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研究題目：Effectiveness of an oral health education program among 12-year-old Vietnamese schoolchildren.

Introduction：

Since 1980, Vietnam has run the School Oral Health Promotion Program among primary schools, but its effects are insufficient. The finding of The National Oral Health Survey in 1999 showed that 59.1% of 12 years old children had at least one tooth decay, 84% of them suffered from gingivitis and periodontitis, and 50.0% of all-aged children brushed their teeth once a day or less. Nonetheless, there was no oral health promotion has been administrated in a secondary school in Vietnam. Therefore, the purpose of this study was to determine the effectiveness of oral health education on oral health knowledge, behavior, oral hygiene, and gingival health among 12-year-old students in Vietnam.

Methods：

An oral health education intervention was conducted in Hue city, located on the Central Coast of Vietnam. The sample was recruited cluster by schools. Among 23 middle schools in Hue city, two schools were randomized selected in the urban and two schools in suburban. The participants were all 12-year-old children from these schools who had informed consent, had no critical medical problems, and were not absent in any examination days.

The baseline survey was carried out in March 2018 for all students, including a self-administrated questionnaire and an oral examination at each school. The questionnaire concerning oral health-related behaviors and oral health knowledge. The oral health behaviors included four questions related to toothbrushing frequency, use of fluoride toothpaste, dental visiting frequency, and sugary consumption frequency. A desirable behavior response was scored as 1-point；otherwise, scored as 0-point. Oral health behavior score（OHB, score：0-4）was calculated by adding the score of each question. The knowledge questionnaire in this study was modified from the oral health knowledge test applied by Blizniuk et al.（Table 1）. Each correct response was awarded 1-point；the cumulative score was calculated for a total knowledge score（OHK, score：0-10）.

All students were clinically examined in their classrooms by the same two calibrated dentists at baseline and 6-month follow-up. Dental caries was assessed using Decayed, Missing and Filled Teeth（DMFT）index, Oral hygiene was evaluated by using the Debris Index（DI）which is one component of Oral Hygiene index of Greene and Vermillon, and gingival status was assessed by P-M-A index of Massler for anterior teeth of maxilla and mandible.

Table 1 Oral health knowledge questionnaire

Q1	Dental decay is caused by bacteria of the oral cavity	True	False	Don't know
Q2	Sweet food and drink have a positive effect on health	True	False	Don't know
Q3	Bleeding when brushing is a primary sign of gingivitis	True	False	Don't know
Q4	Gingivitis is unavoidable	True	False	Don't know
Q5	Plaque is black staining on teeth	True	False	Don't know
Q6	Use of fluoride makes teeth stronger	True	False	Don't know
Q7	The teeth should be brushed at least twice a day	True	False	Don't know
Q8	Visiting a dentist once a year helps to preserve oral health	True	False	Don't know
Q9	Oral health cannot affect general health	True	False	Don't know
Q10	Smoking can cause oral cancer	True	False	Don't know

Oral health education（OHE）intervention

After completing the survey and examination, the intervention group（IG）received a 45-minute education session, including a lecture by a dentist, an oral self-check-up session using a hand mirror（PROSPEC dental mirror）, and a tooth brushing practice. The intervention was a one-session intervention with no reinforce supplement within six months. The control group（CG）did not receive any educational activities.

All statistical analyses were conducted using the Statistical Package for Social Sciences（IBM SPSS version 21.0；IBM Co., Armonk, NY, USA）. A difference-in-difference analysis（DiD-analysis）was used for all outcome parameters to explore the effect of intervention after six months.

Results：

In the beginning, five hundred and forty-five students in four schools were allocated to either the intervention group（n＝291）or the control group（n＝254）. The dropout rate at 6-month follow-up was 16.8% for the intervention and 13.4% for the control. The socio-demographic data of participants in the two groups were presented in table 2. The groups were significantly different in all socio-demographic characteristics.

Table 3 presented the comparison of data within the same groups and between the two groups. At baseline, the knowledge score of schoolchildren in the IG was significantly higher than the ones in CG, whereas the behavior score was not different between them. After six months, only the IG showed significant improvements in knowledge score and behavior score. Statistically significant differences in OHK and OHB were detected between two groups at 6-month post-intervention. Concerning the oral health behavior at follow-up, 'brushing teeth twice a day' and 'using fluoride toothpaste' in IG was reported significantly higher scores than in CG, but the reported of 'Consuming sugary food' and 'Dental visit in last twelve months' were not different between two groups.

Regarding the clinical status, except for the gingival health index（PMA score）, there was no significant difference between the IG and CG at baseline. Six months later, the number of decayed teeth and the PMA score significantly increased in both IG and CG. The oral hygiene（Debris score）worsen in CG, but no change found in IG（Table 3）.

Difference-in-difference model

Table 4 presents the difference in changing oral health knowledge, behavior, and clinical status in IG and CG over six months. Both the knowledge score and behavior score of IG significantly increased when compared with CG (the coefficients were 0.913 and 0.316, respectively). Among the oral health behavior, there was a relative increase of 0.121 points in 'brushing teeth at least twice a day,' and 0.223 points in 'using fluoride toothpaste' in IG compared to CG. Comparing changes in Eating/drinking sugary food and Dental visit experience showed no significant difference. The clinical outcomes in IG, relative to CG, showed significantly improving only in oral hygiene (Debris index score decrease 0.52 point). Changes in the number of decayed teeth and gingivitis status (PMA score) were not significantly related to the intervention.

Table 2 Socio-demographic characteristics of participants by groups

	Total	Intervention	Control	p-value*
	Number (%)			
Total	462	242	220	
Sex				
Girl	252 (54.5)	149 (61.6)	103 (46.8)	0.001
Boy	210 (45.5)	93 (38.4)	117 (53.2)	
Residency location				
Urban	260 (56.3)	150 (62.0)	110 (50.0)	0.010
Suburban	202 (43.7)	92 (38.0)	110 (50.0)	
Mother's level of education				
No school/primary school	55 (11.9)		26 (11.8)	
Secondary school	97 (21.0)	42 (17.4)	55 (25.0)	
High school	41 (8.9)	15 (6.2)	26 (11.8)	0.0 02
College/university	58 (12.6)	38 (15.7)	20 (9.1)	
No mother in household	8 (1.7)	1 (0.4)	7 (3.2)	
Do not know	203 (43.9)	117 (48.3)	86 (39.1)	
Father's level of education				
No school/primary school	40 (8.7)	16 (6.6)	24 (10.9)	
Secondary school	92 (19.9)	42 (17.4)	50 (22.7)	
High school	56 (12.1)	24 (9.9)	32 (14.5)	0.0 12
College/university	60 (13.0)	39 (16.1)	21 (9.5)	
No father in household	19 (4.1)	7 (2.9)	12 (5.5)	
Do not know	195 (42.2)	114 (47.1)	81 (36.8)	
Mother's occupation				
Government/company worker	84 (18.2)	47 (19.4)	37 (16.8)	
Self-employed/freelancer	317 (68.6)	173 (71.5)	144 (65.5)	
Unemployed	33 (7.1)	11 (4.5)	22 (10.0)	0.0 27
No mother in household	20 (4.3)	10 (4.1)	10 (4.5)	
Do not know	8 (1.7)	1 (0.4)	7 (3.2)	
Father's occupation				
Government/company worker	107 (23.2)	64 (26.4)	43 (19.5)	
Self-employed/freelancer	294 (63.6)	159 (65.7)	135 (61.4)	
Unemployed	3 (0.6)	1 (0.4)	2 (0.9)	0.0 07
No mother in household	39 (8.4)	11 (4.5)	28 (12.7)	
Do not know	19 (4.1)	7 (2.9)	12 (5.5)	

＊ Chi-square test

Table 3 Oral health knowledge, behaviors, and clinical status in the intervention group and control group, at baseline and at follow-up

	Intervention group			Control group			IG vs CG	
	Baseline	Follow-up	p-value[a]	Baseline	Follow-up	p-value[a]	p-value[b]	
							Baseline	Follow-up
	mean(SD)	mean(SD)		mean(SD)	mean(SD)			
Oral health knowledge	5.77(2.19)	6.64(2.53)	**<0.001**	5.27(1.97)	5.22(2.38)	0.072	**0.010**	**<0.001**
Oral health behaviors								
Brush teeth twice a day or more	0.76(0.46)	0.78(0.42)	0.504	0.70(0.46)	0.60(0.49)	**0.003**	0.174	**<0.0 01**
Use fluoride toothpaste	0.20(0.40)	0.43(0.50)	**<0.001**	0.30(0.46)	0.30(0.46)	1.000	**0.013**	**0.009**
Visit dentist in the paste 12 months	0.33(0.47)	0.28(0.45)	0.175	0.30(0.46)	0.31(0.46)	1.000	0.549	0.508
Consume sugary food/drink less than once a day	0.35(0.48)	0.36(0.48)	0.905	0.39(0.49)	0.37(0.49)	0.712	0.330	0.669
Total score	1.64(0.92)	1.84(1.0)	**0.003**	1.70(0.95)	1.59(1.03)	0.094	0.750	**0.008**
Oral health status								
Number of teeth	26.84(1.91)	27.34(1.38)	**<0.001**	26.39(2.34)	27.08(1.74)	**<0.001**	**0.023**	0.068
Decayed teeth	2.89(2.86)	3.38(2.79)	**<0.001**	2.61(2.65)	3.11(2.76)	**<0.001**	0.286	0.287
Debris index	2.55(0.96)	2.53(1.01)	0.849	2.55(0.99)	3.07(0.78)	**<0.001**	0.834	**<0.001**
PMA score	14.12(6.12)	14.98(5.26)	**0.005**	16.07(4.83)	16.83(4.57)	**0.004**	**<0.001**	**<0.001**

[a] paired t-test [b] Independent t-test

Table 4 Adjusted Difference-in-Difference Estimates of the impact of oral health education on oral health knowledge, behavior, and clinical status

Variables	β (SE)	p-value
Oral health knowledge	0.913 (0.300)	**0.002**
Oral health behaviors		
Brush teeth twice a day or more	0.121 (0.059)	**0.040**
Use fluoride toothpaste	0.223 (0.060)	**<0.001**
Visit the dentist in the past 12 months	−0.054 (0.061)	0.373
Consume sugary food/drink every day	−0.26 (0.063)	0.676
Total score	0.316 (0.127)	**0.013**
Oral health status		
Untreated decayed teeth	<0.001 (0.353)	0.999
Debris index	−0.517 (0.123)	**<0.001**
PMA score	0.100 (0.690)	0.884

Sex, Residency location, Father's/Mother's educational level, Father's/Mother's job, and the number of teeth were adjusted.

Discussion：

The results of our study indicated that the education program was effective in improving oral health knowledge, behavior, and then had a positive impact on plaque control amongst 12-year-old school children.

School-based oral health education programs have found useful in many studies in other countries. However, to our knowledge, this is the first time an oral health promotion program was applied and reported among secondary school children in Vietnam. The oral health education in this study was an easy-to-implement and low-cost intervention which focus on plaque control and gingivitis for Vietnamese adolescent.

Six months after the intervention, children's knowledge scores in the intervention group showed significant improvement, as previously found in many studies. The result of our one-time education also contributes to the conclusion that oral health education is effective in

improving knowledge regardless of the funding or additional support.

Another remarkable result is that after the intervention, oral health behavior significantly improved in the intervention group. Concerning the toothbrushing habit, the score in the IG was relatively increased compared to the CG. Although the improvement in the IG was not significant when compared before and after the intervention, interestingly, the OHE show an effect in preventing the negative changing trend, which was found in the CG. Unlike the effectiveness of OHE on toothbrushing and using fluoride toothpaste habits, we did not see any significant change in either visiting dentists or sugary food consuming practice. A reasonable explanation for the high-sugar diet in schoolchildren is that most schools have school-canteen, which are selling full of sweet food or drink. Besides, students also reported that their parents were too busy to bring them to the dentist even when they have severe tooth pain. This situation could explain why there was no significant change in visiting the dental clinic among both groups.

Regarding the clinical data, our intervention showed a positive impact on oral hygiene, which prevented the deterioration of plaque control. However, no improvement in gingival health and caries status was found after six months. It is plausible that several limitations might have influenced the results obtained. First, the current intervention is a solely one-time OHE with neither any support from school nor reinforce supplements. Also, our intervention only targeted schoolchildren, not a whole scenario. We did not involve any change in school or home environment, which has been confirmed as essential factors for changing oral health behavior as well as status in children. Another limitation of this study was the unexpected high dropout rate (16.8% in IG and 13.4% in CG), which can be explained by the time-frame of data collection. The baseline data collection was conducted in October 2018 while the 6-month follow-up examination was performed in April, which was usually the busiest time in school-year. Many students were absent on the examination day because of their busy academic schedules. The fact is that secondary schools follow a different curriculum from primary school. The stress children suffered from school curriculum may weaken the effect of OHE in secondary schools. This suggested that other interventions conducting in the future should overcome this obstacle to achieve more effective outcomes.

We are aware that our study design may have limitations. Firstly, we used the cluster-randomized sampling method instead of a true randomized trial, which is a more reliable design for providing evidence. However, in a school-based setting, school randomized allocated into the study groups could prevent the information contamination between students. Secondly, the sample of our intervention was chosen from the urban and suburban of one city of Vietnam, which could not represent the whole population.

Although we randomly assigned one school in the urban area and one school in the suburban area for each group, there were still many parameters that were different between the two groups from the beginning of the study. To address this limitation, DiD-analysis

adjusted for socio-demographic characteristics was conducted in all of the parameters to explore the effectiveness of intervention over six months.

Conclusion：

　Our present OHE program was found to have a positive effect on oral health knowledge, behavior, and oral hygiene. However, no effect as regards reducing gingivitis and prevention dental caries among 12-year-old schoolchildren. Although the effect was not as we expected, the positive results of our study still encourage further OHE program for secondary schoolchildren to prevent the deterioration of their oral health status.

Presentation：

1. Relationship between self-perceived oral health and oral health status among 12-year-olds in Vietnam（Poster presentation）
   Nguyen Thi Nhat Vy, Takashi Zaitsu, Akiko Oshiro, Yoko Kawaguchi
   The 68th General meeting of Japanese Society of Oral Health（JSOH）, Shiga, May 22-24, 2019