



RISK FACTORS FOR DENTAL CARIES IN ELEMENTARY SCHOOL CHILDREN AGED 6-12 IN INDONESIA (SYSTEMATIC LITERATUR REVIEW)

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Abstract

The highest prevalence of dental caries was in the group of children aged 5-9 years (92.6%), and in the age group 3-4 years was 81.1%. Unhealthy teeth and mouth can affect a child's development because the condition of the milk teeth will determine the growth of the child's permanent teeth. Previous research has proven that caries is influenced by how to brush teeth, consumption of cariogenic foods and knowledge. The study aims to identify and analyze the risk factors for dental caries in Indonesian children aged 6-12 years. This study used the literature review method which began with searching research results in 3 databases, namely PubMed, ScienceDirect, and Google Scholar with inclusion criteria published articles from 2020 - 2023, research subjects aged 6 - 12, research conducted in Indonesia, research with cross-sectional, case-control and the cohort is not a review, case report, letters of editor or protocol, articles are presented in full text and can be downloaded. The articles obtained in this literature show that cariogenic food consumption, tooth brushing frequency, how to brush teeth, dental care visits, knowledge, attitude, dental hygiene, stunting, dietary habits, social practices, BMI, tooth brushing time, oral hygiene index, dental plaque index, salivary acidity level, dental and oral health education are variables that are risk factors in the process of dental caries in elementary school children in Indonesia.

Keywords: *risk factor, caries, elementary school*

1. Introduction

The development of caries disease in Indonesia according to basic health research data in 2018 that the prevalence of dental caries in Indonesia is 88.8% with a root caries prevalence of 56.6%. The prevalence of caries tends to be high (above 70%) in all age groups. The highest caries prevalence was found in the age group 5-9 years (96.8%). Meanwhile, the prevalence of dental caries in the group of children was highest at the age of 5-9 years (92.6%), and in the age

group 3-4 years as much as 81.1% (RISEKDAS, 2018).

Unhealthy teeth and mouth can affect a child's development because the condition of the milk teeth will determine the growth of the child's permanently (O.F, 2018). In addition, if the child doesn't have teeth, it will be difficult for him to digest food so the child's growth process will be disrupted. As a result, children will be susceptible to disease. Dental and oral disease is an irreversible disease, that is, it cannot return to normal as before, so it will carry over for the rest of their life and affect their quality of life and health in general (Nurwati, 2019)(Nurwati, 2019).

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Dental caries occurs due to damage to the hard tissues of the teeth which include enamel, dentin, and cementum. The process of tooth decay begins with a demineralization process followed by damage to organic matter resulting in the development of bacteria. Children aged 6-14 years are vulnerable to dental and oral diseases because in general these children still have the habit of snacking on food and drinks both at school and at home (Wulandari, 2019).

As much as 75.4% of a study stated that there were dental caries in children recruited from 11 elementary schools in Jakarta (Utami et al., 2020). As many as 68% of children experience caries in a sub-district in Aceh, and 64% in an elementary school in Mataram (Rekawati & Frisca, 2020) (Rekawati & Frisca, 2020). Caries are affected by tooth brushing (Jalante et al., 2020), how to brush teeth (Yasin et al., 2020) (Yasin et al., 2020), consumption of cariogenic foods (Rehena, 2020) (Rehena, 2020) (Syafriani & Sihombing, 2019), knowledge (Ulfah & Utami, 2020) and possibly many other factors that can affect caries. Therefore this study aims to see the latest trends of risk factors that can affect dental caries in elementary school children in Indonesia.

2. Method

The study uses the literature review method which begins with searching research results in 3 databases, namely PubMed, ScienceDirect, and Google Scholar. The terms or keywords used in this search are in English in all databases and Indonesian in Google Scholar including risk factors, caries, elementary school, and Indonesian. The criteria used to select articles include: (1) published articles from 2020 - 2023 to reflect the latest developments and the relevance of the current context, (2) research subjects aged 6 - 12, (3) research conducted in Indonesia, (4) research with cross-sectional, case-control and the cohort is not a review, case report, letters of editor or protocol, (5) articles are presented in full text and can be downloaded. The strategy of collecting journals for various literature using accredited **Table 1**. Results of the Literature Review

journal sites. The strategy is explained systematically through the PRISMA method (Figure 1):

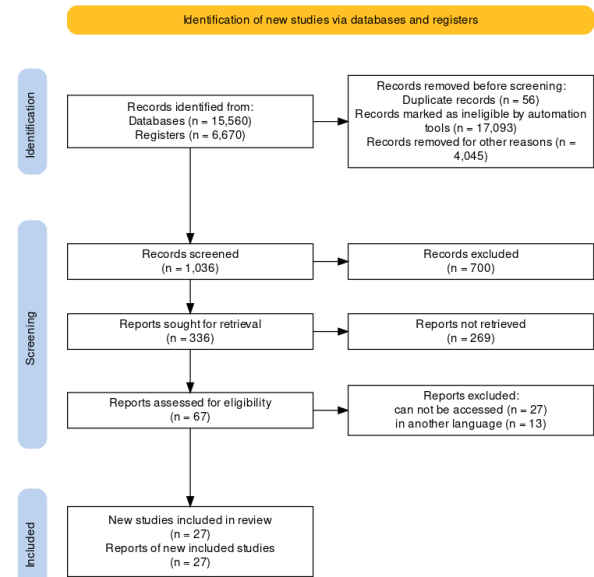


Figure 1. PRISMA Diagram

3. Result and Discussion

The total number of articles obtained was 22,230 articles with details of 21,570 articles obtained from Google Scholar, 35 from Pubmed, and 625 from Science Direct. The article search results were then screened from 2021-2023 with a result of 5,137 articles. Furthermore, the elimination of duplicate articles was carried out and did not have suitability for the research objectives based on the title and abstract, namely 5,070 articles were obtained and then sorted to find duplicate articles, and 56 multiple articles were found, then the selection was carried out based on the research area and type of article, namely cross-sectional, case-control, and cohorts, resulting in 67 articles. Next, articles are selected based on the content of the article, its eligibility level, and can be accessed in full text. The total number of articles used in this study was 27 articles.

No	Researcher Name (Year)	Title	Design Study	Sample size	Research variable	Results
1.	Acep Hamzah (2021) (Hamzah, 2021)	Patterns of Consumption of Cariogenic Foods with the Incidence of Dental Caries in Elementary School Children	Cross-sectional	131	-Cariogenic food consumption patterns	There is a relationship between cariogenic food consumption patterns with dental caries
2.	Putri, Windi Winarto and Nina (2021) (Winarto Putri & Nina, 2021)	Correlation between Tooth Brushing Frequency, How to Brush Teeth and Eating Habits with Caries Incidence	Cross-sectional	110	-Tooth Brushing Frequency -How to Brush Teeth -Eating habit -caries	There is a relationship between the frequency of brushing teeth, how to brush teeth, and eating habits with caries events
3.	Tameon, Josinta Elsiana Maryanti. et al (2021)(Tameon, 2021)	Relationship between Children's Knowledge and Dental Caries in VA Class Children at SDI Raden Paku Surabaya in 2020	Cross-sectional	52	-Child knowledge -caries	There is no relationship between children's knowledge and dental caries
4.	Bahar. et al (2021) (Armasastra Baha, Herialdi Hardan Permana, Risqa Rina Darwita, Febriana Setiawati, Atik Ramadhani, Anton Rahardjo, 2021)	Dental Caries Experience and Associated Factors Among 12-year-old Schoolchildren in East Jakarta, Indonesia	Cross-sectional	146	-Gender -Frequency of consumption of sugar, food, and drink -Brush your teeth in the morning and before bed -Dental care visits -Suffering from toothache -caries	Dental care visits are associated with a lower caries risk
5.	Limanto, Michael Ivan. et al (2021) (Limanto et al., 2021)	Relationship of Tooth Brushing Habits to the Incidence of Dental Caries in Elementary School Children Grades 5-6 at SDN 1 Kerobokan in 2017	Cross-sectional	52	-Tooth Brushing Habits -caries	There is a relationship between brushing teeth and the incidence of dental caries
6.	Nisa, Roifatun and Sukhriyatun (2021)	The Relationship of Knowledge, Attitudes, and Actions About Dental Hygiene to Dental	Cross-sectional	32	- Knowledge - Attitude - Measures Of Dental Hygiene	There is a relationship between knowledge, attitudes, and

No	Researcher Name (Year)	Title	Design Study	Sample size	Research variable	Results
	(Nisa, 2021)	Caries in Children at SD Negeri 2 Mundu, Indramayu Regency			- caries	actions regarding dental hygiene to dental caries
7.	Lutfi, Abubakar (2021) (Lutfi et al., 2021)	The Relationship between Stunting and the Severity of Dental Caries in Children Aged 10-12 Years in Tuah Negeri District, Musi Rawas Regency	Cross-sectional	70	- stunt - Dental caries severity	There is a relationship between stunting and the severity of dental caries
8.	Friandi, Riris (2021) (Friandi, 2021)	Relationship of Knowledge and Diet with the Incidence of Dental Caries in Elementary School Children at SD IT Amanah, Sungai Bungkal District	Cross-sectional	47	-Knowledge -Dietary habit -Dental Caries Incidence	There is a relationship between knowledge and diet with the incidence of dental caries in children
9.	Melvani, Rizcita Prilia (2021) (Melvani, 2021)	Analysis of Factors Associated with the Incidence of Dental Caries in Children at SDN 44 Palembang	Cross-sectional	71	-Socioeconomic status -Social practice -Knowledge -Child behavior -Consumption of cariogenic food and drink -caries	There is a significant relationship between social practices, knowledge, children's behavior, and consumption of cariogenic food and beverages to the incidence of dental caries in children
10.	Widodorin, Trining and Puspaningt yas, Kristina Linggam (2021) (Trining Widodorini, 2021)	Relationship between BMI and Dental Caries in Grade 5 Elementary School Students in Malang City	Cross-sectional	51	-BMI -caries	There is no significant relationship between BMI and dental caries
11.	Nelli, Septa and Ramadhan, Rahmi (2021) (Nelli & Ramadhan, 2021)	Relationship of Knowledge with the Incidence of Dental Caries in Children School	Cross-sectional	47	-Knowledge -caries	There is a relationship between knowledge and the incidence of dental caries
12.	Jauhara,	Dental Caries	Cross-	107	-Knowledge	Risk factors that

No	Researcher Name (Year)	Title	Design Study	Sample size	Research variable	Results
	Fatin Nur and Thresya Febrianti (2021) (Jauhara & Febrianti, 2021)	Incidence and Dental Caries Risk Factors in Elementary School Students	sectional		-How to brush teeth -Tooth brushing time -Tooth check frequency -Tooth brushing period -Cariogenic food consumption rates -caries	influence the incidence of dental caries in students include knowledge, how to brush their teeth, and when to brush their teeth.
13.	Jamila, Mariyam (2021) (Mariyam Jamilah, 2021)	Analysis of the Incidence of Dental Caries in Al-Azhar Elementary School Children in Bangun Jaya Village, Pagar Alam City in 2021	Cross-sectional	50	-Gender -Knowledge -Attitude -Tooth brushing habit -caries	There is a significant relationship between attitude and toothbrush habit, with the dominant factor, namely attitude
14.	Lutfi, Abubakar (2021) (Lutfi, 2021)	The Effect of Stunting on Dental Caries in Elementary School-aged Children in Tuah Negeri District	Cross-sectional	76	-stunt -Keries	There is a significant relationship between stunting and the severity of caries in elementary school-age children
15.	Nilawati, Srinur (2021) (Nilawati, 2021)	Relationship of Teeth Brushing Habits with Dental Caries Incidence in 1st and 2nd Graders Students in State Elementary Schools No. 057205 Old Status of Langkat Regency	Cross-sectional	74	-Rubbing habit -caries	There is no relationship between the habit of brushing children's teeth with dental caries
16.	Halimah, et al (2022) (Anugraini & Pakpahan, 2022)	The Relationship between Diet and Dental Caries Rate in Grade I Children at Public Elementary School 16 North Pontianak	Cross-sectional	66	-Dietary habit -caries	There are differences between eating patterns with dental caries rates
17.	Melinda, Qonaah Eka Teju et al (2022) (Melinda et al., 2022)	Correlation between Knowledge of Cariogenic Foods and Caries Incidence in Children 6-12 Years Environment RT 003/003 Manyar Sabrangan Surabaya	Cross-sectional	40	-Cariogenic food knowledge -caries	There is no relationship between knowledge of cariogenic foods and dental caries

No	Researcher Name (Year)	Title	Design Study	Sample size	Research variable	Results
18.	Kusmana, Aan (2022) (Kusmana, 2022)	Cariogenic Food Consumption Habits and Prevalence of Dental Caries in Elementary School Children: Cross-Sectional Study	Cross-sectional	31	-Habitual consumption of cariogenic foods -caries	There is a relationship between food consumption cariogenic with the prevalence of dental caries in school children base
19.	Lestary, Eva Sri Juhaeni and Lia Idealistiana (2022) (Lestary & Lia Idealistiana, 2022)	The Influence of Mother's Knowledge About Dental Health and Tooth Brushing Habits on the Incidence of Dental Caries in Children	Cross-sectional	80	-Knowledge -caries	There is an influence of mother's knowledge about dental health and tooth brushing habits on the incidence of dental caries in children
20.	Hutagalung, Mangatas Halomoan Parluhutan et al (2022) (Hutagalung M, Nababani, 2022)	Correlation between Dental Health Care Knowledge Level and Severity Level Dental caries	Cross-sectional	30	-Knowledge -caries	There is a significant relationship between the level of dental health maintenance knowledge and the level dental caries severity
21.	Arsad et al. (2022) (Arsad, 2022)	The Habit of Consuming Cariogenic Foods on the Occurrence of Dental Caries in Elementary School Children	Cross-sectional	63	-Habit of Consuming Cariogenic Foods -caries	There is the influence of consumption habits cariogenic foods on the occurrence of caries teeth .
22.	Nadyarani, Lady Meilarisa (2022) (Nadyarani, 2022)	Risk Analysis of Dental Caries in Grade II Students at SD Negeri 141 Palembang Year 2022	Cross-sectional	90	-Oral hygiene index -Tooth brushing habit -Dental plaque index -Salivary acidity level -Knowledge -Dental and oral health education -Cariogenic diet pattern	There is a relationship between oral hygiene index, tooth brushing habits, dental plaque index, salivary acidity level, knowledge, dental and oral health education, and there is no relationship between pattern diet , dental and oral examination.

No	Researcher Name (Year)	Title	Design Study	Sample size	Research variable	Results
					-Examination of teeth and mouth -caries	Cleanliness index Mouth is the most influential variable on caries.
23.	Darmayanti, Rita. et al (2022) (Darmayanti et al., 2022)	Relationship between Tooth Brushing Behavior and Dental Caries Incidence in Class V Children at SDN 045 Pasir Kaliki	Cross-sectional	56	-Tooth Brushing Behavior -caries	Tooth brushing behavior and the incidence of dental caries have a strong relationship
24	Rosyida, Lisa Nuraini. et al (2022) (Rosyida et al., 2022)	Association of Parental Socioeconomic Status on Dental Caries Experience in 6-7 Years Old Children in Nguter	Cross-sectional	53	-Parents income level -Parents' education level -Number of parents' family members	There is no effect of parents' income level on children's dental caries, there is no effect of father's and education level mother's education level on children's dental caries, and there is no effect on the number of parents' family members in children's dental caries.
25.	Prasetyowati, Silvia. et al (2023) (Prasetyowati, 2023)	Relationship Frequency Of Cariogenic Food Consumption With Dental Caries Rate In Class Ii Students Sdn Mojo VIII/227 Surabaya	Cross-sectional	40	-Frequency of consumption of cariogenic foods -caries	There is a relationship between the frequency of cariogenic food consumption and dental caries
26.	Sowwam, Muhammad and Lestari, Pramita Ran (2023) (Muhammad Sowwam, 2023)	Factors Associated with the Incidence of Dental Caries in Children at SD Negeri Bener 4 Ngrampal Sragen	Cross-sectional	43	-Knowledge -Tooth brushing habit -Diet -caries	There is no relationship between knowledge and the incidence of dental caries, there is a relationship between brushing habits and the incidence of dental caries and there is no relationship between diet and the incidence of dental caries.
27.	Supariani, Ni Nyoman Dewi and	The Role of Parents and Student Behavior with Dental Caries	Cross-sectional	250	-The role of parents	There aren't any relationship between the role of

No	Researcher Name (Year)	Title	Design Study	Sample size	Research variable	Results
	Ni Made sirat (2023) (Ni Nyoman Dewi Supariani, 2023)	Incidence in Grade V SD Students in the Work Area of the Bangli Health Center 2019 year			-Student Behavior -caries	parents and student behavior with the incidence of dental caries

The articles that have been obtained in the literature show that there are many variables in the process of dental caries in elementary school children in Indonesia. We divide these variables into several discussion groups. The first is individual characteristics: knowledge, attitude, stunting, BMI; The second is the characteristics of parents: parents' education level, number of family members, and role of parents; The third is consumption patterns: eating habits, frequency of consumption of sugar, food, and beverages, level of consumption of cariogenic foods; Fourth is dental and oral hygiene: frequency of brushing teeth, how to brush teeth, brush teeth in the morning and before going to bed, dental visits, time to brush teeth, suffer from toothache, oral hygiene index, dental plaque index, salivary acidity level; Fifth is social status: socioeconomic status, social practice, parental income level; The sixth is dental and oral health interventions: counseling and dental examinations.

A. Individual Characteristics:

1) Knowledge

Knowledge about dental and oral health plays a role in the formation of an action to maintain dental and oral health. When someone knows the information, the person will likely act according to the information they know (Hardika, n.d.).

2) Attitude

Someone can think and try to maintain good dental and oral hygiene so that they are free from dental caries. In thinking the emotional and belief components come into play so that a person tends to act to prevent dental caries (Notoatmojo, 2007).

3) Stunting

Stunting conditions can cause children's development to be disrupted, including developmental disorders in the oral cavity. Stunted children are more

susceptible to dental caries due to changes in the characteristics of their saliva (Lutfi, 2021).

B. Characteristics of Parents:

1) Parents' education level

Higher education provides higher opportunities to gain better knowledge and insights about health issues (Kusparlina, 2020). Knowledge and information play a role as the basic capital for parents at home in guiding children to maintain healthy teeth and mouth (Harsyaf & Yandi, 2018).

2) The number of people's family members

The greater the number of children and family members, the less time and attention will be paid to children and the greater the financial responsibility for obtaining health services (Amarasena, 2020) (R. A. Ngantung, D. H. C. Pangemanan, 2015).

3) The role of parents

Parents are the most important teachers and the first to provide education to their children and are fully responsible for their growth process including preventing caries (Ni Nyoman Dewi Supariani, 2023).

C. Consumption Pattern :

1) Eating Habits and Frequency of Consumption of Sugar, Food, and Drinks

Students think that foods such as sweets, chocolate, and ice cream have a good and sweet taste so children like them compared to fibrous foods. Sticky foods such as milk, bread, and chocolate are examples of cariogenic foods (Mendur et al., 2017).

2) Cariogenic food consumption rates

Consuming cariogenic foods tends to increase the risk of children have dental caries. Cariogenic foods are sweet and sticky and these leftovers can stick in

the mouth and then settle and ferment. The results of this fermentation are in the form of acids, causing plaque to form on the teeth which can increase the risk of dental caries (Nadyarani, 2022)(Winahyu, K. M., Turmuzi, A. dan Hakim, 2019).

D. Dental and Oral Hygiene:

1) How to Brush Teeth

How to brush teeth that are not as recommended, is 6 times more at risk of having high caries status (Junarti et al., 2017).

2) Brush your teeth in the morning and before bed

Brushing your teeth in the morning after breakfast aims to clean food debris attached to the tooth surface while brushing your teeth at night aims to clean food debris attached to the tooth surface. It the importance of brushing your teeth before going to bed because the germs in the mouth are active, and the activity of germs at night will usually increase 2-fold compared to during the day because, during sleep when the mouth does not carry out activities such as eating, drinking or talking, it is recommended in brushing teeth for a maximum of 5 minutes (Bakar, 2017)· (Ramadhan, 2019).

3) Dental Visit

Routine dental visits in this study were grouped into visits in the last 12 months (Armasastra Baha, Herialdi Hardan Permana, Risqa Rina Darwita, Febriana Setiawati, Atik Ramadhani, Anton Rahardjo, 2021). The optimal time for the first dental visit is considered to be 6-12 months of a child's life, but some sources suggest 12-18 months (Carey, 2014)(Marcinkowska U, Piekarcz T, Mosler B, Michalak E, 2013). Dental examination visits are based on reasons in the form of adaptive visits, toothaches, tooth decay, and tooth injuries (Mika et al., 2018).

4) Tooth brushing time

When brushing their teeth, children who brush their teeth at the wrong time have a 2,3 times greater risk of experiencing dental caries compared to children who brush their teeth correctly (Jauhara & Febrianti, 2021).

5) Tooth brushing habit

Brushing teeth regularly 2 (two) times a day with a toothpaste containing fluoride is highly recommended for all patients to reduce the level of risk (Rosado, 2014). Such maintenance not only reduces the amount of plaque in the mouth but also facilitates the therapeutic process by fluoride (Featherstone, 2006).

6) Oral hygiene index

Students who experience dental caries are students whose oral hygiene index is not good. This means that by maintaining dental hygiene, the incidence of dental caries can be(Nadyarani, 2022).

7) Dental plaque index

Dental plaque is an accumulation of 3-dimensional attachment of microorganisms on certain surfaces. Many diverse microorganisms are found in dental plaque that can cause caries (Nadyarani, 2022).

8) Salivary acidity level

The demineralization process in the teeth can occur due to the low level of salivary acidity, a remineralization process that can benefit the teeth can occur if the salivary acidity level is high (Nadyarani, 2022).

E. Social status

In the search results, there is no relationship between socioeconomic status and dental caries(Melvani, 2021). The relationship between economic level and public health problems, especially dental and oral health, is usually not a direct cause but is more related to the family's ability to provide food, clothing, and shelter that meets health requirements and costs for health (Ariska, 2014)

F. Dental and oral health interventions:

1) Counseling

Dental health education aims to create community behavior from bad to good, from those who lack attention to become concerned about the incidence of dental caries. By carrying out counseling, the community, especially children and the elderly, will gain knowledge regarding dental caries and how to handle it (Ginting, 2019).

2) Dental examination

A good dental examination is carried out every six months(Kesehatan, 2020).

This routine examination is very important because regular dental checks, allow someone to detect problems in the teeth. With controlled dental examinations, one can avoid dental caries(Ajayiand, 2014)

4. Conclusions and recommendations

Variable risk factors for dental caries were grouped into 6 discussion groups, namely individual characteristics, parental characteristics, consumption patterns, dental and oral hygiene, social status, and dental and oral health interventions. Variables that have been proven to be risk factors for caries are cariogenic food consumption, tooth brushing frequency, how to brush teeth, dental care visits, knowledge, attitude, dental hygiene, stunting, dietary habits, social practices, BMI, tooth brushing time, oral hygiene index, dental plaque index, salivary acidity level, dental and oral health education. . We suggest to future researchers to explore stunting as a variable related to the occurrence of caries because apart from caries they will focus on nutritional problems as well.

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