



Impact of Maternal Parenting Approaches in Dental Care on Behavioral Modification and Oral Hygiene of Primary School Children in Banda Aceh

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Abstract

Children's oral health is significantly influenced by parental involvement, particularly maternal parenting practices in daily care routines. This study aimed to analyze the effect of maternal parenting within the context of dental nursing care on behavioral changes and oral hygiene status among primary school children in Banda Aceh. A quasi-experimental design with a pre-test and post-test control group was employed. The sample consisted of 60 children aged 7–8 years and their mothers, divided into an intervention group (n = 30), which received structured education and supervised parenting guidance, and a control group (n = 30), which only received educational modules. Data were collected at three stages: pre-test, post-test I (immediately after the intervention), and post-test II (two weeks later). Findings revealed a significant improvement in mothers' knowledge, attitudes, and practices regarding dental health in the intervention group compared to the control group ($p < 0.05$). Furthermore, the oral hygiene status of children, measured by the Patient Hygiene Performance-Modified (PHP-M) index, showed a statistically significant reduction in scores in the intervention group, indicating better oral cleanliness, while no significant changes were observed in the control group ($p > 0.05$). These results demonstrate that parenting-based dental health education effectively enhances maternal involvement in guiding and supervising children's oral care, thereby fostering improved oral health behaviors and hygiene outcomes. The study concludes that maternal parenting approaches within dental nursing care have a substantial impact on improving both maternal dental health practices and children's oral hygiene status.

Keywords: Children's oral health; maternal parenting; dental nursing care; quasi-experimental study; oral hygiene behavior; parental involvement.

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Introduction

Dental caries is a preventable chronic disease that continues to impose a substantial public health burden, particularly among children, both in high-income and low- to middle-income countries(Nath et al., 2023; Peres et al., 2019). The Global Burden of Disease (GBD) Study 2021, reported in the WHO Global Oral Health Status Report 2025, estimates that oral diseases—including caries, periodontal disease, and edentulism—affect nearly 3.7 billion people worldwide(Baelum et al., 2007; Yousaf et al., 2022). Among these conditions, caries in permanent teeth stands out as the most prevalent, while untreated caries in primary teeth affects approximately 514 million children, positioning it as the most common chronic disease of childhood(Chen et al., 2021). Moreover, there were an estimated 2.3 billion cases of caries in permanent teeth in 2021, with regional variations highlighting the unequal distribution of disease and the relative stagnation of progress in prevention since 1990. These figures reflect persistent shortcomings in global preventive strategies and underscore the need for innovative, community-based, and family-centered interventions to reduce the long-standing burden of oral disease(Gbadebo et al., 2025; Shaw et al., 2024). The consequences of dental caries extend beyond the immediate clinical manifestations of pain, infection, and impaired nutrition. Caries has profound social, developmental, and educational implications(Chamut et al., 2024; Kurt et al., 2025).

For instance, the Centers for Disease Control and Prevention (CDC) reports that an estimated 51.7 million school hours are lost annually in the United States due to dental-related illnesses and treatment visits among school-aged children. Epidemiological evidence further indicates that dental pain and oral discomfort are closely linked to reduced school performance, concentration problems, and diminished quality of life, with long-term impacts that may persist into adulthood(Setijanto et al., 2020). Similar patterns have been documented in Canada and the United Kingdom, reinforcing the understanding that oral health is inseparable from overall well-being, academic achievement, and socio-economic development. Indonesia exemplifies the same challenge, with high prevalence and insufficient preventive care. The 2018 Basic Health Research (Riskesdas) reported a national prevalence of oral health problems of 57.6%, with dental caries constituting the largest share. A subsequent policy review by the World Health Organization (WHO) noted that approximately 45.3% of these oral health cases are attributed to caries, with prevalence rates reaching ~90% among children aged five years and ~72% among those aged twelve years(Chen et al., 2024; Liu et al., 2024). Alarminglly, only 10.2% of individuals with oral health problems sought professional dental care, highlighting gaps in service accessibility, awareness, and preventive behaviors.

Furthermore, localized data from the Banda Aceh City Health Office (2019) indicate that 49% of children aged 6–14 years assessed through the School Dental Health Program (UKGS) at Puskesmas Baiturrahman were diagnosed with caries. This finding mirrors national statistics and emphasizes the urgency of implementing structured, evidence-based interventions tailored to local needs. One promising preventive strategy is the home care model in pediatric dental nursing, which positions parents as primary agents in maintaining their children's oral health under professional supervision(Casamassimo et al., 2009; Han et al., 2025; Kassebaum et al., 2015). This model encompasses multiple components, including oral

hygiene education appropriate to the child's developmental stage, training in proper toothbrushing techniques, regulation of dietary sugar intake, use of fluoride-based preventive measures (e.g., fluoride toothpaste or topical applications), and scheduling of regular dental check-ups. Empirical studies, including those conducted in Brazil and other countries, have demonstrated that active parental involvement through structured home care programs leads to significant improvements in children's oral hygiene behaviors and overall dental health status.

Despite these promising outcomes, Indonesia currently lacks a standardized home care model to guide uniform practice across healthcare facilities and schools, resulting in fragmented and inconsistent implementation. The absence of such a model represents a critical gap in pediatric dental care, given the high prevalence of caries and its multifaceted consequences on children's health, education, and long-term well-being. Developing and evaluating a standardized home care framework is therefore essential—not only to improve oral health outcomes but also to address the broader educational and socio-economic implications of untreated dental disease. What is the effect of implementing a structured home care model in pediatric dental nursing on the oral health behaviors and dental health status of students at SDN 33 Banda Aceh?

Literature Review

Maternal parenting

Maternal parenting, or maternal caregiving, is a key determinant in child development and has been extensively studied in developmental psychology, education, and child health (Rahayu et al., 2024). International literature emphasizes that maternal parenting styles—whether authoritative, permissive, authoritarian, or neglectful—exert significant influence on children's psychological, social, and cognitive outcomes. The authoritative style, which balances responsiveness and control, tends to produce children who are independent, self-confident, capable of regulating their emotions effectively, and socially competent (Humphreys et al., 2024; Zou et al., 2024), whereas authoritarian and neglectful parenting styles are often associated with increased behavioral problems, poor emotional regulation, and difficulties in social interactions (Oliveira et al., 2024).

Key dimensions of maternal parenting include responsiveness to children's needs, parental control, and emotional involvement, all of which are influenced by contextual factors such as maternal age, educational level, socioeconomic status, mental health, past experiences, and social support from partners or extended family (Deffaa et al., 2020; Tome et al., 2020). Research also indicates that parenting stress and maternal depression can disrupt the quality of mother-child interactions, thereby affecting cognitive and emotional development; however, family resilience and social support can serve as moderators, strengthening the positive effects of maternal parenting (Barlow et al., 2015; Dalgaard et al., 2022).

Furthermore, mothers' ability to regulate emotions and communicate effectively with their children is closely linked to the development of children's self-regulation skills, learning motivation, and prosocial as well as adaptive behaviors across contexts, including school and

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broader social environments(Madigan et al., 2024; Sajedi et al., 2020). Sensitive, consistent, and responsive maternal parenting has been shown to correlate with various indicators of children's health and well-being, including nutritional status, healthy lifestyle behaviors, and academic achievement(Choedon et al., 2023; Ghodsi et al., 2023). Overall, the literature indicates that maternal parenting not only shapes individual child development but also has long-term implications for psychosocial well-being and quality of life into adulthood. Therefore, interventions and parenting education programs that support parenting skills, maternal mental health, and family social support are crucial for enhancing the quality of maternal caregiving and optimizing developmental outcomes. Understanding maternal parenting thus requires a multidimensional approach that considers psychological, social, environmental, and cultural factors, given that maternal caregiving constitutes a fundamental foundation for character formation, adaptive capacity, and overall child well-being.

Dental Care

Dental care has a significant impact on the behavior of children and patients, influencing both adherence to oral hygiene practices and broader psychosocial outcomes. Research indicates that early interventions in dental care, such as routine dental check-ups, oral health education, and preventive treatments like fluoride applications, are associated with increased compliance, reduced dental anxiety, and the development of consistent oral hygiene habits among children. Behavioral management techniques in dentistry, including positive reinforcement, modeling(Limo et al., 2024; Pourat et al., 2018), and desensitization, have been shown to enhance patient cooperation and reduce fear-related avoidance behaviors, thereby promoting better long-term oral health outcomes(Gallione et al., 2025; White et al., 2020). Parental involvement and guidance are critical, as parental attitudes and practices strongly shape children's oral health behaviors, including brushing frequency, dietary habits, and adherence to dental appointments (Leung & Chu, 2022). Conversely, poor dental care or neglect has been linked to negative behavioral and psychosocial consequences, such as low self-esteem, social withdrawal, and decreased school attendance due to dental pain or discomfort (Gee & Cohodes, 2021)Furthermore, behavioral interventions aimed at improving oral hygiene, including educational programs, motivational interviewing, and habit-forming strategies, have consistently demonstrated effectiveness in promoting both oral health and adaptive behavioral changes, highlighting the bidirectional relationship between dental care and behavior (Gee & Cohodes, 2021; Zou et al., 2024)Collectively, these findings underscore that dental care is not merely a clinical concern but a multidimensional behavioral and psychosocial issue, where structured preventive strategies, behavior management techniques, and active involvement of parents or caregivers are essential for establishing lifelong oral health habits and positive behavioral outcomes. Such evidence emphasizes the importance of integrating dental health programs with behavioral and educational interventions to optimize both oral health and overall psychosocial development in children and patients across diverse contexts.

Research Method

This study employed a quasi-experimental design with an equivalent control group design using pre-test and post-test measurements, where the intervention involved implementing maternal parenting patterns in dental nursing care to observe their effect on children's behavior and oral hygiene status. Measurements were conducted through a pre-test prior to the intervention, post-test I immediately after the intervention, and post-test II two weeks later, while the control group only received oral health education through a module without the parenting intervention.

The research was conducted at SDN 12 Banda Aceh City in April 2025, with a population comprising all first- and second-grade students and their mothers, totaling 60 participants, all of whom were selected using a total sampling technique, consisting of 30 students and their mothers in the intervention group and 30 in the control group. Inclusion criteria included children aged 7–8 years (grades 1–2) whose mothers agreed to participate, while exclusion criteria applied to those who did not consent. The research stages included obtaining research permits, preparing tools and materials, holding meetings with three dental therapists as enumerators to discuss their respective roles, arranging a visit schedule, conducting initial observations during the first visit, providing oral health education and implementing parenting patterns during the second visit for the intervention group, and assigning mothers to continue parenting practices at home for two weeks before conducting post-test II for both groups. Data analysis was performed using bivariate analysis with paired samples t-test and independent t-test, as well as multivariate analysis with multiple linear regression.

Results

The study was conducted in April 2025 at SDN 12 Banda Aceh City and involved 60 children aged 7–8 years (grades I and II) along with their mothers. Respondents were divided into two groups: an intervention group of 30 children and their mothers who received education and parenting guidance, and a control group of 30 children and their mothers who only received educational modules without active intervention. The intervention process included three measurement stages: a pre-test, post-test I (after the initial education session), and post-test II (two weeks after the intervention). The primary aim of this study was to analyze changes in mothers' knowledge, attitudes, and practices regarding dental health care, as well as the oral hygiene status of their children, following the application of parenting practices based on dental nursing care.

Bivariate Analysis

Bivariate analysis was conducted to test the hypotheses of this study. The hypotheses were examined using paired sample t-test to analyze within-group differences, independent t-test to compare differences between groups, and multivariate analysis using MANCOVA. The results of these statistical analyses are presented below.

Paired Samples t-Test Analysis of Mothers' Knowledge, Attitudes, Practices, and Children's Oral Hygiene Status (PHP-M)

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Mothers' Knowledge

The mean differences from pre-test to post-test I, post-test I to post-test II, and pre-test to post-test II for mothers' knowledge in both the intervention and control groups are presented in the following table:

Table 1. Mean differences and standard deviations

groups	Data	Mean Difference $\pm$ Standard Deviation (SD)	t	P
Intervention	Pre-test ke Post-test I	-2,367 + 2,632	-4,924	0,000*
	Post-test I ke Post-test II	-0,867 + 1,525	-3,112	0,004*
	Pre-test ke Post-test II	-3,233 + 2,161	-8,197	0,000*
Control	Pre-test ke Post-test I	0,233 + 1,040	1,229	0,229
	Post-test I ke Post-test II	-0,300 + 0,877	-1,874	0,071
	Pre-test ke Post-test II	-0,067 + 1,015	-0,36	0,722

Table 1 shows an increase in mothers' knowledge as respondents in the intervention group from pre-test to post-test I, from post-test I to post-test II, and from pre-test to post-test II, with statistically significant differences in mean knowledge scores ($p < 0.05$). In contrast, the control group showed no statistically significant differences in mean knowledge scores across the same measurement points ($p > 0.05$).

Respondents' Attitudes and Actions

The mean differences from pre-test to post-test I, post-test I to post-test II, and pre-test to post-test II for mothers' attitudes and practices as respondents in the intervention and control groups are presented in Table 2, which shows the mean differences and standard deviations for mothers' attitudes and practices at each measurement stage.

Group	Data	Mean Difference $\pm$ Standard Deviation (SD)	t	P	
<i>attitudes</i>	<i>Pre-test ke Post-test I</i>	-2,133 $\pm$ 1,943	-6,014	0,000*	
	<i>Intervention</i>	<i>Post-test I ke Post-test II</i>	-0,567 $\pm$ 1,194	-2,599	0,015*
		<i>Pre-test ke Post-test II</i>	-2,700 $\pm$ 2,277	-6,496	0,000*
		<i>Pre-test ke Post-test I</i>	0,000 $\pm$ 1,050	0,000	1,000
	<i>Control</i>	<i>Post-test I ke Post-test II</i>	0,033 $\pm$ 0,718	0,254	0,801
		<i>Pre-test ke Post-test II</i>	0,033 $\pm$ 1,033	0,177	0,861
<i>practices</i>	<i>Intervention</i>	<i>Pre-test ke Post-test I</i>	-1,467 $\pm$ 1,889	-4,253	0,000*
		<i>Post-test I ke Post-test II</i>	-0,733 $\pm$ 1,741	-2,308	0,028*
		<i>Pre-test ke Post-test II</i>	-2,200 $\pm$ 2,265	-5,32	0,000*
	<i>Control</i>	<i>Pre-test ke Post-test I</i>	-0,300 $\pm$ 1,236	-1,329	0,194
		<i>Post-test I ke Post-test II</i>	0,167 $\pm$ 1,234	0,74	0,465
		<i>Pre-test ke Post-test II</i>	-0,133 $\pm$ 1,106	-0,66	0,514

The results indicate that in the intervention group, there were statistically significant improvements in mothers' attitudes and practices across all measurement stages, as evidenced by significant mean differences from pre-test to post-test I, post-test I to post-test II, and pre-test to post-test II ($p < 0.05$). These findings suggest that the educational intervention and parenting guidance effectively enhanced mothers' attitudes and practices regarding dental

health care over time. In contrast, the control group showed no statistically significant changes ($p > 0.05$), indicating that receiving only the educational module without active intervention did not substantially improve attitudes or practices.

Children's Oral Hygiene Status (PHP-M)

The mean differences from pre-test to post-test I, post-test I to post-test II, and pre-test to post-test II for children's oral hygiene status (PHP-M) in both the intervention and control groups are presented in the following table:

Table 2. Mean differences and standard deviations of children's PHP-M scores in the intervention and control groups.

Group	Data	Mean Difference $\pm$ Standard Deviation (SD)	t	P
Intervention	Pre-test ke Post-test I	17,633 $\pm$ 8,118	11,898	0,000*
	Post-test I ke Post-test II	5,700 $\pm$ 7,657	4,077	0,000*
	Pre-test ke Post-test II	23,333 $\pm$ 7,880	16,219	0,000*
Control	Pre-test ke Post-test I	0,767 $\pm$ 5,056	0,831	0,413
	Post-test I ke Post-test II	0,500 $\pm$ 2,739	1,000	0,326
	Pre-test ke Post-test II	1,267 $\pm$ 5,681	1,221	0,232

Table 2. shows a significant decrease in children's PHP-M scores in the intervention group from pre-test to post-test I, from post-test I to post-test II, and from pre-test to post-test II, indicating statistically significant differences in oral hygiene status ($p < 0.05$). In contrast, the control group showed no statistically significant differences in mean PHP-M scores across the same measurement points ($p > 0.05$).

Analysis of Between-Group Differences (Independent t-test) on Mothers' Knowledge, Attitudes, Practices, and Children's Oral Hygiene Status (PHP-M)

Table 3. Comparison of Mothers' Knowledge, Attitudes, and Practices Before and After Intervention

Mothers' Knowledge,	Group	Mean Difference ± Standard Deviation (Sd)	T	P	Deskripsi
Pre-test Post-test I	Intervension	2,93 + 1,258	-,631	0,530	Tidak Significant
	Control	3,13 + 1,196			
	Intervension	6,60 + 1,429	12,365	0,000*	Significant
	Control	2,90 + 0,803			
Post-test II	Intervension	7,47 + 1,008	17,407	0,000*	Significant
	Control	3,20 + 0,887			
Attitudes					
Pre-test Post-test I	Intervension	3,27 + 1,258	0,214	0,832	Tidak Significant
	Control	3,20 + 1,157			
	Intervension	5,80 + 0,847	9,934	0,001*	Significant
	Control	3,20 + 1,157			
Post-test II	Intervension	6,37 + 1,245	9,887	0,001*	Significant
	Control	3,17 + 1,262			
Practices					

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Pre-test	Intervension	3,57 + 1,104	2,834	0,063	Tidak Significant
	Control	2,73 + 1,172			
Post-test I	Intervension	5,97 + 1,189	11,176	0,001*	Significant
	Control	3,03 + 0,809			
Post-test II	Intervension	6,70 + 1,489	11,803	0,001*	Significant
	Control	2,87 + 0,973			

The independent t-test results show that there were no significant differences between the intervention and control groups at the pre-test stage for mothers' knowledge, attitudes, and practices ($p > 0.05$), indicating comparable baseline conditions. However, at post-test I and post-test II, significant differences were observed for all three variables ($p < 0.001$), with the intervention group demonstrating notably higher mean scores compared to the control group. These findings suggest that the educational intervention and parenting guidance effectively improved mothers' knowledge, attitudes, and practices related to dental health care, while the control group, which only received educational modules, did not experience comparable improvements.

Children's Oral Hygiene Status (PHP-M)

The analysis of children's oral hygiene status (PHP-M) between the intervention and control groups is presented in Table 4.8, which displays the mean scores and standard deviations for both groups.

Table 4. Mean and Standard Deviation of Children's Oral Hygiene Status (PHP-M) Between the Intervention and Control Groups

Caries Risk Score	Group	Rerata $\pm$ SD	t	p	deskripsion
Pre-test	Intervension	48,67 + 6,814	4,956	0,075	No Significant
	Control	39,07 + 8,132			
Post-test I	Intervension	30,53 + 4,133	-4,517	0,001*	Significant
	Control	38,30 + 8,461			
Post-test II	Intervension	24,83 + 6,843	-6,511	0,001*	Significant
	Control	37,80 + 8,495			

The independent t-test results indicate no significant difference in children's oral hygiene status (PHP-M) between the intervention and control groups at the pre-test stage ($p = 0.075$), suggesting comparable baseline conditions. However, significant differences were observed at post-test I and post-test II ($p = 0.001$), with the intervention group showing markedly lower PHP-M scores compared to the control group, indicating better oral hygiene. These findings demonstrate that the parenting-based dental care intervention effectively improved children's oral hygiene status over time, while the control group showed no comparable improvement.

Discussion

The independent t-test analysis revealed no significant differences in mothers' knowledge and attitudes between the intervention and control groups at baseline ($p > 0.05$), indicating that both groups were initially comparable. However, immediately after the intervention and two weeks later, significant differences were observed ($p < 0.05$), demonstrating improvements in the intervention group. These improvements occurred because the intervention not only provided information but also involved practical sessions, discussions, and the application of parenting practices at home, which reinforced mothers' understanding and confidence in maintaining their children's oral health. Interactive education facilitated the internalization of knowledge through direct experience, consistent with cognitive learning theory and the Theory of Planned Behavior. In contrast, the control group, which only received educational modules, showed no significant changes ($p > 0.05$) due to the lack of interaction and behavioral reinforcement.

These findings align with previous studies emphasizing that active parenting approaches and practice-based education are more effective in improving knowledge and attitudes than passive methods. The study revealed that mothers' practices in maintaining their children's dental hygiene significantly improved following an intervention that combined health education with practical guidance on parenting techniques. Statistical analysis (independent t-test) showed no significant difference between intervention and control groups before the intervention ($p > 0.05$), but a significant improvement was observed immediately after and two weeks post-intervention ($p < 0.05$). This change is attributed to a hands-on approach that included not only information delivery but also direct mentoring and habit formation, making mothers more consistent in guiding their children to brush their teeth properly. According to the Knowledge–Attitude–Practice (KAP) model, improved knowledge and positive attitudes lead to better practices, which was evident as mothers translated what they learned into real-life actions. Similarly, children's oral hygiene status (PHP-M index) improved significantly in the intervention group ($p < 0.05$), while no significant change occurred in the control group ($p > 0.05$). This improvement resulted from mothers' active supervision, consistent reinforcement, and proper brushing guidance, which fostered long-term healthy habits. These findings align with prior studies highlighting the role of parental involvement in enhancing children's dental care and demonstrate that family-based interventions are more effective than school-based approaches alone.

These findings align with previous studies emphasizing that active parenting approaches and practice-based education are more effective in improving knowledge and attitudes than passive methods. The study revealed that mothers' practices in maintaining their children's dental hygiene significantly improved following an intervention that combined health education with practical guidance on parenting techniques. According to the Knowledge–Attitude–Practice (KAP) model, improved knowledge and positive attitudes lead to better practices, which was evident as mothers translated what they learned into real-life actions (Graham et al., 2019; Memon et al., 2019). Similarly, children's oral hygiene status (PHP-M index) improved significantly in the intervention group ($p < 0.05$), while no significant change occurred in the control group ($p > 0.05$) (Hu et al., 2016; Wang et al., 2025). This

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improvement resulted from mothers' active supervision, consistent reinforcement, and proper brushing guidance, which fostered long-term healthy habits. These findings align with prior studies highlighting the role of parental involvement in enhancing children's dental care and demonstrate that family-based interventions are more effective than school-based approaches alone.

Conclusion

This study demonstrates that dental health education provided to mothers has a substantial and statistically significant effect on improving their knowledge, attitudes, and practices regarding the maintenance of their children's oral health. Prior to the intervention, no significant differences were observed between the intervention and control groups in terms of maternal knowledge, attitudes, or practices ($p > 0.05$). However, following the educational intervention, mothers in the intervention group exhibited marked improvements across all three domains, as evidenced by significant increases in knowledge and more positive attitudes toward oral hygiene ($p < 0.05$). Furthermore, these behavioral changes translated into more proactive practices, such as guiding children in toothbrushing, monitoring brushing routines, and seeking regular dental check-ups. In addition to maternal outcomes, the intervention also yielded significant improvements in children's oral hygiene status. Post-intervention assessments revealed a considerable reduction in oral hygiene index scores (PHP-M) among children in the intervention group compared to those in the control group ($p < 0.05$), indicating better oral cleanliness and reduced risk of dental caries.

These findings underscore the critical role of parental education in shaping health-related behaviors and promoting long-term oral health benefits in children. Overall, this research highlights the effectiveness of structured dental health education as an evidence-based strategy for enhancing maternal involvement and improving children's oral hygiene outcomes. Incorporating such educational programs into community-based health initiatives, primary care services, and school-based oral health programs can serve as a preventive measure to reduce the burden of oral diseases in early childhood. Further research is recommended to evaluate the sustainability of these improvements over time and to explore the potential integration of digital and visual media tools to enhance engagement and knowledge retention among caregivers.

Declaration of conflicting interest

The authors declare that there is no conflict of interest in this work.

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