

Research Article

Oral Health Behaviors of Elementary School Children in Bandung City

Grace Monica, Ivana Abigayl, Ignatius Setiawan

Department of Dental Public Health, Faculty of Dentistry, Universitas Kristen Maranatha, Bandung, Indonesia

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ABSTRACT

Introduction: Dental health behaviors established from an early age, such as toothbrushing habits, use of fluoride toothpaste, parental supervision, dental visits, and levels of dental treatment anxiety, play a crucial role in preventing caries.

Objective: This study aimed to evaluate five indicators of oral health behavior among elementary school students in Bandung City and to compare behavioral ivana.abigayl@dent.maranatha.edu differences between students attending public and private schools.

Methods: A cross-sectional survey was conducted on 4,721 students, aged 6-9 years, from 14 schools. Data were collected using a questionnaire completed with assistance from dental students. Data were analyzed using the chi-square test with SPSS.

Results and Discussion: The majority of students brushed their teeth twice daily (70.7%) and used fluoride toothpaste (86.9%). Parental supervision during toothbrushing was more common in private schools (18% vs. 8%). 35.3% of students had never visited a dentist, with a higher proportion in public schools (38% vs. 27%). Fear of the dentist was reported by 41.9% of students, while 94.9% stated that they were concerned about their oral health. Significant differences between public and private schools were found in toothbrushing frequency, parental assistance, fluoride use, and dental visit frequency ($p < 0.05$).

Conclusion: Although oral health awareness among elementary school children in Bandung City is relatively high, behavioral gaps remain, particularly regarding dental visits and parental supervision. School-based interventions involving teachers and parents, combined with interactive education and reinforcement of preventive behaviors, are needed to optimize children's oral health sustainably.

Corresponding Author:

Ivana Abigayl
Department of Dental Public Health, Faculty of Dentistry
Universitas Kristen Maranatha, Bandung, Indonesia
Email: ivana.abigayl@dent.maranatha.edu

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INTRODUCTION

Oral health is no longer regarded merely as the absence of caries or periodontal disease, but rather as an essential element contributing to an individual's overall well-being. Everyday activities such as eating, speaking, smiling, as well as social participation and personal creativity, are strongly influenced by oral health status.^{1,2} Maintaining oral health, particularly from an early age, is therefore a strategic step in supporting overall quality of life and individual well-being.³

Children's oral health is a critical determinant of their overall growth and development. Evidence from several studies indicates that oral health status is closely linked to physical growth, developmental milestones, nutritional status, and general well-being. Children affected by dental caries frequently experience pain and discomfort, which can adversely impact their sleep quality, dietary intake, and school attendance, thereby influencing both health outcomes and academic performance.^{2,3}

The School Dental Health Program in Indonesia is integrated within the broader School Health Program, encompassing oral health education, routine dental examinations, and the promotion of a healthy school environment.^{4,5} However, its implementation reveals marked disparities between public and private schools, as well as striking contrasts when compared with school-based oral health programs in other countries.⁴

The available evidence indicates a consistent pattern regarding the effectiveness of the School Dental Health Program in Indonesia. The study by Sihaan et al.⁴ in Deli Serdang and Tanu et al.⁶ in South Kalimantan both demonstrated that schools with active School Dental Health Program implementation achieved significantly better outcomes, including lower DMF-T scores and higher levels of oral health knowledge among students.^{4,6} Taken together, these

findings underscore the critical role of structured, school-based dental health programs in reducing caries prevalence and improving oral health behaviors in Indonesian children. However, the literature also highlights considerable variability in the scope and sustainability of School Dental Health Programs across regions, suggesting the need for stronger policy support, standardized implementation, and integration with broader preventive care strategies.^{5,6} Oral health behaviors among elementary school children constitute a critical aspect of dental caries prevention and the promotion of children's quality of life, particularly in developing countries such as Indonesia, where the prevalence of caries among school-aged children remains high.⁶

The nationwide epidemiological study by Maharani et al.⁷ reported that more than 90% of children aged 6–7 years and 10–11 years had dental caries, accompanied by high sugar consumption and irregular use of fluoride toothpaste. These factors were found to have a significant impact on children's academic performance, self-confidence, and social participation.⁷ Epidemiological studies have demonstrated that poor oral health conditions, particularly high dental plaque accumulation or active caries, exert a significant impact on students' academic performance and school attendance. A meta-analysis encompassing 18 studies from various countries found that children with one or more decayed teeth were more likely to exhibit lower academic achievement (Odds Ratio = 1.44; 95% CI: 1.24–1.64) and reduced school attendance (OR = 1.57; 95% CI: 1.08–2.05) compared to their caries-free counterparts.⁸ Another study conducted in the United States also found that children with poor oral health were more likely to experience school-related problems and higher rates of absenteeism, with the risk of deteriorating academic performance increasing by up to 40–50%, particularly among those aged 12–14 years.⁹

School-based interventions have been proven effective in improving oral health behaviors among school-aged children. For example, a recent meta-analysis concluded that game-based educational approaches significantly enhanced oral health knowledge and hygiene scores, while reducing debris and plaque, compared to traditional methods such as lectures or educational posters.¹⁰ School-based interventions that integrate game-based educational methods have demonstrated high effectiveness in enhancing oral health knowledge and hygiene behaviors among elementary school children.^{9,10} A prospective study conducted by Singh et al. in 2022 evaluated the impact of oral health education delivered through an educational board game, such as a modified version of *Snakes and Ladders* incorporating oral health messages, compared with conventional approaches such as lectures.¹¹

The study involved children aged 7-10 years and revealed that the group receiving game-based interventions showed a significant increase in oral health knowledge scores, as well as a marked reduction in debris and plaque indices at both one-week and three-month follow-up evaluations ($p < 0.05$). This study underscores that interactive media not only enhances student engagement but also exerts a positive influence on long-term oral hygiene behavioral change.¹¹ A systematic review conducted by Bramantoro et al. in 2021, which examined oral health promotion programs among elementary to adolescent students, demonstrated that interventions integrating skills-based education, teacher training, parental involvement, and supportive school environments significantly improved oral health knowledge and toothbrushing behaviors, while reducing DMFT scores and plaque levels.¹²

A meta-analysis conducted in low- and middle-income countries (LMICs) demonstrated consistent positive outcomes of school-based oral health

interventions, particularly in reducing caries experience, as measured by dmft/DMFT scores, as well as plaque accumulation, with standardized mean differences ranging approximately from -0.33 to -1.09 in favor of the intervention groups.¹³ These findings provide robust evidence that structured and systematic school-based oral health programs can yield meaningful improvements in both clinical and behavioral outcomes. Importantly, the analysis also highlighted that interventions incorporating interactive and participatory educational models, such as game-based or skills-oriented activities, were more effective than traditional lecture-based methods, which often result in limited engagement and lower knowledge retention among children. Such results underscore the critical role of interactive pedagogy in fostering sustainable oral health behaviors in resource-constrained settings, where the burden of dental caries among school-aged children remains disproportionately high.¹¹⁻¹³

School-based oral health education interventions in Indonesia have demonstrated significant efficacy in improving oral hygiene behaviors among elementary school children and reducing plaque accumulation. For instance, a quasi-experimental study conducted by Setiawati et al. (2020) implemented a 16-surface tooth brushing program supervised by both teachers and parents among children aged 7-9 years. The results showed a substantial reduction in children's plaque index of up to 47%, accompanied by improvements of approximately 16%-20% in teachers' and mothers' knowledge and tooth-brushing practices. These findings highlight the effectiveness of collaborative involvement between teachers and parents in reinforcing and motivating better oral hygiene behaviors among school-aged children.¹⁴ Oral hygiene behaviors among elementary school children are strongly influenced by the synergy between active parental involvement and supportive

school environments, particularly the roles of teachers and health personnel. Oral health education interventions that incorporate parental participation have been shown to improve children's knowledge significantly, attitudes toward tooth brushing under parental supervision, and overall oral hygiene status.^{13,14}

Improvements in toothbrushing behavior, reductions in plaque scores, and enhanced oral health knowledge have been consistently observed following school-based oral health education, particularly when parents are engaged through interactive materials and actively involved in programs announced and facilitated by the school.^{15,16} Recent data from the 2023 Indonesian Health Survey (SKI) highlight that oral health problems remain a widespread and pressing public health concern in Indonesia, with a national prevalence reaching 56.9% among individuals aged ≥ 3 years. The province of West Java has been reported to exhibit an oral health problem rate exceeding the national average, at approximately 60%. The majority of cases were observed among school-aged children (3–15 years), who accounted for 18.6% of the total cases. More specifically, in urban settings such as Bandung City, 47.88% of the population was reported to have dental caries, with the highest prevalence observed in the 5–9-year age group, at 55.52%.^{17,18} When compared with the findings of the 2023 Indonesian Health Survey (SKI), the prevalence of dental caries among elementary school children (ages 5–9 years) in Bandung is likely to range between $\geq 55\%$ and 60%, considering the slight declining trend observed from the 2018 National Basic Health Research (Riskesdas) to the 2023 SKI. Only a small proportion of dental caries cases receive professional dental care; of the total 56.9% prevalence of oral health problems, merely 10–11% were managed by dental health professionals.^{17,19}

The frequency of toothbrushing in Bandung City has not been specifically reported in the Indonesian Health Survey (SKI); however, data from the Basic Health Research (Riskesdas) indicate that the proportion of individuals brushing their teeth twice daily remains low, particularly among younger populations and those with lower educational attainment.^{17,19} Given the high prevalence of dental caries and the limited access to professional treatment, the practice of proper toothbrushing emerges as a crucial area of investigation within the Bandung context, serving as a key indicator for the early prevention of dental diseases. According to the World Health Organization (WHO), dental caries in children represents a global health concern, with a notably high prevalence ranging from 60% to 90% among those aged 6 to 12 years in many countries worldwide. This condition is regarded as a pressing public health issue that warrants serious attention within communities.^{14,20,21}

In the present study, five indicators of oral health behavior will be evaluated holistically among elementary school children. The first indicator is toothbrushing frequency, which serves as a primary determinant in caries prevention. The Centers for Disease Control and Prevention (CDC) recommends that children brush their teeth at least twice daily using fluoride-containing toothpaste.²² A study conducted in the United Kingdom demonstrated that supervised toothbrushing performed twice daily significantly reduced dental plaque accumulation and caries risk among young children.²³ Secondly, the use of fluoride toothpaste not only facilitates enamel remineralization but also inhibits the growth of cariogenic bacteria. A study conducted in Saudi Arabia revealed that although parental knowledge regarding fluoride was generally high, a considerable proportion of parents still lacked adequate understanding of its safe dosage and appropriate

frequency of use.^{23,24} Third, parental supervision in children's toothbrushing plays a critical role, particularly up to the age of approximately 7–8 years, when children's motor skills are not yet sufficiently developed to brush independently and effectively. Oral health education interventions incorporating a parental-guided brushing component have demonstrated improvements in toothbrushing practices as well as significant reductions in caries incidence and plaque indices among young children.²⁵ Fourth, the frequency of dental visits represents an important indicator, as preventive behaviors remain markedly low among many children in Indonesia; most visits are made only in response to complaints or acute dental problems. Ideally, routine visits should occur every six months, contributing to early detection, continuous education, and long-term caries control. The final indicator concerns the level of dental anxiety or fear, which will also be assessed, as children experiencing excessive fear are more likely to avoid dental visits and may even refuse treatment once pain has already developed. Such anxiety may stem from previous negative experiences, peer narratives, or limited understanding of dental procedures.^{17,26,27} Therefore, the assessment of these five behavioral indicators: brushing frequency, fluoride use, parental involvement, dental visits, and levels of dental fear will provide a comprehensive overview of oral health behaviors among elementary school children. Furthermore, these indicators serve as an essential foundation for designing more effective and contextually relevant educational interventions.

MATERIALS AND METHODS

This study employed a cross-sectional survey design involving 4,892 students in grades 1–3 (aged 6–9 years) from 14 elementary schools in Bandung, consisting of nine public and five private schools. The survey was conducted during school visits as part of

the National Dental Health Month program by distributing questionnaires comprising six simple questions to the students.

Questionnaire completion was supervised by dental students to minimize errors due to potential misunderstanding of the questions. After data cleaning, a total of 4,721 valid responses (3,732 from public schools and 989 from private schools) met the inclusion and exclusion criteria for analysis. The sample distribution closely reflected the overall proportion of public and private elementary school students in Bandung. In the 2024/2025 academic year, the total number of elementary school students in Bandung was 144,905 in public schools and 55,127 in private schools.^{28,29} Differences in oral health behaviors between public and private schools were examined using the chi-square test, performed with SPSS software.

RESULTS AND DISCUSSION

Based on the six questions administered to the elementary school students, the majority reported brushing their teeth twice daily (70.7%), with some brushing three times a day (17.9%). Most students brushed their teeth independently without adult assistance (88%), although a small proportion were still aided by their parents. A large proportion of the students (86.9%) used both a toothbrush and fluoride toothpaste for oral hygiene, while 13.1% did not use one of these. Furthermore, most students (86.9%) believed that brushing with a toothbrush and fluoride toothpaste could prevent dental caries.

The frequency of dental visits varied between one and two times per year; however, 35.3% of the students reported never visiting a dentist. More than half of the students (58.1%) indicated that they did not experience fear during dental visits, and nearly all students (94.9%) stated that they paid attention to their oral health.

Table 2 demonstrates a significant difference between public and private elementary schools regarding the frequency of students' daily toothbrushing. In private schools, 76% of students reported brushing their teeth twice a day, compared to only 69% of students in public schools. Conversely, 19% of students in public schools brushed their teeth three times a day, whereas this behavior was observed in only 13% of students in private schools.

In private schools, 18% of students were still assisted by their mothers when brushing their teeth, whereas in public schools, only 8% received such assistance. Meanwhile, 91% of students in public schools brushed their teeth independently, compared to only 77% of students in private schools. This difference was statistically significant ($p < 0.05$).

In terms of the use of toothbrushes and fluoride toothpaste for oral hygiene, the proportions were nearly similar between private and public elementary schools. However, the difference was statistically significant ($p < 0.05$).

Table 1. Oral health behaviors of elementary school children (Grades 1–3) in Bandung

Item	n (%)
Frequency of toothbrushing per day	
Once	536 (11.4)
Twice	3,339 (70.7)
Three times	846 (17.9)
Person supervising toothbrushing	
Father	105 (2.2)
Mother	463 (9.8)
Self	4,153 (88.0)
Use of fluoride toothpaste	
Yes	4,102 (86.9)
No	619 (13.1)
Perception of fluoride toothpaste use as a preventive measure against dental caries	
Yes	4,102 (86.9)
No	619 (13.1)
Frequency of dental visits	
Once a year	1,553 (32.9)
Every six months	1,500 (31.8)
Never	1,668 (35.3)
History of dental fear during dental visits	
No	2,741 (58.1)
Yes	1,980 (41.9)
Attention to own oral health	
Yes	4,480 (94.9)
No	241 (5.1)

Regarding the frequency of dental visits, a significant difference was observed between students in public and private schools. In private schools, 37% of students reported visiting the dentist every six months, while only 31% of public school students did the same. Moreover, 38% of students in public schools reported never visiting the dentist, compared to 27% of students in private schools. No significant differences were found between public and private school students in terms of dental fear or their level of attention toward their own oral health.

The percentage of elementary school students in grades 1–3 in Bandung City who brushed their teeth twice daily was higher than the general population of West Java, namely 70.7% (Bandung City) compared to 67.8% (West Java). Based on the Indonesian Health Survey (SKI) 2023, the prevalence observed in this study was higher than that reported for the general population in West Java (67.8%) but lower than the national prevalence among children of the same age group (73.6%).¹⁷

Elementary school students enrolled in private schools demonstrated a higher percentage of toothbrushing frequency (76%) compared to those in public schools (69%), and this difference was statistically significant. This may be attributed to socioeconomic differences between parents of children in private schools and those in public schools, where access to oral health care facilities (such as toothbrushes and fluoride toothpaste) may also vary. Studies conducted in Mexico and Korea on elementary school children have reported that toothbrushing frequency is associated with parental socioeconomic status.^{26,30} The practice of brushing teeth twice daily is commonly emphasized during oral health education programs; however, its implementation requires support from the surrounding environment. This

environment includes both the home and the school setting, although toothbrushing is more frequently performed at home. Nevertheless, teachers and schools continue to play an important role in reinforcing proper oral hygiene behaviors. In this study, most students reported brushing their teeth twice daily, although a notable proportion reported brushing three times a day. These findings suggest that the majority of students have adopted an appropriate toothbrushing frequency, while continued oral health education and support from both families and schools remain important to maintain and further improve these practices.^{23,31}

The observed difference in toothbrushing frequency between students attending public and private elementary schools reflects disparities in socioeconomic status. Children from families with higher socioeconomic backgrounds generally have better access to oral health information, dental care, and parental support, all of which can facilitate the adoption of recommended toothbrushing practices. This finding is consistent with previous studies reporting that socioeconomic conditions influence children's oral health behaviors through differences in health literacy, access to resources, and parental supervision.

Table 2. Oral and dental health behavior of 1st-3rd grade elementary school children in Bandung city based on school ownership

Question	Private school n(%)	Public school n(%)	p-value
Frequency of toothbrushing per day			0.033
Once	110 (11)	426 (12)	
Twice	748 (76)	2,591 (69)	
Three times	131 (13)	715 (19)	
Person supervising toothbrushing			0.015
Father	52 (5)	53 (1)	
Mother	179 (18)	284 (8)	
Self	758 (77)	3,395 (91)	
Use of fluoride toothpaste			0.023
Yes	961 (97)	3,659 (98)	
No	28 (3)	73 (2)	
Perception of fluoride toothpaste use as a preventive measure against dental caries			<0.001
Yes	904 (91)	3,198 (86)	
No	85 (9)	534 (14)	
Frequency of dental visits			<0.001
Once a year	365 (37)	1,188 (32)	
Every six months	361 (37)	1,139 (31)	
Never	263 (27)	1,405 (38)	
History of dental fear during dental visits			0.093
No	555 (56)	2,186 (59)	
Yes	434 (44)	1,980 (41)	
Attention to own dental health			0.432
Yes	931 (94)	3,549 (95)	
No	58 (6)	183 (5)	

Private school students generally come from families with higher levels of education and income, which influences their knowledge and practices regarding oral hygiene.^{32,33} Evidence synthesized in the systematic review by Kazemini et al.,³⁴ including studies conducted by Acuña-

González et al. (2022) in Mexico and Kawachi and Ryu (2025) in Korea, supports these findings, indicating that toothbrushing practices and dental visits are associated with parental socioeconomic and educational levels.³⁴

Private school students were more frequently assisted by their parents (mothers) when brushing their teeth (18% vs. 8%), whereas public school students brushed their teeth independently to a greater extent (91% vs. 77%). This indicates a higher level of independence, but also suggests a potential lack of parental supervision, which may affect the quality of brushing. The World Health Organization (WHO) supports parental or caregiver supervision of toothbrushing until children reach approximately seven years of age, as a means of reducing the risk of inappropriate fluoride use and improving children's brushing techniques. WHO studies also recommend the implementation of supervised toothbrushing programs in schools or at home as a standard preventive practice.³⁵ Furthermore, one study demonstrated that toothpaste containing fluoride compounds produced greater remineralization of human premolar enamel compared to non-fluoride toothpaste, as evidenced by microscopic analysis and increases in calcium and fluoride levels within the enamel layer.^{36,37}

The study reveals a highly significant difference $p < 0.001$ in respondents' perception of using a toothbrush and toothpaste as a preventative measure against dental caries. While the majority of students across both school types agreed with this protective function, private school students exhibited a slightly higher rate of agreement (91%) compared to their public school counterparts (86%). Although the absolute difference is narrow, this statistically significant finding may point toward a higher level of health literacy and stronger belief in the preventive function of oral hygiene products among private school students or their parents.^{38,39} This difference is likely correlated with the socio-economic background that distinguishes the two school groups. Parents with

higher levels of education and income, which are typically associated with private school enrollment, are often more exposed to and receptive to evidence-based health information, subsequently fostering a deeper understanding of the specific function of fluoride in caries prevention.⁴⁰ Disparities in health beliefs and practices have been shown to persist despite widespread public health campaigns, indicating that socio-economic status remains a critical determinant of both dental health knowledge and preventive behaviors adopted by the family unit.⁴¹ Therefore, this finding underscores the need for targeted educational interventions to bridge the existing gap, ensuring that all demographic groups recognize the specific disease-preventive role of fluoride toothpaste, not just its general role in hygiene.¹³

Analysis of dental visit frequency revealed a highly significant $p < 0.001$ between students of private and public elementary schools. A substantial majority of private school students reported visiting the dentist routinely, totaling 74% (37% annually and 37% semi-annually). In stark contrast, public school students showed a markedly higher rate of never having visited a dentist (38%) compared to their private school peers (27%). This finding suggests disparities in the utilization of preventive dental services between the two groups. One possible explanation is the influence of socioeconomic factors, as families with greater financial resources may have better access to dental care, higher oral health awareness, and greater ability to prioritize regular preventive visits.

These findings are consistent with previous studies reporting higher dental service utilization among children attending private schools. For example, in a 2020 study from the Eastern Mediterranean region, children attending private schools were significantly more likely to use dental

services than those in public schools; school type remained significantly associated with service use after adjusting for other variables.⁴² Similarly, a 2021 Saudi study found that children in private schools reported higher rates of regular dental attendance compared to children in public schools (11,1% vs 7,3%; $p=0,038$).⁴³ These findings indicate that school type may reflect broader socioeconomic and healthcare access differences that influence children's oral health behaviors.

Despite the higher frequency of routine dental visits among private school students, dental fear remained common in both groups, affecting approximately 44% of private school students and 41% of public school students. The relatively small difference suggests that access to dental services alone does not eliminate dental fear. Our findings back up what earlier studies have already shown: dental anxiety stems from a mix of past bad experiences, fear of pain, their parents' own anxiety, and the child's natural temperament. Because nervous children are much more likely to put off or completely skip their dental appointments, they face a much higher risk of untreated cavities. This alignment with past research highlights a clear takeaway: if we want preventive oral health strategies for children to actually work, we have to address their dental anxiety head-on.^{26, 44-45}

According to Table 2, the variable "Concern for one's own dental health" shows that 94% of private-school students (931 students) reported being concerned about their own dental health, compared with 95% (3,549 students) of public-school students. Although the percentages are very high in both groups and nearly identical, the numerically slightly lower concern among private-school students (94% vs 95%) stands out in the context of the many other variables where private-school students show more favourable oral-

health-related behaviours (such as higher routine dental visits). This suggests that concern for dental health is almost ubiquitous in both populations, but its translation into preventive behaviours may differ by school type. A study among mothers in Saudi Arabia found that although knowledge and attitudes were adequate, actual preventive practices were inadequate (only 40% of children brushed twice daily) even though many parents said they cared.⁴⁵ In behavioural models (such as the Health Belief Model), concern (or perceived susceptibility/severity) is one component, but must be supported by cues to action, self-efficacy, and enabling factors (access to clinics, finances, parental involvement). A 2020 Indonesian study found that the level of concern, motivation, and knowledge were significantly related to children's cooperation in dental care visits.^{46,47}

CONCLUSION

The findings indicate that elementary school students in Bandung City generally demonstrate good knowledge of oral hygiene and positive toothbrushing practices. Important gaps remain in regular dental attendance, parental guidance regarding oral health at home, and dental anxiety. Differences observed between students attending public and private schools suggest that socioeconomic factors may influence oral health behaviors and access to preventive dental care. These findings underscore the need for collaborative efforts involving schools, parents, dental professionals, and local health authorities to strengthen school-based oral health promotion and improve parental engagement. From a policy perspective, integrating comprehensive oral health education, routine dental screening, and preventive dental services into school health programs, particularly in public schools and underserved communities, may help

reduce oral health disparities and promote equitable access to preventive care from an early age.

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