

EFFECT OF DENTAL AND ORAL HEALTH IN UNDER WEIGHT CHILDREN UNDER FIVE YEARS OF AGE FOR STUNTING PREVENTION: A SYSTEMATIC REVIEW

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ABSTRACT

Background: Malnutrition and dental caries in early childhood remain persistent and intertwined global health challenges, particularly for indigenous and geographically-remote populations. In addition, a pandemic of childhood dental caries has emerged. Caries is the most common chronic disease of childhood, affecting 60–90% of young children worldwide. Untreated caries can lead to chronic oral infection, mouth pain, malnutrition, and reduced educational potential persisting into adulthood. This study aimed to review systematically the effect of dental and oral health in under weight children under five years of age for stunting prevention.

Subject and Method: This systematic review was conducted through six steps: (1) Frame a question (based on a theory); (2) Run a search (on Pubmed, Google Scholar, and Proquest which published articles from 2008 to 2018); (3) Read the abstract and title of the individual papers; (4) Abstract information from the selected set of final articles; (5) Determine the quality of the information in these articles, which was done using a judgment of their internal validity but also using the GRADE criteria; (6) Determine the extent to which these articles were heterogeneous. The dependent variable was under weight children under five years. The independent variable was dental and oral health. The keywords for this review were carries, nutrition and children under five. The inclusion criteria were qualitative, quantitative, and full text. After review process 15 articles were included in this review.

Results: Dental and oral health of children under five associated with growth and under weight. Nutritional status also associated with dental and oral health as well as the period of tooth growth. Underweight was associated with several factor included malnutrition, illness, mother knowledge, and social status.

Conclusion: Dental and oral health affects nutritional status in children under five. An integrated dental and oral health effort program is needed to prevent stunting.

Keywords: dental, oral health, carries, nutritional status, children under five, under wight, stunting.

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BACKGROUND

In 2017, an estimated 22.2 percent or 150.8 million stunting children were under the age of 5 years old, globally, 83.6 million were in Asia, 58.7 million were in Africa and 5.1 million were in Latin America and the Caribbean. Half of the number of stunting chil-

dren in the world lived in Asia under the age of 5 years old (WHO, 2018). Stunting was a condition of growth failure in children (body and brain growth) due to long-term malnutrition (Minister of Health, 2018; WHO, 2018). Therefore, the children were shorter than normal children and has

a delay in thinking. Nutritional Status Monitoring (PSG) in 2017 showed that the prevalence of stunting toddlers in Indonesia was still high, which was 29.6% above the WHO limit (20%) (Ministry of Health RI, 2018a).

The causes of malnutrition according to UNICEF (1998) in Soekirman (2000) (the state of the worlds children 1998 Oxford University) were that malnutrition has a direct cause and indirect causes, basis and main problems. First, the direct cause was food and infectious diseases suffered by children. Second, the indirect causes of food security in the family, the pattern of child care and health services and environmental health, child care. Third, the problem was women and families, lack of utilization of community resources driven by education, knowledge, skills. Fourth, economic, political and social driven by unemployment, inflation, poverty (Soekirman, 2000).

Toddlers (aged 1-3 years old) needed special attention, because at this age, there was growth, appetite decreases, but the toddler's movement increased and food intake decreased, which lead to severe BGM (Nelson, 2000). Below the red line (BRL) was a child who has less weight according to age based on the standard, which was seen visually on the plot in KMS (Health Card) below the red line (Sadjaja, 2009)

Nutritional status affected the teeth during pre-eruption. Vitamin D deficiency, vitamin A, and energy protein malnutrition (KEP) have been associated with hypoplastic enamel. The definition of PEM and vitamin A was also associated with atrophy of

the salivary gland, which in turn reduced oral defense on infection and its ability to protect acidic plaque (Sridhar,2014).

Oral and dental health was still a problem throughout history (sridhar, 2014). Based on data from the Basic Health Research in 2018, the proportion of dental and oral health problems was 57.6% and those who received services from dental medical personnel were 10.2%. While the proportion of teeth brushing behavior was 2.8% (Ministry of Health RI, 2018b).

Early tooth decay or babby bottle tooth decay at the age of 1-3 years old was because babies were left too long to drink milk from bottles (Arisman, 2014). Early childhood caries (ECC) was the most important dental health problem infants and toddlers. One of the causes of early childhood caries was because parents allowed the toddlers and babies to sleep by drinking milk bottles containing fermented carbohydrates (milk) (Widmer, 2013). Sweet liquid would gather around the teeth, then there would be enamel demineralization (Arisman, 2014).

SUBJECTS AND METHOD

This review was conducted in accordance with the Preferred Reporting Items for Systematic Review and Meta-Analysis from the PRISMA Statement (Liberati et al., 2009).

A systematic database search was performed from 23 December to 29 December 2018. The databases included Google Scholar, Proquest, Pubmed and other journal data base with keywords "nutrition" and "early

dental carries” and “toddlers”.

Inclusion criteria

For inclusive criteria, the researchers considered a study (feasible) that was suitable for systematic review: (1) goals: toddlers, children aged 1 to 5 years old, (2) outcome: dental and stunting caries under 5 years old, (3) research methods: qualitative and quantitative, (4) research was written in English and Indonesian.

The subjects in this study were toddlers aged 1 to 5 years old. The research method was Systematic Review from the journal obtained. The research protocol method used was Preferred Reporting Items For Systematic Reviews (PRISMA-P) and Meta-Analysis (2015). The search strategies used to identify relevant studies were as follows (1) Article type: text availability, free full text, Indonesian and English; (2) Publication dates: The last 10 years from 2008 to 2018; (3) Species: Children aged 0 to 5 years old (human). (4) The term included three titles related to dental and oral health, dental caries, nutrition, mal-

nutrition, toddlers under the red line and children.

Exclusion criteria

Selection of published articles based on titles and abstracts that were not complete text and irrelevant. In addition, the study also did not discuss the influence of oral health on children over the age of 6 years old.

RESULTS

Search results in the database, namely Google Scholar, Pubmed, and several other related journals have been identified 4,922 articles. The results of the selection were 15 appropriate articles, consisting of 13 cross-sectional articles, 1 case control study article, 1 case study article from 8 countries, namely India, Vietnam, Brazil, Indonesia, Poland, Boston, Canada, Sanfransisco. Of the 15 articles representing several countries that have the highest stunting rate in Asian were 9 articles which came from Vietnam, India, Indonesia, Africa, Brazil, America, Boston, Canada, and Poland.

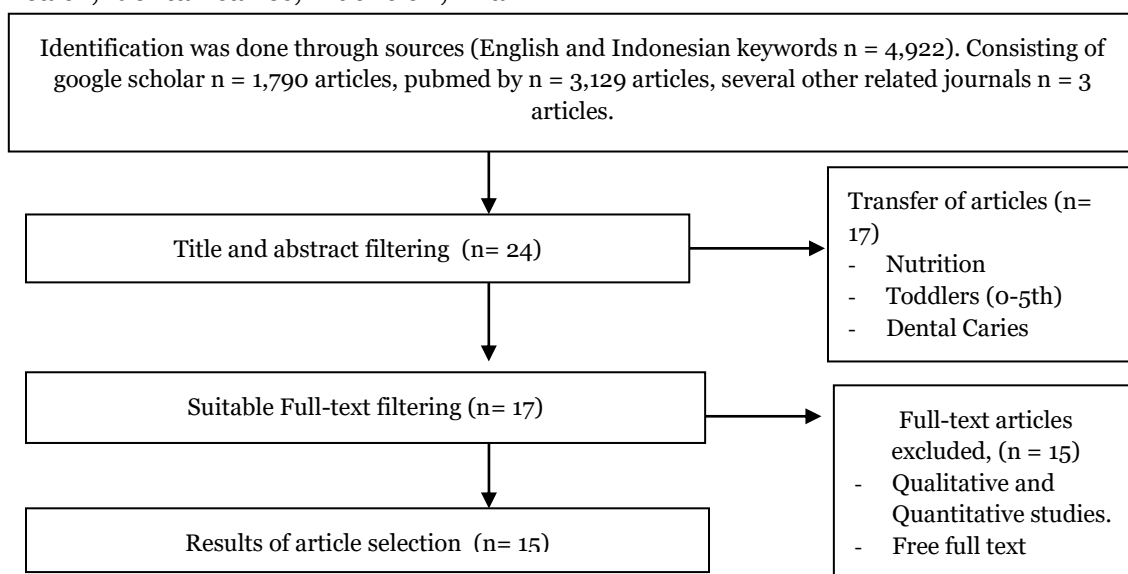


Figure 1. PRISMA Sitematic review, identification, screening, eligibility, and inclusion

The results of the selection were 15 articles that were in accordance with the results of the study proving the various causative factors that affect body weight under the red line and malnutrition of 8 countries. The factors influencing malnutrition and weight under the red line and dental and oral health were then categorized into 4 general categories. This category affected each other, namely malnutrition, disease, maternal knowledge, social status based on high caries index in infants with borderline malnutrition or malnutrition has a higher probability of dental caries compared to those with normal nutritional status. There was one article that stated the causes of multifactor early caries in children, including dental and oral hygiene that was not well maintained, the presence of systemic diseases suffered by children such as malnutriti-

on, asthma, recurrent infections, chronic infectious diseases, the use of drugs. From 15 articles, it can be concluded that several causes of 8 articles were concluded that malnutrition with dental and oral health in toddlers BGM or malnutrition, 3 articles concluded that diseases suffered by infants with dental and oral health for toddlers BGM or malnutrition, 5 articles stated that knowledge of parents about nutrition and dental and oral health for toddlers BGM or malnutrition, 4 articles concluded that social status and family income with dental and oral health in toddlers BGM or malnutrition. Presented in table. 1. The effect of dental and oral health on body weight below the toddler's red line (0 to 5 years of age) as an effort to prevent stunting, namely malnutrition, infantile illness, maternal knowledge, social status.

RESULTS

Table 1. The Results of Journal Search

Author	Title	Results
Chandrashekar, 2018. India	Association of Undernutrition and Early Childhood Dental Caries	Children with borderline malnutrition (OR= 2.05; 95% CI= 1.20 to 3.49) or malnutrition (adjusted OR = 3.46; 95% CI 1.93 to 6.29) were more likely to have dental caries than those with normal nutritional status.
Chaffee, 2017. USA.	Oral health-related quality scores differ in socioeconomic status and caries experience	Caries prevalence (def-t) is 39.7%; low education (ratio: 0.7; 95% CI=0.5 to 1.0), low social status (ratio: 0.7; 95% CI=0.5 to 1.0), low family income (ratio: 0.8; 95% CI=0.6 to 1.03)
Khanh et al., 2015. Vietnam.	Early Childhood Caries, Mouth Pain, and Nutritional Threats in Vietnam,	Caries group with low severity, mean weight and BMI score for age were 0.46 (P = 0.006; 95% CI= -0.81 to -0.11) and 0.44 (P = 0.012; 95% CI= -0.81 to -0.08) lower than caries-free child. For children in the high severity of the caries group, the average weight and BMI-for-age z-score was 0.59 (P <0.001; 95% CI= -0.91 to -0.27) and 0.64 (P <.001 ; 95% CI= -0.97 to -0.31) lower than those in children who were caries free. There was a

Author	Title	Results
		relationship between caries experience and knowledge of parents
Santos et al., 2014. Brazil.	Early childhood caries and its relationship to perinatal, socio-economic and nutritional risk: a cross-sectional study	The prevalence of ECC has been shown to be associated with low family income, low birth weight, obesity and shorter gestational age of infants ($p < 0.05$) other factors: About 20% of children have ECC, and multivariate Poisson analysis showed that family income ($p = 0.009$), weight birth ($p < 0.001$) and infant obesity ($p < 0.001$) were associated with increased ECC, and pregnancy. Age was not significantly associated with ECC ($p = 0.149$).
Asrianti et al., 2015. Indonesia.	The relationship between Early Childhood Caries (ECC) with food intake and nutritional status of children aged 3-5 years old	There was no significant relationship between caries and energy intake ($p = 0.112$), there was a significant relationship between caries and protein intake ($p = 0.042$)
Fajriani et al., 2011. Indonesia.	Talaksanaan early childhood caries Management of early childhood caries	The causes of multifactorial early caries in children include dental and oral hygiene that was not well maintained, the presence of systemic diseases suffered by children such as malnutrition, asthma, recurrent infections, chronic infectious diseases, the use of drugs.
Susanti et al., 2014. Indonesia.	The relationship between maternal knowledge about nutrition and nutritional status of children aged 1-3 years old	Nutritional problems in children were caused by various causes, one of the causes of nutritional problems in children was poor consumption of food, so that the energy intake and outake was not balanced. There was a relationship between maternal knowledge about children's nutrition and nutritional status of children aged 1-3 years old ($p = 0.004$).
Shilfia et al., 2017. Indonesia	Factors related to the level of nutritional status in toddlers in the village of Lambang, Undaan, Bali	There was a relationship between diet and the level of nutritional status in infants, which was ($p < 0.001$; $r = 0,81$). There was a relationship between family income and the level of nutritional status of toddlers, which was ($p < 0.00q$; $r = 0.69$)
Rahman et a., 2016. Indonesia.	The relationship between stunting and the level of dental caries	Based on the result, caries index in the group of stunting children was 8.23 higher than the normal nutrition group. Chi square test analysis with a confidence level of 95% showed a p value of < 0.001 which was a significant difference between the dental caries index in children with stunting and normal nutrition.

Author	Title	Results
Andriany, 2008. Indonesia.	Differences in the caries and permanent dental caries severity curves and factors that play a role in children with poor nutritional status and good nutrition	The positive correlation between milk teeth caries and permanent teeth mean that children with good nutrition showed that dental caries and teeth were low. children who have low nutrition showed caries of teeth and teeth were high
Wahdah et al., 2015. Indonesia.	Risk factors for stunting in children aged 6-36 months old in the Outback Region of Silat Hulu Subdistrict, Kapuas Hulu, West Kalimantan	Diet, exclusive breastfeeding. The incidence of stunting was not related to infectious diseases, and maternal education ($p > 0.05$). And it was not related to maternal education ($p > 0.05$). Stunting incidents were significantly associated with maternal work, father's height, maternal height, income, number of household members, parenting, and exclusive breastfeeding ($p = 0.05$).
Olczak-Kwalczyk et al., 2017. Poland.	Parental nutrition in childhood and consequences for tooth and gingival growth	Parenteral nutrition groups were significantly less (56.25%) and ($p = 0.002$). DMFT and deft were also lower.
So, 2017. USA.	The relationship between early caries, mouth pain, and malnutrition in the Ecuadrian Amazon Region	Malnutrition with 35.9% of children stunted, 1.15 wasted, 7.4% less weight, and 6.85 overweight. As the frequency of mouthache increased, an increase in the frequency of severe caries interfered the sleep. (OR: 1.27; 95% CI= 1.02 to 1.54).
Schroth et al., 2013. Kanada.	Vitamin D status of children with dental caries	Children with dental caries had an average of vit D (OH) D ($P < 0.001$), calcium ($p < 0.001$) and albumin levels ($p < 0.001$), significantly, the paratiroin hormone level was higher ($p < 0.001$). Education ($p < 0.001$) Dental caries was related to social health determinants and family income ($p < 0.001$),

DISCUSSION

Caries risk factors were age, gender, fluoride, disease, treatment, poor oral hygiene, food (Premkumar, 2014). The nutritional problems of the community were apparently closely related to economic, agricultural, educational and political issues. Malnutrition has direct and indirect causes, basis and main and problems. Direct causes were food and infectious disea-

ses that children suffer. Indirect causes were food security in the family, pattern of parenting.

The main problem was women and families, lack of utilization of community resources driven by education, knowledge, skills, economics, politics and social development driven by unemployment, inflation, poverty (Soekirman, 2000). Dental and oral health in children that were often

found was early dental caries that can affect nutritional intake, especially Indonesia. Weight based on a healthy card (KMS). Below the red line (BGM) was a child who has less weight according to age based on the standard, which is seen visually on the plot in KMS below the red line. It means that below the red line included BGM before the lowest line of malnutrition.

Based on WHO data, Indonesia still has a high stunting rate. From several studies, the influence of dental and oral health in toddlers under the red line was categorized in 4 general categories. This category affected each other, namely malnutrition, illness, maternal knowledge, social status. This study only described the influence of dental and oral health in infants under the red line (BGM) as an effort to prevent stunting.

The results of the study showed the influence of oral and dental health on toddlers BRL, from 15 articles, there were 2 articles which stated that in Indonesia, the incidence of stunting was not related to infectious diseases, and maternal education ($p > 0.05$) (Siti et al, 2015). But there was one study that stated that the causes of multifactorial early caries in children include dental and oral hygiene that was not well maintained, the presence of systemic diseases suffered by children such as malnutrition, asthma, recurrent infections, chronic infectious diseases, drug use (Fajriani et al, 2011). Indonesia as a country that donated stunting populations in the world from Asia.

The results showed the influence of dental and oral health on BRL

toddlers, from 15 articles, there were 5 articles stating that in addition of illness and knowledge, the social status of families can influence dental and oral health for BRL toddlers, from several studies stated in the USA that social status was low (ratio: 0.7; 95%), low family income (ratio: 0.8; 95%) (Benjamin, 2018), family income ($p = 0.009$) in Brazil (Valedeci, 2014), in Canada Dental caries was related to social health determinants, family income ($p < 0.001$) (Robert et al, 2013), in Indonesia nutritional status was related to family social status (Siti, 2014) and family income level (Noor, 2016).

Therefore, mothers who play a role in the growth of children should have knowledge about dental and oral health that can affect under nutrition or weight below the red line. Based on research in Indonesia, knowledge was related to nutritional status ($p = 0.004$) (Noor, 2016), but one study stated that there was no relationship between education and nutrition ($p = 0.005$) (Siti, 2015). While other studies stated that education was associated with dental caries and oral and dental health ($p = 0.001$) in Canada (Robert, 2017), in USA the education was low (ratio 0.7: 95%) (Benjamin, 2017) and in Vietnam, parents' knowledge (Linh et al., 2015) both were related to dental and oral health and nutrition.

The main factor was malnutrition, from 15 articles, there were 11 articles which concluded that children with borderline malnutrition (OR= 2.05, 95%) or malnourished (adjusted OR= 3.46, 95%) had a higher likelihood of dental caries in compared to

those with normal nutritional status (Chandrashekar, 2018). In addition, there was a significant relationship between aries and protein intake ($p = 0.042$) (Asrianti1, 2015), so that the caries index in stunting nutrition children was higher than normal nutrition children ($p= 0.05$) (Rahman, 2016). So it was necessary to prevent and improve nutrition since early age because according to the research, children with good nutrition showed that the dental caries was low while children with low nutrition showed that teeth caries was high (Andary, 2008), parenteral nutrition has more def and lower DMF ($p=0.002$) (Olczak et al., 2017). Malnutrition with 35.9% of children was hampered, 1.15 was wasted, 7.4% was underweight, and 6.85 was overweight. As the frequency of mouthache increased, an increase in caries frequency severely interfered the sleep ($OR= 1.27$; 95%) (Malvin et al., 2017). Children with dental caries had an average of vit D (OH) D ($p<0.001$), calcium ($p< 0.001$) and albumin levels ($p<0.001$), significantly higher paratiroid hormone levels ($p<0.001$) (Robert, 2013).

The first human digestive tool that food went through was the mouth. Teeth were the main organs that play a role in mechanical digestion in the oral cavity. Teeth that grow first were milk teeth (Arikianto, 2014). At the age of 1 year old, the teeth would begin to grow and then small teeth would be formed. Nutrition would affect the pre-eruption. Factors that affect dental caries at the age below 5 years old were milk and maternal knowledge in maintaining dental and oral health. Nutritional

status affected teeth during pre-eruption. Vitamin D deficiency, vitamin A, and energy protein malnutrition have been associated with hypoplastic enamel. The definition of PEM and vitamin A was also associated with atrophy of the salivary gland, which in turn reduced oral defense on infection and its ability to protect acidic plaque (Premkumar, 2014).

It can be concluded that there was an effect of dental and oral health in infants under the red line in an effort to prevent stunting with high dental caries index or high caries severity, low weight growth can affect dental growth and development of toddlers. This was influenced by several factors related to malnutrition, comorbidities, knowledge, social status. Then, an integration program for dental and oral health efforts was needed to prevent stunting. Therefore, it was expected that child case data would be controlled and integrated.

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