Snack Consumption in Normal and Undernourished Preschool Children in Northeastern Thailand

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Objective: *A cross-sectional study was conducted in a rural area of the Northeastern region in Thailand. The study aimed to investigate factors influencing nutritional status and to explore the pattern of snack consumption.*

Material and Method: *Subjects were 85 normal and 85 undernourished pre-school children with ages ranging from 2-6 years old. The authors collected demographic data including socio-economic status and family background by using an interview administered questionnaire. A 5-day food record was used to evaluate nutritional intake.*

Results: *The results indicated that children in both groups preferred crispy snacks between breakfast and lunch. Energy, protein, fat, carbohydrate, calcium and sodium intake derived from snacks and overall intake were significantly lower in undernourished children than those in normal children (p-value < 0.01). The results indicated that energy intake in pre-school malnourished children (2-3 years) as percentage of recommended daily allowance was lower than the recommended level. High sodium intake was observed in the presented study children and the results supported the observation that snack foods contribute to excessive sodium intake.*

Conclusion: *The present results have highlighted the impact of snack consumption. Programmes aimed at increasing nutritional knowledge and information for parents and guardians are important. Furthermore, promotion of nutritious snack consumption among children is important.*

Keyword: *Snack consumption, Sodium, Preschool children, Nutritional status*

J Med Assoc Thai 2006; 89 (5): 706-13
Full text. e-Journal: *http://www.medassocthai.org/journal*

Thailand, a country with rapid economic growth, has become more industrialised in the last decade. The extensive use of advanced technology in both communication and transportation has resulted in an expansion of the industrial market including the food industry. Many more products such as snack food have now reached people residing in rural residents. Snack food constitutes about 15-20% of the food market[1] and their target is predominantly the younger age population. Their availability can compromise childrens' consumption behavior. A previous study in Thailand suggested that 86% of primary school children chose snacks by themselves and 73% for the guardians paid for the snacks. Eighty two percent of the respondents, their choice of snacks were mainly puff and candies from shops in villages with an average consumption about 2 times per day[2]. It was evident that more than 60% of snacks were composed of starch[3]. A further study on snack composition showed that crispy snacks contained high carbohydrate (80%) but were low in protein[4]. Moreover, the ratio of carbohydrate, fat and protein failed to meet the Thai recommended values.

Regularly consumed snacks containing a high content of fat and carbohydrate such as starch and sugar, in additional to the main meals can have a negative impact on health. Such snacks provide energy but not nutrients. The concern is that in younger people would eat less at regular meal if they frequently consume large amount of low nutrient snacks prior to their meals. Additionally, salty crispy snacks may also

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cause children to be thirsty and drink large amounts of water which may make them feel nauseous and decrease their appetite[5]. The long term consequence on the substitution of main food with low nutritious snacks is malnutrition[6]. Data from Nutritional Surveillance in 1998 by the Ministry of Public Health showed that 10.8% of children in the Northeastern region were still undernourished. This figure is higher than those in other regions in Thailand[7]. It is, therefore, of interest if this particular group of children was affected by this snacks consumption behaviour. The widespread availability of snacks together with the malnutrition problem in children leads to question whether the pattern of snack consumption and overall intake is different between normal and malnourished preschool children.

Objectives

1. To explore the pattern of snack consumption in children in the northeastern area of Thailand.

2. To assess snack intake and overall daily food intake in normal and undernourished children.

Material and Method

The study was a cross-sectional study. The survey was conducted in 18 rural villages in Sansuk subdistrict, Panompri district, Roi-ed Province, the province in northeastern region where the number of undernourished children was the highest in the country (20%). The sample size was calculated based on an acceptance level of type I error (less than 5%)[8,9]. A total of 175 pre-school children aged 2-6 years old were assessed for their nutritional status. Since the study focused on normal and undernourished children, 5 overweight children were, therefore, excluded. A total of 170 pre-school children aged 2-6 years were allocated into the normal or undernourished groups. Indicators used to identify nutritional status included weight for age, height for age and weight for height as a percentage of standards. For the latter, the authors either used 50th percentile as a standard or calculated by 100% of the standard Thai children[10]. There were 85 normal and 85 undernourished children. These groups were further stratified by age, 2-3 and 4-6 years old.

Data were collected from March toApril 2001 by public health volunteers. Data were obtained by interview. Demographical, socio-economic status, anthropometric data such as weight and height were recorded. Data on snack and overall food intake (including main meals and snacks) were obtained by using a five day food record (3 working days and a weekend). The interviewers were trained to record food intake prior to data collection. The interview took place after dinner of each day. Additional tools used in the present study included a balance scale and microtoise, balance scale for 1 kilogram worth of fine food. Standard cups, standard tablespoon, household tablespoon and examples of raw and cooked food were also employed to aid the recall process.

A program called INMUCAL was used to analyze nutrients and energy content of snack products[11]. Nutritional values were presented as mean value of average daily intake, standard deviations and percentage of Thai recommended daily allowance (%RDA).

Statistical analysis

Data were verified for completion and correction prior to analysis. The two-tailed student t-test was used to compare the difference of intake values between the two groups. The relationships between variables were also tested using Chi-square test. A p-value of 0.05 was considered significant. All analysis was performed by using SPSS V.11.0.

Results

In each age strata, there were an equal number of 28 and 57 preschool children in the normal and undernourished groups. Number of males was slightly higher than those of females (47 and 38 respectively). Undernourished preschool children were attending nursery school half as often as normal preschool children (25.1% and 50.0%, respectively). The number of children who were still breast fed was almost equal between the two groups (4 and 5). In the school age group, there were also a lower percentage of undernourished children enrolling in kindergarten than those of normal children (61.4% and 82.5%). There was no association between parents or guardians socioeconomic factors including education, family income, occupation and children's nutritional status (Table 1).

Results on the types of snack consumption showed that commercial package snacks were consumed in the highest frequency in both groups. Undernourished children consumed desserts, milk and dairy products less frequently than normal children (p-value < 0.01). The frequency of snack consumption per day averaged 2.7 times in the undernourished group and 2.9 times in the normal group. Considering weight of snacks consumed daily, the results showed that undernourished children consumed 135.76 g/d and normal children consumed 198.33 g/d. Snack with the

Table 1. General characteristics of study children

Characteristics	Undernourished (n = 85) Number (%)	Normal (n = 85) Number (%)
Sex		
- Male	47 (55.3)	47 (55.3)
- Female	38 (44.7)	38 (44.7)
Age/Child care		
2-3 years old	n = 28	n = 28
- Breast milk fed	5 (17.8)	4 (14.3)
- Not in the nursery care	16 (57.1)	10 (35.7)
- In the nursery care	7 (25.1)	14 (50.0)
4-6 years old	n = 57	n = 57
- Not in the nursery care	22 (38.6)	10 (17.5)
- In the nursery care	35 (61.4)	47 (82.5)
Parents' Education level*	n = 85	n = 85
- Primary school	76 (89.4)	79 (92.9)
- Secondary school	9 (10.6)	6 (7.1)
Children family income per year (Thai baht)*	n = 85	n = 85
- 12000-24000	63 (74.1)	62 (72.9)
- > 24000	22 (25.9)	23 (27.1)
Parents' Occupation*		
- Agriculture	73 (85.9)	77 (90.6)
- Labor	8 (9.4)	6 (7.1)
- Proprietor of a small business	4 (4.7)	2 (2.3)

***** p-value > 0.05

Table2. Frequency and quantity of snack consumption per day

Type of snacks	Undernourished (n = 85)		Normal (n = 85)	
	Frequency $\bar{X} \pm SD$	Weight grams/person/day	Frequency $\bar{X} \pm SD$	Weight grams/person/day
Commercial package snack	1.40±0.39	21.55	1.27±0.39	20.18
Desserts	0.10±0.16	4.16	0.18±0.24	8.42
Beverage	0.16±0.16	13.15	0.11±0.10	9.08
Milk and dairy products	0.29±0.22	47.67	0.56±0.38	105.01
Fruit	0.64±0.26	48.15	0.73±0.31	54.32
Ready to eat	0.06±0.15	1.08	0.08±0.18	1.32
Total	2.65±0.22	135.76	2.93±0.27	198.33

significant difference at p-value < 0.05

highest contribution on weight in the undernourished group was fruit (48.2 g/d) whilst in the normal group it was milk and diary products (105.01 g/d) (Table 2). The frequencies of snack consumption between meals were similar between the two groups. Snacks were often consumed between breakfast and lunch in both groups. Average snack consumption during breakfast-lunch of undernourished and normal children were 1.23 and 1.36 times/person/day. Undernourished children aged 2-3 years received lower energy and nutrients from

Table 3. Energy and nutrients intake from snacks and foods consumption per day stratified by age

Type	Intake	Age 2-3 years (n=56)				p-value	Age 4-6 years (n=114)				p-value
		Undernourished		Normal			Undernourished		Normal		
		Mean ±S.D	% RDA	Mean ±S.D	% RDA		Mean ±S.D	% RDA	Mean ±S.D	% RDA	
Snacks	Energy (kcal)	179.77±52.97	14.98	266.99±79.79	22.25	0.00	206.39±67.32	14.23	247.36±71.56	17.06	0.00
	Protein (g)	3.27±1.37	19.25	6.46±2.7	38.02	0.00	4.10±2.14	19.52	5.46±2.28	25.98	0.00
	Fat (g)	7.00±2.89	-	10.47±3.98	-	0.00	8.45±3.67	-	9.52±3.49	-	0.11
	Carbohydrate (g)	26.18±7.85	-	36.86±9.96	-	0.00	28.65±8.23	-	35.04±9.2	-	0.00
	Calcium (mg)	48.78±36.85	6.1	135.89±74.49	16.99	0.00	69.23±58.65	8.65	111.57±60.23	13.95	0.00
	Iron (mg)	0.74±0.34	7.41	0.98±0.38	9.76	0.02	0.78±0.26	7.76	0.86±0.26	8.64	0.07
	Vitamin A (RE)#	22.53±14.68	5.78	51.13±29.21	13.11	0.00	24.18±21.11	6.04	40.97±20.54	10.24	0.00
	Sodium (mg)	146.83±64.97	45.18	201.80±70.55	62.09	0.00	172.30±73.59	38.29	184.47±70.06	41.44	0.29
Total intake (foods and snacks)	Energy (kcal)	691.24±96.15	57.61	942.53±78.99	78.54	0.00	978.69±114.14	67.50	1039.26±117.48	71.67	0.01
	Protein (g)	21.56±3.10	126.81	30.48±3.13	179.31	0.00	30.27±4.23	144.16	32.36±3.89	154.11	0.01
	Fat (g)	18.16±4.69	-	25.76±5.12	-	0.00	21.47±5.31	-	25.20±4.49	-	0.00
	Carbohydrate (g)	110.24±16.07	-	146.85±11.71	-	0.00	165.76±18.19	-	170.30±21.3	-	0.22
	Calcium (mg)	126.52±71.54	15.81	258.03±84.27	32.25	0.00	181.72±91.04	22.72	248.96±95.13	31.12	0.00
	Iron (mg)	2.97±0.67	29.74	4.03±0.67	40.28	0.00	3.88±0.68	38.83	4.18±0.60	41.78	0.02
	Vitamin A (RE)#	140.70±43.13	36.08	210.46±68.41	56.27	0.00	207.67±160.28	51.92	209.98±54.44	52.50	0.92
	Sodium (mg)	380.72±84.53	117.15	541.25±107.44	166.54	0.00	491.5±123.64	110.02	581.57±150.23	129.24	0.00

#Retinol equivalent, mg = milligram, g = gram, kcal = kilocalorie

Table 4. Energy distribution of carbohydrate, protein and fat from overall intake per day

Nutrients	% of energy distribution			
	Age 2-3 years (n = 56)		Age 4-6 years (n = 114)	
	Undernourished	Normal	Undernourished	Normal
Carbohydrate	63.8	62.4	67.7	65
Protein	12.5	13.0	12.4	13
Fat	23.7	24.6	19.9	22

snacks than normal children. The significant results were observed in the preschool age group (all p-value < 0.01). In the school age group, energy, protein, carbohydrate, calcium and vitamin A were statistically significantly lower in children with under nutritional status than those in normal children (p-value < 0.01). The results on energy and nutrients intake derived from overall intake followed the pattern observed from snacks in both age groups (Table 3). The distribution of energy derived from carbohydrate was slightly lower in children aged 2-3 years than those in children aged 4-6 years.For fat, the pattern was the reverse (Table 4).

Discussion

The present research aimed to study snack and overall daily intake in normal compared to undernourished children. The study consisted of 85 children with normal nutritional status and 85 undernourished status with age ranging from 2-6 years. The authors stratified children into two age groups for two reasons. Firstly, to reflect their participation in nursery or kindergarten, given that different types of care providers could potentially affect their food and snack consumption on a day to day basis while they were in care. Secondly, it would allow the authors to compare the present results with the National Thai's RDA. The results indicated that the number of undernourished children in their preschool age (2-3 years) who are still breast fed and did not attend nursery was greater compared to normal children in the same age group. The number of undernourished children in their school age (4-6 years) who did not attend kindergarten was also greater than normal nutritional status children in the same age group. The results on socio-economic factors indicated that over 70% of parents or care takers of children in both groups are in agriculture. Data from the interview suggested that although parents or guardians were aware that the school would provide a complementary food such as milk, learning ability skills and a development in social and physical behavior, they felt their children were too young for school. Moreover, they were uncomfortable to take their children to nursery or kindergarten especially when their occupations were farmers or laborers in farms. Neither family income nor parents' education level was associated with children nutritional status, therefore parents or guardians' socio-economic backgrounds were unlikely to explain the children's nutritional status.

The frequency of snack consumption in undernourished and normal children was 2.65 and 2.93 times per day, respectively. The present results were in keeping with those reported in a previous study by Punyagnam et al[12]. They studied nutritional status of school age children in the lower socio-economic families in Bangkok. They reported that children ate snacks 2.99 times per day. The most frequent snack consumed among children in the present study was a crispy snack followed by fruit and milk and dairy products. This finding was consistent with those reported by Keawsiri et al[13]. They reported that 85% of study subjects liked crispy snacks and 21% had this particular snack two times a day. The study of Cross et al[14] reported that in American children, fruit was most likely to be consumed followed by salty crispy snacks. The authors further explored the time that children were most likely to eat snacks and it was between breakfast and lunch. No significant difference was demonstrated on the frequency of snack consumption between morning and afternoon, even though the average frequency is slightly higher. A similar finding has been previously reported[15], where school age children liked to have snacks during their free time in the morning (after breakfast). They preferred to buy snacks and have them on the way to school and preschool age children were likely to follow their older brothers/ sisters' behavior.

Energy and protein intake from snacks as a percentage of recommended daily allowance (%RDA) was found to be within an acceptable range in the undernourished group and slightly higher in the

normal group according to the Thai RDA. The%RDA of energy and protein from snacks was recommended at about 10-15% and 20% respectively[16]. In 1995, Sae-na[17] reported that snacks consumed by school children provided by RDA's recommended energy and nutrients less than 20%. On the other hand, Summerbell et al[18] found that boys received energy from snacks accounting for 29% of RDA whilst girls received energy at 24% of RDA.

The findings from the pre-school age group showed that energy and nutrient intake from snacks in the undernourished group were statistically significantly lower from those in the normal group. The values were higher in the normal than those in the undernourished group. This can be explained by the lower percentage of undernourished children attending the nursery which could potentially affect their consumption behavior. In the school age group, similar findings were observed and the number of undernourished children enrolled in the kindergarten was also smaller than normal children. The consumption behavior therefore could be somewhat different. Average values of protein and calcium intake from snacks in the normal group (both age groups) were two times greater compared to the malnourished group. Higher consumption of milk and dairy products in the normal children was likely to contribute to the high values of protein and calcium. Although milk and dairy products are not considered regular snacks among Thai children particularly the children in the remote area, however, in any school or in any public community nursery, milk and dairy products were subsidized by the Ministry of Education. Therefore, children in school or in nursery would warrant free milk and dairy product snacks. Milk is known to be a key source of protein[19]. Jessadametakachorn et al, suggested that carton milk as a supplement along with other foods in a sufficient amount contributed to a better nutritional status in children[20].

The authors assessed total energy and nutritive values taken within a day which included snacks and other foods. The authors then compared theirs results to the Thai's recommended daily dietary allowance (RDA). According to the Thai's committee of RDA, an adequacy of daily energy intake should be at least 67% and energy derived from protein, fat and carbohydrate should be 10-15%, 25-30% and 55-60% respectively. Also sodium daily requirement in young children aged 1-3 and 4-6 years are recommended at 325 and 450 mg/person/day, respectively[21]. The present results suggested that overall daily intake provided adequate protein, insufficient fat and excessive carbohydrate and sodium. In the undernourished group, however, energy and nutrients intake were significantly lower compared to normal group. This could be possibly due to participation in either nursery or kindergarten which would warrant prepared meals. The authors observed high sodium intake in the present study population. Sodium intake was found to be higher than the recommended level in both groups. Since crispy snacks were primarily chosen by the presented subjects, sodium from snacks is therefore likely to be high. These high values contributed to overall intake since sodium from snacks accounted for 40% of total sodium intake per day. Chanworachaikul et al found that salty flavor made up 44% of all crispy snacks[22]. An excessive intake of sodium could potentially lead to kidney failure[23] and heart problems[24]. Prior to data collection process, the authors surveyed snacks in the shops and markets located in the study sites. The authors found over 200 different types of snacks. Some were locally produced and were not approved by the Thai Food and Drug Administration. Although the authors have not assessed the quality of snacks consumed by the studied population here, the findings from the present study, however, have highlighted the importance of snack consumption. Since it is not possible to make children quit snacking, an alternative would be to educate parents or care takers on how to choose the good ones.

Conclusion

Snacks are recognized as a complement to normal meals for children. A problem rises when low nutritious snacks were frequently consumed and thus substituted the intakes from the main meals resulting in an unbalance of nutritional status. The authors investigated snacks as well as food consumption by using a five day food record in 85 normal and 85 undernourished children dwelling in the Northeastern part of Thailand. The authors finds that children preferred crispy snacks the most. The frequency of commercial snack consumption was slightly higher in the undernourished group. The result was reversed for milk and dairy products. Energy and nutrients gained from snacks and overall intake were lower in undernourished children, and these were insufficient in the preschool age group when compared to%RDA. Additionally, children in the present study had a total intake of sodium higher than the recommended level. Given that sodium from snacks accounted for nearly 40% of sodium intake per day, snacks with high sodium content should, therefore, be avoided.

The present results showed that energy, fat, carbohydrate and sodium intake from snacks attributed at least a quarter of overall intake, therefore, parents and guardians should be advised to provide nutritious snacks and food for their children. As a national policy, mandate of food regulations on the so called illegal snacks is required. Nutritional information such as labelling is necessary to guide parents and guardians to choose the appropriate snacks.

References

1. Kasikorn Thai Research Center. Snack food: get through the hurdles... to reach the target of 10,000 million baht. Research report. Bangkok: Kasikorn Thai Bank; 2004. 1 March.
2. Wonkongkathep S. Measurement of snack consumption behavior of primary school children in Kok-Soung district, Pattananikom subdistrict, Lopburi Province. J Med Science Research 1997; 11: 139-55.
3. Aungsomwang S. Only one snack out of hundred has standard label. Smart Buyer Magazine 1994; 1: 12-21.
4. Sinsawat T. Nutritional value of snack and ready to eat food among children in rural area and its effect on nutritional status in children ages between 2-5 years in Khon Kaen [Research report]. Bangkok: Khon Kaen University; 1995.
5. Editorial sector. Is it the lure of snack? Thai people still rely on FDA logo. Smart Buyer Magazine 2000; 6: 24-9.
6. Worawongtut C. In supplementary document for special seminar on "Nutrition for life" topic. Bangkok: Institute of Nutrition, Mahidol University; 1998.
7. Wongthong A. Family Nutrition. Bangkok: Kasetsart University Printing; 1998.
8. Wiwatwongkasem C. Sample size determination for research. J Med Science Research 1984; 8: 121-4.
9. Diel WW. A foundation for analysis in the health sciences. New York: Wiley & Sons; 1995.
10. Department of Health MOPH, Thailand. Standard weight and height and other indicies of nutritional status of Thai people. Bangkok: Office of Printing Mill of the War Veteran Organisation of Thailand; 1984.
11. Institute of Nutrition. Food Composition Database for INMUCAL Program. 2nd ed. Salaya, Nakhonprathom, Thailand: Institute of Nutrition, Mahidol University; 2002.
12. Punyagnam Y, Sacholvijarn W. Nutritional status of school children from a low socio-economic position in Bangkok Metropolitan area. J Public Health 1991; 21: 32-9.
13. Kaewsiri D, Klunklin S, Isaranuruk S, Jarupoonpul P, Wongarsa C. Health and methods for child care aged under 5 years old in slum area: a case study, Wat Makok. J Public Health 2001; 31: 49-62.
14. Cross AT, Babicz D, Cushman LF. Snacking patterns among 1,800 adults and children. J Am Diet Assoc 1994; 94: 1398-403.
15. Uttamayotin P. Snack consumption behaviour of children in Northeastern region. [Research report]. Khon Kaen: Khon Kaen University; 1982.
16. Intralasupp W. Nutrition for people at different ages. 2nd ed. Bangkok: Sangthawee Printing; 1990.
17. Sae-na C. Dietary patterns and nutritive value of food intakes of students in Bangkok municipal schools in 1985 and 1995. [M.S. Thesis in Nutrition] Bangkok: Mahidol University; 1997.
18. Summerbell CD, Moody RC, Shanks J, Stock MJ, Geissler C. Sources of energy from meals versus snacks in 220 people in four age groups. Eur J Clin Nutr 1995; 49: 33-41.
19. Prachakul B. The growth of preschool children from weight for age and height for age. [M.S. in Home Economics]. Bangkok: Kasetsart university; 1983.
20. Jessadametakachorn A, Sasaen W, Nuansri P, Phaholthep S, Samhormhob N. The study of relationship between nutritional status of children aged between 0-5 years old relation to their social and families. Bulletin of the Department of the Medical Service 1999; 24: 254-60.
21. Department of Health MOPH, Thailand. Recommended daily dietary allowances for Thai people. Bangkok: Office of Printing Mill of the War Veterans Organisation of Thailand; 1989.
22. Chanworachaikul S, Watcharapunchai C, Theprathom N. The servey study on lead and sodium content in snack products of kindergarten and primary school in Bangkok. J Public Health 2001; 31(Suppl): 111-20.
23. Boero R, Pignataro A, Quarello F. Salt intake and kidney disease. J Nephrol 2002; 15: 225-9.
24. Selmer RM, Kristiansen IS, Haglerod A, Graff-Iversen S, Larsen HK, Meyer HE, et al. Cost and health consequences of reducing the population intake of salt. J Epi Community Health 2000; 54: 697-702.

การบริโภคอาหารว่างในกลุ่มเด็กก่อนวัยเรียนที่มีภาวะโภชนาการปกติ และเด็กขาดสารอาหารในเขตชนบท ภาคตะวันออกเฉียงเหนือประเทศไทย

สิริประภา กลั่นกลิ่น, คำปุ่น จันโนนม่วง

การวิจัยนี้เป็นการศึกษาแบบภาคตัดขวาง ในพื้นที่เขตชนบทภาคตะวันออกเฉียงเหนือ วัตถุประสงค์เพื่อศึกษาปัจจัยที่มีผลต่อภาวะโภชนาการของเด็ก โดยสำรวจแบบแผนการบริโภคอาหารว่างในกลุ่มเด็กก่อนวัยเรียนที่มีภาวะโภชนาการปกติ จำนวน 85 คน และเด็กที่มีภาวะทุพโภชนาการ จำนวน 85 คน อายุตั้งแต่ 2-6 ปี โดยศึกษาข้อมูลพื้นฐานด้านเศรษฐกิจ-สังคม ประวัติครอบครัว และบันทึกอาหารบริโภค 5 วัน จากการสัมภาษณ์ผู้ปกครองและผู้ดูแลเด็กโดยตรง

ผลการศึกษาพบว่าอาหารว่างที่เด็กทั้งสองกลุ่มนิยมบริโภคมากที่สุด คือ ผลิตภัณฑ์ขนมขบเคี้ยว ในระหว่างมื้อเช้า และมื้อเที่ยง กลุ่มเด็กขาดสารอาหารได้รับปริมาณพลังงาน, โปรตีน, ไขมัน คาร์โบไฮเดรต, แคลเซียม และโซเดียม จากอาหารว่าง และอาหารหลักน้อยกว่ากลุ่มเด็กปกติอย่างมีนัยสำคัญทางสถิติ ($p < 0.01$) และในกลุ่มเด็กขาดสารอาหาร อายุ 2-3 ปี ได้รับปริมาณพลังงานจากอาหารหลักต่ำกว่าค่าเสนอแนะคิดเป็นร้อยละของข้อกำหนดสารอาหารที่ควรได้รับประจำวัน ปริมาณโซเดียมเด็กได้รับสูงเช่นกัน จากการศึกษาอาหารว่างประเภทขนมขบเคี้ยวมีส่วนทำให้เด็กได้รับ ปริมาณโซเดียมสูงกว่าค่าเสนอแนะ

จากการศึกษานี้ ชี้ให้เห็นถึงความสำคัญของการบริโภคอาหารว่างของเด็ก เป็นการยากที่จะห้ามเด็กรับประทานอาหารว่าง_ควรมีโครงการให้ความรู้ และข่าวสารด้านโภชนาการกับผู้ปกครองหรือผู้ดูแลเด็ก_รวมทั้งการส่งเสริมให้เด็กได้บริโภคอาหารว่างที่มีคุณค่าทางโภชนาการไปพร้อมกัน