Asian Journal of Dental Sciences

Volume 7, Issue 1, Page 186-193, 2024; Article no.AJDS.117907

Development of an Education Intervention for Parents to Improve Oral Health of Children in Vientiane Province, Lao P.D.R.

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/117907

Original Research Article

Received: 27/03/2024
Accepted: 31/05/2024
Published: 11/06/2024

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Cite as: *Vongsa, Souksavanh, Khamphouvy Chanbounmy, Phetmany Sihavong, Soudsakhone Phanpadith, Somneuk Sangvilay, Phetlamphay Sidanoumonh, Phonesavanh Soundara, Maiboun Simalavong, Chanthavisao Phanthanalay, and Vilada Chansamouth. 2024. "R". Asian Journal of Dental Sciences 7 (1):186-93. https://journalajds.com/index.php/AJDS/article/view/194.*

ABSTRACT

Background: Dental caries is a major problem in young children worldwide, particularly in Southeast Asia. The prevalence of dental caries among preschool children is very high. In addition, parents are playing an important role in the development of caries in children.
Objective: The aim of this study was to evaluate dental education intervention for parents to improve oral health of children in Vientiane Province, Lao P.D.R. (Laos).
Methods: This is a cohort study with a follow-up period of 3 months in two kindergartens in Vientiane province. Using modified oral health literacy and behavioral questionnaires to interview the parent or guardian before and after giving the education intervention. The oral health examination of all preschoolers was observed to record the quantity and severity of dental caries.
Results: A total of 218 children aged 3-5 years old in two kindergartens in Vientiane province, 117 (53.70%) were boys and 101 (46.30%) were girls. The prevalence of dental caries was 69.30% and the decayed, missing and filled teeth (dmft) index was 3.88 at baseline, lastly increased to 4.67 in the subsequent examination at 3 months post-intervention. In comparison with the pulpal involvement, ulceration, fistula and abscess (pufa) index was decreasing from 1.56 to 1.31 after intervention. The guardians who participated in the survey were mostly father/mother (90.80%), their average age was 35.79 ($\pm$ 6.70) years old. There was a significant difference in the level of oral health knowledge, behavior and parental practices after intervention (t = 5.41, 95% CI = 2.10-4.50, $p < 0.001$).
Conclusion: The findings of this investigation indicate that providing dental education to parents is an important way to improve oral health knowledge, behavior, and parental practices. However, the severity of dental caries in young children remains high. Therefore, it is crucial to implement oral health education and prevention programs in kindergartens.

Keywords: Dental education; intervention; dental caries; preschool children.

1. INTRODUCTION

Dental caries is a major problem in young children worldwide, particularly in Southeast Asia, the prevalence of dental caries among preschool children is very high (79%) [1]. A longitudinal study in Cambodia, Indonesia and Lao PDR reported the prevalence of dental caries and odontogenic infections in the primary dentition was 94.40% and 69.20% respectively [2]. To date, many studies presented the severity of dental caries in preschooler and young children vary from 73.30% to 94.90% in Laos including the Lao National Oral Health Survey in 2013 [3-8]. In addition, parents are playing an important role in the development of caries in children [9], dental caries does not only cause much pain and suffering for young children, the severe dental caries affects the height and weight of children too. Also, it has been shown that large levels of untreated dental caries can interfere with child growth and development [10-12]. Apart from this, Parents are recognized as key influencers in the development of caries in children in relation to the oral health educational intervention program based on the Theory of Planned Behavior supports the oral self-care behavior both in mothers and in their children [13]. Also, the burden of oral disease among primary school children in low- and middle-income countries could be decreased by implementing school-based interventions [14]. Similarly in Laos, the twenty-two primary schools in Vientiane Capital had been obtained the Fit For School programme for two years [2]. Nevertheless, the interventions of oral health knowledge, behavior and practices of parent or guardian among preschool children have ever been conducted in Laos.

Vientiane province is located in the northwest of the country nearby Vientiane Capital including 11 districts with approximately 470,000 populations [15], unfortunately there are not many oral health surveys among preschool children. Therefore, the aim of the present study was to evaluate dental education intervention for parents to improve the oral health of children in Vientiane Province, Lao P.D.R. Moreover, this survey was able to describe changes in terms of oral health knowledge, behaviors and parental practices over a period of 3 months, to investigate the difference of children's oral health status before and after dental education obtained to their parents and to determine any risk factors of dental caries development in children.

2. METHODOLOGY

2.1 Study Design

The preliminary survey and a follow-up survey were conducted between May and September 2023 in Vientiane Province. The Phonemee and Provincial (Mittaphab) kindergartens in Viengkham district were selected through convenience sampling methods. All preschoolers aged 3-5 years old who were enrolled in these kindergartens in 2023 and their parents or guardians written informed consent forms were obtained for their agreement to be included in this study.

2.2 Sample size Calculation

The sample size was calculated by following formula of Thomas P. Ryan [16].

n = $\frac{FP(100-P)}{d^2}$ ≈ 206 children (P=73.3%; d=10%; F=10.51)

n = sample size
F = value that depends on 5% of significance level and 90% power of the study
P = the prevalence of dental caries among children aged 3 years old [8]
d = smallest difference of clinical or scientific importance
As a result, the sample size was estimated as 206 children. Overall, there were 218 preschoolers with their parents or guardians recruited to the present study.

2.3 Data Collection Methods

Data were collected through researcher-made questionnaires by interviewing the parent or guardian and clinical oral examination of their children at baseline and three months after intervention.

The questionnaire was consisted of three parts including socio-demographic data, oral health knowledge, behavior and practices. The first part focuses on the demographic characteristics of the parent or guardian including age, educational level and employment. Secondly, the oral health knowledge questionnaire was gathered by 15 questions and all responses were scored from 1 (strongly disagree) to 5 (strongly agree), the possible score range was 0-75 and the higher score than 80% indicated the high level of oral health knowledge. Lastly, the oral health behavior and practices of the parents and their children were gathered by 8 questions (6 items about parents or guardians and 2 items about their children). The possible score range was 0-16 and the higher score than 60% indicated the high level of oral behavior and practices.

During intervention, two researchers had given short lecture to the parents or guardians about the importance of oral health care for preschool children and showing them how to brush their teeth by using teeth model practicing. At the same time, a brochure and five minutes video contents of primary teeth development and how to prevent dental caries for preschool children were delivered to parents via Whatsapp or Facebook messenger (a brochure was developed and proofed by the Faculty of Dentistry, University of Health Sciences and a video was produced by the Colgate-Palmolive (Thailand) Co.Ltd.).

Regarding the clinical oral examination form for children, it was modified versions of the World Health Organization assessment (WHO) form 1997 and the data on caries had been collected worldwide using the DMFT/dmft - index, which reports caries severity and prevalence based on the number of teeth which are decayed (D/d), missing due to caries (M/m), or filled (F/f). This index provides information on caries experience and restorative and surgical treatment [17]. The pufa index was the new index to evaluate the prevalence and severity of oral conditions resulting from untreated dental caries. The pufa index is also used to record the number of teeth which have extensive caries with pulpal involvement. This index records Pulpal exposure (P/p), Ulceration (U/u), Fistula (F/f) and Abscess (A/a) [18]. For clinical oral examination, participants were lying on the table in a supine position. The two examiners carry out a headlamp were fully gloved and wore a mask. All intraoral examinations were carried out with meticulous infection control.

The children's height and weight were measured with a pediatric height and weight measurement apparatus specifically designed to accurately measure the height and weight of small children (manufactured by: Tanita Scales Corporation, Japan. Model number: 174-8630 HD-655, 2009).

2.4 Statistical Method

To analyze the dental caries data, the mean number of decayed, missing and filled teeth for

primary was calculated based on the detection codes assigned to for each tooth. The percentage of children with a dmft score equal or greater than one was used to calculate severity of dental caries. And the pufa index was scored and calculated as dmft index.

SPSS version 22 (SPSS, Inc., Chicago, IL, USA) statistical software was used to analyze the data. Descriptive statistics were performed using means and standard deviation, median, range and frequencies for categorical data. Paired samples *t*-test was used to compare the dental caries, oral health knowledge, oral self-care behaviors and practices score at baseline and follow-up (immediately and 3 months after the intervention). For all tests, the significance level of α was considered as 0.05.

3. RESULTS

A total of 218 children, 117 (53.70%) were boys and 101 (46.30%) were girls (Table 1). Among those, the guardians who participated in the survey were mostly father or mother (90.80%), their average age was 35.79 (± 6.70) with the interquartile range from 19 to 65 years old. About 17.90% of the guardians had completed college/university, 34.90% completed high school and only 6% was illiteracy. The most common occupation was government employed (45%), followed by farmer (26.60%), worker (14.20%), business/self-employed (11.40%) and others (1.80%) respectively see in Table 2.

At baseline, the level of oral health knowledge of parent or guardian was 42.70%, which was increasing in three months follow-up (60.60%, $p < 0.001$). It showed that there was a significant difference in the level of parental oral health knowledge after intervention. Also, the mean score of parental oral health behavior and practices were statistically increasing after having the oral health education intervention; which was only 36.70% at baseline and increased to 48.60% ($p < 0.001$) in three months later as shown in Table 3.

The prevalence of dental caries was 69.30% and the dmft index was 3.88 at the preliminary, then increased to 4.67 in the final survey. On the other side, the pufa index was decreasing from 1.56 to 1.31 after intervention. Overall, there was no significant difference of oral health status of children during dental educational intervention to their parents or guardians ($p > 0.001$) see in Table 4.

Table 1. Demographic data of children by age group and sex

Age/sex	Boy	Girl	Total
3 years old	31 (64.60%)	17 (35.40%)	48 (22.00%)
4 years old	45 (51.20%)	43 (48.80%)	88 (40.40%)
5 years old	41 (50.00%)	41 (50.00%)	82 (37.6%)
Total	117 (53.70%)	101 (46.30%)	218 (100%)

Table 2. Socio-demographic data of parent/guardians

1. Age		**35.79 (± 6.70) 19-65 years old**
2. Sex	Male	80 (36.70%)
	Female	138 (63.30%)
3. Education Levels	Illiteracy	13 (6.00%)
	Primary school	21 (9.60%)
	Secondary school	65 (29.80%)
	High school	**76 (34.90%)**
	College/University	39 (17.90%)
	Others	4 (1.80%)
4. Occupations	Government employed	**98 (45.00%)**
	Business/ self-employed	25 (11.50%)
	Farmer	58 (26.60%)
	Worker	31 (14.20%)
	Others	6 (2.70%)
5. Relationship to a child	Father/ mother	**198 (90.80%)**
	Grandfather/ grandmother	13 (6.00%)
	Uncle/ aunt	6 (2.80%)
	Others	1 (0.40%)

Table 3. Oral health knowledge, behavior and practices of parent or guardians

Variables	Before	After	Paired T-test
	n=218(%)	n=218(%)	
Oral Health Knowledge of Parents			
Low/moderate level	125	86	Mean difference:3.30
(≤80%, 21-56 points)	(57.30%)	(39.40%)	t = 5.41
High level	93 (42.70%)	132	95% CI = 2.10-4.50
(>80%, 57-70 points)	54.81	(60.60%)	$p < 0.001$
Mean	6.88	58.12	
SD	21-70	6.03	
Min-Max		46-72	
Oral Behavior and Practice of Parents			
Low/moderate level	138	112	Mean difference:0.93
(≤ 60%, 2-9 points)	(63.30%)	(51.40%)	t = 3.74
High level	80	106	95% CI = 0.40-1.40
(> 60%, 10-15 points)	(36.70%)	(48.60%)	$p < 0.001$
Mean	8.52	9.45	
SD	2.54	2.23	
Min-Max	2-15	3-25	

Table 4. The oral health status of children

Variables	Before	After	P-value
dmft index	3.88	4.67	> 0.001
dt	3.72 (69.30%)	3.78 (66.50%)	
pufa index	1.56 (41.30%)	1.31 (30.30%)	> 0.001

Table 5. Height and weight of children

	Before intervention	After intervention
Height (cm)	103	103
Weight (kg)	15.73	14.83

There was no difference of children's height average in a 3 months follow-up and the average of weight was slightly decreased (see in Table 5).

There was a correlation between the pufa index of children and parental oral health knowledge at baseline ($p = 0.043$). After intervention, the dmft index was associated with parental behavior and practices ($p = 0.047$). However, there were no relationship between parental education level and their child oral health status.

4. DISCUSSION

Tooth decay is a worldwide public health problem and toothache and dental sepsis is common worldwide [19]. The prevalence of untreated dental caries in children particularly in the deciduous (primary) dentition is extremely high in many developing countries, which is concerning from a general health and well-being point of view. A review of the dental literature reveals that 95% of the decayed primary teeth of children of low-income African and Asian nations remain untreated [20].

The present study demonstrated that the dental caries prevalence in preschool children aged 3-5 years old was 69.30%, which was lower than the Lao national oral health survey in 2013 (73.30%) [8]. The prevalence of dental caries in 3-4 years old children in Vientiane capital was 82% and the dmft index was 5.50 that were higher than the current results [7]. These differences might occur due to socioeconomic status, health education, environments, lifestyles, and family background. Besides, the Thai national oral health reported 75.60% of caries in the primary dentition [21] and the caries prevalence in preschool children in Samut Sakhone Province, Thailand was 80.80% and mean of dmft was 8.20 [22] that were higher than the current study too.

Additionally, the parent or guardian's education level was one of the most common risk factors for dental caries among young children

[1,12,22,23]. In contrast, our study showed that the oral health status of preschoolers was not related to their parents' education level.

Similar to the findings of previous study [13], after intervention, the mean score of perceived behavioral and parental practices was increased significantly. This finding is also consistent with study by Pan et al. [24] that found the oral health knowledge, behaviors and parental practices among migrant children were significantly improved during a one-year follow-up period [25-27].

This study has several major limitations. First, this was a prospective study with short duration of follow-up, it was unable to indicate the relationship between the parents' behavior and their children's dental caries. Second, there were 11 districts in Vientiane province, only two public kindergartens with small sample size in Viengkham District were purposively selected. Therefore, the results of the present study could not represent the preschool children and their parents in the province. Third, the calibration was not carried out, there was no data of the level of agreement on diagnosis between and within the dentists. Without calibration, the compromises might be appeared in the findings of the present study. Finally, the behavioral questionnaire of parent or guardian was performed by question-and-answer method without observations and no data of eating behavior either parent or their child.

To fully evaluate the impact of the education intervention program for parents on children's oral health, a longitudinal or quasi-experimental study will be necessary.

5. CONCLUSION

The findings of this investigation indicate that providing dental education to parents is an important way to improve oral health knowledge, behavior, and parental practices. However, the severity of dental caries in young children remains high. Therefore, it is crucial to implement oral health education and prevention programs in kindergartens.

Additionally, involving parents or guardians and the community in the design of the intervention model would likely make it more effective. Long-term follow-up could also help identify any changes in outcomes such as dental caries and oral health practices.

ETHICAL APPROVAL AND CONSENT

The protocol of the study was reviewed and approved by the Department of Education of Viengkham District and the Research Ethics Committee of University of Health Sciences, Lao PDR. (No. 495/REC, dated: 6th April, 2023) before the study began. Also, the written informed consent was obtained from the guardians of the preschooler prior to the survey.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

ACKNOWLEDGEMENTS

We would like to thank the Asian Development Bank for its support to this CRF initiative. We are grateful to Dr. Alexo Esperato and the TA TA9397-REG organization team for their support, and to thank the parental/guardians and their children for participation and all teachers in kindergartens for their collaboration and kind support in this study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/117907