Original Article

Exploratory Factor Analysis of Parental Behaviors for Preventing Childhood Caries in Rural Thailand

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Background and Objective: Dental caries is still a major health problem in pre-school children, especially in rural areas of Thailand. In early childhood caries [ECC], parents provide the total care for a child's oral hygiene. Thus, the parents' role is essential for preventing tooth decay in pre-school children both with and without cleft lip and palate. The purpose of this study was to develop the factors that characterize parental behaviors in oral hygiene for the pre-school children.

Materials and Methods: Exploratory factor analysis was used to test the relationships between the parental behaviors in oral hygiene for the pre-school children and factors from health belief model and from social learning cognitive theory.

Results: The 5 factors found to be related with one another in the analysis, including the child's oral hygiene, the parental behaviors modification in oral hygiene for the pre-school children, parental belief in oral care, parental perception of personal ability, and parental oral hygiene knowledge. These 5 factors were measured by the 14 observation variables, which can be explained with the variance at 68.98%. In addition, food choices and social support were not indicative of oral care practice.

Conclusion: The factor loading can be used to analyze the causal relationships between parental oral hygiene practices and pre-school children oral hygiene. These factors will help to determine the patterns of oral care for all preschool children both with and without the cleft palate at an early age.

Keywords: Early childhood caries, Parental behavior, Causal relationship

J Med Assoc Thai 2018; 101 (Suppl. 5): S197-S202
Full text. e-Journal: http://www.jmatonline.com

Oral health is one of the most important components of a child's well-being[1]. If a child has molar tooth decay, not only he or she cannot eat normally but this will also result in delays growth of the muscles and facial bone[2]. Early Childhood Caries [ECC] as defined by The American Academy of Pediatric Dentistry in 2009 refers to the presence of cavities in the teeth of young children[3]. There are many causes of dental caries in children is toothbrush, consumption of bottled milk, parental behaviors and other[4].

However, the main causes of dental caries in pre-school children and cleft palate children at a young age are mainly due to the parental behavior in toothbrush, food choices and other[5]. Because the children are unable to take care of their own dental health. The purpose of this research is to determine the factors that characterize parental behaviors in oral hygiene care for preschool children. Variables found may be useful for future behavior modification program.

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Materials and Methods

Study design

Cross-sectional study.

Setting

The study was conducted in 4 rural children's development centers in rural areas of Thailand. The oral hygiene of the child was measured during the routine oral health checks for children. The parents had to answer the question on the same day. The study was conducted from May 2017 to September 2017. Ethic permission number HE 601190 from Khon Kaen University Ethics Committee for Human Research.

How to cite this article: Thongjit S, Bumrerraj S. Exploratory Factor Analysis of Parental Behaviors for Preventing Childhood Caries in Rural Thailand. J Med Assoc Thai 2018;101;Suppl. 5: S197-S202.

Participants

The study population was composed of 146,811 parents with their preschoolers aged 3 to 5 years who were attending the Child Development Center in the 7th and 12th health service regions during the year. The 7th health service regions (Kalasin, Khon Kaen, Mahasarakham and Roi-Et provinces) had the lowest tooth decay in the population for the past 3 years. And the 12th health service regions (Phatthalung, Songkhla, Trang, Naradhiwat, Pattani, Yala, and Satun provinces) had the most tooth decay in the population for the past 3 years[6].

Using the rule of sample size, in the factor analysis, the ratio between the sample units and the observation variables should be between 15 to 20 units[7]. In this study, there were 62 observational variables. The sample size of this sample was at least 930. Sample selection by multi-step random method (Multi-stage sampling) was used. The Child Development Center was then used as a random unit and children with parents would be the sample.

Variables

The factors related to parental behaviors and preschool childhood caries were composed of 5 latent variables and 17 observed variables as follows: 1) perception of personal ability consisting of three observation variables: Social Support (So), Public media (Me) and Good role model (Go); 2) parental oral hygiene knowledge[8] comprising three observation variables: Remembering the content (Rem), Comprehension (Co) and Application (Ap); 3) parental belief in oral care[9] for prevention of ECC comprising five observation variables: Perceived Susceptibility (Persu), Perceived Severity (Perse), Perceived Benefits (Perbe) Perceived Barriers (Perba), and Perceived Self-efficacy (Sel); 4) the parental behaviors modification[10] in oral hygiene consisting of three observation variables: Observational Learning (Ob), Self-regulation (Re) and Moral disengagement (Mor); 5) oral care practice (OHP)[11,12] was composed of two observation variables: food choices for oral health (Fc)[13,14] and oral health care measured by Debris index (DI). The child oral hygiene comprised of one observation variable, the decayed, missing and filled teeth index, (dmft index)[15].

Data sources/measurement

The questionnaire was developed to measure the factors influencing parental behaviors in oral health care for pre-school children dividing into six parts: 1) Parent information; 2) Factors affecting the oral health care of the parents to children; 3) Knowledge of oral health care of the parents to children; 4) The attitudes towards oral care for children; 5) Cues to action; and 6) Behavioral modification. Oral health assessment was used for the dental health checkup for preschool children. The content of the questionnaire was discussed with the experts in the field and then revised accordingly.

Statistical methods

Double data entry was used to check for to data duplication and missing. Exploratory factor analysis was performed to examine latent variables under the observation variables by grouping or combining variables that were related to one another. The relationship, both positive and negative, were used. Variables within the same element were highly correlated. Each component must have an Eigen value >1, Factor loading >0.5, and each group must have two observation variables, which would be appropriate for computation. If not, it would not be included in the model. The statistics used to describe subgroups were Kaiser-Meyer-Olkin [KMO] and Bartlett's test. This measurement used to test the population's correlation metric as an identity matrix. To further test whether the variable metrics can be used to analyze the causal relationship (Causal model) with the Structural Equation Modeling [SEM] method, by examining the relationship between the two variables using bivariate relationship by Pearson product moment correlation coefficient.

Results

Participants

A total of 943 parents and preschool children were enrolled in the study, 462 of them were from the 7th health service region and 481 were from the 12th health service region.

Table 1 displays the participants' demographic data. The majority of the respondents (943, 82.4%) were female. The most common relationship to the child was the mother (64.8%). Just above half (52.3%) graduated from high school or vocational school. The most common occupation was daily wager (30.1%). The average age of the respondents was 35.73 years (SD = 11.5). The average age of the children when receiving milk other than breast milk was 10.29 months (SD = 8.90). The average age of children to start cleaning the mouth was 12.88 months (SD = 7.86) (Table 1).

Outcome data

Data obtained from the questionnaire were

Table 1. Demographic data

Variables	Number	Percentage
Gender		
Male	166	17.6
Female	777	82.4
Relationship		
Father	88	9.3
Mother	611	64.8
Grandparents	221	23.4
Others	23	2.4
Education		
No formal education	10	1.1
Elementary school	301	31.9
High school	493	52.3
Bachelor degree	139	14.7
Occupation		
Unemployed	85	9.0
Rice farmer	219	23.2
Orchard owner	223	23.6
Daily wager	284	30.1
Small business owner	82	8.7
Government work	31	3.3
Others	19	2.0

Variables	Mean	SD	MIN	MAX
Age (years)	35.73	11.15	18	69
Number of the family members	4.78	1.68	2	20
Age of receiving other milk after breast milk (months; (Exclusive breast feeding = 42 children)	10.29	8.90	0	72
Age at which children began having their mouths cleaned (months; No cleaning = 23 children)	12.88	7.86	0	72

analyzed by factorial analysis using Exploratory Factor Analysis [EFA]. Six components were identified, each with Eigen value >1 Factor loading >0.5. Bartlett's test, *p*-value <0.001, can explain the variance = 68.98%. The results are shown in Table 2 and can be expressed as Factor loading in model by separating each of the indicators as Figure 1.

Main results

When analyzing by exploratory factor analysis [EFA], the latent factor was left with 5 factors and the related observed factors were reduced to 14. The 5 latent factors and their observation factor were as follows: 1) The parental behaviors modification in oral hygiene (Modi) was related to four observed factors: Observational Learning (Ob), Self-regulation (Re), Role model and Moral disengagement (Mor); 2) Parental belief in oral care for Prevention of ECC (Beli) was related to four observed factors: Perceived Susceptibility (Persu), Perceived Severity (Perse) Perceived Benefits (Perbe) Perceived Barriers (Perba); 3)Perception of personal ability was related to two observed factors: receiving information on dental health (Me) and self-efficacy (Se); 4)Oral care practices and the child oral hygiene were reduced to one factor, i.e., child oral hygiene. The two observed factors for child oral hygiene were the index of deciduous teeth (dmft), oral cleaning, plaque index, microorganisms (DI). Finally, the parental oral hygiene knowledge (Know) was related to two indicators: Comprehension (Co) and Application (Ap).

Discussion

Key results

The result of this study demonstrated the parental behaviors in oral care for preschool children which have direct causal relationship to the child oral hygiene. The behavior is mainly modified by the belief, perception of personal ability, and the comprehension and application of knowledge.

Interpretation

Based on the findings of this present study, the individualized knowledge-based approach to disease and oral hygiene, consisting of two determinants, comprehension and application, correspond to the study of Harris et al[16], which concluded that lack of knowledge were associated with the prevalence of dental caries. The lack of knowledge can have an impact on the incidence of dental caries, which was consistent with several studies[17,18]. A randomized controlled trial of E. Jiang et al[19]. demonstrated that giving knowledge about oral hygiene alone and giving knowledge about oral hygiene along with brushing demonstration did not make the different in the caries risk in children. It showed that parental health education was an important factor in preventing tooth decay in preschool children. Indicators of attitudes towards belief in oral care (Beli) included four measures: perceptual perception, perceived barriers. Based on a systematic review by Hooley[20], the attitudes of parents about oral health care given to a child by saying that when the parents are good

Table 2. Orthogonal factors

Component	Initial eigen values			Extraction sums of squared loadings			Rotation sums of squared loading		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.640	27.292	27.292	4.640	27.292	27.292	2.886	16.976	16.976
2	1.915	11.262	38.554	1.915	11.262	38.554	2.474	14.553	31.529
3	1.558	9.163	47.717	1.558	9.163	47.717	2.029	11.936	43.465
4	1.392	8.187	55.904	1.392	8.187	55.904	1.661	9.771	53.236
5	1.127	6.629	62.533	1.127	6.629	62.533	1.432	8.425	61.662
6	1.095	6.442	68.975	1.095	6.442	68.975	1.243	7.314	68.975
7	0.837	4.924	73.900						
8	0.734	4.317	78.216						
9	0.626	3.684	81.900						
10	0.555	3.265	85.165						
11	0.503	2.962	88.127						
12	0.455	2.675	90.802						
13	0.402	2.363	93.165						
14	0.362	2.127	95.292						
15	0.292	1.719	97.011						
16	0.271	1.593	98.603						
17	0.237	1.397	100.00						

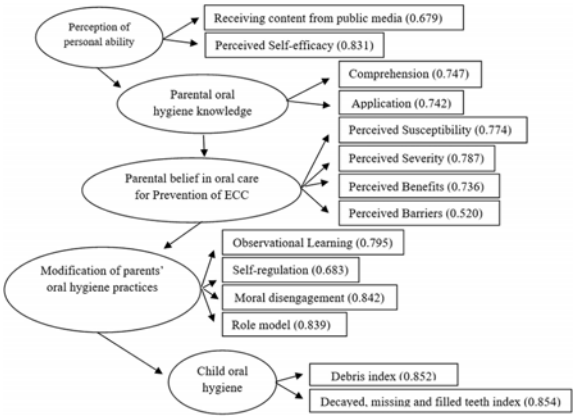

Figure 1 Factor loading of variable to determine the weight measuring latent variable of parental behaviors.

attitudes, the parents will be able to take care of their children's dental health as well. Similar to several studies[21], the leading factors were positive attitudes toward dental health in which infants and young adults are more likely to be affected by this disease than those who do not. Correlation between parental behaviors in brushing their children are significantly related to their child oral hygiene. In this present study, the theory of health beliefs was adopted to explain in the research model related to the individual beliefs. The four factors that change the behavior of oral health care of parents to children consists of Ob, Mor, Self, and Go. Corresponding to the theory of social learning, Bandura[22] believes that self-efficacy is important to make a person change the behavior. The person must believe that he or she is capable of behaving and can control himself or herself to do so.

Limitations

This study examines dental health status by using community setting. Thus, the dental caries were not confirmed with x-ray or laboratory.

Generalisability

The results of this present study showed the factors that could use to measure parental behaviors for the oral health of their pre-school children with cleft lip and palate. It can be used as factors to understand parental behaviors and/or to design a program to modify parental behaviors to improve the oral hygiene of their pre-school children, in which this can also be applied to the children with cleft lip and cleft palate and the application may also cover the areas in rural Thailand.

What is already known on this topic?

Food preferences and oral health care of children are known as parental factors (including their knowledge and attitudes) that affect the oral hygiene of school children as well as children with cleft palate.

What this study adds?

The new knowledge gained from this research is that the food choices for oral health is not a parental behaviors measure that affects children oral hygiene. The Exploratory Factor Analysis method can provide us with a sequence for each observed variable. Future work using Structure Equation Model can be achieved to calculate the strength of each component in the predictive model to find key factors which influence the oral care behavior.

Acknowledgements

The present study was supported by the Center of Cleft Lip-Cleft palate and Craniofacial Deformities, Khon Kaen University under Tawanchai Royal Grant Project. We would like to express my deepest and sincere gratitude to my co-advisor, Associate Professor Dr. Manop Kanato for his kindness in providing an opportunity to be his advisee. We are also appreciated for his valuable supervision, suggestions, encouragement, supporting, guidance and criticism throughout the course of my study.

Funding

This study was granted by Faculty of Medicine, Khon Kaen University, Thailand (Grant Number IN60333)

Potential conflicts of interest

The authors declare no conflict of interest.

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