CORRELATION BETWEEN MATERNAL BEHAVIOR AND CHILDHOOD DENTAL CARIES

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Abstract

Early Childhood Caries (ECC) remains the most prevalent disease among children. The role of mothers plays a critical part in forming their children's dental hygiene practices, which influences the incidence of dental caries. This study aims to analyze the correlation between maternal behavior and the occurrence of ECC. This study employed a cross-sectional design involving 305 mothers of children from seven kindergartens. Data on maternal behavior were collected using a structured questionnaire, while children's dental status was assessed through clinical examination based on the DMF (Decayed, Missing, and Filled) index. Statistical analyses included descriptive statistics, normality testing, and correlation analysis using the ANOVA test with a significance level of $\alpha = 0.05$. The mean maternal behavior score was 43.134 (SD = 6.807), and the mean DMF index of children was 7.345 (SD = 4.609). The normality test showed that maternal behavior was not normally distributed ($p < 0.0001$), whereas the DMF variable was normally distributed ($p = 0.147$). The correlation test revealed a very weak and non-significant relationship between maternal behavior and children's dental caries status ($r = –0.067$, $p = 0.306$). There was no significant correlation between maternal behavior and the incidence of dental caries in children. These findings indicate that maternal behavior alone may not directly influence children's oral health outcomes. Future interventions should adopt a multifactorial approach that includes improving maternal oral health literacy, dietary supervision, and access to dental care services.

Keywords: Dental caries, Maternal behavior, Children, Correlation

1. INTRODUCTION

Early Childhood Caries (ECC) remains the most chronic disease suffered by children in the world. Mother's role in the practice of oral hygiene, feeding habits, oral-health knowledge, and attitude is consequential in shaping the children's dental health outcomes [1], [2]. The actions towards those practices influence the children's exposure to cariogenic bacteria, dietary patterns, and daily oral care routines. This is because caries occurs as a consequence of demineralization of the enamel and dentin of the teeth, which is related to dietary patterns such as consuming cariogenic foods [3]. Besides, the habit of sharing utensils and inappropriate feeding practices such as frequent consumption of sugary foods and drinks, prolong the risk of ECC. Another factor of limited maternal dental health literacy and low access to dental health care, shows the increasing risk of ECC [4], [5].

The risk of ECC in Indonesia is still high. It is mentioned by the national report that in 2023, the DMF-T index of children aged 3-4 years old is 4.9, which is a high risk of caries. Besides, those at age 5 years old had a 6.7 DMF-T index, categorized as very high risk of caries. Comparing the global dental and oral disease of Indonesians in 2018, it was 57.6% and in 2023, the number decreased to 56.9%. However, those who were treated only 10.2% in 2018 and 11.2 % in 2023. Besides, in 2023, it is known

that 95.6% of Indonesians brush their teeth every day. However, only 6.2% brush their teeth correctly way [6]. This number explicitly reveals that the parental behavior of dental care is still a problem.

Recent studies have expressed the multifactorial nature of ECC development. A systematic review confirms that parental oral hygiene behavior, feeding patterns, and socioeconomic conditions are related to the occurrence of ECC [7]. Maternal oral health status, as well as psychosocial conditions, also play a part in the behavior of children in maintaining oral health. Children often adopt their parents' tooth-brushing habits and attitudes in dental care. Research regarding parental behavior towards dental health shows that 61% parents with a strong intention towards the behavior of toothbrushing had better oral hygiene behavior than the parents with a weak intention [8]. Nevertheless, research shows that from the study of surveying the mothers at primary school, there were only 46.7% mothers who had a good category of knowledge, and 90% had a positive attitude towards dental health care [9]. However, few analyze the correlation between the maternal behavior towards ECC. Analyzing the correlation between maternal behavior and the incidence of caries in children is crucial because mothers play a central role in shaping children's dental health habits from an early age. Mother becomes the figure who provides daily care, such as diet and dental hygiene. Assessing the maternal behavior towards ECC helps design more effective preventive interventions. For example, if research finds that mothers' lack of knowledge about brushing their children's teeth is a dominant factor, educational programs can focus on improving mothers' dental health literacy. Furthermore, behavioral factors such as giving sweet foods, breastfeeding at night without brushing teeth, or using sugar-filled pacifiers can be changed through evidence-based educational approaches. But child factors may have a more significant direct effect because children have bodily integrity to control their own bodies and right to influence outcomes [10]. Therefore, this study aims to analyze whether maternal behavior correlates with children's caries.

2. METHODOLOGY

This research explores maternal behavioral patterns in maintaining early childhood oral health. Employing a multivariate, cross-sectional design, the study investigates the correlation between maternal behavior and its influence on dental caries in children. Data were collected simultaneously through structured observations and questionnaires to capture the dynamics of these correlations.

The study population consisted of 305 mothers whose children, were enrolled in seven kindergartens across Bukittinggi City. A cluster random sampling method was applied to ensure proportional representation from each kindergarten. In total, 305 respondents met the inclusion criteria, which comprised mothers of children aged five years and above, officially registered in the selected schools, and willing to participate voluntarily throughout the study process. Both mothers and their children consented to take part as respondents.

The variable being observed is the behavior of the mother as the independent variable and the children's caries index as the dependent variable. The instrument used in the research was a questionnaire. The questionnaire consisted of the behavioral habits of the mother. The questionnaire for the maternal behavior variable contains 15 questions regarding the assessment of the behavior, with four answer choices that reflect the level of suitability for the individual. The questionnaire assessment uses an ordinal scale with scores of 1 (very inappropriate), 2 (inappropriate), 3 (appropriate), and 4 (very appropriate). The questions regarding maternal behavior cover several points, including habits of maintaining children's dental and oral health, having children's dental and oral health checked at least once every six months, and using toothpaste containing fluoride. The caries scoring was conducted by examination of the children's teeth using an examination form. Dental caries is defined as a disease of the tooth tissue characterized by tissue damage, which can occur on one or more tooth surfaces and can spread to deeper parts of the tooth. The oral health examination form was completed directly with mothers and children attending Bukittinggi Kindergarten. The examination was conducted using a mouth mirror, WHO CPI probe, additional equipment (handscone, mask, nierbeken),

alcohol, and cotton swabs. After all teeth were examined, the results were recorded on the oral health examination form. The child's dental status was considered *Good* when the score reached 90% or higher, and *Poor* when it was below 90% using DMF (Decayed, Missing and Filled) score.

The research data were analyzed using multivariate analysis to assess the correlation between maternal behavior and children's caries. Multivariate analysis was used to describe the characteristics of each research variable. Multivariate analysis in this study included ANOVA regression. Numerical data are presented in the form of mean, standard deviation (SD), and median. Data analysis used a 95% significance level (p-value <0.05). The categorization of correlation is based on the coefficient value. If the value is <0.20, it is considered very weak; correlations between 0.20 – 0.39 are weak; correlations 0.40 – 0.59 are considered moderate; correlations 0.60 – 0.79 are strong, and correlations >0.80 are very strong [11].

3. RESULTS

This section presents the results of the study on the relationship between maternal behavior and the incidence of dental caries in children. The collected data were processed and analyzed to describe the characteristics of the respondents and to determine the correlation between the studied variables.

3.1 Frequency Distribution of Children's Age

The frequency distribution of the children age who were observed in the research is shown in Table 1.

Table 1. *Frequency distribution based on ages*

No.	Age (Years)	Frequency	Percentage (%)
1.	4 – 5 years old	91	30
2.	6 – 7 years old	214	70
	Total	305	100

Table 1 shows the distribution of respondents based on the children's age.

The majority of the participants were children aged 6–7 years old, accounting for 214 children (70%), while 91 children (30%) were aged 4–5 years old. This indicates that most of the children involved in this study were in the older age group (6–7 years), which may correspond to the period of early school attendance when dietary habits and oral hygiene behaviors begin to develop more independently.

3.2 Correlations between Variables

The data analysis was conducted in several stages. First, descriptive statistical analysis was performed to provide an overview of maternal behavior and children's dental caries status. Next, a normality test was conducted to verify that the data met the assumption of normal distribution before proceeding with further analysis. Finally, a correlation test was conducted to identify the strength and direction of the relationship between maternal behavior and the occurrence of dental caries in children. The results of these analyses are presented sequentially in the results.

Table 2. *Descriptive statistics of the variables*

Variable	Average	Standard Deviation
Maternal behavior	43.134	6.807
DMF of children	7.345	4.609

Table 2 shows that the maternal behavior has an average value of 43.134 with an SD of 6.807. This indicates a moderate level of variation among respondents. Meanwhile, the variable of DMF of the children got an average of 7.345 and an SD of 4.609, suggesting that most children experienced a relatively high level of dental caries. These results illustrate differences in maternal behavior and children's dental caries conditions within the study population.

Table 3. *Normality test results between variables*

Variable	p-value	α
Maternal behavior	<0.0001	0.05
DMF of children	0.147	

Table 3 shows the results of the normality test for each variable. The maternal behavior variable had a p-value of <0.0001, which is lower than the significance level (α = 0.05). This indicates that the data for maternal behavior are not normally distributed. In contrast, the DMF of children variable had a p-value of 0.147, which is greater than α = 0.05, suggesting that the data for children's dental caries status are normally distributed. The conclusion of these results is the data is not normally distributed.

Subsequently, the correlation test was conducted to determine the relationship between maternal behavior and the incidence of dental caries in children. Based on the results, a correlation coefficient (r) indicates the direction and strength of the relationship between the two variables. The p-value obtained from the analysis was compared to the significance level (α = 0.05).

Table 4. *Correlation between behavior and caries of the children*

Variables	*p-Value*	Correlation Coefficient
Behavior Caries	0.306	-0.067

Table 4 presents the results of the correlation analysis between maternal behavior and the dental caries status of children. The analysis shows that the p-value was 0.306, which is greater than the significance level (α = 0.05). This indicates that there is no statistically significant relationship between maternal behavior and the incidence of dental caries in children. Then, the correlation coefficient (r) shows -0.067. This result indicates a very weak negative correlation between the two variables. The relationship is not strong enough to be considered significant. Overall, these results suggest that maternal behavior alone may not directly influence the occurrence of dental caries in children, and other factors such as dietary habits, fluoride exposure, or access to dental care may also play an important role.

3.3 Maternal Behavior and Caries Incidence

Children are prone to dental caries. As stated by the Indonesia Health Survey in 2023, the aged 5 years have a 6.7 DMFT score, or categorized as having caries very high. Meanwhile, children aged 3-4 years have a 4.9 DMFT score or are categorized as high [6]. Therefore, the preventive action of dental caries should be performed at an early age to maintain the teeth. Because early childhood oral health determines the outcomes at their next ages and is considered essential, as it can impact oral health in adulthood [12].

This study aimed to evaluate the relationship between maternal behavior and the incidence of dental caries using the correlation analysis. The results of descriptive analysis show that the mean maternal behavior score was 43.134 (SD = 6.807), while the mean DMF index of children was 7.345

(SD = 4.609). The normality test indicated that the data are not normally distributed, as the maternal behavior has p < 0.0001, and the DMF index has a p-value. of 0.147. The correlation test produced a correlation coefficient (r) of –0.067 with a p-value of 0.306, demonstrating a very weak and statistically non-significant relationship between maternal behavior and children's dental caries status.

The findings of the study indicate that maternal behavior is not a single factor and is not sufficient to predict the incidence of caries in children. This is because dental caries is a multifactorial disease influenced by numerous factors, including maternal knowledge, children's oral hygiene habits, dietary patterns, fluoride exposure, and socioeconomic status [13], [14]. Previous studies have demonstrated a significant relationship between maternal factors and children's dental health outcomes. A study found that mothers with poor oral health (higher DMFT) were associated with higher DMFT scores in children (P < 0.001). Besides, mothers with low income also influence the children's oral health score (p-value = 0.043), a lower ratio of protein consumption (p-value = 0.014), showing that dietary patterns influence the dental health of the children. Most importantly, it is found that mothers who have behavior of dental health care, such as using a dental mouth rinse is significantly influence the incidence of DMFT of the children (p-value = 0.007) [15]. However, the study found different results because the maternal behavior variable used in this study may not have captured all relevant factors, such as oral health knowledge, supervision of children's hygiene, and access to dental care. Besides, there are also no confounding factors such as maternal education, income level, and dental health access, which may have influenced the results. The effect of maternal behavior on children's caries may be indirect, mediated by other variables such as diet, brushing frequency, or fluoride use.

It is mentioned in a study from Azimi et al (2018) that observed children at their mothers at an average age of 5.1 and 31 years, that the mothers' knowledge and children's DMFT have an inverse correlation (r = -0.6). This indicates that knowledge correlates with the incidence of caries in children, with a strong correlation. The result is also the same with mothers' knowledge of their DMFT (r = -0.7) [16]. This shows the consistent correlation that knowledge and DMFT have an inverse correlation. The same result as the study that the correlation between mothers' behavior and caries incidence in the children has an inverse correlation with a negative value (r=-0.067), even though it has a very weak correlation. The value indicates that if the behavior of the mother changes to a higher level of dental health behavior, the score of DMFT of the children decreases on average by 0.067. However, the result is not significant, proven by the p-value of 0.306 (p >0.05).

3.4 Implications, Limitations, and Future Studies

The findings of the study imply that interventions focusing solely on maternal behavior change may be insufficient without integrating broader preventive measures. Some strategies need to be performed to improve the mothers' oral health knowledge, concern towards access to dental health, and health promotion of dietary and environmental factors. Recent studies highlight the mother's literacy about oral health, which becomes a stronger determinant of children's oral health outcomes than behavior alone [17], [18]. Therefore, preventive programs should combine educational and structural interventions to effectively reduce caries prevalence in children.

This study is limited to behavioral measurement to a single composite score without deeper exploration factors such as oral hygiene supervision or dietary control. Besides, the potential confounders such as the education of the mothers, socioeconomic status and access of dental health services were not controlled. Future studies should adopt longitudinal designs to evaluate behavioral changes and their long-term effects on children's dental health. Expanding the behavioral constructs to include maternal knowledge, supervision, and dietary management, as well as incorporating mediating variables such as fluoride exposure and dental visit frequency, will provide a more comprehensive understanding of the complex pathways linking maternal factors to childhood dental caries.

4. CONCLUSIONS

The study found that the correlation between maternal behavior and dental caries is very weak, with a coefficient of correlation of -0.067. Besides, there is no statistically significant correlation between maternal behavior and dental caries incidence in children, with a p-value of 0.306. These results suggest that only maternal behavior may not have a direct or substantial effect on the occurrence of dental caries in children.

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REFERENCES

[1] R. Amalia, F. Chairunisa, M. F. Alfian, and A. Supartinah, “Indonesia: Epidemiological profiles of early childhood caries,” *Front Public Health*, vol. 7, no. AUG, 2019, doi: 10.3389/fpubh.2019.00210.

[2] A. Rahman Prasetyo and M. Pendidikan Agama Islam UIN Sunan Kalijaga Yogyakarta, “Early Childhood Physical, Cognitive, Socio-Emotional Development,” vol. 4, no. 2, 2020, doi: 10.29313/ga:jpaud.v4i2.6049.

[3] A. Li *et al.*, “Research progress of milk and dairy products to prevent caries,” *J Funct Foods*, vol. 110, p. 105837, Nov. 2023, doi: 10.1016/j.jff.2023.105837.

[4] Y. M. Kamalabadi, M. K. Campbell, R. Gratton, and A. Jessani, “Oral Health Status and Dental Services Utilisation Among a Vulnerable Sample of Pregnant Women,” *Int Dent J*, vol. 75, no. 2, pp. 524–536, Apr. 2025, doi: 10.1016/j.identj.2024.07.009.

[5] P. Bunnatee, F. I. Abdulsalam, and N. Phoosuwan, “Factors associated with oral health care behaviors of pregnant women in a northeastern province in Thailand: A hospital-based cross-sectional study,” *PLoS One*, vol. 18, no. 8, p. e0290334, Aug. 2023, doi: 10.1371/journal.pone.0290334.

[6] Kemenkes BKPK, “Survey Kesehatan Indonesia,” Jakarta, 2023.

[7] N. K. Rai and T. Tiwari, “Parental Factors Influencing the Development of Early Childhood Caries in Developing Nations: A Systematic Review,” *Front Public Health*, vol. 6, Mar. 2018, doi: 10.3389/fpubh.2018.00064.

[8] M. Mustafa, E. F. Nasir, and A. N. Åstrøm, “Attitudes toward brushing children’s teeth—A study among parents with immigrant status in Norway,” *Int J Paediatr Dent*, vol. 31, no. 1, pp. 80–88, Jan. 2021, doi: 10.1111/ipd.12683.

[9] K. Zalukhu, A. Veronika, R. M. Manik, and B. Ambarita, “Description of Mother’s Knowledge and Attitudes About Dental and Oral Health in Pre-School Children 3-4 Years Old,” *Jurnal eduhealth*, vol. 14, no. 03, pp. 2023–1167, 2023, [Online]. Available: http://ejournal.seaninstitute.or.id/index.php/healt

[10] P. Alderson, “Bodily integrity and autonomy of the youngest children and consent to their healthcare,” *Clin Ethics*, vol. 19, no. 4, pp. 291–296, Dec. 2024, doi: 10.1177/14777509231188006.

[11] S. N. Papageorgiou, “On correlation coefficients and their interpretation,” *J Orthod*, vol. 49, no. 3, pp. 359–361, Sep. 2022, doi: 10.1177/14653125221076142.

[12] M. A. Simancas-Pallares *et al.*, “Children’s oral health-related behaviours and early childhood caries: A latent class analysis,” *Community Dent Oral Epidemiol*, vol. 50, no. 3, pp. 147–155, Jun. 2022, doi: 10.1111/cdoe.12645.

[13] B. Kuter and İ. Uzel, “The Influence of Maternal Factors on Children’s Oral Health: Mothers’ Age, Education Level, Toothbrushing Habit and Socioeconomic Status,” *The Journal of Pediatric Research*, vol. 7, no. 4, pp. 331–335, Jul. 2020, doi: 10.4274/jpr.galenos.2020.96977.

[14] N. E. Nicksic *et al.*, “Dietary intake, attitudes toward healthy food, and dental pain in low-income youth,” *JDR Clin Trans Res*, vol. 3, no. 3, pp. 279–287, 2018, doi: 10.1177/2380084418774039.

[15] S.-M. Lee, H.-N. Kim, J.-H. Lee, and J.-B. Kim, “Association between maternal and child oral health and dental caries in Korea,” *J Public Health (Bangkok)*, vol. 27, no. 2, pp. 219–227, Apr. 2019, doi: 10.1007/s10389-018-0936-2.

[16] S. Azimi, J. B. Taheri, M. Tennant, E. Kruger, H. Molaei, and Z. Ghorbani, “Relationship Between Mothers’ Knowledge and Attitude Towards the Importance of Oral Health and Dental Status of their Young Children.,” *Oral Health Prev Dent*, vol. 16, no. 3, pp. 265–270, 2018, doi: 10.3290/j.ohpd.a40760.

[17] K. Sowmya, M. P. Puranik, and K. Aparna, “Association between Mother’S Behaviour, Oral Health Literacy and Children’S Oral Health Outcomes,” *Indian Journal of Dental Research*, vol. 32, no. 2, pp. 147–152, Apr. 2021, doi: 10.4103/ijdr.IJDR_676_18.

[18] K. Kamolchaiwanich, J. Y. Lee, and P. Leelataweewud, “Exploring the Link Between Maternal Oral Health Literacy and Child Oral Health Behaviours,” *Int Dent J*, vol. 75, no. 3, pp. 2042–2052, Jun. 2025, doi: 10.1016/j.identj.2024.12.033.