] longitudinally evaluated the risk factors of caries in 786 children aged 1 year and they were checked again at age 3.5 years to check for dental caries occurence. This study was supported by Fujiwara et al[23] and Roeters et al [J]; they confirmed that early infection of *S mutans* is a significant risk factor for the occurrence of dental caries in the future.

Knowledge the initial acquisition of *S mutans* promotes optimum dental caries prevention. Therefore one of the primary prevention of ECC is to prevent or delay the acquisition of 5 */mutans* at an early age through the reduction in the amount of *S mutans* in the mother as the primary source of transmission.[48] Primary prevention of ECC needs to be started prenatal and perinatal period (including pregnancy and the first month of birth). Mothers with high amount of *S mutans* have greater risk to pass it on to their babies. Dental care in the mother can delay transmission to infants.[4'] Research conducted Prawati Nuraini et al[50] showed a correlation between the level of 5 *mutans* mother and her child, in addition to the mother's level of *S mutans* can be predictive of caries in children.[51]

Several attempts were made to reduce the risk of transmission of *S mutans* such as reducing the amount of 5 *mutans* in mothers, sisters, and caregivers; eliminate active dental caries lesions; avoiding contamination of saliva (e.g. tasting food before eating and sharing toothbrushes); maintain oral hygiene; avoid the consumption of cariogenic foods, and visit a dentist at the early age.[17]

DISCUSSION

The spread of 5 *mutans* in the oral cavity can be influenced by the bacterial properties and host factors including saliva, teeth and immunity; the composition of the diet and environmental factors. These factors related to habit and life styles are varying in each population. Factors that are associated with the risk of caries in children include the age of child, level of *S mutans*. sucrose consumption, and the habit of tooth brushing.[52-57] The earlier a child acquires *S mutans* the higher risk of caries in children. This is due to an early age the child's ability to maintain the oral health still low, such as the ability to brush their teeth. Children preference on high sucrose containing food such as candy, milk is still high. Morphology of primary teeth is different from permanent teeth. This contributes to the occurrence of caries faster in primary teeth. The existence of 5 *mutans* in early childhood provides the higher possibility of caries occurrence.

Risks of *S mutans* initial acquisition in children increases along with teeth eruption, either the primary or permanent teeth. The eruption of teeth provides area for *S mutans* colonization. The more areas available in oral cavity the higher risk of *S mutans* initial acquisition. *S mutans* need a "non-shedding" surface to persistently colonize, such as the tooth surface or oral obturator in babies with cleft palate. *S mutans* colonization on mucosal surfaces can occur but because of exfoliative process on mucosal surface the 5 *mutans* colonies is lost along with the mucosa. The existence of S mutans colonies after 2 primary teeth eruption reported by Citrakusumadina et al[5] and the cumulative probability increases with the number of primary teeth erupted.[51-54]

The mother as the child closest person is widely reported as the main source of transmission. Indonesian family is considered as the extended family, where the mother is not the only child's caregiver. The main transmission source is the closest person to the child, in this case can be a caregivers or babysitter, children's playmates or close relatives including the father. Parenting and lifestyle are contributing factor for transmission. The eating habit, sharing glasses and spoons etc consider as a potential transfer media of bacteria. Transmission occurs either directly or indirectly through saliva.

Efforts to prevent transmission can be done for example by lowering the amount of 5 *mutans* from the person surround the child who could potentially pass it. Decreasing the number of bacteria can be done by treating the caries teeth, improving oral hygiene by brushing teeth or use mouthwash etc. The efforts of caries prevention could be focused on the mothers. Prevention is done before pregnancy, during pregnancy and after pregnancy.

Previous research has reported that the age of initial acquisition of *S mutans* in Indonesian children occurred in the range of age 9,7 months[4] and 7.6 months.[5] that are earlier than the period "window of infectivity" reported by Caufield et al[15] in the age range of 19-31 months. It is true that the studies in children at the area of Pucang Sewu Community health center and Simomulyo Surabaya region were not yet representative Indonesian children, but it shows die possibility of initial acquisition of *S mutans* in Indonesia children occur at such an early age. However, this may be one of the predictions of the potential causes of high prevalence of dental caries in Indonesia children. At the age of 7 months a child has gained S mutans so no wonder that at the age of 2 years the child has been exposed to caries.

An extended family style in Indonesia could be condusive conditions for transmission of *S mutans'*. due to the caretaker of the child is not only the mother but also the members of family. Mode of administration and the selection of food are contributing to the early age of the initials acquisition, including providing snack foods with high sugar levels between meals, and the habit of prolonged bottle feeding. Oral hygiene creates conducive conditions to 5 *mutans* transmission. This article suggests that the increased risk of caries in children related to the age of S mutans initial acquisition. Transmission of 5 *mutans* can occur vertically or horizontally. Knowledge regarding the acquisition and transmission of *S mutans* could be the basis of a comprehensive effort to prevent dental caries in preschool children.

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