PROTECTION FACTORS AND RISK FACTORS OF CARIES IN CHILDREN AGED 10-13 YEARS IN UJUNG TANAH SUB-DISTRICT, MAKASSAR CITY, SOUTH SULAWESI

a Muhammad Nurung, b Andi Zulkifli Abdullah, c Sudirman Nasir, d Wahiduddin, e Santi Martini, f Harun Achmad, g Anwar Mallongi, h Fridawaty Rivai

ABSTRACT

Background: Caries is one of the oral diseases that is often experienced by children around the world by 60%-90%, especially in low socioeconomic groups. The causes of caries are multifactorial, including socioeconomic level, age, gender, diet and oral hygiene. Sucrose or sugar commonly consumed is an important factor causing caries. Elementary school children are an age group that is very vulnerable to caries because they have poor behavior in maintaining oral and dental health.

Aim: Knowing the protection factors and risk of caries in children aged 10-13 years.

Method: The study was conducted in September 2022 - March 2023 on elementary school students aged 10-13 years in 3 (three) elementary schools in Ujung Tanah District, Makassar City, South Sulawesi Province. The number of samples at SD Hang Tuah was 64 people, SDN Ujung Tanah 54 people, and SDN Cambaya 49 people with a total sample of 167 people with quantitative research methods using questionnaires.

Results: The average value of protection factor against caries in SD Hang Tuah was 66.8%, SDN Ujung Tanah 72.5%, and SDN Cambaya 64.2%. The protection factor against caries in the three schools still needs to be improved. The average value of risk factors for caries in SD Hang Tuah was 33%, SDN Ujung Tanah 29.3%, and SDN Cambaya 32.7%. Risk factors for caries in the three schools still need to be reduced.

Conclusion: The protection factor still needs to be improved while the risk factor still needs to be lowered by the three elementary schools. In addition, this study also found caries rates in the three schools in the very high category with a caries index of >6.6.

a Postgraduate student, Faculty of Public Health, Hasanuddin University, Makassar, Indonesia, E-mail: drg.muhammad.nurung@gmail.com, Orcid: 0009-0000-9401-9340
b Department of Epidemiology, Faculty of Public Health, Hasanuddin University, Makassar, Indonesia, E-mail: zulkifliabdullah@yahoo.com, Orcid: 0000-0003-4437-6811
c Department of Health Promotion and Behavioral Science, Faculty of Public Health, Hasanuddin University Makassar, Indonesia, E-mail: sudirmannasir@gmail.com, Orcid: 0000-0002-9735-1178
d Department of Epidemiology, Faculty of Public Health, Hasanuddin University, Makassar, Indonesia, E-mail: wahiduddin@unhas.ac.id, Orcid: 0009-0000-9686-6148
e Department of Epidemiology, Biostatistics & Population, Health Promotion, Faculty of Public Health, Airlangga University, Surabaya, Indonesia, E-mail: santi-m@ikm.unair.ac.id, Orcid: 0000-0003-2424-1776
f Department of Pedodontics, Faculty of Dentistry, Hasanuddin University, Makassar, Indonesia, E-mail: harunachmader@gmail.com, Orcid: 0000-0003-3124-2064
g Department of Environmental Health, Faculty of Public Health, Hasanuddin University, Makassar, Indonesia, E-mail: anwar_envi@yahoo.com, Orcid: 0000-0001-6438-1154
h Department of Hospital Management, Faculty of Public Health, Hasanuddin University, Makassar, Indonesia, E-mail: fridarivai@yahoo.com, Orcid: 0000-0002-7336-7001
Keywords: caries protection, risk of caries, dental caries, poor behavior, maintaining oral.

Received: 07/08/2023
Accepted: 01/11/2023
DOI: https://doi.org/10.55908/sdgs.v11i11.1814

FATORES DE PROTEÇÃO E FATORES DE RISCO DE CÁRIES EM CRIANÇAS COM IDADES COMPREENDIDAS ENTRE 10 E 13 ANOS NO SUBDISTRITO DE UJUNG TANAH, CIDADE DE MAKASSAR, SULAWESI DO SUL

RESUMO

Contexto: Caries é uma das doenças orais que muitas vezes é experimentada por crianças em todo o mundo em 60%-90%, especialmente em grupos socioeconômicos baixos. As causas da cárie são multifatoriais, incluindo nível socioeconômico, idade, sexo, dieta e higiene oral. A sacarose ou o açúcar comumente consumido é um fator importante que causa cárie. Crianças do ensino fundamental são um grupo etário muito vulnerável à cárie porque têm mau comportamento na manutenção da saúde bucal e dental.

Objetivo: Conhecer os fatores de proteção e o risco de cárie em crianças entre 10 e 13 anos.

Método: O estudo foi realizado em setembro de 2022 - março de 2023 em alunos do ensino fundamental com idade entre 10 e 13 anos em três (três) escolas do ensino fundamental no distrito de Ujung Tanah, na cidade de Makassar, na província de Sulawesi do Sul. O número de amostras na SD Hang Tuah foi de 64 pessoas, SDN Ujung Tanah 54 pessoas e SDN Cambaya 49 pessoas com uma amostra total de 167 pessoas com métodos de pesquisa quantitativa usando questionários.

Resultados: O valor médio do fator de proteção contra a cárie em SD Hang Tuah foi de 66,8%, SDN Ujung Tanah 72,5% e SDN Cambaya 64,2%. O fator de proteção contra a cárie nas três escolas ainda precisa ser melhorado. O valor médio dos fatores de risco para cárie em SD Hang Tuah foi de 33%, SDN Ujung Tanah 29,3% e SDN Cambaya 32,7%. Os fatores de risco de cárie nas três escolas ainda precisam ser reduzidos.

Conclusão: O fator de proteção ainda precisa ser melhorado enquanto o fator de risco ainda precisa ser reduzido pelas três escolas de ensino fundamental. Além disso, este estudo também encontrou taxas de cárie nas três escolas da categoria muito alta com índice de cárie >6,6.

Palavras-chave: cárie proteção, risco de cárie, cárie dentária, mau comportamento, manutenção oral.

1 INTRODUCTION

One of the human rights that is crucial to overall physical health is having good oral health. In order to assist the community in addressing dental and oral health issues, FDI organizations and dental practitioners must play a part in encouraging proper oral hygiene. (1). One of the oral diseases often experienced by children is caries, but the attention given to addressing this problem is very less as it happens in rural Nigerian
children. So planning was carried out for dental and oral health promotion programs oriented towards rural communities (2). However, the prevalence of caries decreased in EU countries for 35 years. This happens because they have used fluoride toothpaste accompanied by increased awareness to maintain oral hygiene (3).

The World Health Organization (WHO) defines caries as the development of damage to tooth enamel brought on by oral bacteria fermenting sugar-containing meals. Caries in schoolchildren affect 60% to 90% of the global population, meaning that 6-9 children in every 10 children experience caries (4). The prevalence of caries in European Union countries has decreased within 35 years, this is due to the increasing public awareness to maintain oral hygiene and use toothpaste containing fluoride (3).

Children aged 6 to 8 years old in Saudi Arabia had an 83% caries prevalence, compared to poor nations, particularly those in Africa, whose rates are 40.2%, 50.3%, 52.4%, and 40.98% in Tanzania, Kenya, and Sudan. Furthermore, the prevalence of caries in the Indian city of Vadodara is quite high in school children aged 6-12 years (5). Then the prevalence of caries in low socioeconomic groups that occur in children is also quite high. The risk of caries is influenced by many factors such as gender, age, socioeconomic status, diet and oral hygiene status (6–8).

The prevalence rate of caries (damaged/cavities/diseased teeth) in South Sulawesi Province is 55.5% higher than the national average of 45.3% for children aged 10-14 years, according to 2018 National Riskesdas data on the Proportion of Dental Problems by Province. The time to brush your teeth properly is only 8.8% (9). Based on data from the Riskesdas of South Sulawesi Province in 2018 concerning the Proportion of Dental Problems in Residents Aged ≥ 3 Years by Regency / City, the prevalence of caries (damaged / cavities / disease) in Makassar City is 52.09% with the average prevalence of South Sulawesi Province is 55.5%, while brushing teeth properly is only 5.19%. Gowa Regency is the area with the highest caries prevalence rate of 66.24%, while the lowest is Pare Pare city at 34.93% (10).

Caries is caused by bacteria and results from the fermentation of acidic carbohydrates, which damages the teeth's hard structures. Caries arises from a physiological imbalance between tooth minerals and plaque, and its causes are multifaceted. This happens because of a decrease in pH in the mouth which causes loss of minerals in the hard tissues of the teeth (11). Loss of dental structure due to the process of caries so that holes are formed will cause infection and cause pain in the teeth. Holes
formed in teeth due to the destruction process are irreversible so it is very important to make efforts to prevent caries early so that the prognosis becomes better (12).

The activity of biofilms on the surface of dentin or enamel starts the caries process. Biofilm activity is thought to be a precursory indicator of the carious process. The presence of biofilms causes the caries process, which has numerous significant clinical ramifications. The partial or whole removal of biofilms will be able to halt additional mineral loss. The process begins to occur at each stage of the beginning of the formation of lesions. However, because biofilms are always formed and metabolically active, the process of caries can be considered a natural phenomenon that can occur at any time. The process actually cannot be prevented, but can be controlled if early detection of clinically visible caries is handled quickly and precisely. Biofilm composition and thickness factors will also affect the magnitude of pH fluctuations. The level of activity in the biofilm is characterized by the presence of lesions which is an early sign of the activity of the caries process. This is an early sign of caries (13).

The process of caries involves activity between substrate factors, hosts and microorganisms that take place continuously. The main factor in the occurrence of caries is the presence of low molecular weight carbohydrates that easily spread into plaques such as glucose, fructose and lactose (14). The importance of the presence of sugar as a cause of caries has received less attention in efforts to prevent caries (14,15). Monosaccharides metabolized by oral bacteria will cause increased acid production resulting in enamel demineralization. The occurrence of demoralization by the fermentation process of monosaccharides is an etiological factor for the occurrence of caries (16,17).

Patterns of behavior related to health are obtained at home in childhood such as the habit of consuming fruits, vegetables, sugar, and teeth cleaning habits. The role of parents is very important in the initiation process and instilling behavioral habits related to oral and dental health (18). A study that looked at the behavior of sugar consumption, sugar-sweetened drinks, and eating frequency associated with severe caries conditions is one evidence of the risk of caries in early childhood aged 2-6 years (19).

2 THEORETICAL FRAMEWORK

Biofilm or plaque is a means for microorganisms to attach to the tooth surface. Lead interactions between microorganisms, hosts and the environment cause tissue
damage to teeth, which results in caries and periodontitis (20). The process of caries involves activities between substrate, host and microorganism factors which take place continuously. Carbohydrates fermented by cariogenic bacteria spread into dental plaque found on the tooth surface from the oral environment. Low molecular weight carbohydrates such as glucose, fructose and lactose, which easily spread into plaque, are the main factors in the occurrence of caries (14).

Sucrose or sugar that is commonly consumed is an important factor causing caries. The importance of sugar as a cause of caries has received little attention in caries prevention strategies (14,15). Caries activity causes cavities on the surface of the teeth, which due to loss of tooth structure can also cause infection and pain. The process of destruction of teeth which causes cavities and is irreversible. Therefore, preventive measures against caries, as well as early prognosis and diagnosis, are very important (12). Most bacteria are actually harmless, but under certain conditions they can cause oral infections such as caries and periodontal disease. Thus, a strategy to reduce the risk of dental caries is to reduce the growth and activity of S. Mutan bacteria (21).

The caries process requires repeated and long exposure times below pH 5.5 to destroy enamel tissue, then returning to pH 7.0 for the remineralization process. Failure to remove plaque on teeth due to frequent consumption of carbohydrates causes disruption of the dynamic balance between demineralization and remineralization which will lead to dominant demineralization resulting in the formation of clinically detectable white lesions (22). The causes of dental caries in children involve a complex interaction of many factors such as behavioral, social, economic, political and environmental conditions, and epigenetic modifications are an important indicator of caries risk to consider and are necessary because oral health is an important part of general health (23).

A fairly effective method for preventing caries is the use of fluoride, but it requires selective use. The use of this prevention method is quite good for school-aged children. The introduction of community water fluoridation dates back to the 1940s. A more widely used topical fluoride gel is fluoride varnish. Fluoride varnish can last longer on the tooth surface and was developed more than thirty years ago with the aim of preventing dental caries (24).

Parental knowledge is very important in shaping children's dental and oral hygiene behavior. The attitude of parents or mothers plays a role in determining
children's dental health behavior. A mother who has a high level of health will cause her child to have better dental health. A mother has a greater role in determining a child's health in general, including maintaining the health of the child's teeth and mouth. A mother's failure to maintain her child's dental health is due to a lack of knowledge about dental and oral health (25). Caries can be prevented and must be willing to limit children's exposure to carbohydrates or foods/drinks containing sugar and help children practice good oral hygiene. (26).

3 METHOD

The subject of the study was human, in this study it was carried out by filling out questionnaires that did not have the potential for harm and negative influence. Before carrying out the research, a research permit was obtained to the Ethics Committee with letter number 10970/UN4.14.1/TP.01.02/2022, dated September 20, 2022. Furthermore, write a research permit to the school leader who is responsible for the school which is a research site at SD Hang Tuah, SDUjung Tanah, SD Cambaya, SD Tabaringan as a place for questionnaire testing.

The study was conducted in September 2022 – March 2023 on elementary school students aged 10-13 years in 3 (three) elementary schools in Ujung Tanah District, Makassar City, South Sulawesi Provision. The number of samples at SD Hang Tuah was 64 people, SD Ujung Tanah 54 people, and SD Cambaya 49 people with a total sample of 167 people.

This study was conducted with quantitative methods as preliminary research to determine the protection factors and risk factors for caries, namely the habit of cleaning teeth and mouth and eating / drinking habits. Then the next study was conducted to determine the effect of dental and oral health education through a combination of the application of healthy teeth and healthy dental gymnastics with teacher assistance on the behavior and status of dental hygiene as a reinforcement of the prevention of caries events in children aged 10-13 years.

Sample selection is carried out by purposive sampling technique based on inclusion criteria with exclusion. The inclusion criteria: 1) Physically healthy and able to communicate; 2) All permanent teeth have erupted except the third molar. While the exclusion criteria: 1) Not willing to take part in the examination and filling out the questionnaire; 2) There is no systemic disease.
4 RESULTS

4.1 PROTECTIVE FACTOR AGAINST CARIES.

Protection factors against caries are activities carried out to maintain dental hygiene and health which include brushing teeth in the morning, brushing teeth at night, using mouthwash, consumption of fibrous vegetables and consumption of fibrous fruits.

Table 1 shows the results of the answers to questionnaire questions regarding protection factors against caries in Hang Tuah Elementary School students, it can be concluded that the highest protection factor is the habit of using toothpaste (95.3%) and the lowest is the use of dental floss (17.2%). In the rest of SDN Ujung Tanah, the highest caries protection factor was the use of toothpaste (98.1%) and the lowest was the use of dental floss (20.4%). In Cambaya Elementary School students, the highest caries protection factor was the use of toothpaste (95.9%) and the lowest was the use of dental floss (24.5%).

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>SD Hang Tuah</th>
<th>SDN Ujung Tanah</th>
<th>SDN Cambaya</th>
</tr>
</thead>
<tbody>
<tr>
<td>n %</td>
<td>n %</td>
<td>n %</td>
<td>n %</td>
</tr>
<tr>
<td>Brushing your teeth in the morning</td>
<td>50 78,1</td>
<td>49 90.7</td>
<td>4 87,8</td>
</tr>
<tr>
<td>Brushing your teeth at night</td>
<td>52 81,3</td>
<td>46 85,2</td>
<td>3 75,5</td>
</tr>
<tr>
<td>Using toothpaste</td>
<td>61 95,3</td>
<td>53 98,1</td>
<td>7 95,9</td>
</tr>
<tr>
<td>Using dental floss</td>
<td>11 17,2</td>
<td>11 20,4</td>
<td>4 24,5</td>
</tr>
<tr>
<td>Using mouthwash</td>
<td>24 37,5</td>
<td>26 48,1</td>
<td>7 24,5</td>
</tr>
<tr>
<td>Consumption of fibrous vegetables</td>
<td>52 81,3</td>
<td>47 87,0</td>
<td>2 77,6</td>
</tr>
<tr>
<td>Consumption of fibrous fruits</td>
<td>49 76,6</td>
<td>42 77,8</td>
<td>8 63,3</td>
</tr>
<tr>
<td>Average</td>
<td>66,8</td>
<td>72,5</td>
<td>64,2</td>
</tr>
</tbody>
</table>

Source: Prepared by Author (2023)

The average value of protection factors against caries which includes the habit of brushing teeth in the morning, brushing teeth at night, using toothpaste, using dental floss,
using mouthwash, the habit of consuming fibrous vegetables and fibrous fruits at SD Hang Tuah with an average value of 66.8%, SDN Ujung Tanah 72.5%, and SDN Cambaya 64.2%. This is a factor of protection against caries in the three schools still needs to be improved.

4.2 RISK FACTORS FOR CARIES.

Risk factors for caries are activities carried out that can lead to caries including the habit of eating biscuits, bread, cake, eating chocolate, eating ice sticks, ice cream, eating sweets, confectionery, eating pie, agar, jelly, drinking soft drinks and drinking sugary milk. Table 2 shows the results of questionnaire answers from questions about risk factors for caries in Hang Tuah Elementary School students with the highest risk factors being the habit of eating biscuit, bread and cake (51.3%), while the lowest is eating chocolate (21.9%). At SDN Ujung Tanah, the highest risk factor was eating biscuits, bread and cake (40.7%) and the lowest was the habit of eating sweets and confectionery (18.5%). At SDN Cambaya, the highest risk factor was the habit of eating biscuits, bread and cake (46.9%), and the lowest was eating sweets and confectionery (12.2%).

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>SD Hang Tuah</th>
<th>SDN Ujung Tanah</th>
<th>SDN Cambaya</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Eat biscuits, bread, cake</td>
<td>34</td>
<td>53.1</td>
<td>22</td>
</tr>
<tr>
<td>Eat chocolate</td>
<td>14</td>
<td>21.9</td>
<td>13</td>
</tr>
<tr>
<td>Eat ice sticks, ice cream</td>
<td>15</td>
<td>23.4</td>
<td>15</td>
</tr>
<tr>
<td>Eat sweets, confectionery</td>
<td>16</td>
<td>25.0</td>
<td>10</td>
</tr>
<tr>
<td>Eat pie, agar, jelly</td>
<td>19</td>
<td>29.7</td>
<td>18</td>
</tr>
<tr>
<td>Drink soft drinks</td>
<td>18</td>
<td>28.1</td>
<td>12</td>
</tr>
<tr>
<td>Drink sugary milk</td>
<td>32</td>
<td>50.0</td>
<td>21</td>
</tr>
<tr>
<td>Average</td>
<td><strong>33</strong></td>
<td><strong>29.3</strong></td>
<td><strong>32.7</strong></td>
</tr>
</tbody>
</table>

Source: Prepared by author (2023)

The average value of risk factors for caries which include the habit of eating biscuits, bread, cake, eating chocolate, eating ice sticks, ice cream, eating sweets, confectionery, eating pie, agar, jelly, drinking soft drinks, drinking sugary milk at SD Hang Tuah with an average value of 33%, SDN Ujung Tanah 29.3%, and SDN Cambaya
32.7%. This risk factor for caries in the three schools still needs to be reduced. Limiting sugar consumption to less than 5% of total energy intake is a recommendation from WHO which aims to reduce the risk of caries throughout human life (20).

5 DISCUSSION

Protection factors against caries are activities carried out to maintain dental hygiene and health which include brushing teeth in the morning, brushing teeth at night, using mouthwash, consumption of fibrous vegetables and consumption of fibrous fruits. Risk factors for caries are activities carried out that can cause caries include the habit of eating biscuits, bread, cake, eating chocolate, eating ice sticks, ice cream, eating sweets, confectionery, eating pie, agar, jelly, drinking soft drinks and drinking sugary milk.

Protection factors and risk factors for caries in the form of teeth cleaning behavior and eating / drinking habits were found at the study sites in three elementary schools (SD Hang Tuah, SDN Ujun Tanah, SDN Cambaya) in Ujung Tanah District, Makassar City with an average value of protection factors reaching 67.8% while the average value of risk factors for caries was 31.7%.

The results of preliminary research that has been conducted in the three elementary schools, found that the caries protection factor is still not optimal to increase the level of oral hygiene, causing the caries rate in the three schools to be included in the DMFT (Decay, Missing, Filling Teeth) index category is very high (index value >6.6). The same study conducted to see the relationship between caries protection factors on the incidence of caries, found that in poor caries protection factors, subjects who experienced caries as much as 71.8% while those who did not experience caries as much as 28.2%. Furthermore, in the good caries protection factor, subjects who still occur caries as much as 48.6%. In the study, it was concluded that there is a significant relationship between caries protection factors and the incidence of caries (21).

A study on the relationship between karyogenic food consumption and the incidence of caries found that 81.2% of research subjects with a high frequency of karyogenic food consumption experienced caries, then 56.8% of low category consumption did not experience caries. Then based on gender it was also obtained that women consume more karyogenic foods / drinks when compared to men (21). A study conducted on young adults in the USA, with intervention in the form of intake of drinks added sugar associated with the incidence of caries, found that there was 26% loss of
at least one permanent tooth. The occurrence of tooth loss has a positive relationship with the frequency of beverage intake, the higher the probability of tooth loss (22).

Most bacteria in the oral cavity can be removed by saliva flow and the mastication process as well as by oral cleaning activities such as brushing teeth. Saliva also plays a role in the remineralization process in teeth affected by caries and helps reduce the exposure time of tooth enamel to acid and normalizes the pH in the oral cavity (29).

Caries is not a simple process, but multifactorial. The most important thing is that caries prevention efforts are the process of providing knowledge on how to remove plaque by maintaining oral hygiene to be free from caries (30). Plaque control as a factor causing caries can be done both mechanically and chemically. Mechanical plaque control is by brushing and flossing, while chemical plaque control is by using mouthwash (31).

Gargling with mouthwash can reduce the amount of plaque. In research using rosetta infusion as a mouthwash, it was proven to reduce the amount of plaque on acrylic crowns. Plaque control can be done chemically with mouthwash and mechanically by brushing teeth and interdental cleaning with dental floss. The use of mouthwash can reach more cavity surfaces which has the function of preventing the growth of supragingival and subgingival dental plaque (32).

The benefits of gargling besides helping clean the mouth and throat (33). A study on the effects of using mouthwash containing Glycyrrhiza uralensis extract to determine changes in the pH of dental plaque and caries-causing bacteria, found that this ingredient could be used as an effective caries prevention agent (34).

Caries can be prevented and must be willing to limit children's exposure to carbohydrates or foods/drinks containing sugar and help children practice good oral hygiene. (26).

6 CONCLUSION

Protection factors and risk factors for caries in the form of teeth cleaning behavior and eating / drinking habits were found at the study sites in three elementary schools (SD Hang Tuah, SDN Ujung Tanah, SDN Cambaya) in Ujung Tanah District, Makassar City with an average value of protection factors reaching 67.8% while the average value of risk factors for caries was 31.7%.
Protection factors and risk factors for caries in the form of teeth cleaning behavior and eating / drinking habits were found at the research location in the three elementary schools (SD Hang Tuah, SDN Ujung Tanah, SDN Cambaya) in Ujung Tanah District Makassar City with the finding of caries rates in students aged 10-13 years in the three schools in the very high category with a caries index of >6.6. The protection factor still needs to be increased while the risk factor still needs to be lowered.
REFERENCES


25. Lili Ega M. Ulin. The level of knowledge of parents about the maintenance of dental
and oral health in toddlers [Internet]. 2020. Available on: http://repository.poltekeskupang.ac.id/id/eprint/2150


