

## Behavioral Change Interventions in Dental Hygiene for Prevention of Dental Caries in Children at SDN 09 North Pontianak

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### ABSTRACT

West Kalimantan has extensive peatlands, so its groundwater has a low calcium and fluorine content. The low content of these two minerals can make teeth susceptible to damage and affect the development of children's teeth. The high rate of dental caries in children requires intervention in order to change dental hygiene behavior and prevent further development of dental caries. *Method:* The intervention was carried out by training dental hygiene to first grade students of SDN 09 North Pontianak and their parents. This study used promotive and preventive approaches by training both parents and children on the proper way to do dental and oral cleaning. Routine training after school in small groups with the assistance of an instructor was held for the students. Parents then help and supervise the child when brushing their teeth at home twice a day and report it in the diary that has been prepared. *Result:* Behavioral changes including frequency, duration, tooth brushing technique, tongue cleaning, and oral cleaning after eating, were obtained after the intervention. An increase in teeth and mouth cleaning skills was found to be in line with a decrease in plaque value (PHP-M Index) from 29.66 to 16.39. *Conclusion:* Tooth-brushing training activities can improve children's ability to clean their teeth and mouth. A tooth-brushing diary can be a medium to remind children about when to brush their teeth. The role of parents is to increase children's motivation to develop dental and oral cleaning behavior.

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## INTRODUCTION

West Kalimantan Province has natural conditions that does not support dental and oral health. Extensive peatlands in West Kalimantan have groundwater characteristics which do not meet the quality as drinkable water. Peat groundwater is acidic (pH 3.98–4.25) and contains high levels of iron so it requires special processing before it can be used. (A'idah et al., 2018; Astiani et al., 2018) Alternative sources of drinking water used by the people of West Kalimantan are rainwater and river water processed by the Regional Drinking Water Company (PDAM). However, this alternative source of drinking water also has several disadvantages, especially in terms of calcium and fluoride levels which are important for dental and oral health.

Research on the mineral content of drinking water sources in West Kalimantan shows that the levels of fluoride, calcium and phosphate in drinking water are low. The fluoride content was found to be below the optimal level (<0.1 mg/liter) while the optimal fluoride requirement to maintain dental health is in the range of 0.5-1 mg/liter. Low levels of fluoride cause tooth structure become brittle and susceptible to caries. (Puspa Dewi et al., 2019) West Kalimantan has a fairly high dental caries rate of 49.55% with 22.28% of them receiving tooth extraction treatment and 3.83% having fillings. (Ministry of Health of the Republic of Indonesia, 2018)

Global Goals for Oral Health 2020 targets a DMF-T (Decay, Missing, Filled-Teeth) index in children aged 12 years of less than 1 and an increase in the caries-free rate in primary teeth in children aged 6 years and above (Hobdell et al., 2003). The problem of low calcium and fluoride content in drinking water sources and food intake is important because it is able to increases the risk of children experiencing dental caries and other oral diseases. Another factor that can be intervened in treating children's dental caries rates is maintaining proper dental hygiene. Activities to prevent dental caries in children with dental hygiene behavior interventions at SDN 09 North Pontianak are aimed to improve children's dental hygiene behavior in a sustainable manner thereby improving dental and oral health and reducing caries rates.

## METHOD

Activities were conducted for five months, from June to October 2023. Activities were held in several meetings. The population of the activity was first grade students at SDN 09 North Pontianak (96 students), but only 48 students were willing to participate in the activity. The methods used during the activity are initial assessment, lecture, practice and evaluation. The activities in this study explained thoroughly in Fig. 1.

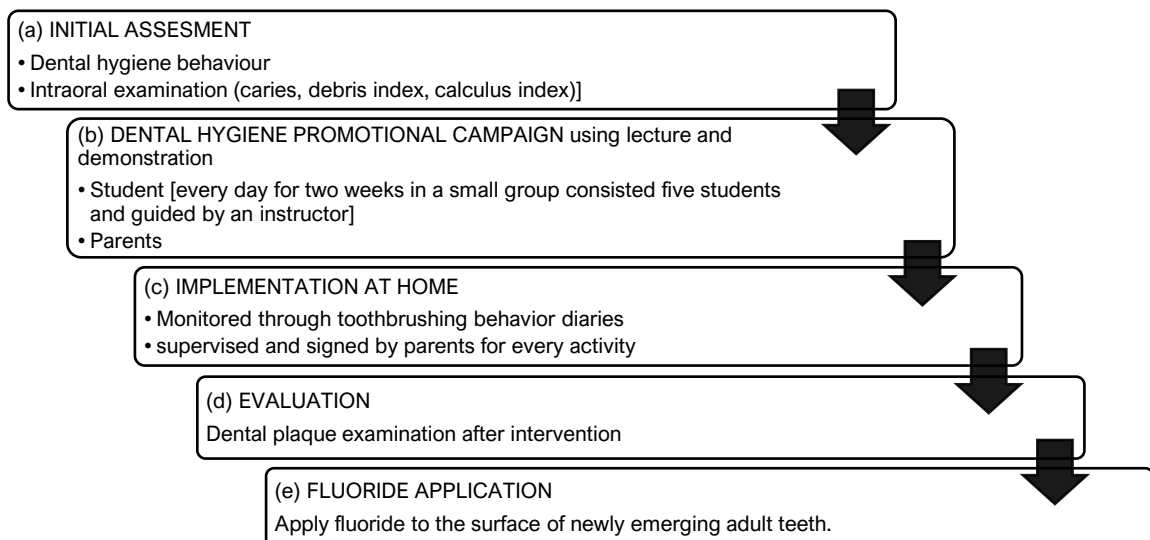


FIGURE 1. Activities Flowchart

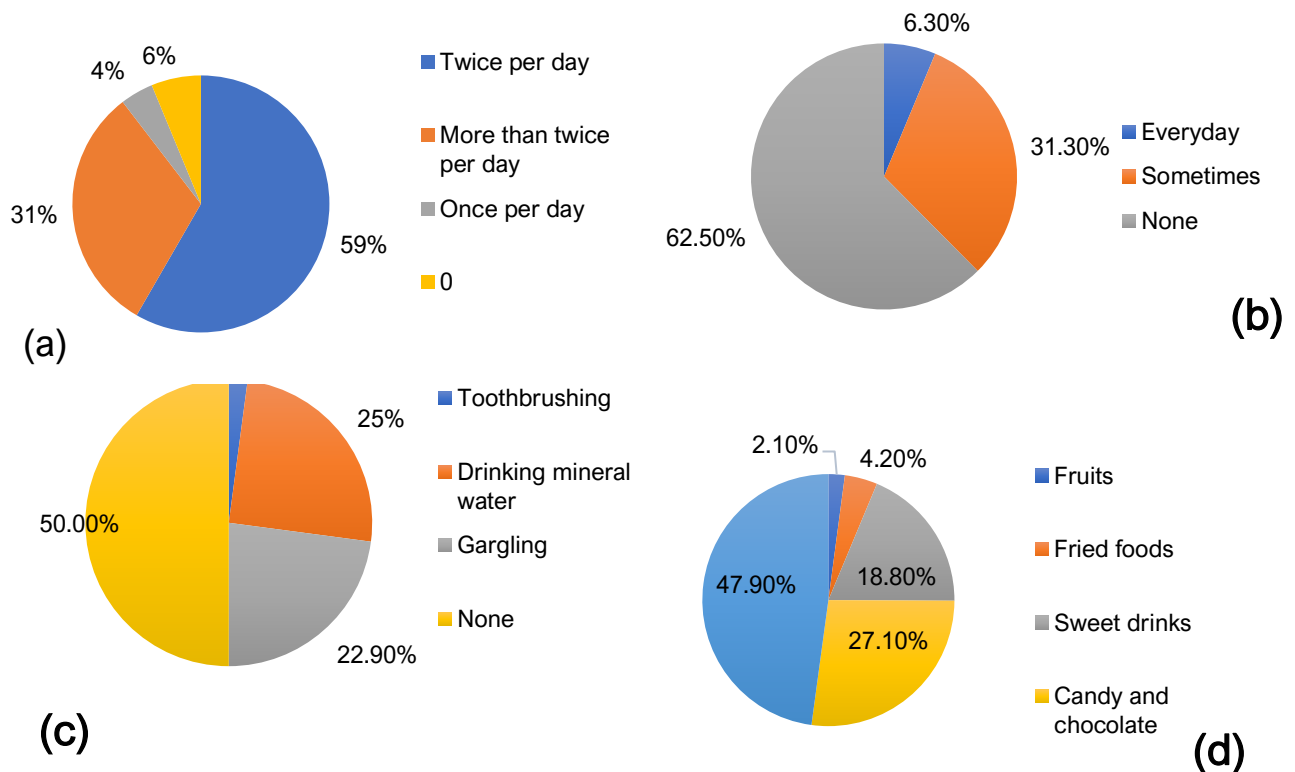
The flowchart demonstrated the activities which were done by students and their parents to promote dental hygiene behavior. (a) Initially, students were assessed by examiner for their pre-intervention dental hygiene behavior and intraoral health. (b) Then, instructors from dental nursing department of Pontianak Health Polytechnic would explain and demonstrate the dental hygiene behavior to students and their parents. For students, the activities were going continuously every after school for two weeks in small groups which were consisted five students with one instructor per groups. (c) After the campaign period, both of students and parents would allow to implement and practice proper dental hygiene at home. This task would be monitored and supervised by parents using daily dairy. (d, e) The evaluation would be the last activities following with fluoride application to examined post-intervention dental hygiene behavior and intraoral health of the students.

## RESULT AND DISCUSSION

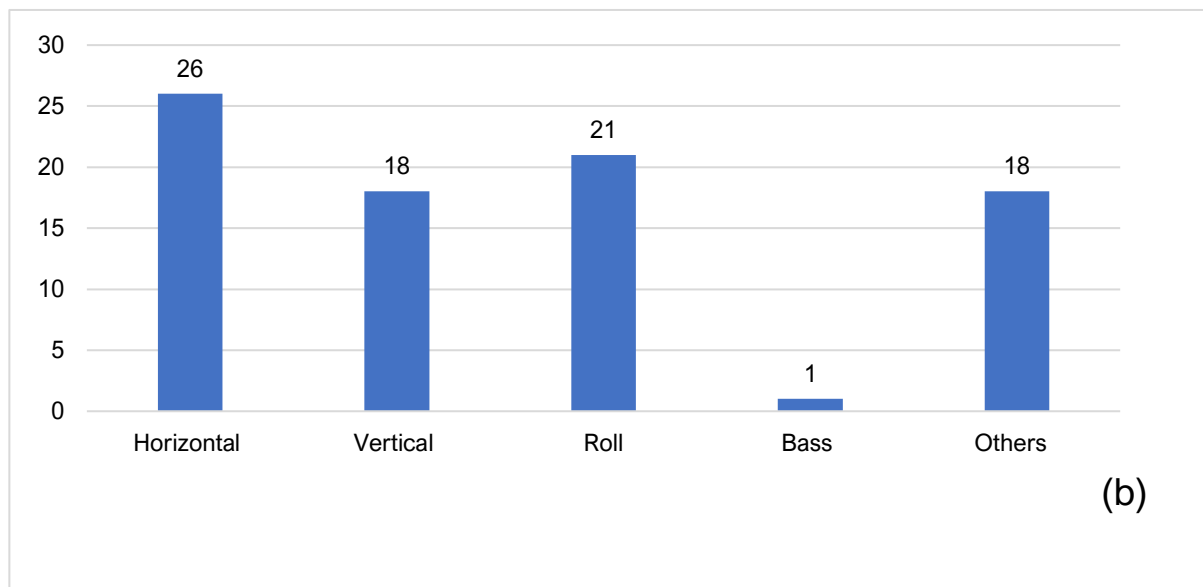
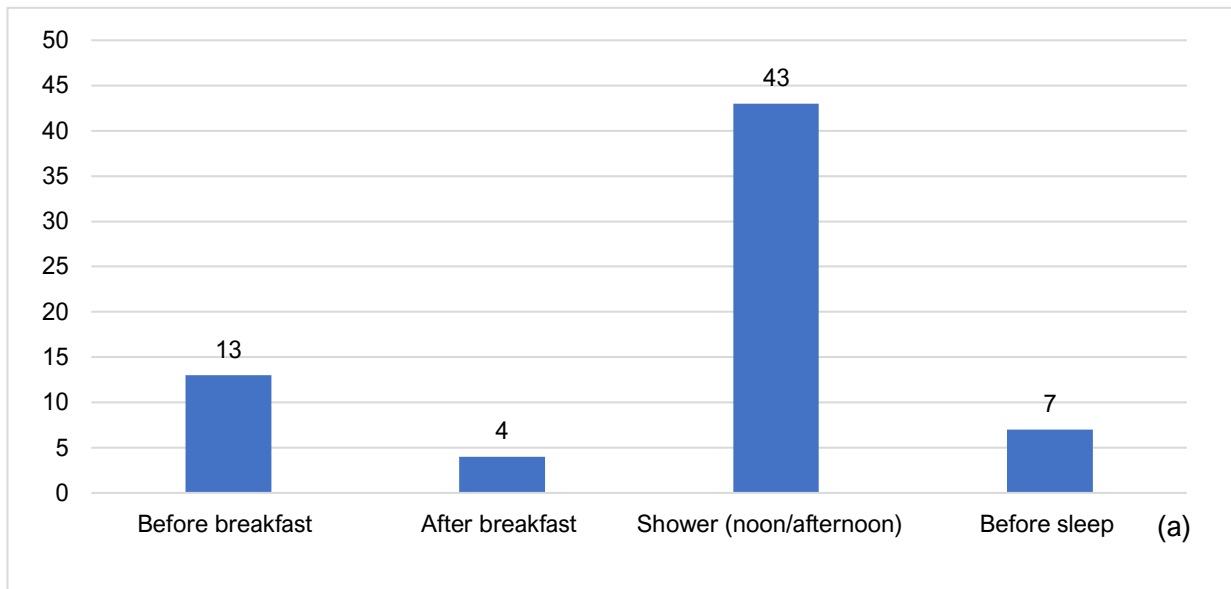
### Dental and Oral Hygiene Behavior

#### *Frequency of Toothbrushing*

Almost the majority of participants (90%) had brushed their teeth at least twice a day with 31% of them brushing their teeth more than twice a day. Only a small number of students do not brush their teeth regularly every day, 6% of them even admit that they do not brush their teeth regularly once a day (Fig. 2a). Brushing your teeth twice a day has an optimal effect on oral hygiene and gingival condition for both men and women (Azodo et al., 2010).



**FIGURE 2.** These charts represent dental and oral hygiene behavior among first grade students in SDN 09 North Pontianak. (a) Frequency of toothbrushing, (b) Tongue cleaning on daily dental hygiene, (c) Oral cleaning method after eating a snack (d) Students' favorite snack



**FIGURE 3.** Graphics above illustrate dental and oral hygiene methods used by first grade students in SDN 09 North Pontianak. (a) Moments of dental cleaning by toothbrushing (b) Techniques of dental and oral cleaning.

*Moments of Dental Cleaning*

Most children brush their teeth outside the recommendation time. There are 43 students said they used to brushing their teeth on the shower moment which usually at noon or afternoon (Fig. 3a). Toothbrushing is recommended to be done at least twice a day in the morning after breakfast and in the evening before bed (Purwaningsih et al., 2022).

### *Toothbrushing Technique*

The most frequently used toothbrushing technique was individual movements with a horizontal technique (26 students) while the least frequently used toothbrushing technique was the bass technique (1 person) (Fig. 3b). The bass technique is a technique for brushing teeth by prying the brush at a position of 45 degrees from the surface of the teeth. This movement allows brush moves from the gums to the teeth. The majority of methods or techniques used are combination techniques (Purwaningsih et al., 2022), so that all tooth surfaces are clean from dental plaque.

### *Tongue Cleaning*

Tongue cleaning behavior is not commonly known by students. Most students (62.5%) admitted that they had never cleaned their tongue when brushing their teeth. Some other students did not clean their tongues regularly and only 6.3% of students admitted to cleaning their tongues every day (Fig. 2b). Tongue cleaning is one component of oral hygiene measures. Plaque or debris coating the tongue is known to be the main cause of halitosis (Azodo et al., 2010).

### *Oral Cleaning Method after Eating Snacks*

Some students (50%) did not clean their mouths after eating snacks. Oral cleaning actions in the form of gargling with water and drinking water are quite popular among students who choose to clean their mouths after eating snacks. Almost half of the students chose to use water alone to clean their mouths either by gargling (22.9%) or by drinking water (25%). Another small portion (2.1%) chose to brush their teeth after eating a snack. (Fig. 2c)

### *Students' Favorite Snacks*

The snacks that students like are cakes and bread (47.9%), followed by candy/chocolate (27%), sweet drinks (18.8%), and fried foods and fruit (6%) (Fig. 2d). Mother's behavior in providing cariogenic snacks is related to the emergence of dental caries in children. (Pramudho & Hermawan, 2019)

## **Planning of Action**

The results of the behavior analysis will form the basis for creating a planning of action for this activity. The planning of action was consisted by few of these activities.

- Assessment and examination of school children's mouths.  
In the initial assessment, it was found that the average grade 1 student had 7 carious teeth with an average value of debris of 1.6 and calculus of 0.006. Oral examination also showed that the student's plaque number before brushing his teeth was 29.6 (table 1).
- Planning of action  
The biggest problem found in students is dental caries. The promotive and preventive program are aim to educate the students and parents the proper way of dental hygiene including frequency, technique, timing of tooth brushing and tongue cleaning, as well as the behavior of cleaning oral cavity after eating snacks.
- Extension program  
This lecture of how to brush teeth in proper way for parents and children also includes demonstration and practice of how to brush teeth correctly. Counseling activities were carried out regularly for 2 weeks for students and continued with the practice of brushing their teeth at home (Fig. 4 and 6).



**FIGURE 4.** Parents and children are given education about the importance of maintaining oral hygiene

- Implementation and evaluation of dental hygiene behavior

Children are given task to clean their teeth as taught by the instructor and this task would be monitored by their parents. The results of the teeth and mouth cleaning activities were then documented by parents signing a diary which was distributed as documentary evidence (Fig. 5).

This activity is monitored by parents and it is hoped that there will be good and sustainable changes in behavior so that healthy teeth are obtained. Monitoring is documented in a diary given to student. This diary will then be collected at the end of the activity period.



Dental plaque examination on students was also carried out to assess the post-intervention PHP-M index. The average post-intervention student PHP-M index score was 16.39. This figure decreased from the pre-intervention value of 29.6 (Table 1). The activity then ends with the application of fluoride to the child's grown adult teeth.



FIGURE 5. A diary for teeth brushing guidance that must be signed by parents every day as documentary evidence



FIGURE 6. Counseling and demonstration of dental and oral cleaning to students

## Assessment of the Activities

**TABLE 1.** Description of Caries, Debris Index, Calculus Index, And Plaque Before and After Tooth Brushing Training

	N	Minimum	Maximum	Mean	Std. Deviation
Caries	49	0.00	17.00	7.0625	4.08965
Debris Index	49	0.10	6.60	1.6379	1.04451
Calculus Index	49	0.00	0.16	0.0067	0.03197
Pre-intervention Plaque	49	9.00	43.00	29.6667	8.34249
Post-intervention Plaque	49	3.00	28.00	16.3958	5.76173

**TABLE 2.** The Average Difference Between Plaque Before and After Tooth Brushing Training

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pre-intervention-Post-intervention Plaque	13.27083	4.48488	0.64070	11.98263	14.55904	20.713	48	0.000

The difference between plaque values before and after training was shown to decrease significantly with sig 0.000 (table 2). This activity can improve children's skills in brushing their teeth by changing the plaque value from the initial 29.6 to 16.39. Plaque is the precursor to dental caries. Dental caries arises as a result of a complex interaction of many factors, initially all tooth surfaces are covered with a thin, adherent biofilm (Ástvaldsdóttir, 2016) then grow with specific bacteria that adhere to the teeth (Manu Rathee & Sapra, 2020), as well as substrates in saliva, biofilm bacteria can also use food sugars as a substrate, producing acids, especially lactic acid. Bacterial activity causes decrease in pH, which ultimately leads to the release of enamel hydroxyapatite crystals. In periods without sugar intake, acid production decreases and pH rise again (Ástvaldsdóttir, 2016).

Dental hygiene behavior must be carried out regularly. Continuous supervision and training are needed to obtain good behavior. This activity trains behavior by teaching children to brush their teeth every day for 2 weeks before the children come home from school. Parents would provide supervision and monitoring in their daily task of brushing their teeth properly. Discipline is the key in efforts to keep teeth clean and avoid dental caries.

The entire tooth surface has potential to become a place for the growth of plaque accompanied by bacteria and soft food residue, which will result in a demineralization process due to acids produced by the bacterial metabolic process, and ultimately cause caries. Frequency of brushing teeth, daily gargling habits, and oral hygiene status are related to dental caries (Kyaw Myint et al., 2020). Proper dental hygiene behavior can reduce the demineralization process by producing a clean tooth surface, so that food residue and *S.mutans* do not produce acid which is a stimulator. The increases incidence of dental



caries is influenced by knowledge about oral hygiene (Qin et al., 2008); (Purwasih, Sapriani & Slamet, 2018), as well as children's oral hygiene behavior (Wulaerhan et al., 2014; Pierce et al., 2019; Kyaw Myint et al., 2020). The influencing behaviors are parenting (Selwitz et al., 2007), frequency of brushing teeth, daily mouth rinsing habits, experience of visiting the dentist, and consumption of sweet snacks (Kyaw Myint et al., 2020).

Not all children aged 6-7 years are able to clean the surface of their teeth properly, this can be seen by the presence of disclosing solution on the lingual and palatine surfaces. Even the position of the back teeth is still often found to be less clean by students. Therefore, continuous training and the role of parents are needed to teach and help children to brush their teeth in order to keep them clean and avoid the demineralization process which results in dental caries. The application of fluoride gel could help strengthen tooth enamel therefore it can strengthen the tooth structure from the demineralization process.

The benefit of dental hygiene training is it could prevent children's dental caries early so that economic losses due to tooth decay can be reduced and children could independently maintain healthy teeth.

## CONCLUSION

Dental and oral cleaning training activities can improve children's ability to clean their teeth. Diaries are a medium for reminding children about when to brush their teeth. The role of parents could increase children's motivation to develop teeth cleaning behavior. The application of fluoride gel can help strengthen tooth enamel so that it can strengthen the tooth structure from the demineralization process.

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