

**Original Article****Determinants of Oral Health Behavior among Preschool Children: Application of the Theory of Planned Behavior****Raheleh Soltani<sup>1</sup>, Gholamreza Sharifirad<sup>2</sup>, Behzad Mahaki<sup>3</sup>, Ahmad Ali Eslami<sup>4</sup>**<sup>1</sup> Medicine Education Research Center, Health Management and Safety Promotion Research Institute, Tabriz University of Medical Sciences, Tabriz, Iran.<sup>2</sup> Faculty of Medicine, Islamic Azad University, Qom Branch, Iran.<sup>3</sup> Dept. of Bio-Statistics and Epidemiology, School of Health, Kermanshah University of Medical Sciences, Kermanshah, Iran.<sup>4</sup> Dept. of Health Education and Health Promotion, School of Health, Isfahan University of Medical Sciences, Isfahan, Iran.**KEY WORDS**

Children;  
 Dental caries;  
 Oral health;  
 Theory of Planned Behavior;  
 Parent;  
 Preventive Dentistry;  
 Tooth brushing;

**ABSTRACT**

**Statement of the Problem:** Dental caries is the most common chronic disease among children. Determinants of children's oral health behavior should be better understood and known.

**Purpose:** This study aimed to investigate the predictive factors of oral health behavior among preschool children based on the theory of planned behavior (TPB).

**Materials and Method:** This cross-sectional study included 833 mother-child pairs referring to twenty health centers in Tabriz, North-West Iran, from August 2014 to November 2015. The participants were selected by multi-stage stratified random sampling. Data were collected through self-administered questionnaires completed by the participating mothers. The questionnaire consisted of demographic characteristics, oral health behavior, and TPB structures (attitude, subjective norms, perceived behavioral control, and intention).

**Results:** The mean±standard deviation (SD) of children's age was 4.6±1.1 years (ranging 3–6), and 52% were boys. 20.3% of mothers had university degrees. The mean (SD) score of children's oral health behavior was 5.8 ( $\pm 1.9$ ) out of 8. Multiple regression analysis revealed a positive relationship between all TPB structures and children's oral health behavior  $F(11,821)=41.8$ ,  $R=0.6$ , ( $p< 0.001$ ). Furthermore, the TPB structures explained 35% and 29% of the variance in children's oral health behavior and maternal intention towards it, respectively.

**Conclusion:** Based on the current finding, TBP is the important predictor of children's oral health behavior. Effective promotion interventions could be designed based on this predictor to help improving the children's oral hygiene behavior.

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Received July 2017;

Received in Revised Form October 2017;

Accepted November 2017;

Cite this article as: Soltani R., Sharifirad Gh., Mahaki B., Eslami AA. Determinants of Oral Health Behavior among Preschool Children: Application of the Theory of Planned Behavior. J Dent Shiraz Univ Med Sci., 2018 December; 19(4): 273-279.

**Introduction**

Dental caries is the most common chronic disease that can be prevented in children. [1] According to the World Health Organization, "Early childhood caries continues to be a pandemic disease worldwide". [2] Previous studies reported the prevalence rate of dental caries to be 27.3-69.5% among preschool children. [3-5]

The National Oral Health Survey conducted in Iran in 1995 found that the mean dmft score (d=decayed teeth, m=missing teeth, and f=filled teeth) was 5 for 6-year-old children. [6]

The children's dental caries not only influences their wellbeing, [7] quality of life, [8] and growth, [9] but can also be a risk factor for caries in permanent

teeth. [10] Therefore, dental caries and oral hygiene should be seriously considered in preschool children. Studies declared that dental caries could be associated with oral health behavior, eating habits, and frequency of tooth brushing in children. [3, 5, 11-13] Despite the importance of oral hygiene behavior, it is not satisfying in preschool children. [14-15] Meanwhile, parents, [16] particularly mothers play an imperative role in children's oral health. [17-18]

Promoting the children's oral health behavior is highly suggested. [3, 5] Hence, to develop effective programs, influential determinants of children's oral health behavior should be better understood. Knowing the predicting factors of oral health-related behavior can help in planning interventions that are more effective in promoting the oral health programs. More investigations should be conducted to clarify the parents' knowledge about their children's oral health behavior accurately and to identify what they need to improve it. [19]

Health behavior theories can help identify the determinants of oral health-related behavior and their influence. [20] The theory of planned behavior (TPB) describes the main elements of healthy behavior, consisting of attitude, subjective norm, perceived behavioral control, and intention. [21-22]

According to TPB, an individual's behavior is determined by intention. This intention is formed by the individual's attitude towards behavior, subjective norm, and perceived behavioral control. Attitude is defined as the beliefs about the positive or negative consequences of the engaging behavior. Subjective norm refers to someone's beliefs about other important people's thought (such as family, dentist, health nurses) regarding the specific behavior that someone should be engaged in. Perceived behavioral control is the degree to which a person believes the engaging behavior is under his/her control. [22]

Very few theory-based studies have investigated the children's oral health behavior. [23] The present study aimed to determine how TPB could predict the oral hygiene behavior in children aged 3-6 years old.

## Materials and Method

This cross-sectional study was conducted on 833 mother-child pairs with children aged 3-6 years. They referred to the Health Centers of Tabriz for routine pre-

ventive child health care (checking child growth, development, and immunization) from August 2014 to November 2015. Tabriz, the center of East Azerbaijan province, is located in Northwest Iran with a population of around 2 million. [24]

To select the participants through multi-stage stratified random sampling, twenty health centers were randomly selected from all the ten districts of the city (2 centers per each district). [25] Eligible participant were randomly selected according to the ratio of children  $\leq 6$  years of age that referred to each health center. Finally, 950 mother-child pairs were recorded from 20 centers (35-50 participants per center).

The inclusion criteria were willingness to participate in the research, mothers with children aged 3-6 years old, having profile in the health centers, and not suffering from physical, mental, and emotional diseases based on their medical profiles.

Data were collected through self-administered questionnaire completed by the mothers. They were informed about the purpose of the study and subsequently, they signed a written consent. Completing the questionnaire took approximately 25 minutes. The participants were granted some gifts (such as toothpaste, toys, notebook and so on) for their voluntarily participation in the study. The strengthening the reporting of observational studies in epidemiology (STROBE) statement was applied in this study. [26]

## Measurements

The questionnaire was composed of three sections: demographic characteristics, children's oral health behavior, and TPB constructs. The demographic characteristics included maternal and children's age, child gender, maternal occupation and education (illiterate, primary school, secondary school, high school, diploma, and academic), the number of residents at home, the number of offspring, and self-report economic status (weak, average, good).

## Children's oral health behavior

The children's oral health behaviors were evaluated via two questions derived from the previous similar study. [20] The questions were about the child's tooth brushing frequency (by using 5-point scale from 0=irregularly or never to 4=twice daily or more) and the frequency of child's tooth brushing assisted by parent (by using 5-point scale from 0=never to 4=always). The scores

could possibly range 0–8, with the higher scores indicating better oral health behavior.

#### **TPB constructs items**

The TPB constructs related to the children's oral health behavior were assessed through 18 items derived from the available literature according to the TPB procedures and guidelines. [21, 27] The TPB-based questions addressed the mother's attitude, subjective norm, perceived behavioral control, and intention towards the child's oral health behavior. The responses to all items were assessed with a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree).

#### **Mothers' attitude towards the children's oral health behavior**

The mothers' attitude was evaluated through rating 6 statements such as "It is important to do routine dental examinations for children." The scores ranged 6–30, with the higher score indicating more positive attitude towards oral hygiene behavior.

#### **Subjective norms of children's oral health behavior**

The subjective norms were assessed through six items such as "The people who are important to me (such as family, dentist, and so on) think my child's teeth should be brushed every day." The possible score range was 6–30.

#### **The perceived behavioral control of children's oral health behavior**

The perceived behavioral control was measured in form of four statements one of which was "I am confident that I can perform my child's oral health self-care." The scores ranged 4–20; the higher score indicated higher PBC towards child's oral health.

#### **Intention towards children's oral health behavior**

The intention was evaluated through two questions (one question per each behavior) like "I intend to brush my child's teeth regularly next month." The scores ranged 2–10, with the higher score being an indicative of higher intention towards child's oral health.

#### **Reliability and validity**

The content validity of questionnaire was confirmed by a panel of experts consisting of ten scholars in this field (a dentist, health education and health promotion, and experience in health care nurse). Two questions were omitted and four were revised based on the experts' comments. The mean content validity ratio (CVR) and content validity index (CVI) were calculated to be 0.79 and 0.87, respectively.

The estimated reliability of the questionnaire was 0.81 ( $p < 0.001$ ) as assessed by test-retest method (two-week interval) among 32 eligible participants. The reliability coefficient ( $\alpha$ ) was calculated for each TPB constructs and was reported to be 0.81 for attitude, 0.89 for subjective norms, 0.88 for the perceived behavioral control and 0.75 for the intention. The total reliability (Cronbach's alpha) was 0.89, indicating a good internal consistency.

#### **Statistical analysis**

All data were analyzed by using the SPSS software, version 16 (SPSS Inc., Chicago, IL, USA). The significance level of  $\alpha$  was considered 0.05 in all tests. The normality of the data was tested by Kolmogorov-Smirnov test. Descriptive statistics were performed to explore the means and standard deviation (SD) for continuous variables and prevalence (%) for categorical variables, respectively (Table 1).

The one-way ANOVA test and independent samples t-test were used to compare the oral hygiene behavior in groups of categorical variables (Table 2). The simple and multiple linear regression analyses were done to determine the predictors of children's oral hygiene behavior (Tables 3 and 4). The final analysis was done on 833 questionnaires out of 950. About 117 questionnaires were omitted because of missing data. The participation rate was 87.5%.

## **Results**

Table 1 displays the participants' demographic characteristics. The children's mean $\pm$ SD age was  $4.6 \pm 1.1$  years (range=3–6); and 52% were boys. The mothers' mean $\pm$ SD age was  $31.8 \pm 5$  (range=20–48). About 20.3% of mothers (169/833) had university degrees; 97 mothers (11.6%) were employed; and 53.9% (449/833) had two children.

Table 2 shows the association between the children's oral health behavior score and socio-demographic characteristics. The children's oral health behavior score was also statistically associated with the maternal education, father's education level, and economic status. However, the no significant relationship was detected between the oral health behaviors and maternal occupation and child's gender. The mean $\pm$ SD score of oral health behaviors was  $5.8 \pm 1.9$  out of 8, and the mean $\pm$ SD score of behavioral intention was  $9.4 \pm 2.4$  out of 15.

**Table 1:** Distribution of socio-demographic characteristics, oral health behavior and mean (SD) of each TPB construct of the participants (n=833)

Variable	Categories	N(%)	Variable	Categories	N(%)
Child's gender	Boys	433(52)	Maternal occupation	Employed	97 (11.6)
	Girls	400 (48)		Unemployed	736(88.4)
Mother's education	≤ High school	275(33)	Father 's education	≤ High school	327(39.3)
	Diploma	389(46.7)		Diploma	297(35.7)
	University	169(20.3)		University	209(25)
Economic status	Weak	218(26.2)	Number of child	1	315(37.8)
	Average	455(54.6)		2	449(53.9)
	Good	160(19.2)		≥3	69(8.3)
Child's toothache history	Yes	30.4(253)	Child's dental visits	yes	38.3(319)
	No	69.6(580)		no	61.7 (514)
The children's tooth brushing frequency	Never / Irregularly less often than daily Once a day Twice or more a day	168(20.2) 188(22.6) 369(44.3) 108(12.9)	Mother's supervision child tooth-brushing	Never/ Irregularly Sometimes Often Always	165(19.8) 266(31.9) 159(19.1) 243(29.2)
Variable				Mean (SD)	Range
Mother's age (yr.)				31.8(5)	20-48
Child's age (yr.)				4.6(1.1)	3-6
Oral health behavior (OHB)				4.8(2)	0-8
Intention(IN)				7.6(1.9)	2-10
Attitude(AT)				24.1(4.8)	6-30
Subjective norms(SN)				24.7(4.5)	6-30
Perceived behaviour control (PBC)				15.1(4.1)	4-20

SD: Standard deviation

The correlation analysis revealed a significant positive association between the children's oral health behavior and the maternal intention ( $r= 0.478, p< 0.001$ ), attitude ( $r= 0.458, p< 0.001$ ), subjective norms ( $r= 0.351, p< 0.001$ ) and perceived behavioural control ( $r= 0.499, p< 0.001$ ). The maternal intention was also significantly and positively associated with the perceived behavioural control ( $r= 0.482, p< 0.001$ ), attitude ( $r= 0.473, p< 0.001$ ) and subjective norms ( $r= 0.325, p< 0.001$ ).

According to the results of multiple regression, all TPB components were major predictors of the children-

's oral health behavior ( $F (11,821)= 41.8, R= 0.6, p< 0.001$ ). Moreover, perceived behavioral control, subjective norms, and attitude were the strongest predictors of intention (Table 4). Overall, the TPB explained 35% and 29% of the variance in children's oral health behavior and maternal intention towards oral health behaviors, respectively.

## Discussion

This study investigated the relationship between TPB constructs and the children's oral health behavior. To the

**Table 2:** Mean and standard deviation of children's oral health behavior and the associated factor, n=833

Characteristic	Categories	Frequency	Percent	Children's oral health behavior		
				Mean(SD)	f or t*	p Value
Child's gender	Boys	433	52	4.8 (2.1)	0.26	0.79 <sup>t</sup>
	Girls	400	48	4.9 (2)		
Mother's education	≤ High school	275	33	4.5 (2.2)	7.2	0.001 <sup>a</sup>
	Diploma	389	46.7	4.9 (1.9)		
	University	169	20.3	5.3 (1.8)		
Father 's education	≤ High school	327	39.3	4.5 (2.2)	7.4	0.001 <sup>a</sup>
	Diploma	297	35.7	5 (1.8)		
	University	209	25.1	5.2 (2)		
Number of child	1	315	37.8	5.2 (1.9)	7.3	0.001 <sup>a</sup>
	2	449	53.9	4.7 (2.1)		
	≥3	79	8.3	4.3 (2.3)		
Maternal occupation	Employed	97	11.6	5.1 (1.8)	2.3	0.13 <sup>t</sup>
	Unemployed	736	88.4	4.8 (2.1)		
Economic status	Weak	218	26.2	4.4 (2.1)	7.3	0.001 <sup>a</sup>
	Average	455	54.6	4.9 (2)		
	Good	160	19.2	4.9 (1.9)		

\* Tests applied: independent sample t-test, One-way ANOVA.

**Table 3:** Results of simple linear regression analysis for prediction of children's oral health behavior and mothers' intention (n=833)

Variables	Unstandardized coefficients		t	p	Adjusted R <sup>2</sup>
	B	SE			
Oral health behavior	AT	0.21	0.014	14.8	<0 .001
	SN	0.15	0.014	10.8	<0 .001
	PBC	0.25	0.015	16.6	<0 .001
	IN	0.48	0.031	15.7	<0 .001
Intention	AT	0.21	0.014	15.4	<0 .001
	SN	0.14	0.014	9.9	<0 .001
	PBC	0.24	0.015	15.8	<0 .001

AT= Attitude, SN= Subjective norms. IN= Intention, PBC= Perceived behavior control

authors' knowledge, few documents have been published about the children's oral health behavior by using TPB at the time of this study. The current findings showed that all TPB constructs were significant predictors of the children's oral health behavior; and it explained 35% of the variance in behavior. This finding confirms the previous similar research, which explained 39% of variance in brushing by the TPB components in 5-year-old children. [20] This is also in line with another similar study, which reported that TPB explained 32.3% of the variance in oral health behavior. [28]

Our results showed that TPB components were significantly associated with mothers' intention (explained 29% of the variance). The present results are in line with other studies in this field, which found that TPB components were significantly associated with the intention towards oral health behavior. [29-30] Van den Branden *et al.* [20] reported that the parents' intention towards their children tooth brushing was directly correlated with TPB constructs.

The present study showed that the children's oral health behavior was significantly and positively associated with all TPB components, and that the mothers' perceived behavioral control ( $R=0.499$ ) was the major predictor of their children's oral health behavior. This is consistent with Van den Branden *et al.*'s study [20] who found that the parents' perceived behavioral control was

the strongest predictor of their children's oral hygiene. This finding also confirms the early study by Soltani *et al.* [14] who reported that the mothers' self-efficacy towards the children's teeth brushing had positive significant correlation with the children's oral health. Likewise, Pakpour and Sniehotta [31] reported that the perceived behavioral control was the strongest predictor of tooth brushing among Iranian adolescents.

The findings of this study revealed that attitude ( $R=0.473$ ) and perceived behavioral control ( $R= 0.482$ ) were the major predictors of intention towards the children's oral health. This finding is in agreement with the studies by McDermott *et al.* [32] and Saied-Moallemi *et al.* [33] Likewise; Bennadi *et al.* [4] reported the significant relationship between maternal positive attitude towards oral health and their children's tooth brushing frequency. Attitude and perceived behavioral control are the influential factors to develop health-promoting behaviors. Health care professionals should implement programs to increase the mothers' attitude as well as perceived behavioral control regarding the children's oral health. This can lead to healthy dental habits and promote in children's oral health behavior.

According to this study, the level of oral hygiene behavior was not satisfactory among children. Soltani *et al.* [14] and Baghiani Moghadam *et al.* [15] who showed poor oral health behavior in preschool children

**Table 4:** Results of Multiple regression analysis for prediction of children's oral health behavior and intention (n=833)

Variable	Unstandardized coefficients		t	p	95% CI for B		Adjusted R <sup>2</sup>
	B	SE			Lower Bound	Upper Bound	
Oral health behaviour	AT	0.064	0.017	3.7	<0 .001	0.031	0.098
	SN	0.043	0.014	3.0	0.003	0.015	0.070
	PBC	0.119	0.019	6.3	<0 .001	0.082	0.156
	IN	0.25	0.034	7.6	<0 .001	0.191	0.324
Intention	AT	0.11	0.017	6.9	<0 .001	0.08	0.15
	SN	0.04	0.015	2.6	0.009	0.09	0.06
	PBC	0.14	0.019	7.9	<0 .001	0.11	0.18

\*F(11,821)=41.8, R=0.6 \*\*F(10,822)=35.2, R=0.548; AT= Attitude, SN= Subjective norm. IN= Intention, PBC= Perceived behaviour control  
The multiple linear regression: Demographic variables included in the model are age of maternal and child, the parents' education level, economic status, number of children, maternal employment status (insignificant factors are not present in this table), SE: Standard error

previously declared it. Children generally adopt the patterns of oral health behavior such as tooth brushing during preschool age. [34] Hence, providing appropriate programs is of great importance to promote the children's oral hygiene behavior.

Among the limitations of this study was the cross-sectional nature of the study, as well as the self-reported questionnaire, which could be a subject to social desirability and recall biases. Furthermore, there is a possibility of uncontrolled confounding and residual confounding which could negatively affect the causal inferences to be drawn from the findings. Yet, the strong point of this study was the large community-based sample and use of TBP. Further studies on oral health behavior and theory-based studies in dentistry [35] are suggested.

## Conclusion

TBP was proven as an important predictor of children's oral health behavior. This finding provides useful information to promote the children's oral health behavior. Effective educational oral health promotion interventions can be designed based on this predictor (components of TPB) to improve the mothers' perspectives towards oral health and their children's oral health behavior. Health professionals in health-care settings can provide the mothers with accurate practical information and trainings about oral self-care behavior. However, more studies are needed to confirm the results of this study.

## Acknowledgments

The authors appreciate the Education Deputy of Isfahan University of Medical Sciences for financially supporting this study (grant#393296). Appreciations are also expressed to the participants for taking time to complete the questionnaires, and the staff of health centers for their cooperation.

## Conflict of Interests

The authors declare that they have no conflict of interests.

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