The Overview of Correct Toothbrushing and Diet Habit Towards Oral Health Status Using Indonesian Digital Caries Risk Assessment (IDCRA)

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Abstract. Dental caries is an infectious disease in oral health and has become a major problem in Indonesia due to a lack of awareness. There are several causes of dental caries, such as consuming sugary snacks and toothbrushing habits which are common in school-aged children. Based on the caries risk assessment survey conducted in Yogyakarta, as many as 76.5% of the children had a high caries risk, 12.9% had a low caries risk, and 10.6% had a moderate caries risk. This research aims to determine the overview and correlation of correct toothbrushing and diet habit on oral health status using the IDCRA application at SD (Elementary School) Muhammadiyah Pepe and SD Muhammadiyah Warungboto Yogyakarta. This research type is descriptive-analytic with a cross-sectional design. The data were collected by subjective and objective intra-oral screening to examine the number of dental caries experiences (DMF-T/def-t) using IDCRA application in elementary school students aged 6-9. The data were then analysed using Spearman correlation by SPSS. The results revealed that students at SD Muhammadiyah Pepe and SD Muhammadiyah Warungboto Yogyakarta had caries with an average of DMF-T/def-t 7.5, meaning each had seven teeth with caries. In addition, most students (74%) consumed sugary snacks 1-3 times daily, while 60.6% needed to brush their teeth correctly. The caries incidence in school-aged children at SD Muhammadiyah Pepe and Warungboto Yogyakarta was classified as very high. This was influenced by their habit of brushing teeth and dietary habits done by the students. So promotive and preventive activities to increase the knowledge and awareness of children and parents need to be carried out regularly.

Keywords: dental caries, toothbrushing habit, snacking habit, DMF-T/def-t

1 Introduction

Health is a complete physical and mental well-being free from disability and pain. Dental and oral health is important because the mouth is a window for the entry of various diseases [1]. One age group vulnerable to this problem is the school-age group. Based on Indonesian Basic Health Research 2018 (RISKESDAS) data, 57.6% of Indonesia's population has dental and oral health problems. Based on age group, school age is the largest proportion with 67.3%, of which only 14.6% have received medical treatment. The main dental and oral health problem is caries (88.8%) (RISKESDAS) [2]. Based on a survey conducted on pre-school children living in Yogyakarta, as many as 76.5% has a high caries risk, 12.9% has a low caries risk, and 10.6% has a moderate caries risk [3].

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Knowledge, attitudes, and behaviors influence the high risk of caries in children in maintaining oral health [4]. In addition to brushing the teeth twice a day after breakfast and before bed, it is important to apply various behaviors to maintain oral health. Besides brushing teeth conventionally, using dental floss can increase the effectiveness of interdental cleaning compared to a regular toothbrush [5]. The use of mouthwash is also recommended if there are any indications [6]. In addition, reducing the consumption of high-sugar and sticky foods can also reduce the risk of cavities. High-sugar food left in the oral cavity for a long time catalyzes bacteria to multiply. Thus, the tooth demineralization process occurs [7].

Dental caries is a dynamic lesion that depends on several complex factors, including biofilms, sugar fermentation, host, and time supported by environmental conditions, which play a role in the demineralization process and remineralization of the hard tooth tissue in both baby and permanent teeth [8, 9]. Dental and oral health is very important for human life because the mouth is not just an entrance for food and drink but has a very important role in food digestion, aesthetics, and communication. Dental and oral hygiene problems that cause diseases such as caries at school age are based on a need for more understanding and awareness of the importance of maintaining healthy teeth and mouth [10].

Dental and oral health index can be measured using various instruments. One of the most frequently used instruments in assessing the community's dental and oral health index is the DMF-T index. DMF-T is an abbreviation of D which means Decay or cavities, and M which means Missing or missing teeth due to being removed or released by themselves. Furthermore, F which means Filling. The DMF-T index can describe the average number of damaged teeth in each individual, which is categorized as very low (0.0-1.1), low (1.2-2.6), moderate (2.7-4, 4), high (4.5-6.6), and very high (>6.6) [11].

The high rate of dental caries in Indonesia is the basis that dental and oral health care behaviors should be introduced early to school-aged children. Dental care for school-aged children is largely determined by brushing habits. Effective tooth brushing must meet requirements including time, frequency, and correct method. The minimum frequency to brush the teeth properly is twice a day [12]. The most mandatory time to brush the teeth is after breakfast and before bed [13, 14]. In addition to the correct time and frequency of brushing teeth, how to brush teeth also needs attention. Good and effective tooth brushing to protect teeth is to use fluoride toothpaste [15].

Based on the previous study, this research aims to find out the overview and correlation between tooth brushing and dietary habits with DMF-T/def-t in SD Muhammadiyah Pepe and SD Muhammadiyah Warungboto students using the Indonesian Digital Caries Risk Assessment (IDCRA) application.

2 Methodology

This research is a descriptive observational study with a cross-sectional design. The research was conducted on students at SD Muhammadiyah Pepe and SD Muhammadiyah Warungboto Yogyakarta. Before implementing the activity, an informed consent procedure was carried out for all parents of students at SD Muhammadiyah Pepe and SD Muhammadiyah Warungboto Yogyakarta about dental and oral examinations that would be carried out on students. The implementation of the activity began with promotive dental and oral health education activities and a practice on how to brush teeth properly and correctly which involved 521 students. The next program was preventive efforts by conducting subjective and objective examinations on 142 students in grades 1-3 aged 6-9 years. The screening procedure was carried out by Dental Clinical Students of the Faculty of Dentistry Universitas Muhammadiyah Yogyakarta (UMY) using a tool in the form of the IDCRA
application – an intellectual property right to the Faculty of Dentistry UMY, which refers to the examination method based on Caries Management by Risk Management (CAMBRA).

A subjective examination was in the form of individual short questions to identify the habit of brushing teeth and dietary. Toothbrushing includes time, frequency, and method, while diet habit consists of snacking frequency and their liking of sweet and sticky food. An objective examination was carried out to determine the dental and oral health level using the DMF-T/def-t (Decay, Missing, and Filling Teeth) index. IDCRA provides a caries risk calculation for each child, which can be used to support and motivate parents and children in maintaining healthy teeth and mouth, as well as being a monitoring tool in the future. The data obtained from subjective and objective examinations using IDCRA were then processed descriptively and analytically using SPSS Statistics Software 26.0. The analysis regarding the relationship between tooth brushing and diet habits toward oral health status (DMF-T/def-t) was carried out using the Spearman correlation test.

3 Results and Discussion

![Elementary School Respondent](image)

**Figure 1. Data of Elementary School Respondent**

This research involved 82 students from SD Muhammadiyah Pepe and 60 from SD Muhammadiyah Warungboto. The respondents were students from grade 1 to grade 3 elementary school—the student were examined by IDCRA subjective and objective survey. The subjective section consisted of questions related to the contributing conditions of student oral health status (Fig. 2). The next section was the objective condition of student oral health which was examined by the operator or dentist (Fig.3). After the contributing section and objective data were collected by the operator, the IDCRA application reported the PDF file about the student caries risk assessment and suggestion treatment for the parents, dentist, and teacher (Fig. 4). Therefore, the continuous prevention of caries risk assessment remained effective.
Figure 2. Question of contributing factors/subjective examination and Figure 3. List of objective examination by dentist/operator

Figure 4. The PDF file consists of caries risk assessment result and its recommendation for parent, dentist, and teacher.
Based on a survey on the toothbrushing habits of the students of SD Muhammadiyah Pepe and SD Muhammadiyah Warungboto, it was found that 75% of students brushed their teeth twice a day, and 23% of students brushed their teeth once a day. As many as 2% of students never brushed their teeth. Below is a table of tooth brushing habits based on the time and method of brushing teeth.

Table 1. Toothbrushing Habit Percentage

<table>
<thead>
<tr>
<th>Toothbrushing Habit</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time (After Breakfast and Before Bed)</td>
<td>39,4%</td>
<td>60,6%</td>
</tr>
<tr>
<td>Method (Use Fluoride Toothpaste)</td>
<td>91,5%</td>
<td>8,5%</td>
</tr>
<tr>
<td>Method (Know how to brush correctly)</td>
<td>37,3%</td>
<td>62,7%</td>
</tr>
</tbody>
</table>

A survey related to student’s dietary habits revealed that as many as 74% of students snacked 1-3 times a day. In addition, as many as 50% of students ate sweet and sticky foods.

Table 2. DMF-T/def-t Index of the Community

<table>
<thead>
<tr>
<th>DMF-T/def-t Index Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Index</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>D/d</td>
</tr>
<tr>
<td>875</td>
</tr>
</tbody>
</table>
From the 142 students screened, 875 teeth were found to have cavities, 176 were extracted due to caries or lost due to caries, and 14 had undergone restorations. The measurement results from these data obtained a DMFT/deft index in the community of 7.5 which was classified as having very high caries severity. The index had an interpretation that each individual in the community had a caries incidence of 7 teeth.

**Table 3. Spearman correlation between toothbrushing and diet habit towards DMFT/deft**

| Habits         | P-Value | *
|----------------|---------|------
| Toothbrushing  | .000*   |      |
| Diet           | .018*   |      |

*. Correlation is significant at the 0.05 level (2-tailed).

The data on dietary habits and tooth brushing habits were then correlated with DMFT-T/def-t in these communities. The result of the Spearman correlation illustrated that dietary habits and toothbrushing habits were significantly correlated to DMF-T/def-t as an index of the dental and oral health of an individual or community.

The result of this study indicated that there was a relationship between toothbrushing habits and the incidence of caries (p<0.05) (Table 3). As many as 75% of students already applied the right frequency of brushing teeth, which was twice daily (Figure 2). Dentists recommend brushing teeth at least twice daily to maintain healthy teeth and mouth [16, 17].

As many as 60.6% of respondents did not brush their teeth after breakfast and at night before going to bed (Table 1). The recommended time to brush your teeth is in the morning, 30 minutes after eating and at night before going to bed. Brushing your teeth after eating aims to clean food residue on the tooth surface and prevent plaque formation. Brushing your teeth before going to bed at night aims to prevent the interaction of bacteria and food residue that is still attached due to a decrease in saliva production during sleep so that it cannot clean the oral cavity naturally [18].

The use of fluoride toothpaste can prevent dental caries. In this study, 91.5% of respondents used fluoride toothpaste (Table 1). Brushing teeth with fluoride toothpaste for 2 minutes twice a day is recommended as good practice by the National Health Service (NHS) in England [19]. The fluoride works by enlarging and stabilizing the enamel crystals during tooth formation and then blocks the enolase enzyme during glycolysis. This can inhibit the growth of bacteria on the teeth, decrease the demineralization process, and increase the remineralization of teeth by forming fluorapatite [17]. Brushing teeth irritates the dental biofilm and reduces the number of bacteria, while the fluoride contained in toothpaste helps remineralize carious lesions [20].

Behavior that can affect caries is proper toothbrushing. This study conveyed that 62.7% of the students did not know how to brush their teeth properly (Table 1). This finding supports the results of a previous survey by Riskesdas (2018), which indicated that out of 94.9% of Yogyakarta residents, only 6% had the correct behavior in brushing their teeth [2]. The ideal standard for brushing teeth is that the technique of brushing teeth must be able to clean the entire surface of the teeth, especially in the cervical and interdental areas. Tooth brushing movements should not cause damage to either the soft or hard tissues of the teeth. Good toothbrushing technique must be simple and easy to learn, especially for children [24]. Many toothbrushing techniques include Roll, Bass, Stillman, vertical, phonetic/circular, Charters, or combinations [25, 26]. The phone technique involves brushing teeth with circular movements from the gingiva to the tooth surface. This technique is done by placing the bristles perpendicular to the surface of the teeth when the upper and lower jaws are closed. This technique is applied to children because it is easy to move the brush in a big circle to clean the teeth and gums of the upper and lower jaw [26]. A good brushing should be done
with short and gentle movements and with light pressure; place the brush on the edge of the gums where the plaque is attached, the chewing surface of the teeth where there are very small fissures or gaps and brush the area of the back teeth [22].

The research conducted by Sukarsih et al. (2019) shows that children with good brushing skills show low caries status [18]. Frequency, time, and method of brushing teeth are important aspects of dental and oral health care for preventing caries, especially in children. Learning these skills early can help them maintain good oral hygiene practices, lowering their risk of dental disease later in life [17]. Therefore, parents play an important role in providing education and guiding dental and oral health to children [18].

Dietary habits correlate with the incidence of caries (Table 3). In this study, 74% of students consumed snacks 1-3 times daily (Figure 3). The findings regarding consuming sweet foods/snacks were like the results reported by Zeng et al. (2018), which revealed that high-frequency consumption of sweet foods over a long time could increase the risk of caries [16]. The high frequency of snacking is the most influential factor in caries rates compared to other habits [20].

Snacks or sweet foods such as candy, chocolate, and cakes, often called cariogenic foods, including carbohydrate foods like flour or liquid that are sticky and disintegrate in the mouth. These foods can cause caries because it is related to plaque formation on the tooth surface. The plaque will convert sugars and carbohydrates from cariogenic foods in the teeth into acids which can cause demineralization so that the teeth become damaged [21]. Forming good oral hygiene habits and controlling snacking habits from an early age is important for achieving long-term good dental condition and avoiding dental caries from an early age [19].

Thus, IDCRA was approved as an effective tool to examine and suggest continuous improvement of children's oral health. IDCRA could simplify the subjective and objective examinations recorded by CAMBRA as a tool to assess caries risk assessment on children. Nonetheless, this effectiveness needs to be implemented in a wider community sample.

4 Conclusions

From the data obtained, caries incidence in school-aged children at SD Muhammadiyah Pepe Yogyakarta and SD Muhammadiyah Warungboto elementary schools is very high. This can be influenced by the habit of brushing their teeth and dietary habits carried out by students. So promotive and preventive activities to increase the knowledge and awareness of children and parents need to be carried out regularly. Nevertheless, the number of samples used should be expanded and further research is needed with a more representative sample.

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