

The Correlation between Mothers' Behaviors of Maintaining Their Children's Oral Hygiene and Early Childhood Caries (Based on the Theory of Planned Behavior)

Melissa Adiatman^{1*}, Almas Riska Zhafarina², Anton Rahardjo¹,
Iwany Amalliah Badruddin¹, Ciptasari Prabawanti³

1. Department of Dental Public Health and Preventive Dentistry, Faculty of Dentistry, Universitas Indonesia
2. Undergraduate Program, Faculty of Dentistry, Universitas Indonesia
3. Family Health International 360 Jakarta, Menara Salemba Building 3rd Floor, Jalan Salemba Raya, Jakarta, Indonesia

Abstract

Objective: To obtain information regarding the relationship between mothers' behaviors of maintaining their children's oral hygiene and Early Childhood Caries (ECC) based on the Theory of Planned Behavior (TPB). **Methods:** This study was conducted as a cross-sectional study of 295 pairs of mothers and children in the District of Beji, Depok. A clinical examination was carried out and a TPB questionnaire was used. Prior to the research, the TPB questionnaire was constructed and calibrated under the supervision of a TPB expert. The internal and external reliability of the questionnaire were both acceptable (Cronbach's alpha = 0.820; ICC = 0.771). **Results:** The study showed that 53.9% children had ECC, with a 3.46 dmft score and a 7.66 plaque score. With respect to mothers' behaviors of maintaining their children's oral hygiene, there was a significant relation between two components of TPB behavior (attitude (ATT) and subjective norms (SN)) and intentions and between intentions and behavior; however, there was no significant relation between Perceived Behavioral Control (PBC) and intentions or between behavior and dmft and plaque in children ($p > 0.05$). **Conclusion:** Although there was a relation between intentions and behavior, there was no significant impact on children's oral hygiene habits or ECC. Thus, according to the TPB, there was no correlation between mothers' behaviors of maintaining their children's oral hygiene and ECC.

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Introduction

Dental caries is one of the most prevalent childhood diseases worldwide.¹ Caries is defined as a chronic infection of the tooth caused by the *Streptococcus mutans* bacteria.² Caries in the primary teeth of children under six years of age is referred to as Early Childhood Caries (ECC).² Caries can disrupt children's mastication functions and, thus, reduce their nutritional intake. Caries also has the potential to affect children's activities by causing toothaches. ECC, or early

caries, is a common problem in children aged three to five years. In the United States, the prevalence of ECC in children aged three to five years is 90%. The 2004 National Oral Health Survey revealed that the prevalence of caries in five-year-old children in India was 51.9%.³

According to the Ministry of Health of the Republic of Indonesia (Kemenkes RI), the prevalence of caries in children under 12 years old in 2009 was 89%.⁴ Setiawati (2001) found that the prevalence of caries in children aged three to five years in Jakarta was 81.2%.⁵ Similarly, Riskesdas found that the prevalence of dental and oral problems in Indonesia in 2007 was 80% and that 90% of these problems occurred among children under five years of age. Given the high prevalence of ECC and the high potential for the exposure of permanent teeth to

*Corresponding author:

Melissa Adiatman
Department of Dental Public Health and Preventive
Dentistry, Faculty of Dentistry,
Universitas Indonesia
E-mail: melle_gigi@gmail.com

dental caries, ECC has become a serious problem among children. Health is affected by several determinants. Blum suggested that these determinants are fourfold: healthcare services, genetics, the environment, and behavior.

According to Hickman, behavior, including lifestyle choices, has a greater impact on health than any other determinant.⁶ Therefore, behavior is very important for maintaining dental and oral health. In the family, the mother is critical in developing children's oral habits and health, particularly among children under six years old. According to Suresh et al., a mother's dental and oral hygiene knowledge and habits, such as teeth brushing, diet, and food selection, can affect the dental and oral health of her children.⁷

Considering the close relationship between mothers and children and the tendency of children under the age of six to copy their mothers' practices, it is important to observe the dental and oral hygiene maintenance habits of mothers. In addition to mothers' dental and oral knowledge, motivation is also important for improving dental and oral hygiene maintenance behaviors.

One of the most widely used theories of motivation in dental and oral health intervention is the Theory of Planned Behavior (TPB).⁸ The TPB defines three psychological factors as independent determinants of behavior intention: attitude (ATT), subjective norms (SN), and perceived behavior control (PBC).⁹ ATT is an overall assessment of behavior; SN represents behavioral pressures from parents, peers, beliefs, culture, or public opinion; and PBC describes the possibility that a behavior may be desired but limited due to difficulties in its execution.⁸

The above data illustrate the high prevalence of caries in children, and it is known that children under the age of six years spend significant time with their mothers, on whom they rely for guidance on cleaning their teeth and mouths. Furthermore, as a general rule, greater or better ATT, SN, and PBC all increase the possibility that a person will perform a behavior.¹⁰

Hence, this study examines the relation between mothers' dental and oral health behaviors (according to the TPB) and ECC in children.

Methods

This study uses an observational analytic design with cross-sectional approach. The study was conducted in five posyandu (integrated health service posts) in the District of Beji, Depok, from September to October 2016. The subjects of the study were children under the age of six years in the period of primary teeth, all raised by their biological mothers, for a total of 295 mother-child pairs.

The study involved an intra-oral examination of the children, including the computation of a dmft score and a plaque score, as well as a TPB questionnaire interview with the mothers. The reliability of the TPB questionnaire had been previously tested. In the questionnaire concerning the children's dental and oral hygiene habits, the Cronbach's alpha was 0.820, indicating good consistency and internal reliability, while the test-retest (ICC) score was 0.771, indicating good agreement external reliability. Prior to conducting the study, the researchers submitted an ethical proposal to the Commission of Ethics of Dentistry Research (KEPKG).

Data were collected from informed consent forms completed by the mothers, an intra-oral examination of the children, and a questionnaire interview with the mothers. After all data were collected, data analysis was performed using SPSS. Specifically, a frequency distribution analysis to determine the characteristics of the subjects and the prevalence of ECC, and a bivariate analysis in the form of a Spearman correlation test was conducted to examine the relation among the variables.

Results

Of the original 335 pairs of mothers and children, only 295 pairs provided complete information. The prevalence of ECC among the children in this sample below the age of six years in the District of Beji is 53.9%, with an average dmft score of 3.46 and an average plaque score of 7.66. The participants' characteristics are shown in the table below.

The questionnaire examined the children's dental and oral hygiene habits, including whether the mothers helped their children brush their teeth twice a day and whether they cleaned their children's teeth after drinking milk or eating. The answers to the

questionnaire were provided on seven scales, in which greater scores meant better behaviors. The total scores for the ATT questions ranged from 5 to 35, those for SN ranged from 3 to 21, and those for PBC, intention, and behavior each ranged from 1 to 7. The neutral category (no answer) received the smallest percentage of answers for all components. The distribution of answers concerning the mothers' habitual behaviors of helping their children brush their

teeth twice a day indicated that most mothers answered 'good' for ATT, SN, PBC, intention, and behavior. For this behavior, neutral answers (no answers) represented the smallest percentage of all components, except PBC (i.e., the percentage of bad category answers and no answers at all).

Table 1. Characteristics of the Children and Mothers

	n (%)	Mean ± SD
Age		
Children (months)		31.70 ± 16.30
Mothers (years)		31.09 ± 5.80
Gender of Children		
Male	150 (50.8)	
Female	145 (49.2)	
Education of mothers		
Low	96 (32.5)	
Medium	180 (61.1)	
High	19 (6.4)	
Employment status		
Do not work	262 (88.8)	
Work	33 (11.2)	
Family economic status		
≤ Rp 3,046,180	192 (65.1)	
>Rp 3,046,180	103 (34.9)	

With respect to the habitual behavior of cleaning children's teeth after drinking milk or eating, most mothers answered 'good' for ATT, SN, PBC, and intention, but 'bad' for behavior. Neutral answers (no answers) were the least common.

With respect to the habitual behavior of helping children brush their teeth twice a day, the correlation test showed a significant correlation between ATT and SN and intentions to help children brush their teeth twice a day ($p < 0.001$), whereas there was no significant correlation between PBC and intention ($p > 0.05$). There was also a significant correlation between intention

and the habitual behavior of helping children brush their teeth twice a day ($p < 0.001$).

The correlation between ATT and SN and intentions to help children brush their teeth twice a day and between intention and a habitual behavior of helping children brush their teeth twice a day showed a positive correlation, meaning that an increase in ATT and SN will increase intentions, which will increase the habitual behavior of helping children brush their teeth twice a day. The correlation test between the habitual behavior of helping children brush their teeth twice a day and ECC and plaque in children showed no significant correlation ($p > 0.05$).

Table 2. Distribution of Answers Concerning Mothers' Habits of Helping Their Children Brush Their Teeth Twice a Day

	n (%)	Mean
ATT: Feeling/thought toward the habit of helping children brushing their teeth twice a day		33.31
Good (21 – 35)	285 (96.6)	
Bad (5 – 19)	8 (2.7)	
No Response(20)	2 (0.7)	
SN: Opinion of people involved in the habit of helping children brushing their teeth twice a day		19.01
Good (13 – 21)	278 (94.2)	
Bad (3 – 11)	13 (4.4)	
No Response(12)	4 (1.4)	
PBC: Ability to help children brush their teeth twice a day		5.00
Good (5 – 7)	175 (59.3)	
Bad (1 – 3)	60 (20.3)	
No Response(4)	60 (20.3)	
Intention: Intention to help children brush their teeth twice a day		6.39
Good (5 – 7)	266 (90.2)	
Bad (1 – 3)	17 (5.8)	
No Response(4)	12 (4.1)	
Behavior: Habit of helping children brush their teeth twice a day		5.48
Good (5 – 7)	220 (74.6)	
Bad (1 – 3)	54 (18.3)	
No Response(4)	21 (7.1)	

Table 3. Distribution of Answers Concerning the Habit of Cleaning Children's Teeth after Drinking Milk or Eating.

	n (%)	Mean
ATT: Feeling/thought toward the habit of cleaning children's teeth after eating or drinking milk		32.83
Good (21 – 35)	279 (94.6)	
Bad (5 – 19)	13 (4.4)	
No Response(20)	3 (1)	
SN: Opinion of people involved in the habit of cleaning children's teeth after eating or drinking milk		19.01
Good (13 – 21)	280 (94.9)	
Bad (3 – 11)	10 (3.4)	
No Response(12)	5 (1.7)	
PBC: Ability to clean children's teeth after eating or drinking milk		4.72
Good (5 – 7)	163 (55.3)	
Bad (1 – 3)	80 (27.1)	
No Response(4)	52 (17.6)	
Intention: Intention to clean the children's teeth after eating or drinking milk		6.34
Good (5 – 7)	269 (91.2)	
Bad (1 – 3)	17 (5.8)	
No Response(4)	9 (3)	
Behavior: The habit of cleaning children's teeth after eating or drinking milk		4.25
Good (5 – 7)	123 (41.7)	
Bad (1 – 3)	130 (44.1)	
No Response(4)	42 (14.2)	

Table 4. Relations among ATT, SN, PBC, and Intentions with Respect to Mothers' Oral Health Behavior on Children

	Number of subjects (n)	Correlation coefficient (r)	p-Value
Habit of helping children brush their teeth twice a day			
ATT	295	0.341	0.000
SN	295	0.420	0.000
PBC	295	0.047	0.418
Habit of cleaning children's teeth after drinking milk or eating			
ATT	295	0.384	0.000
SN	295	0.439	0.000
PBC	295	0.101	0.084

The results of the correlation test for the mothers' habitual behavior of cleaning their children's teeth after eating or drinking milk showed a significant correlation between ATT and SN and intentions to clean children's teeth after eating or drinking milk ($p < 0.001$), whereas PBC and intentions showed no significant relation ($p > 0.05$). The correlation test between intentions and the habitual behavior of cleaning children's teeth after eating or drinking milk

showed a significant correlation ($p > 0.05$). Finally, the correlations between ATT and SN and intentions to clean children's teeth after eating or drinking milk and between intentions and the habitual behavior of cleaning children's teeth after eating and drinking milk were positive, meaning that an increase in ATT and SN will increase intentions and an increase in intentions will increase the habitual behavior of cleaning children's teeth after eating or drinking milk.

Table 5. Relation between Intention sand Mothers' Oral Health Behaviorswith Children

	Number of subjects (n)	Correlation coefficient (r)	p-Value
Intention to help children brushtheir teeth twice a day	295	0.287	0.000
Intention to clean children's teeth after drinking milk or eating	295	0.167	0.004

Table 6. Relation between Mothers' Oral Health Behaviors with Children and ECC and Plaque in Children

	ECC (dmft)			Plaque		
	Number of subjects (n)	Correlation coefficient (r)	p-Value	Number of subjects (n)	Correlation coefficient (r)	p-Value
Habit of helping children brushtheir teeth twice a day	295	0.038	0.515	295	0.091	0.119
Habit of cleaning children's teeth after drinking milk or eating	295	-0.036	0.533	295	-0.010	0.862

Discussion

The prevalence of ECC in this study was 53.9%, with an average dmft score of 3.46 and an average plaque score of 7.66 (of a total score of 18). These values are higher than those outlined by the WHO Oral Health Global Goal 2010, which called for children aged five to six to be caries-free.

The results of this study indicate that some caries can still be found among children under six years old.¹¹ The determinants of mothers' habitual behaviors of helping children brush their teeth—TPB, intention, and behavior—had the highest percentage of 'good' responses. With respect to ATT, 96.6% of answers were 'good', and the maximum total score was 33.31. For SN, 94.2% of answers were 'good', and the average total score was 19.01. For PBC, 59.3% of answers were 'good', and the average total score was 5.00. Intention and behavior had 'good' percentages of 90.2% and 74.6%, respectively, and average scores of 6.39 and 5.48, respectively.

The distribution of answers on habitual behaviors of cleaning children's teeth after drinking milk or eating showed that most mothers responded 'good' with respect to ATT, SN, behavior perception, and intention, but 'bad' with respect to behavior. For ATT, 94.6% of mothers answered 'good', and the average total score was 32.83. For SN, 94.9% of mothers answered 'good', and the average total score was 19.01. For PBC, 55.3% of mothers answered 'good', and the average score was 4.72. For intentions, 91.2% of mothers answered 'good', and the average total score was 6.34. Behavior had the highest percentage of 'bad' category answers (44.1%), but the average score was good (4.25). With respect to the habit of helping children brush their teeth twice a day, it was found that there are relations between ATT and SN and intentions to help children brush their teeth twice a day; however, there was no relation between PBC and such intentions.

This suggests that ATT and SN influence intentions, whereas PBC does not. These relations between ATT and SN and intentions are in line with the preliminary theory of TPB (i.e. TRA), indicating that, for the population in this study, behavior is planned and involves rational consideration. In a research study of two

countries, Buunk found a difference in results concerning the PBC determinant, such that one country exhibited a relation between PBC and oral hygiene behaviors and the other country did not. Buunk explained that differences could be due to differences in region or experience.¹²

The correlation test for intentions and the behavior of helping children brush their teeth twice a day indicated a relation. Similarly, Branden showed a relation between intentions and oral hygiene behaviors.¹³ However, the correlation test for the behavior of helping children brush their teeth twice a day and ECC and plaque in children showed no relation, and though the average score of behavior-related answers was good, the children demonstrated a high prevalence of caries.

This result contradicts the findings of a research study in Iran, which showed a relation between the behavior of brushing teeth and the dmft of children of aged three to five.¹⁴ Difference among countries may be due to country-specific characteristics. This study's finding of no relation may be due to the fact that the interviewed mothers did help their children brush their teeth twice a day, but that the technique or duration of the brushing was incorrect or that the toothpaste or drinking water lacked fluoride.¹⁵ ECC is a multi factorial disease, which means it depends on the presence of many factors (i.e. a host, a substrate, a bacteria, and time).¹⁶

The behavior of brushing teeth twice a day focuses mostly on removing bacteria and substrate and does not consider other factors such as teeth and saliva, which are have to do with both the host factor and the time factor. Further more, children's dental anatomies or low salivary production may increase their risk of caries.

The correlation tests between ATT, SN, and PBC and the intention to clean children's teeth after drinking milk or eating showed relations between ATT and SN and intentions to clean children's teeth after eating or drinking milk, but no relation between PBC and such intentions. This result was similar to the result obtained for intentions to help children brush their teeth twice a day. Ajzen explained that, in some cases, ATT is associated with intentions.¹⁷

Furthermore, a research study conducted in the Netherlands found relations between ATT,

SN, and PBC and oral hygiene behavior, such that PBC had a higher correlation with oral hygiene behaviors than ATT and SN. Differences across countries may be due to country-specific characteristics. According to Buunk, the TPB questionnaire should be adapted in accordance with regional and cultural differences in order to assess and evaluate oral hygiene behaviors.¹²

Furthermore, this study found a relation between intentions and the habitual behavior of cleaning children's teeth after drinking milk or eating. In accordance with TPB theory, the combination of intentions and PBC can directly predict behavior.¹⁷

Meanwhile, the correlation test between the habitual behavior of cleaning children's teeth after drinking milk or eating and ECC and plaque in children showed no relation with either ECC or plaque in children, and though the average score of behavior-related answers was good, the children exhibited a high prevalence of caries. This may be because brushing behaviors are not effective if they are not performed properly.

Another possibility is that different teeth anatomies, such as pits and fissures, can increase the risk of caries.¹⁸

As explained earlier, caries is a multi factorial disease, so there are many factors that may cause its formation. There was a difference in the correlation coefficient values for the relations between ATT, SN, and PBC and intentions for each behavior. In this study, the correlation coefficient values between the three determinants of TPB and intentions were low.

Furthermore, the correlation coefficient value for ATT was not strong. This contradicts the findings of Dumitrescu et al., who showed that ATT has a strong predictor value. However, their findings were likely due to their choice to divide ATT into two constructions: ATT affective and ATT instrumental. A model comprising both ATT affective and ATT instrumental would produce a significantly better relation than a model in which the two types of ATT are combined.¹⁹

Furthermore, the correlation coefficient value of SN and intentions in this study was also weak. Tramow and Finlay (1996) opined that SN has a low impact because only a small percentage of individuals are strongly driven by perceived social pressure.²⁰ According to Armitage and Conner, social pressure is rarely

seen as directly affecting intentions. This has led some researchers to suggest changing the concept of TPB studies.²¹ Some research has found that PBC is the strongest predictor of intentions. However, according to Ajzen, there is a possibility that PBC is weakly correlated with intentions. Similarly, the present study also showed a weak correlation coefficient value for PBC and intentions.¹⁷ This may be because the dimension relation between PBC and intention depends on the type of behavior and the situation.²²

Conclusion

This study suggests that the prevalence of ECC among children in the District of Beji, Depok, in 2016 was 53.9%, with an average dmft of 3.46 and average plaque score of 7.66. The correlation tests showed a significant relation between ATT and SN and intentions to help children brush their teeth twice a day, but no significant relation between PBC and such intentions or between such behaviors and dmft and plaque in children. With respect to the habitual behavior of cleaning children's teeth after drinking milk or eating, there was again a significant relation between ATT and SN and intentions and between intentions and behaviors, but no significant relation between PBC and intentions or between behaviors and dmft and plaque in children.

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