



Impact of Maternal Health Education on Pediatric Oral Health in Banda Aceh: A Quasi-Experimental Study

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Abstract: In Banda Aceh City, Indonesia, particularly in Punge Jurong Gampong, the effectiveness of child oral health service interventions is notably impacted by the level of maternal knowledge and involvement. This quasi-experimental study was designed to scrutinize the impact of maternal behaviors on the maintenance of children's dental and oral health, employing a primary verbal healthcare strategy. Utilizing a pre-test and post-test approach, the research encompassed 45 mothers in the intervention group and an equal number in the control group. The intervention primarily consisted of educating mothers about the critical importance of dental and oral health, integrating promotional and preventive measures. The findings of this study reveal that maternal influence is a pivotal factor in shaping the oral health habits of children, with such influence being modulated by variables including cultural perceptions, socioeconomic status, educational background, and information accessibility. The range of maternal activities observed varied significantly, encompassing diligent teeth brushing practices and challenges in recognizing the significance of primary teeth. The study underlines a substantial need for customized, culturally sensitive interventions tailored to the unique context of Punge Jurong Gampong. It was observed that while the average knowledge level and Hypertext Preprocessor (PHP)-M scores of mothers in both the intervention and control groups did not show a significant difference, notable variances in attitudes and behaviors related to oral health were statistically significant ($p > 0.05$). These results highlight the criticality of context-specific, culturally informed educational programs in improving pediatric oral health outcomes. The study emphasizes the role of collaborative efforts involving healthcare professionals, community leaders, and educational institutions in creating an enabling environment for the effective implementation of primary oral healthcare strategies. Thus, this research contributes to the understanding of the multifaceted nature of maternal influence on child oral health and underscores the necessity of personalized and culturally adaptive educational interventions.

Keywords: Children's dental health; Maternal behavior; Health education intervention; Community intervention; Oral health care

1. Introduction

Dental caries among children remains a critical health issue globally. The World Health Organization (WHO) in 2016 highlighted a concerning prevalence of 60–90% in caries incidence among the young (Petersen & Ogawa, 2016). In the Aceh region, a substantial 55% of the population reported oral health issues over a 12-month period, as per the 2018 Basic Health Research survey findings. Notably, only a mere 2.8% of individuals aged over three years engaged in adequate dental hygiene practices (Farihatini, 2019). Furthermore, a staggering 78% of children aged between three and five years undergoing dental examinations were found to have caries (Samuel et al., 2020). These statistics underscore a widespread lack of public awareness regarding dental and oral health maintenance.

Cavities in children under five adversely impact their nutritional status, as pain and discomfort from cavities

often lead to reduced food intake, subsequently affecting their overall health. Factors contributing to childhood cavities include nocturnal milk feeding, high sugar intake in foods and beverages, and a general lack of parental awareness and knowledge in managing dental care for their children (Vozza et al., 2017). The toddler years, often referred to as the 'golden age', are pivotal in a child's growth and development (Budiati et al., 2021). Experiences and learnings from this stage lay a foundational role in forming lasting memories, actions, habits, and attitudes. This principle extends to oral health; habits and attitudes towards dental care ingrained during these formative years tend to persist into adulthood.

The influence of parental behavior and involvement in healthcare, particularly in dental and oral health, has been recognized as a critical factor in the development of children's oral hygiene habits. The active participation of parents in monitoring and supervising their children's dental care and dietary habits plays a pivotal role in the maintenance of dental and oral health. The significance of mothers in fostering positive oral health behaviors in children has been well-documented (Nourijelyani et al., 2014). The nurturing, teaching, caring, educating, guiding, and training provided by mothers are paramount in cultivating children's independence, which in turn influences their ability to maintain personal hygiene, including dental and oral hygiene. Education and services related to dental and oral health have a substantial impact on the cleanliness of a child's oral cavity. As primary caregivers and executors of family health services, mothers are entrusted with the responsibility of guiding their children in maintaining healthy teeth and oral hygiene, tailored to each child's specific conditions and needs.

Addressing dental and oral health problems, especially dental caries, in children necessitates considerable attention. Lewis et al. (2000) emphasized the importance of caries prevention in dental health maintenance programs for school-aged children. Similarly, Achmad et al. (2018) observed that school-age children are largely dependent on their parents, particularly mothers, for maintaining oral health. It is imperative for mothers to recognize that the dental health of their children falls within their purview of responsibility. The role of the mother is crucial in shaping children's behaviors through guidance, understanding, reminders, and provision of facilities to maintain oral hygiene. The responsibility of mothers extends to cleaning plaque and debris on teeth, a task that can be performed daily using a toothbrush. The dependence of school-age children on their parents for maintaining oral hygiene is noteworthy, particularly when a child's motor skills are not yet fully developed, necessitating parental assistance in maintaining oral cavity cleanliness. The role of a mother in accompanying and assisting in teeth brushing should continue until the child is capable of assuming full responsibility for their oral hygiene. Furthermore, the role of parents and the family unit as role models and key influencers in promoting healthy and environmentally friendly behaviors is fundamental. Primary oral health care methods, including educational strategies, are essential to enhance community engagement and capability in dental health maintenance.

The primary oral health care approach constitutes an educational strategy that amalgamates promotional and preventive efforts in dental health within various community health initiatives. This approach, grounded in primary health care principles, seeks to elevate awareness, willingness, and participation of families in maintaining dental health and self-care. It encompasses an educational program targeted at parents, aiming to enhance their understanding of child development and the upkeep of children's dental health. This ensures a harmonious alignment of children's education between home and school environments. Furthermore, this approach includes training oriented towards parenting and family support strategies. It addresses the emergence of deviant behaviors, emotional challenges, and problems in children (Leve et al., 2012). Positive engagement techniques, such as soft-spoken communication, encouraging dialogue exchange, and providing quality time with children, are instrumental in fostering attitude changes in children. These methods also facilitate children's emotional control, openness, and self-confidence. Fundamental to this process is effective communication between children and parents, which positively influences children's overall development. Education in this context transcends the mere imposition of parental desires or rote learning; it is about providing stimulation, guidance, and training that equip children with necessary life skills for both present and future contexts. In the realm of primary oral health care, recognizing and rewarding children's achievements, beyond academic accomplishments to include commendable behavior, is vital. Such recognition and rewards, alongside consistent implementation of discipline, are crucial. Additionally, it is imperative for parents to embody the role of exemplars for their children.

The family-centered primary oral health care approach has been acknowledged as a pivotal means to achieve enhanced dental health across all family members. Within this framework, dental nursing interventions play a crucial role. These interventions include coaching and peer education aimed at recognizing dental disease issues, deciding on appropriate actions, treating family members, modifying the environment, and utilizing health services for dental and oral diseases management (Spielman et al., 2005). The capability of families to provide comprehensive dental care is integral to preventing dental and oral diseases. Strategies for intervention encompass behavior therapy, counseling, coaching, and community empowerment to foster community competence. Additionally, building coalitions to attain desired objectives with various potential stakeholders is essential. The primary oral health care approach also includes implementation strategies such as imparting education to families in key areas of health promotion, enhancing the quality of information in communication programs, providing skill instruction, and offering training on proper tooth brushing techniques. Recommendations for appropriate preventive and simple curative measures are also a part of this approach.

Research by Tarabaih (2016) has indicated disparities in the oral hygiene index-simplified (OHI-S) and decay missing filled-teeth (DMF-T) statuses of children, as well as in their knowledge, attitudes, and behaviors before and after intervention. This suggests that family dental nursing care, including home visit services, can augment parental involvement and ameliorate children's dental health. Similarly, Naidu et al. (2015) have demonstrated significant changes in mothers' knowledge, attitudes, behaviors, and children's caries risk scores following interventions emphasizing positive parenting in family dental nursing care. These findings are particularly relevant in the context of evolving regular health care practices. Furthermore, the research by Vanagas et al. (2009) highlights the profound impact of parental involvement on dental caries in preschoolers. This study revealed that a majority of dental caries in children are attributable to insufficient parental involvement. Therefore, the role of parents is deemed critical for managing the child's dental health status, especially concerning the quality of dental caries. A unique approach involving positive behavior modification is necessary to address these challenges.

The Aceh region, as highlighted by the 2018 Basic Health Research survey, is a critical area for this study due to its high prevalence of oral health issues and notably low engagement in proper dental hygiene practices. This situation underscores a significant concern regarding the overall oral health status of the population. Additionally, the unique cultural and socio-economic nuances of the Aceh region present both challenges and opportunities in the endeavor to enhance children's oral health via maternal influence. The scarcity of research specifically targeting oral health practices in this region further underscores the importance of this study. It aims to provide insights that are not only beneficial for the local community but also applicable to similar contexts globally.

This research is centered on filling the gap in understanding how maternal behaviors influence the preservation of children's dental and oral health within the context of Punge Jurong Gampong, Banda Aceh City, Indonesia. The study's objectives include identifying key factors that affect maternal oral health practices, evaluating the impact of primary oral health care interventions, and formulating recommendations to improve oral health outcomes for children in this community. Despite existing literature on the prevalence of dental caries and its correlation with parental involvement, there is a notable lack of in-depth analysis regarding the implementation of primary oral health care strategies in this specific community setting. This gap necessitates the present research to enhance both understanding and practical application.

The paper seeks to conduct a thorough analysis of maternal behaviors in maintaining the dental and oral health of their children through a primary oral health care approach. The focus is on a case study conducted in Punge Jurong Gampong, Banda Aceh City, Indonesia. The study aims to explore the various factors influencing maternal oral health practices, assess the effectiveness of primary oral health care interventions, and propose strategic recommendations to improve children's oral health outcomes in the context of this specific community.

2. Methodologies

2.1 Study Design

The research adopted a quasi-experimental design (Baker, 2017; Gorman, 1995; Harris et al., 2006), encompassing a pre-test and post-test with a control group for comparative analysis. The study was conducted in Gampong Punge Jurong, Banda Aceh City, where the intervention applied a primary oral health care approach focusing on maternal behavior to enhance children's dental health. Initially, a pre-test was administered to evaluate the existing state of dental health and maternal behaviors related to oral care.

Subsequent to the introduction of the primary oral health care method in family dental nursing care, a post-test was executed. A follow-up, designated as Post-test II, was conducted two weeks after the initial post-test. The research participants were segregated into two groups: the intervention group, comprising families in Gampong Punge Jurong utilizing the primary oral health care approach, and the control group from Gampong Peuniti, who did not receive the intervention.

The implementation of primary oral health care was executed educationally, integrating promotional and preventive dental health efforts into diverse community health initiatives. This approach was aimed at augmenting awareness, willingness, and participation of the community/family in maintaining dental health. The application of the primary oral health care approach in family dental nursing care fostered a clean and healthy lifestyle, particularly in maintaining early childhood dental health at home. Repeated activities, tailored appropriately for children, were employed to establish sustainable oral health patterns. Parents, especially mothers, played a crucial role in this approach, impacting positively on children's development. Hence, it was essential for parents to be well-informed and conscientious about oral health maintenance, given their strategic role in informal early childhood education.

2.2 Data Collection

The educational component of this study incorporated promotional and preventive dental health efforts, delivered through dental nursing practices. This intervention was designed to support families in managing dental

health issues, with an emphasis on adopting a clean and healthy lifestyle from early childhood. Training and support were provided in proper brushing techniques, vitamin-rich teeth polishing, and fostering a parenting style characterized by affection and mutual respect. The objectives included enhancing awareness, motivation, and community participation in dental health maintenance. Furthermore, the study assessed the mother's level of knowledge, attitude, and practices, as well as the dental hygiene status of the children.

Data for this research comprised both primary and secondary sources. Primary data were directly sourced and included information regarding mothers' knowledge, attitudes, and practices, gathered using questionnaires, and data on children's dental hygiene status (Januś et al., 2023). Secondary data served to complement and support the primary data, obtained from preliminary studies and reports from related agencies (Orsini et al., 2020). The sample size was set at 45 for each of the intervention and control groups.

2.3 Data Analysis

Data analysis encompassed both univariate and bivariate analyses. The univariate analysis was conducted on the study variables, describing the independent and dependent variables individually as frequency distributions, with percentages calculated accordingly (Dhall, 2019; Pohl et al., 2001; Shiau et al., 2006). Bivariate analysis involved the examination of quantitative data results using the paired sample *t*-test (El-Assal et al., 1998; Muraina et al., 2016; Saccenti et al., 2014). This analysis aimed to identify differences in changes in knowledge, attitudes, maternal practices, and changes in children's dental hygiene status with the implementation of the primary oral health care approach in family dental nursing care. This included comparisons from pre-test to post-test I, post-test I to post-test II, and pre-test to post-test II in each group. An independent *t*-test was employed to ascertain differences in knowledge, attitudes, maternal practices, and changes in children's dental hygiene status between the intervention and control groups at pre-test, post-test I, and post-test II stages.

The Methodology section should be written concisely, yet provide enough details to allow others to replicate and build on published results. The well-established methods can be introduced briefly with proper citations. Do not describe these published methods in details. In contrast, detailed descriptions are required for new methods. If multiple methods are adopted in the work, this section may be divided into several subsections, each providing details on a specific method. Note that the publication of your manuscript means all materials, data, codes, and protocols associated with the publication must be made available to readers. Remember to disclose restrictions on the availability of materials or information at the submission stage. If your manuscript uses large datasets deposited in an opensource database, please specify where the data have been deposited. If your study requires ethical approval, do not forget to list the authority and code of the ethical approval.

3. Results

3.1 Paired Samples *t*-Test Analysis

The intergroup analysis, employing the independent *t*-test between the intervention and control groups, indicated no significant difference in the average knowledge level of mothers as respondents prior to the intervention, with a *p*-value greater than 0.05 (Table 1). Conversely, substantial changes in mothers' knowledge were observed in tests conducted before and two weeks after the intervention. These alterations were statistically significant, evidenced by *p*-value less than 0.05.

Table 1. Statistical analysis of mother's knowledge in intervention and control groups

Group	Data	Value	<i>t</i> -Test	<i>p</i> -Value
Intervention	Pre-test to Post-test I	-46.2 ± 2 5.20	-12.30	0.001*
	Post-test I to II	-10.10 ± 24.70	2.70	0.008*
	Pre-test to Post-test II	-56.4 ± 2.00	-16.30	0.000*
Control	Pre-test to Post-test I	-0.33 ± 13.20	-0.17	0.866
	Post-test I to II	0.27 ± 15.00	-0.12	0.906
	Pre-test to Post-test II	-0.60 ± 13.40	-0.29	0.766

The observed increase in knowledge can be attributed to the implementation of the primary oral health care approach, which effectively enhances mothers' awareness of dental health. This approach integrates educational and counseling elements, emphasizing the significance of maintaining healthy teeth and oral hygiene. Mothers were provided with information on preventive practices, including proper dental brushing techniques, the relevance of a tooth-friendly diet, and early indicators of dental issues. This knowledge empowered mothers to better care for their children's and their own dental health. The primary oral health care approach places a strong emphasis on the prevention of dental problems, furnishing mothers with strategies to avert oral health issues early on, including the avoidance of detrimental habits that could harm teeth. Additionally, this approach underlines the

importance of early detection of dental health problems. Recognizing early signs of potential issues enables mothers to take proactive measures before the conditions worsen, thereby fostering a culture of active participation in sound dental hygiene practices. Through this method, mothers gain experiential learning and a deeper understanding of the benefits of consistent oral care.

The findings demonstrate a significant enhancement in mothers' knowledge, affirming the efficacy of the primary oral health care approach in improving maternal understanding of children's dental health. Enhanced knowledge among mothers has been observed to correspond with improved dental care for children. Mothers equipped with this knowledge are more likely to implement preventive practices effectively, such as assisting children with proper tooth brushing, selecting tooth-friendly foods, and avoiding harmful habits that could detrimentally impact dental health. Improved understanding of dental care and oral health among mothers contributes to reducing the risk of dental problems, potentially enhancing the overall quality of life. The knowledge imparted through the primary oral health care procedures is poised to have a lasting impact on the dental and oral health of children and families, aiding in the prevention of future dental issues.

Table 2 elucidates the shifts in mothers' attitudes from pre-test to various post-test stages, as analyzed through a paired sample *t*-test in both the intervention and control groups. In the control group, where no intervention or therapy was administered, no significant variation in the mean attitude scores was noted ($p > 0.05$). Conversely, in the intervention group, a statistically significant difference was observed in mothers' mean attitude scores from pre-test to post-test I, from post-test I to post-test II, and from pre-test to post-test II ($p < 0.05$).

Table 2. Statistical analysis of mothers' attitudes in intervention and control groups

Group	Data	Value	<i>t</i> -Test	<i>p</i> -Value
Intervention	Pre-test to Post-test I	-33.3 ± 20.7	-10.80	0.001*
	Post-test I to II	-8.3 ± 21.0	-2.70	0.011*
	Pre-test to Post-test II	-41.6 ± 23.7	-11.80	0.000*
Control	Pre-test to Post-test I	-1.3 ± 12.9	-0.70	0.506
	Post-test I to II	-0.2 ± 9.6	-0.10	0.889
	Pre-test to Post-test II	-1.5 ± 11.8	-0.80	0.403

These results suggest that the primary oral health care approach significantly shifts the focus from responsive to proactive dental care. This shift in approach may facilitate mothers in transforming their attitudes from addressing existing dental problems to preventing such issues from arising. The interaction between the primary oral health care education and mothers' attitudes towards dental care could serve as a positive exemplar for emphasizing the importance of dental health (Table 3). The education provided in primary oral health care equips mothers with a comprehensive understanding of proper dental care practices, which in turn influences their attitudes towards enhanced dental care practices.

Table 3. Statistical analysis of respondent behavior in intervention and control groups

Group	Data	Value	<i>t</i> -Test	<i>p</i> -Value
Intervention	Pre-test to Post-test I	-32.87 ± 22.1	-9.90	0.001*
	Post-test I to II	-7.9 ± 24.5	-2.20	0.036*
	Pre-test to Post-test II	-40.8 ± 24.8	-11.00	0.000*
Control	Pre-test to Post-test I	-0.3 ± 17.2	-0.10	911
	Post-test I to II	-0.3 ± 16.7	-0.10	0.908
	Pre-test to Post-test II	-0.6 ± 14.5	-0.30	0.791

This study reveals a positive shift in dental care practices following the implementation of primary oral health care. This approach, which prioritizes prevention, education, and early intervention, appears to significantly influence maternal behaviors and awareness regarding dental hygiene. Central to primary oral health care is the provision of counseling and education to mothers, emphasizing the critical role of dental health. It has been observed that comprehension of the benefits associated with regular dental care leads to an increased propensity among mothers to adopt preventive measures for both themselves and their children. This proactive stance facilitates the early identification and treatment of dental issues, thereby mitigating the progression to more severe conditions. Mothers who appreciate the advantages of early intervention are more likely to adhere to recommended guidelines and seek prompt treatment for dental concerns affecting their families. Furthermore, primary oral health care fosters the perception of dental and oral health as essential components of overall well-being. Recognition of the adverse impacts of poor dental health on general health may serve as a catalyst for mothers to engage more diligently in preventive practices.

Furthermore, the results suggest that the primary oral health care approach positively influences children's dental health behaviors by setting a commendable example through maternal actions. Children are known to emulate the

habits observed in adults, especially parents. Therefore, an increase in maternal proactive dental care practices is likely to create a future generation more conscious of dental health. Mothers gain the skills to independently maintain their and their family's dental health through the primary oral health care approach, thereby bolstering overall health maintenance.

The implementation of the primary oral health care approach has been shown to bring about changes in dental and oral hygiene status, placing a strong emphasis on prevention as a primary strategy. By imparting knowledge and skills to children through parents, this approach focuses on preempting dental problems through proper tooth brushing techniques and avoidance of high-risk foods. Education and awareness-raising about the importance of dental health are pivotal components of this approach. Informed children, aware of the risks associated with caries, gum disease, and the adverse effects of sugary foods, are more likely to eschew harmful dental habits. In the primary oral health care approach, children learn from the positive examples set by adults, whether parents or teachers. When adults demonstrate commendable oral hygiene habits, children are inclined to emulate these practices.

The paired sample *t*-test analysis conducted within the control group revealed no statistically significant variations in the mean dental hygiene status of children from pre-test to subsequent post-tests ($p > 0.05$), as illustrated in Table 4. This lack of significant change can be attributed to the absence of any intervention or therapy in the control group. In contrast, the intervention group demonstrated statistically significant improvements in the mean oral hygiene status of children from pre-test to post-test I, post-test I to post-test II, and from pre-test to post-test II ($p < 0.05$).

Table 4. Statistical analysis of PHP-M scores in intervention and control groups

Group	Data	Value	<i>t</i> -Test	<i>p</i> -Value
Intervention	Pre-test to Post-test I	18.5 ± 7.6	16.30	0.001*
	Post-test I to II	5.9 ± 7.9	5.03	0.001*
	Pre-test to Post-test II	24.4 ± 9.7	16.90	0.001*
Control	Pre-test to Post-test I	0.4 ± 6.07	0.47	0.643
	Post-test I to II	0.20 ± 2.34	0.57	0.57
	Pre-test to Post-test II	0.6 ± 6.5	0.60	0.521

These findings underscore the effectiveness of the primary oral health care approach in instilling the understanding among children that dental health is integral to overall well-being. This awareness fosters a heightened motivation in children to maintain good dental hygiene. The implementation of primary oral health care typically involves support and follow-up from various stakeholders, such as teachers, parents, or healthcare professionals, ensuring children's adherence to dental care practices. This collaborative approach leads to positive changes in dental hygiene habits and practices, reducing the risk of developing dental issues like caries and gum disease. Consequently, children are more likely to experience better dental health, avoiding discomfort and related complications. Furthermore, the primary oral health care approach facilitates the formation of healthy dental care habits from an early age, which can persist into adulthood, contributing to sustained oral health. Children receiving dental health education through this approach develop a comprehensive understanding of the importance of dental care and the potential consequences of neglecting it. This knowledge positively influences their behavior towards dental hygiene.

Table 5. Comparison of mothers' knowledge in intervention and control group

Mother's Knowledge	Group	Value	<i>t</i> -Test	<i>p</i> -Value
Pre-test	Intervention	37.07 ± 15.802	-0.864	0.39
	Control	39.91 ± 15.424		
Post-test I	Intervention	83.29 ± 19.109	11.816	0.000*
	Control	40.24 ± 15.233		
Post-test II	Intervention	93.42 ± 14.306	19.687	0.000*
	Control	40.51 ± 10.972		

3.2 Independent *t*-Test Analysis

Preliminary analysis indicated no significant variance in maternal attitudes between the treatment and control groups prior to intervention, as evidenced by a *p*-value exceeding 0.05 in intergroup comparisons conducted via an independent *t*-test (Table 5). However, a notable shift was observed in the post-operative phase. Specifically, at two weeks post-intervention, significant differences in the perceptions of mothers were recorded in both post-tests I and II, with a *p*-value falling below 0.05, thus denoting statistical significance. These findings imply an

enhancement in maternal awareness regarding the preservation of their children's dental and oral health. The primary verbal health care approach, a cornerstone of this study, plays a pivotal role in facilitating this shift. By emphasizing the early detection of dental health issues, this strategy empowers mothers with the knowledge and vigilance necessary for timely and effective oral health care. The increased awareness and understanding of early warning signs are likely to result in heightened attention and proactive measures concerning their children's oral health.

Similarly, the comparison of mothers' attitudes in the intervention and control groups, as shown in Table 6, initially revealed no significant differences ($p>0.05$). However, significant changes in mothers' attitudes were observed after the implementation of the primary oral health care approach, both immediately and two weeks post-intervention ($p<0.05$).

Table 6. Comparison of respondents' attitudes in intervention and control group

Respondent's Attitude	Group	Value	<i>t</i> -Test	<i>p</i> -Value
Pre-test	Intervention	37.09 ± 15.110	-0.721	0.473
	Control	39.31 ± 14.106		
Post-test I	Intervention	70.36 ± 18.502	8.879	0.001*
	Control	40.60 ± 12.770		
Post-test II	Intervention	78.67 ± 18.241	11.003	0.001*
	Control	40.80 ± 14.150		

The analysis findings indicate that there was no statistically significant difference in the mean value of maternal knowledge from pre-test to post-test II. Similarly, no significant difference was observed in maternal actions from pre-test to post-test I or from post-test I to post-test II within the control group, as shown in Table 7. This lack of significant change is attributed to the absence of intervention or therapy in the control group. Conversely, in the intervention group, a statistically significant difference was observed in maternal actions from pre-test to post-test I, from post-test I to post-test II, and from pre-test to post-test II, with *p*-value less than 0.05.

Table 7. Statistical comparison of respondents' behavior in intervention and control groups

Respondent's Attitude	Group	Value	<i>t</i> -Test	<i>p</i> -Value
Pre-test	Intervention	43.04 ± 13.696	-1.585	0.117
	Control	38.27 ± 14.879		
Post-test I	Intervention	75.91 ± 19.625	11.019	0.001*
	Control	38.56 ± 11.492		
Post-test II	Intervention	83.80 ± 18.472	13.506	0.001*
	Control	38.84 ± 12.544		

Initial analysis of the children's oral hygiene status, as measured by the PHP-M index, revealed no significant disparities between the treatment and control groups prior to the intervention, with a *p*-value exceeding 0.05, as delineated in Table 8. This assessment was based on the outcomes of an independent *t*-test conducted to compare the two groups. Subsequent observations, however, unveiled a marked improvement in the dental and oral hygiene states of the children in the post-intervention phase. Statistically significant enhancements were recorded in both immediate and two-week follow-up assessments (children's PHP-M), evidenced by *p*-value falling below 0.05.

Table 8. Statistical comparison of PHP-M levels in intervention and control groups

Respondent's Attitude	Group	Value	<i>t</i> -Test	<i>p</i> -Value
Pre-test	Intervention	49.56 ± 6.811	7.335	0.411
	Control	37.69 ± 8.450		
Post-test I	Intervention	31.04 ± 5.196	-4.064	0.001*
	Control	37.27 ± 8.858		
Post-test II	Intervention	25.13 ± 6.831	-7.231	0.001*
	Control	37.07 ± 8.711		

3.3 Discussion

The predisposing factors influencing the knowledge, attitudes, and practices of children and their parents include characteristics such as age and gender. In this study, it was observed that the majority of children in the intervention

group were 6 years old, while the control group predominantly consisted of 5-year-olds. At this developmental stage, children generally lack a sense of responsibility or established behavior patterns in maintaining dental and oral health. It is acknowledged that the role of parents, particularly mothers, is crucial in guiding and enhancing children's dental and oral health. Davis & Carter (2008) have posited that maternal behavior significantly influences the behavior of children under five years of age, thus emphasizing the mother's role in shaping the child's behavior. Additionally, the majority of children in both groups were girls.

Regarding the age of the respondents, the majority in the intervention group were aged between 36 and 45 years, while in the control group, the majority were between 26 and 35 years. This age range is considered mature for motherhood. Studies have shown that mothers aged 25 to 45 years possess the maturity and experience necessary for effective parenting, including the attention to dental and oral health (Ueno et al., 2012). The educational level of the respondents, predominantly holding diplomas and undergraduate degrees, is crucial in influencing maternal behavior patterns concerning dental health, particularly in preventing caries in children. The majority of the respondents being homemakers did not present a significant disparity in the context of this research, indicating that the respondent's occupation does not substantially impact the study.

The primary oral health care approach in dental health is fundamentally based on the concept of prevention, early treatment, and the promotion of general dental and oral health. This approach prioritizes preventive measures and early intervention to uphold oral health and mitigate the risk of severe dental health problems in the future. It is emphasized that preventing dental health issues is more advantageous than treating them. This includes incorporating daily practices such as proper tooth brushing, flossing, adhering to a healthy diet, and avoiding detrimental habits to dental health. Public education on the importance of maintaining dental health is pivotal, and it is executed through counseling in various settings including health facilities, schools, communities, and media platforms. Primary oral health care also motivates individuals to actively engage in maintaining their dental health by adopting appropriate dental care practices.

These findings align with the research by Ueno et al. (2012), which investigated the correlation between educational level and dental status in adults in Japan, utilizing data from the Japan Public Health Center-Based Oral Health Study. A significant trend was observed in the dental index, demonstrating that a lower level of education correlates with poorer dental conditions. This study established that educational level independently influences dental status in adults in Japan, even after accounting for factors related to dental health. Consequently, the hypothesis postulating a change in mothers' knowledge about maintaining children's dental and oral health with the application of primary oral health care is substantiated.

The analysis reveals that the implementation of primary oral health care affords mothers increased access to information, interaction with dental health professionals, and motivation to adopt better dental care practices. This concurs with the findings of Potisomporn et al. (2019), which emphasized the need to enhance parents' knowledge, attitudes, and beliefs regarding the importance of dental health. Coordinated efforts among pediatricians, pediatric dentists, and other health workers are essential to disseminate dental hygiene education and promote preventive dental care programs. Based on the results of this study, it can be concluded that the hypothesis asserting a change in attitudes towards dental and oral health of children with the implementation of primary oral health care is validated.

These results align with the findings of Potisomporn et al. (2019), which demonstrated that dental health education conducted by trained school teachers positively impacted children's knowledge and attitudes toward dental health. Despite the lack of significant difference in plaque score after three months, the increase in knowledge and attitude remains a crucial indicator of the success of dental health education programs. Consequently, the hypothesis that posits a change in maternal practice in maintaining their child's dental and oral health through primary oral health care is substantiated.

The predominance of girls in both the intervention and control groups was observed, yet the influence of gender on the outcomes has not been extensively discussed. Gender can be a pivotal factor affecting results, as existing research indicates its potential impact on attitudes and behaviors related to dental health. A comprehensive analysis considering gender's role could provide valuable insights into its influence on children's dental health outcomes.

The study's findings suggest that parents, particularly through increased understanding and awareness, significantly influence children's dental hygiene status. Enhancing preventive dental care in preschool children could aid in averting more severe dental issues later. Thus, the hypothesis stating a change in the dental hygiene status and oral health of children with the implementation of primary oral health care is corroborated.

A critical assessment of the study's limitations is essential for a holistic understanding of the research. Potential biases arising from the gender predominance in both groups should be evaluated. Additionally, the generalizability of the findings to other populations or contexts warrants examination. The measurement of outcomes, including any constraints or shortcomings, needs thorough analysis. This comprehensive review is crucial to understand the potential impact of biases, the applicability of the findings beyond the study's sample, and the reliability of the employed measurement methods.

4. Conclusions

This study, conducted in Punge Jurong Gampong, Banda Aceh City, Indonesia, has critically examined the influence of maternal behaviors on children's oral health within a primary oral health care framework. It has been determined that factors such as cultural beliefs, socioeconomic status, education level, access to information, and community support significantly influence maternal oral health practices. These findings underscore the necessity for customized interventions that address these specific factors to enhance oral hygiene practices in this community. A collaborative approach, involving healthcare providers, community leaders, and educational institutions, is imperative to fill the gaps in maternal knowledge and practices identified in this study. The implementation of comprehensive oral health education programs targeted at mothers and families is essential in fostering enduring behavioral changes. This research contributes significantly to the understanding of the intricate relationship between maternal behavior and child oral health. It highlights the critical need for tailored interventions and collective efforts to ameliorate children's oral health outcomes, not only in Punge Jurong Gampong but also in similar underserved communities worldwide. The pursuit of community-specific strategies, coupled with a holistic approach, holds substantial promise in significantly improving oral health among children in these areas. In conclusion, this study illuminates the path towards more effective and culturally sensitive oral health care practices, offering valuable insights for future interventions in similar contexts.

Ethical Approval

This study adheres to strict ethical guidelines, ensuring the rights and privacy of participants. Informed consent was obtained from all participants, and personal information was protected throughout the study. The methodology and procedures of this research have been approved by the appropriate ethics committee. Participants were informed of their rights, including the right to withdraw from the study at any time. All collected data is used solely for the purpose of this research and is stored and processed in a secure and confidential manner.

Data Availability

The data used to support the research findings are available from the corresponding author upon request.

Conflicts of Interest

The authors declare no conflict of interest.

References

- Achmad, H. R. U. N., Samad, R., Handayani, H., Ramadhany, S., Adam, M., & Suc, D. (2018). Analysis of disease risk factors of early childhood caries (ECC) on pre-school children psicosocial project review. *Asian J. Microbiol. Biotech. Environm. Sci.*, 20, 18-25.
- Baker, C. (2017). Quantitative research designs: Experimental, quasi-experimental, and descriptive. In D. Hartas (Ed.), *Evidence-based practice: An integrative approach to research, administration, and practice* (pp. 239-256). UK, London: Bloomsbury Academic. <https://doi.org/10.5040/9781474243834.ch-015>.
- Budiati, B., Hardiany, D. R., & Haryani, S. (2021). Optimizing golden period through early detection of language skills and multilanguage stimulation. *Philos. J. Bahasa, Sastra, dan Budaya*, 4(2), 98-104. <https://doi.org/10.35473/po.v4i2.1425>.
- Davis, N. O. & Carter, A. S. (2008). Parenting stress in mothers and fathers of toddlers with autism spectrum disorders: Associations with child characteristics. *J. Autism Dev. Disord.*, 38, 1278-1291. <https://doi.org/10.1007/s10803-007-0512-z>.
- Dhall, P. (2019). Quantitative data analysis. In R. N. Subudhi & S. Mishra (Eds.), *Methodological Issues in Management Research: Advances, Challenges, and the Way Ahead* (pp. 109-125). Emerald Publishing Limited. <https://doi.org/10.1108/978-1-78973-973-220191019>.
- El-Assal, O. N., Yamanoi, A., Soda, Y., Yamaguchi, M., Igarashi, M., Yamamoto, A., Nabika, T., & Nagasue, N. (1998). Clinical significance of microvessel density and vascular endothelial growth factor expression in hepatocellular carcinoma and surrounding liver: Possible involvement of vascular endothelial growth factor in the angiogenesis of cirrhotic liver. *Hepatology*, 27(6), 1554-1562. <https://doi.org/10.1002/hep.510270613>.
- Farihatini, T. (2019). Environmental impact on human health and sustainable development: A comprehensive study on drinking water quality and severity of dental caries in school children in South Kalimantan Province, Indonesia. *2013*(1), 3498. <https://doi.org/10.1289/isee.2013.o-1-23-05>.
- Gorman, K. S. (1995). Malnutrition and cognitive development: Evidence from experimental/quasi-experimental

- studies among the mild-to-moderately malnourished. *J. Nutr.*, 125(S8), 2239S-2244S. https://doi.org/10.1093/jn/125.suppl_8.2239s.
- Harris, A. D., McGregor, J. C., Perencevich, E. N., Furuno, J. P., Zhu, J., Peterson, D. E., & Finkelstein, J. (2006). The use and interpretation of quasi-experimental studies in medical informatics. *J. Am. Med. Inform. Assoc.*, 13(1), 16-23. <https://doi.org/10.1197/jamia.m1749>.
- Januś, D., Wójcik, M., & Starzyk, J. B. (2023). Testicular microlithiasis in paediatric patients with Klinefelter syndrome from infancy till adolescence: Early start of degenerative process in the testes-preliminary results. *Eur. J. Pediatr.*, 182(1), 225-235. <https://doi.org/10.1007/s00431-022-04663-w>.
- Leve, L. D., Harold, G. T., Chamberlain, P., Landsverk, J. A., Fisher, P. A., & Vostanis, P. (2012). Practitioner review: Children in foster care-vulnerabilities and evidence-based interventions that promote resilience processes. *J. Child Psychol. Psychiatry*, 53(12), 1197-1211. <https://doi.org/10.1111/j.1469-7610.2012.02594.x>.
- Lewis, C. W., Grossman, D. C., Domoto, P. K., & Deyo, R. A. (2000). The role of the pediatrician in the oral health of children: A national survey. *Pediatrics*, 106(6), e84. <https://doi.org/10.1542/peds.106.6.e84>.
- Muraina, I. O., Rahman, M. A., & Adeleke, I. A. (2016). Statistical approaches and decision making towards bivariate and multivariate analyses with visirule. *Br. J. Educ. Soc. Behav. Sci.*, 14(2), 1-10. <https://doi.org/10.9734/bjesbs/2016/23003>
- Naidu, R., Nunn, J., & Irwin, J. D. (2015). The effect of motivational interviewing on oral healthcare knowledge, attitudes and behaviour of parents and caregivers of preschool children: An exploratory cluster randomised controlled study. *BMC Oral Health*, 15, 1-15. <https://doi.org/10.1186/s12903-015-0068-9>.
- Nourijelyani, K., Yekaninejad, M. S., Eshraghian, M. R., Mohammad, K., Foroushani, A. R., & Pakpour, A. (2014). The influence of mothers' lifestyle and health behavior on their children: An exploration for oral health. *Iran Red Crescent Med J.*, 16(2). <https://doi.org/10.5812/ircmj.16051>.
- Orsini, L. S., Berger, M., Crown, W., Daniel, G., Eichler, H. G., Goettsch, W., Graff, J., Guerino, J., Jonsson, P., & Lederer, N. M. (2020). Improving transparency to build trust in real-world secondary data studies for hypothesis testing—Why, what, and how: Recommendations and a road map from the real-world evidence transparency initiative. *Value Health*, 23(9), 1128-1136. <https://doi.org/10.1016/j.jval.2020.04.002>.
- Petersen, P. E. & Ogawa, H. (2016). Prevention of dental caries through the use of fluoride—The WHO approach. *Comm. Dent. Health*, 33(2), 66-68.
- Pohl, T., Seiler, C., Billinger, M., Herren, E., Wustmann, K., Mehta, H., Windecker, S., Eberli, F. R., & Meier, B. (2001). Frequency distribution of collateral flow and factors influencing collateral channel development: Functional collateral channel measurement in 450 patients with coronary artery disease. *J. Am. Coll. Cardiol.*, 38(7), 1872-1878. [https://doi.org/10.1016/s0735-1097\(01\)01675-8](https://doi.org/10.1016/s0735-1097(01)01675-8).
- Potisomporn, P., Sukarawan, W., & Sriarj, W. (2019). Oral health education improved oral health knowledge, attitudes, and plaque scores in thai third-grade students: A randomised clinical trial. *Oral Health Prev. Dent.*, 17(6), 523-531. <https://doi.org/10.3290/j.ohpd.a43752>.
- Saccenti, E., Hoefsloot, H. C., Smilde, A. K., Westerhuis, J. A., & Hendriks, M. M. W. B. (2014). Reflections on univariate and multivariate analysis of metabolomics data. *Metabolomics*, 10, 361-374. <https://doi.org/10.1007/s11306-013-0598-6>.
- Samuel, S. R., Acharya, S., & Rao, J. C. (2020). School interventions-based prevention of early-childhood caries among 3–5-year-old children from very low socioeconomic status: Two-year randomized trial. *J. Publ. Health Dent.*, 80(1), 51-60. <https://doi.org/10.1111/jphd.12348>.
- Shiau, J. T., Wang, H. Y., & Tsai, C. T. (2006). Bivariate frequency analysis of floods using copulas1. *J. Am. Water Resour. Assoc.*, 42(6), 1549-1564. <https://doi.org/10.1111/j.1752-1688.2006.tb06020.x>.
- Spielman, A. I., Fulmer, T., Eisenberg, E. S., & Alfano, M. C. (2005). Dentistry, nursing, and medicine: A comparison of core competencies. *J. Dent. Educ.*, 69(11), 1257-1271. <https://doi.org/10.1002/j.0022-0337.2005.69.11.tb04025.x>.
- Tarabaih, A. S. (2016). Caries prevalence and prevention in young children: A community-based preventive approach.
- Ueno, M., Ohara, S., Inoue, M., Tsugane, S., & Kawaguchi, Y. (2012). Association between education level and dentition status in Japanese adults: Japan public health center-based oral health study. *Comm. Dent. Oral Epidemiol.*, 40(6), 481-487. <https://doi.org/10.1111/j.1600-0528.2012.00697.x>.
- Vanagas, G., Milašauskienė, Ž., Grabauskas, V., & Mickevičienė, A. (2009). Associations between parental skills and their attitudes toward importance to develop good oral hygiene skills in their children. *Medicina*, 45(9), 718. <https://doi.org/10.3390/medicina45090094>.
- Vozza, I., Capasso, F., Marrese, E., Polimeni, A., & Ottolenghi, L. (2017). Infant and child oral health risk status correlated to behavioral habits of parents or caregivers: A survey in central Italy. *J. Int. Soc. Prev. Comm. Dent.*, 7(2), 95-99. https://doi.org/10.4103/jispcd.jispcd_470_16.