International Journal of Community Medicine and Public Health
Noochpoung R et al. Int J Community Med Public Health. 2018 Jul;5(7):2742-2749
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: http://dx.doi.org/10.18203/2394-6040.ijcmph20182608

Original Research Article

Dietary assessment of the 'sweet enough program' for primary school students in Chiang Mai, Thailand

Rakchanok Noochpoung, Shyamkumar Sriram*

Department of Health Services Policy and Management, University of South Carolina, Columbia, South Carolina, USA

Received: 24 April 2018
Revised: 30 May 2018
Accepted: 31 May 2018

***Correspondence:**
Dr. Shyamkumar Sriram,
E-mail: shyam.silverhawk@gmail.com

ABSTRACT

Background: Since 2007, Chiang Mai Public Health Office has conducted a campaign called "Chiang Mai On Wan" to decrease sugar consumption. The aim of this study was to evaluate the dietary patterns of students in schools participating in the program.
Methods: The cross-sectional data were obtained from primary school children during November 2010 to February 2011. A total of 240 children were selected from Prathom 5 students (US Grade 5) in 12 schools. Sweet Enough Program (SEP) schools are those which implement public nutrition policies and supportive environments according to the Ottawa Charter, including no candy, no high-risk decay food or drink, and campaigns to reduce sugar consumption. Dietary patterns were collected using 7-day meal books in which each student recorded individual consumption.
Results: Students in the SEP were found to have a much lower sugar intake than those in non-SEP schools. All students consumed candy, jelly and sweet snacks but the percentages of candy, jelly, and sweet snacks for SEP students were 1.7%, 3.4%, and 11.8%, respectively, while non-SEP students' percentages were 26.4%, 11.6%, and 37.2%, respectively. There were significant differences between program school students and non-program school students with regards to candy ($p<0.001$), jelly ($p=0.043$), sweet crackers ($p<0.001$), biscuit ($p<0.001$), and chips ($p<0.001$).
Conclusions: The success of this program is highlighted by the nutritional changes among the students. This was achieved by creating public health policies and supportive environments, as set out in the Ottawa Charter strategy.

Keywords: Dietary assessment, Sweet enough program, Primary school student

INTRODUCTION

Healthy eating patterns in childhood and adolescence promote optimal childhood health, growth, and intellectual development; prevent immediate health problems, such as iron deficiency anemia, obesity, eating disorders, and tooth decay; and may prevent long-term health problems, such as coronary heart disease, cancer, and stroke.[1] Steyn reviewed the scientific evidence that suggests that sugar is a risk factor in developing various illnesses. The patterns of sugar consumption and the sugar-related conditions experienced by adults and children were examined.[2] Sugars are an integral part of decay etiology.[3] Snacking has gained an increasing role as a risk indicator for decay development in children.[4] Low-nutrient and energy dense foods are characterized by a high content of added sugar, but several modern snack products such as chips (crisps), popcorn and shrimp crackers, while not sweet, are still potentially cariogenic due to their extensively hydrolyzed starch. In 2003, an

expert panel of the World Health Organization (WHO) has identified the association between tooth decay and excessive sugar consumption and the strength of evidence linking dietary factors to dental cavity.[5]

The Thai oral health national survey of 2007 reported that 56.87% of children aged 12 years old had decay. These Children have a 1.55 according to the decay missing filling teeth index (dmft).[6] A Chiang Mai survey in 2008 showed the prevalence of decay in the same age group as 42.8% and a dmft of 1.9.[7] Since schools are an important food source for children, dental health prevention and promotion have been performed in schools.[5] However, health promotion cannot be compartmentalized to specific parts of the body. Dental health promotion should be fully integrated into broadly based health-promoting strategies and should be supplemented with more disease-specific policies.[8]

Since 2007, the Dental Department of the Chiang Mai Public Health Office has conducted a campaign to decrease sugar consumption called "Chiang Mai On Wan" in Chiang Mai (Mae Taeng, Hang Dong and Muang Districts). "Chiang Mai On Wan" is a provincial program of the 'Sweet Enough Network' that was initiated in 2003 and supported by Thai Health, the non-profit organization for Health promotion and prevention program in Thailand. The 'Sweet Enough Program' emphasizes four goals which follow the Ottawa Charter. These goals are: creating public health policies, creating supportive environments, strengthening community action, and developing personal skills.[9] According to the Ottawa Charter, health promotion is the process of enabling people to increase control over, and improve their health. Health is a positive concept emphasizing social and personal resources, as well as physical capacities. Therefore, health promotion is not just the responsibility of the health sector, but ultimately health professionals want to empower and educate individuals so they may take responsibility for their individual healthy lifestyles and well-being. Chiang Mai health-promotion teams employ the same strategies as the Network and conform to those of Thai Health.[10]

The aim of this study was to evaluate the dietary patterns of students in schools that are in the Sweet Enough Program. The results generated from this study could lead to the improvement and expansion of these programs for school children in the Chiang Mai area.

METHODS

This study was a cross sectional study conducted using data from 11-year-old primary school children from November 2010 to February 2011. A total of 240 children were selected from Prathom 5 (US Grade 5) students in 12 schools in 3 districts (Mae Taeng, Hang Dong and Muang) in Chiang Mai Province. We collected the 7 days dietary record of the Grade 5 students to compare sugar consumption between the students who participated and not participated in the Sweet Enough Program.

Inclusion criteria

Dietary record from all Grade 5 students who study in the selected schools. The non-Sweet Enough Program School was chosen to compare with the Sweet Enough Program School which has similar environment and geographic characteristics. All of the student's dietary record were reported by students who were oriented to the guideline before recording their meals.

Exclusion criteria

Students having uncompleted 7 days dietary recording.

The students were divided into two groups, the first group from schools that had Sweet Enough Program activities (as defined in Table 1), and another group from schools that did not conduct Sweet Enough Program activities. Dietary patterns were collected using 7-day meal books in which each students recorded individual consumption. The directions and guidelines for recording food consumption data were explained by a dentist from the Chiang Mai Public Health Office who also ran the Sweet Enough Program. Records were collected by the teacher 7 days later.

Table 1: Policy and environment in sweet enough program schools.

Items	Sweet enough program school (N=6)	Non-program school (N=6)
Public health policy		
No soft drink in school	yes	yes
No candy in school	yes	no
Fruit for refreshment	yes	no
Oral health education	yes	yes
Environment		
No high risk decay food and drink	yes	no
Teeth brushing after lunch	yes	yes
Sweet enough campaign	yes	no

Data processing analyses and statistical evaluation were performed using the Statistical Package for Social Sciences, SPSS 11.5. Frequency distributions were calculated for student food and drink consumption. A Chi-square test for association was used to compare proportions in order to assess the relative effect of dietary behaviors and children in the Sweet Enough Program.

A conceptual framework of program assessment (see Figure 1) shows input, process, output, effect and impact of the Chiang Mai Sweet Enough Program. The program

was conducted in 3 districts by focusing on creating public health policy and a supportive environment following Ottawa Charter strategies. This study aims to assess the achievement of the program by showing its effect on the dietary behavior of students by changing to healthier practices and decreasing the consumption of sugar and low-nutrient, energy dense products.

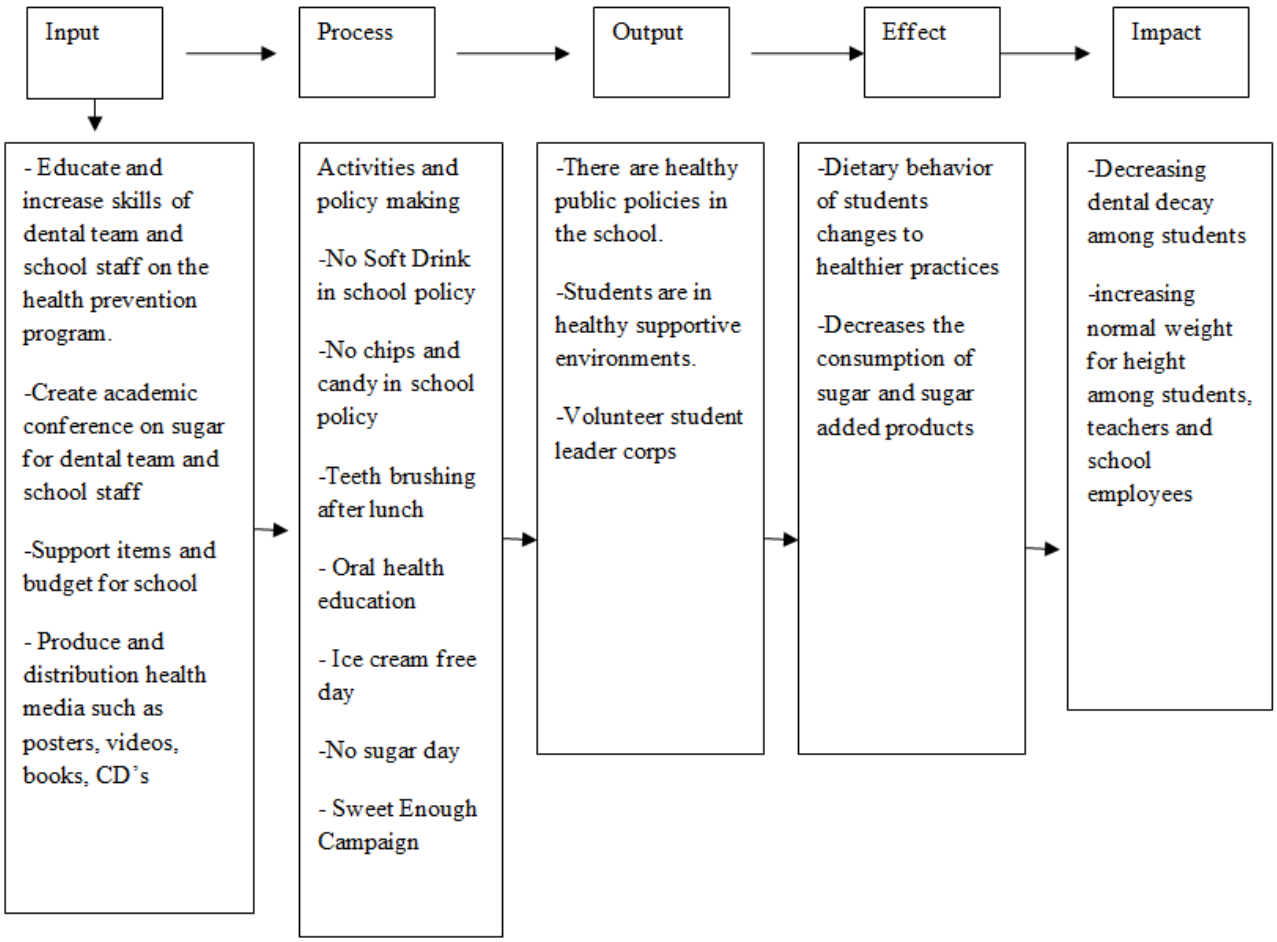

Figure 1: The conceptual framework of program assessment.

RESULTS

Dietary data was collected from 11 year old students studying in Prathom 5 (US Grade 5) in the Sweet Enough Program Schools (n=3) and Non-Program Schools (n=3). A total of 240 subjects participated in the study from schools in Mae Taeng, Hang Dong and Muang Districts of Chiang Mai. Of these, 45% were male and 55% were female students (Table 2). While both Sweet Enough Program Schools and Non-Program Schools have policies and supportive environment including no soft drink in school, teeth brushing after lunch and oral health education. Some policies and supportive environments including no candy in school, fruit for refreshment, no high risk decay food and drink and the Sweet Enough Campaign were only in the program schools (Table 1).

The dietary patterns of student consumptions for 7 days are shown in table 3. It was found that 8% of students in program schools and 9.1% of students in non-program schools had no breakfast. Most of the students in non-program schools drank beverages both during and between meals, which was more frequent than students in program schools. Students who drank beverages during and between meals more than 3 days a week in non-program schools were 40.5% and 62% respectively and those in program schools were 56.3% and 52.9%. For snack eating patterns, students in non-program schools ate snacks between meals more than 3 days a week more often than students in program schools. Figures were 57.1% and 24.6%, respectively. Students in the program had significantly better dietary patterns than those in non-program schools, except for consuming snacks during meals (Table 4).

Table 2: General information regarding location and gender of participants.

Character	Program School Group N=119		Non-Program School Group N=121		Total N=240	
	Number	(%)	Number	(%)	Number	(%)
District						
Mae Taeng	41	34.5	41	33.9	82	34.2
Hang Dong	34	28.6	25	20.7	59	24.6
Muang	44	37.0	55	45.5	99	41.3
Gender						
Male	55	46.2	53	43.8	108	45.0
Female	64	53.8	68	56.2	122	55.0

Table 3: Dietary patterns by duration among students.

	Prathom 5 primary school children						P value
	Program School Group N=119		Non-Program School Group N=121		Total N=240		
	Number	(%)	Number	(%)	Number	(%)	
Breakfast							
None	1	8	11	9.1	12	5.0	<0.001
1-3 days/week	118	99.2	81	66.9	153	63.5	
>3 days/week	0	0	29	24.0	76	31.5	
Beverages during meal							
None	20	16.8	28	23.1	48	20.0	0.050
1-3 days/week	32	26.9	44	36.4	76	31.7	
>3 days/week	67	56.3	49	40.5	116	48.3	
Beverages between meals							
None	24	20.2	11	9.1	35	14.6	0.050
1-3 days/week	32	26.9	35	28.9	67	27.9	
>3 days/week	63	52.9	75	62.0	138	57.5	
Snacks during meals							
None	42	35.6	28	25.0	70	30.4	0.218
1-3 days/week	40	33.9	44	39.3	84	36.5	
>3 days/week	36	30.5	40	35.7	76	33.0	
Snacks between meals							
None	35	29.7	12	10.7	47	20.4	<0.001
1-3 days/week	54	45.8	36	32.1	90	39.1	
>3 days/week	29	24.6	64	57.1	93	40.4	

Table 4: Dietary behavior by frequency among students.

	Prathom 5 primary school children						P value
	Program School Group N=119		Non-Program School Group N=121		Total N=240		
	Number	(%)	Number	(%)	Number	(%)	
Candy							
None	117	98.3	89	73.6	206	85.8	<0.001
1-3 days/week	0	0	20	16.5	20	8.3	
>3 days/week	2	1.7	12	9.9	14	5.8	
Jelly							
None	115	96.6	107	88.4	222	88.4	0.043
1-3 days/week	4	3.4	12	9.9	16	6.7	
>3 days/week	0	0	2	1.7	2	0.8	

Continued.

	Prathom 5 primary school children						P value
	Program School Group N=119		Non-Program School Group N=121		Total N=240		
	Number	(%)	Number	(%)	Number	(%)	
Sweet crackers							
None	105	88.2	76	62.8	181	75.4	<0.001
1-3 days/week	12	10.1	38	31.4	50	20.8	
>3 days/week	2	1.7	7	5.8	9	3.8	
Biscuits							
None	64	53.8	104	86.0	168	70	<0.001
1-3 days/week	43	36.1	13	10.7	56	23.3	
>3 days/week	12	12	4	3.3	16	6.7	
Thai desserts							
None	98	82.4	95	78.5	193	80.4	0.453
1-3 days/week	21	17.6	26	21.5	47	19.6	
>3 days/week	0	0	0	0	0	0	
Chips							
None	63	52.9	20	16.5	83	34.6	<0.001
1-3 days/week	39	32.8	51	42.1	90	37.5	
>3 days/week	17	14.3	50	41.3	67	27.6	
Yogurt							
None	93	78.2	92	76	185	77.1	0.262
1-3 days/week	19	16.0	26	21.5	45	18.8	
>3 days/week	7	5.9	3	2.5	10	4.2	
Ice cream							
None	102	85.7	81	66.9	183	76.3	0.003
1-3 days/week	14	11.8	33	27.3	47	19.6	
>3 days/week	3	2.5	7	5.8	10	4.2	
Fruit							
None	75	63	61	50.4	136	56.7	0.118
1-3 days/week	37	31.1	53	43.8	90	37.5	
>3 days/week	7	5.9	7	5.8	14	5.8	

The snacks that students ate during the 7 days were candy, jelly, sweet crackers, biscuits, Thai desserts, chips, yogurt, ice cream and fruit (Table 4). The frequency was divided into three categories: not eaten; eaten 1-3 days a week; and eaten more than 3 days a week. Students ate chips the most (65.1%). Students in non-program schools ate chips significantly more than students in program schools. When considering high decay risk foods such as candy, jelly and sweet crackers it was found that students in non-program schools ate them significantly more than students in program schools. The percentages of students who ate candy, jelly and sweet crackers were 26.4%, 11.6% and 37.2%, respectively. Students in non-program schools who ate candy, jelly and sweet crackers 1-3 days a week were 16.5%, 9.9% and 31.4% respectively, compared with program school students at 0, 3.4% and 38%, respectively. The study also found that students who ate candy, jelly and sweet crackers more than 3 days a week in non-program schools were 9.9%, 1.7% and 5.8% respectively, compared with program schools at 1.7%, 0, and 1.7%, respectively. Overall, program school students ate dental risk foods significantly less than non-program school students. The same scenario is evident for Thai desserts, yogurt, and ice cream with students in non-program schools who ate them at 21.5%, 24%, and 33.1%, respectively, and those in program schools at 17.6%, 16.0%, and 11.8%. There was a significant difference between school groups in eating ice cream, but there was no significant difference in eating Thai dessert, yogurt and fruit. An exception was found in the consumption of biscuits. In program schools, the percentage of students eating biscuits 1-3 days a week and more than 3 days a week were 36.1% and 12% respectively compared with non-program school students at 10.7% and 3.3%.

Beverages that students drank during the 7 days were soft drinks, sugar added beverages, sweetened milk, and fresh milk (Table 5). Students in the program school group drank soft drink 1-3days a week and more than 3 days a week at 25.2% and 3.4% respectively. This is less than students in the non-program school group who drank soft drinks at frequencies of 29.8% and 5.8%, respectively. However, there was no significant difference in drinking soft drinks between the two groups. Data showed that most of the students in the two groups drank sugar added

beverages the most, namely 64.7% in program schools and 76.9% in non-program schools. There was also no significant difference between the two groups. Nonetheless, there were significant differences between students who drank sweetened milk and fresh milk in program schools and non-program schools. Students in program schools who drank sweetened milk 1-3 days a week and more than 3 days a week were 26.1% and 35.3% respectively, compared with non-program school students at 38.8% and 23.1%. In addition, students in program schools who drank fresh milk 1-3 days a week and more than 3 days a week were 15.1% and 47.1% respectively, compared with non-program school students at 30.6% and 43.0%.

Table 5: Drink Behavior by frequency among students.

Drinks	Prathom 5 primary school children						P-value
	Program School Group N = 119		Non-Program School Group N = 121		Total N = 240		
	Number	(%)	Number	(%)	Number	(%)	
Soft drinks							
None	85	71.4	78	64.5	163	67.9	0.439
1-3 days/week	30	25.2	36	29.8	66	27.5	
>3days/week	4	3.4	7	5.8	11	4.6	
Sugar added beverages							
None	42	35.3	28	23.1	70	29.2	0.094
1-3 days/week	51	42.9	57	47.1	108	45	
>3 days/week	26	21.8	36	29.8	62	25.8	
Sweetened milk							
None	46	38.7	46	38.0	92	38.3	0.048
1-3 days/week	31	26.1	47	38.8	78	32.5	
>3 days/week	42	35.3	28	23.1	70	29.2	
Fresh milk							
None	45	37.8	32	26.4	77	32.1	0.012
1-3 days/week	18	15.1	37	30.6	55	22.9	
>3 days/week	56	47.1	52	43.0	108	45.0	

DISCUSSION

Schools have an important role in determining the general health of students, including nutrition, due to the fact that students spend much of their lives at school, and that food and drink are the main sources of energy for these students. School health programs can assist children and adolescents in attaining their full educational potential and good health by providing them with the skills, social support, and environmental reinforcement they need in order to adopt long-term healthy eating behaviors.[1] The Education Ministry of Thailand has a lunch menu policy for students.[11] Therefore, there is no concern about the lunch meal but there are still problems with students independently buying food and drink.

This study corroborated that students in program schools have more healthy dietary behaviors compared with students in non-program schools. The results of this study were in agreement with those of many similar studies.[12-15] A healthy school with a nutritionally supportive environment helps students to adopt and maintain healthy eating behaviors and promotes academic achievement.[1,13] Previous research suggests that environmental approaches in conjunction with educational approaches may be the most effective way of bringing about positive change in students' eating behaviors.[12] Different epidemiological studies indicated that the optimization of diet and nutrition combined with a healthy life style, can decrease the risk and even lead to amelioration of various non-communicable diseases.[1,12,13,16,17] Promising food-based dietary guidelines have been recommended in order to improve nutrition and health.[17] Sustainability of environmental change is more likely if a school nutritional policy is adopted. A written policy may help schools maintain healthy food choices during times of transition, such as turnover in school administration or food service personnel and shifts in food preferences among faculties and students. A committee that includes stakeholders and selected decision makers may be best positioned to accomplish this.[12]

The results of this study showed that creating healthy public policies and supportive environments, according to the Ottawa Charter, have affected nutritional change among students who participated in the program.[9] It found that students in the nutritional supportive environment ate and drank dental risk foods less frequently than students without the nutritional supportive environment. High dental risk foods such as candy, jelly and sweet crackers were consumed significantly differently in the two groups. Furthermore, many countries place an importance on policy management in schools. The rule, order, regulation or

guidance to abandon soft drinks and sugar added beverages in schools is being launched in America, Brazil and South Korea.[18,19] In Thailand there is an agreement between the Public Health Ministry and the Education Ministry to have a No Soft Drink policy in schools.[11] This policy was in effect in the 3 study area districts.

When considering dietary behavior by type and frequency of students in program and non-program schools, it was found that students in program schools consumed fewer snacks than those in non-program school, so it is doubtful that students in program schools would lower their consumption or change food types. However, it found that students in program schools ate biscuits and drank fresh milk significantly more than students in non-programs schools. This could indicate that students can choose low risk decay food and drink, even though they didn't consume healthy food like fruit. Therefore, improvement of the Chiang Mai Sweet Enough Program should focus on developing personal skills and strengthening community action, which are two other strategies of the Sweet Enough Network, which is based on the Ottawa Charter.[1,9,18,20]

CONCLUSION

According to a concept of program assessment, this study shows the results the program effects. This program, following Ottawa Charter strategies, resulted in nutritional change among students. This study does not examine the relationship between dietary patterns and dental decay, but further investigation of tht relationship is the ultimate goal of the program presented in this study. The impact involving oral health and nutrition, data and study will be reported in the next issue.

ACKNOWLEDGEMENTS

We thank Dr. Dejpitak and Dr. Oungchitpaisan of the Chiang Mai Public Health Office, Thailand and Dr. Chatiketu of the Department of Community Dentistry of the Chiang Mai University for the constant help in the research and write up of the report.

Funding: Funded by the Sweet Enough Network, Thailand
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee from Chiang Mai Office of Public Health

REFERENCES

1. Guidelines for school health programs to promote lifelong healthy eating. J Sch Health. 1997;67(1):9-26.
2. Steyn NP, Myburgh NG, Nel JH. Evidence to support a food-based dietary guideline on sugar consumption in South Africa. Bull World Health Org. 2003;81:599-608.
3. Burt BA, Kolker JL, Sandretto AM, Yuan Y, Sohn W, Ismail AI. Dietary patterns related to caries in a low-income adult population. Caries research 2006;6(40):473-80.
4. Johansson I. Snacking habits and caries in young children. Caries Res. 2010;44(5):421-30.
5. Mobley C, Marshall TA, Milgrom P, Coldwell SE. The contribution of dietary factors to dental caries and disparities in caries. Acad Ped. 2009;6(9):410-4.
6. Prasertsom P, Ratanarangsima K. The Thailand National Oral Survey 6th Report. Dental Health Division, Department of Health, Ministry of Public Health, Thailand; 2007: 42-43.
7. Noochpoung R, Detpitak A. The Chiang Mai Oral Survey 5th Report. Chiang Mai Public Health Office, Chiang Mai, Thailand; 2008: 11-43.
8. Maltz M, Jardim JJ, Alves LS. Health promotion and dental caries. Braz Oral Res. 2010;2:18-25.
9. World Health Organization. Milestones in health promotion: Statements from global conferences, 2009. Available at: http://www.who.int/health promotion/milestones/en/. Accessed 10 January 2018.
10. Piyanart C. Team performance indicators for a Thai health-promoting organization: A case study of the sweet enough network. Diss. Chiang Mai: Graduate School, Chiang Mai University. 2011.
11. The Office of the Basic Education Commission. Primary School Lunch Project Procedure: Bangkok Office; 2002: 27-28
12. Davee AM, Blum JE, Devore RL, Beaudoin CM, Kaley LA, Leiter JL, et al. The vending and à la carte policy intervention in Maine public high schools. Prev Chronic Dis. 2005;2:14.
13. Chawannakul M, Otakum S. Outcome evaluation of the Sweet Enough Campaign Project, at Wat Kaw Wang School in Muang District, Rajburee Province. 2008.
14. Kanyarat K, Sheiham A, Srisuphan W, Srisilapanan P. Promoting healthy eating in nursery schoolchildren: a quasi-experimental intervention study. Health Edu J. 2008;67(1):16-30.
15. Chawannakul M, Otakun S. Outcome evaluation of the Sweet Enough Campaign Project: Thailand J Dent Pub Health. 2008;13(1):117-29.
16. Tagliaferro EP, Ambrosano GM, Meneghim MC, Pereira AC. Risk indicators and risk predictors of dental caries in schoolchildren. J Appl Oral Sci. 2008;16(6):408-13.
17. Elmadfa I, Freisling H. Fat Intake, Diet Variety and Health Promotion. Diet diversification and health promotion. 2005;57:1-10.
18. Corinna H. Marketing food to children: the global regulatory environment. World Health Organization, 2004. Available at: http://apps.who.int/iris/handle/10665/42937. Accessed 11 February 2018.
19. United States Department of Agriculture. Available at: https://www.fns.usda.gov/school-meals/child-nutrition-programs. Accessed 10 February 2018.

20. Briggs M, Safaii S, Beall DL. Position of the American Dietetic Association, Society for Nutrition Education, and American School Food Service Association-Nutrition services: an essential component of comprehensive school health programs. J Am Diet Assoc. 2003;103(4):505-14.

Cite this article as: Noochpoung R, Sriram S. Dietary assessment of the 'sweet enough program' for primary school students in Chiang Mai, Thailand. Int J Community Med Public Health 2018;5:2742-9.