



## Nutritional Intervention and Breakfast Behavior of Kindergartens

Yongqing GAO<sup>1</sup>, Chunsheng CAI<sup>1</sup>, Jian LI<sup>2</sup>, \*Wenjie SUN<sup>1,2</sup>

1. School of Food Sciences, Guangdong Pharmaceutical University, Zhongshan, China
2. School of Public Health and Tropical Medicine, Tulane University, New Orleans, USA

\*Corresponding Author: Email: wsun3@tulane.edu

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### Abstract

**Background:** To examine the effect of nutritional education on children's breakfast patterns

**Methods:** A kindergarten based nutrition intervention was started in September 2001 among 8 kindergartens in Hefei with a total of 2,012 children aged 4-6 years and their parent pairs.

**Results:** Monthly nutrition education sessions were held over two semesters in kindergartens part of the intervention arm. The approach in education and the content of other activities were uniform across all the kindergartens. A validated questionnaire was used to record breakfast behavior over 7 days including at least one weekend. The parents recorded the children's breakfast pattern (frequency, time, and food selection) at baseline, middle, and end of the study. After intervention, there were significant differences at the final stage, but none at the baseline before intervention. There were changes not only in breakfast frequency, but also in the breakfast selection

**Conclusion:** The breakfast pattern of Chinese children can be modified through nutrition education after a long term intervention.

**Keywords:** Breakfast, Children, Intervention, China

### Introduction

Breakfast is associated with nutrient adequacy and often regarded as the most important meal of the day (1-2). Breakfast does benefit for growing children in many health aspects. Regular eating breakfast not only great increase the overall daily diet quality (3), but also is associated with increased intelligence quotient in kindergarten children (4). Evidence suggests that breakfast consumption may improve cognitive function related to memory, test grades, and school attendance. As part of a healthy diet, breakfast can improve children's health and well-being (5). The prevalence of breakfast skipping is 5.3% in boys and 5.2% in girls, according to a survey conducted in Hong Kong among 68,606 Chinese school children (6). However, the prevalence of breakfast skipping among Chinese pre-

school children is unclear due to a lacking of relevant national data.

In children, near-daily basis regularly breakfast was significant associated with increasing full scale, verbal, and IQ test scores, compared to "sometimes" have breakfast (4). Regular breakfast consumption is associated with increased IQ in kindergarten children (4). Additionally, the prevalence of obesity among Chinese children is high (7), which could be partly due to breakfast patterns. For example, a Dutch birth cohort study has shown that breakfast skipping is associated with being overweight among 1,366 children aged 2-5 years (8). In China, 6% of boys and 7% of girls did not "regularly" eat breakfast among 1,344 pre-school Chinese children, according to China Jintan Child Cohort

Study (9). Thus pose a problem in the area of child nutrition.

Patterns of breakfast intake include breakfast frequency, time of breakfast, and breakfast food selection. While it is beneficial to have breakfast, the type of food selected for breakfast should also be factored in when considering breakfast pattern. Patterns of breakfast intake among children and adolescents are a public health concern (10), however, there are only a few studies that have assessed the children's breakfast pattern.

In China, children with both working parents have limited income, lacking of healthy options at home/knowledge on the benefits of breakfast, rush out to work in the morning. Parents influence the child's food selection and availability, although they lack the related information. Most unhealthy dietary behavior is highly associated with parents. Early childhood is important for development. Parents are more likely to be communicating with the kindergarten. Hence, it is important to cultivate a healthy breakfast pattern during early childhood by implementing nutrition education programs through the kindergarten channel. Little is known about breakfast skipping in Chinese children aged 2 to 5 years; we studied factors in this very young group.

Chinese kindergarten refers to full-day programs serving children from age 3 to age 6. Education on physical care is the primary emphasis in this program. Class size increases with age, ranging from 20 to 40 children. Each group typically has two teachers and a nurse. Kindergarten is an important component of the pre-school education system. According to the Chinese Education Department, the prevalence of kindergarten is 47.8% in 2008 across the nation. Kindergarten has been universalized in city. Most kindergartens provide lunch and snack. All the kindergartens in our study did not provide breakfast. Usually, kindergarten children arrive around eight o'clock and class sessions alternate with free play-time. Following a hot, nutritious lunch, children take a long nap and then eat a snack and have free play-time. Families pick up the children after work. Learning and developing life skills is considered an important part of the curriculum, particularly for younger children.

The presented study investigated breakfast patterns of Chinese pre-school children and whether their breakfast patterns can be modified by nutrition education. We hypothesized that breakfast patterns can be modified in both Chinese children and parents by appropriate nutrition education.

## Methods

Previous reports have described the methods used in this study (11-12). Briefly, kindergarten based nutrition intervention is an interventional study that began in September 2001. We recruited 8 kindergartens in Hefei City (the capital of Anhui Province, PR China) with 2,012 children aged 4-6 years old and their parents. Hefei City was divided into three administrative districts: east urban, central urban and west urban, containing a total of seventeen kindergartens (8,752 children). Eight kindergartens were selected by stratified cluster sampling from all the kindergartens in each of the 3 districts, according to the population density in each area. Kindergartens with a small sample size (less than 200 children) are excluded. Randomization was stratified by administrative district in order to achieve heterogeneity in each location; the kindergartens were then randomized to either an intervention group (five kindergartens and 1,252 child-parent pairs) or a control group (three kindergartens and 850 child-parent pairs) using computer-generated numbers within each district. Informed consent forms were obtained from 92.3% families agreeing to participate in the project after the purpose of the study was explained.

### Data collection

At baseline, social and demographic information (e.g. age, gender, parental education, family income) were collected. A questionnaire on breakfast habits, demonstrated to be both feasible and reliable (13), was used to record breakfast behaviors over 7 days including at least one weekend. The parents and teachers recorded the children's breakfast behaviors (frequency, time, and selection) at home and during kindergarten instruction, respectively. Instructions were provided to parents and teachers on how to properly record the consump-

tion of any foods or drinks of children during mealtime. The questionnaires were reviewed by the study authors for completeness and accuracy of data collection. All questionnaires were completed by the children's parents and teachers.

### ***Intervention***

In the intervention kindergartens, monthly nutrition education sessions were held over two semesters in the 2001/2 school year (total 10 months, exception of 2 months of summer and winter vacation). Both the education approach and the content of other activities were uniform across the kindergartens. The intervention content was as follows:

A flexible curriculum for in-kindergarten education was delivered monthly to children and parents by nutritionists. The curriculum was developed by nutrition professionals and included basic nutritional information, based on the National Dietary Guidelines for China. Eight lectures or activities were implemented in each kindergarten part of the intervention arm during the 1-year intervention period. The monthly curricula had an overall theme but in general the classes were not related to previous classes. The topics covered the benefits of breakfast for children, breakfast style, how to prepare breakfast, skills for breakfast food arranging, the purpose of consuming breakfast, nutrients in the food, how to evaluate the breakfast, and elements in the breakfast: eggs and milk.

Parents were informed of the interventions by their children's teachers and the training took place in the kindergartens. The nutritionist and pediatric physician selected each topic. A picture and model of the food were used to give the children and parents a direct impression of the breakfast food and volume. At least eight lectures or activities were implemented in each intervention group kindergarten during the 1-year intervention period.

An illustrated book was distributed by teachers to all the children. The intervention group received a book with a nutritional and breakfast behavior theme while the control group received a book of general picture stories. As teachers told stories from the book, the intervention group children received significant amounts of information regard-

ing nutrition and healthy breakfast behaviors, such as breakfast food style and how to select breakfast food.

Pamphlets giving nutritional information and describing healthy breakfast behaviors were delivered to each parent pair included in the intervention group at the beginning of the intervention since the parents are responsible for the daily diet of their child. The pamphlets emphasized breakfast consumption and healthy breakfast patterns. Parents were instructed to read the pamphlet and were periodically interviewed by the authors. The nutritional prejudices of the parents were addressed directly in a series of activities.

Two series of promotional pictures providing information concerning nutrition, the most common unhealthy breakfast behaviors were displayed in the intervention group kindergartens throughout the intervention, one series per semester.

### ***Follow-up and outcomes***

The baseline data was collected in September 2001. The last date of follow-up or censor date was June, 2002. We analyzed the results after 2 different durations of follow up: (a) Dec 2001 and (b) June 2002. The first phase was 4 months from September to December, 2001 while the second phase was 6 months from February 2012 to June 2012 including Chinese Spring Festival which usually runs for more than 3 weeks. We have presented results from halfway through the study and at the final stage after follow ups. There were 1,092 and 727 in intervention and control groups with 1,042 and 713 followed up to the end.

### ***Evaluation of outcomes***

Breakfast patterns were evaluated by validated questionnaires (12). These assessments were repeated at both the middle and at the end of the study.

### ***Statistical methods***

The characteristics related to breakfast behaviors were compared between groups stratified by follow up time. Longitudinal data analysis was used to compare outcomes pre- and post-intervention, and was also conducted within both groups. All statis-

tical analyses were performed by the statistical software SAS version 10.0. (Cary, NC, USA). Chi-square test and Kruskal-Wallis test were used to compare breakfast behaviors between the two arms at different times, e.g. baseline. Kruskal-Wallis test was used for the control arm's self-comparison during different times on breakfast frequency, food quantity, and food type. All the tests were two sided and with a significance level of 0.05.

## Results

Table 1 shows the demographic information about the participants. Children part of the intervention group were younger than those part of the control group ( $P<0.01$ ). There were no statistical differences on child gender ratio, and family income between two groups ( $P>0.05$ ).

**Table 1:** The information of intervention and control groups (Mean  $\pm$  SD)

	Intervention	Control	P value
Sex ratio (Boy/Girl)	651/601	456/394	0.55
Age (yr)	4.8 $\pm$ 0.7	5.2 $\pm$ 1.0	<0.01
Family income (RMB)	1914.2 $\pm$ 1256.2	1865.1 $\pm$ 1504.5	0.53

Note: (1 \$ = 6.75 RMB)

### Breakfasting frequency

Regarding the frequency of having breakfast, there were no significant differences between intervention and control groups at baseline and metaphase ( $P>0.05$ ), but a significant difference at the end ( $P=0.02$ ). In the intervention group, daily break-

fast practice frequency was significantly different between baseline, middle, and end stage ( $P<0.001$ ). At the end of the study, the intervention group children showed increased breakfast frequency however there was a decrease in the control group (Table 2).

**Table 2:** Breakfast practices of children (%)

Frequency	Baseline		Middle		Final	
	Intervention	Control	Intervention	Control	Intervention	Control
Daily	91	91	90.5	92.2	92.2	89.1
Often	6.1	6.4	6.1	4.1	5.3	7.7
Sometimes	1.6	1.5	2.4	2.3	1.9	2.7
Occasionally	0.9	1.1	0.8	0.9	0.3	0
Never	0.3	0	0.2	0.5	0.3	0.5
P value*	0.07		0.19		0.01	
P value†	<0.001					

Note: \* Intervention group compare with control group in the different time; † Intervention group self-compare during the different time.

### The number of foods consumed in breakfast

As for the food diversity in breakfast consumption, there were no differences between intervention and control groups at baseline ( $P>0.05$ ), but there were significant differences in the metaphase and in the end ( $P<0.05$ ). In the intervention group, the quantity of food consumed in breakfast

practice frequency was significantly different among baseline, middle, and end stage ( $P<0.001$ ). At the end of the study, the intervention group children increased the quantity of food for breakfast but the quantity of food consumed decreased in the control group (Table 3).

**Table 3:** The numbers of foods consumed in breakfast (%)

	Baseline		Middle		Final	
	Intervention	Control	Intervention	Control	Intervention	Control
≤3	42.2	41.5	61.3	54.1	37.3	46.1
4-6	54.1	55	36.2	44	59.9	51.1
≥7	3.8	3.4	2.4	1.9	2.8	2.7
<i>P</i> value*	0.82		0.03		<0.001	
<i>P</i> value†	<0.001					

Note: \* Intervention group compare with control group in the different time; † Intervention group self-compare during the different time.

### Breakfast foods selection

As for the food selection in breakfast consumption, there were no differences between intervention and control groups at baseline ( $P>0.05$ ), but having significant differences in the metaphase and end stage ( $P<0.05$ ). In the intervention group, the kinds of food consumed in breakfast practice frequency were significantly different between

baseline, middle, and end stage ( $P<0.001$ ). At the end of the study, the intervention group children chose more high-in-nutrient foods for breakfast (i.e. fruit) compared to children from the control group who chose more high-in-energy foods (i.e. biscuit, cake, candy, ham, and sausage) according to the nutrition label on the food (Table 4).

**Table 4:** The most foods consumed in breakfast (%)

Food type	Baseline		Middle		Final	
	Intervention	Control	Intervention	Control	Intervention	Control
Rice gruel	63	67	61.6	71.6	62.6	70.2
Steamed bun	30.3	25.8	28	28.4	31.4	27.3
Stuffed bun	61.7	58.4	60.1	61.6	61.3	55.9
Twisted cruller	17.1	13.9	13.1	15.3	15.3	14.1
Fried mochi	13.8	14.7	6.2	18.5	12.6	21.7
Boiling rice	22.4	23.7	22.8	27.3	22.5	27.4
Milk	73.4	74.2	76.5	72.2	76.8	73.2
Bean milk	37.7	33.5	32.4	31.2	36	30
Soy milk	14	13.2	13.5	21.4	15.1	21.9
Egg	87.9	86.1	89.7	85.2	86.6	82.2
Greens	10.2	8.7	13.5	9.3	9.7	8.2
Fruit	11.6	7.5	13.1	10.7	14.9	8.2
Pickles	27.6	30.3	22.5	25.6	25	29.1
Ort	1.7	2.6	3.4	0.9	2.4	3.6
Other	21.6	19.9	14.4	14.6	18.1	12.8
<i>P</i> value*	0.06		<0.001		<0.001	
<i>P</i> value†	<0.001					

Note: \* Intervention group compare with control group in the different time; † Intervention group self-compare during the different time.

## Discussion

Our results show that breakfast consumption patterns of children in our intervention group were

significantly modified, i.e. selection of nutrient rich food. The modification on eating breakfast food has also been observed. Our results indicate that the approach of kindergarten-based nutrition-

al intervention was successful at modifying the breakfast consumption patterns among young children. We creatively involved the parents and participants and through multiple channels for the duration of the study in order to keep those parents and participants informed. The intervention method was based on the cognitive-behavioral change theory (14-15).

Nutrition intervention involves both child and parent and has been an effective way to modify a child's dietary behavior (16), due to the importance of the parental roles and influences in their lives (17-18). In an Asian setting, a traditional breakfast is rice based while western foods for breakfast are more popular (19). It might be an oversimplified view of breakfast patterns, which in reality are much more complex and often not straightforward. Our strategy on breakfast behavior modification is to create awareness of the "right" breakfast. Unrestrained high fat and low in vitamin, minerals, and protein would be obstructive to the growth and development of children (20). Short-term fasts can lead people to make additional food choices, such as selecting higher quantity of high-calorie (relative to low-calorie) foods (21). Consumption of a healthy breakfast to gain enough energy can be a major concern for a child's wellbeing. Lack of breakfast intake will lead to increased cumulative energy intake in children (22).

Limiting exposures to low nutrients/ high calories food is a principle to improve breakfast choice (23). High-in-nutrient food was referred to as nutrient-dense foods which are often defined not in terms of the nutrients they contain, but in terms of being fat-free and sugar-free, e.g. milk, fruit, yogurt, cereals etc. High-in-energy foods refer to energy-dense foods like fats and sweets, e.g. candy, chips, soda, baked goods, ice cream (24). Reducing consumption of sugary beverages, high-fat and energy-dense foods could decrease the risk of obesity (25). Alternatively, providing a variety of vegetables and fruits as breakfast can lead to increased consumption of both food types in a childcare facility (26).

Our study has several limitations. First, breakfast behavior varied from period to period. The infor-

mation collected from a short span may not be representative of the time of the whole project period. Second, the information on breakfast behaviors was "self-reported" (parents to teachers), which could be underestimated because they tend to not report the unhealthy breakfast behaviors of children as readily. Third, there may be volunteer biased because the participants in our study could be more aware of health concerns and public health issues compared to others, although other characteristics based on demographics were similar overall. Third, there may be "contamination" since the study was conducted within same community and the participants could communicate on the intervention measure. The long-term effects of breakfast consumption behavior modifications warrants for future follow-up studies. Fourth, the cultural differences between countries, limited the generalizability of the findings of the study. Particularly, race and ethnicity are important determinants in genetic differences and differences in lifestyles and food selection (27). Fifth, there was a difference in sample size between the experimental group and the control group, which could underestimate the results. The strengths of the study include a random large sample size (2,102 child- parent pairs) which is an effective representation the target population. Additionally, repeat measuring on breakfast patterns of children and extended-time (one week) food recalling make the results more reliable. Lastly, a multi-channel approach toward education has been applied.

To our knowledge, the study was the first population-based intervention study on breakfast patterns of Chinese children. Nutrition intervention based in Kindergartens can effectively modify the breakfast patterns of Chinese children. It provides an effective model for breakfast food pattern intervention methods, involving both parents and teachers, but also provides solid scientific foundation for related nutritional policy and guidelines on breakfast behavior. Our study also proves nutrition education is useful to public nutrition practitioners.

## Conclusion

The breakfast food pattern of young children can be modified through educational intervention involving both parents and teachers. The effect of the long time intervention is better than that of short time.

## Ethical considerations

Ethical issues (including plagiarism, obtaining informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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## References

1. Barr SI, DiFrancesco L, Fulgoni VL (2013). Consumption of breakfast and the type of breakfast consumed are positively associated with nutrient intakes and adequacy of Canadian adults. *J Nutr*, 43(1): 86-92.
2. Nicklas TA, Bao W, Webber LS, Berenson GS (1993). Breakfast consumption affects adequacy of total daily intake in children. *J Am Diet Assoc*, 93(8): 886-91.
3. Morgan KJ, Zabik ME, Stampley GL (1986). The role of breakfast in diet adequacy of the U.S. adult population. *J Am Coll Nutr*, 5(6): 551-63.
4. Liu J, Hwang WT, Dickerman B, Compher C (2013). Regular breakfast consumption is associated with increased IQ in kindergarten children. *Early Hum Dev*, 89(4): 257-62.
5. Rampersaud GC, Pereira MA, Girard BL, Adams J, Metzler JD (2005). Breakfast habits, nutritional status, body weight, and academic performance in children and adolescents. *J Am Diet Assoc*, 105(5): 743-60.
6. Tin SP, Ho SY, Mak KH, Wan KL, Lam TH (2011). Breakfast skipping and change in body mass index in young children. *Int J Obes (Lond)*, 35(7): 899-906.
7. Sun W, Wang J, Ma G (2008). Cross-sectional survey of children body fat and influence analysis in Beijing and Guangzhou. *Wei Sheng Yan Jiu*, 37(1): 71-4.
8. Kupers LK, de Pijper JJ, Sauer PJ, Stolk RP, Corpeleijn E (2014). Skipping breakfast and overweight in 2- and 5-year-old Dutch children-the GECKO Drenthe cohort. *Int J Obes (Lond)*, 38(4): 569-71.
9. Liu J, McCauley L, Compher C, Yan C, Shen X, Needleman H, Pinto-Martin JA. (2011). Regular breakfast and blood lead levels among preschool children. *Environ Health*, 10(1): 28-38.
10. Tin SP, Ho SY, Mak KH, Wan KL, Lam TH (2012). Location of breakfast consumption predicts body mass index change in young Hong Kong children. *Int J Obes (Lond)*, 36(7): 925-30.
11. Gao Y, Huang Y, Zhang Y, Liu F, Feng CX, Liu T, Li C, Ling D, Mu Y, Tarver SL, Wang M, Sun W(2014). Evaluation of fast food behavior in pre-school children and parents following a one-year intervention with nutrition education. *Int J Environ Res Public Health*, 11(7): 6780-90.
12. Sun WJ, Gao YQ (2006). [Factors influencing snack behaviours of young children in Hefei and evaluation of the effect of interventions]. *Wei Sheng Yan Jiu*, 35(5): 615-7.
13. Sun W, Gao Y (2002). Logistic Regression Analysis of Influence Factors on Snacking of Infancy and Young Children. *Wannan Acta Med Acad*, 21(4): 301-3.
14. Vega WA, Sallis JF, Patterson TL, Rupp JW, Morris JA, Nader PR (1988). Predictors of dietary change in Mexican American families participating in a health behavior change program. *Am J Prev Med*, 4(4): 194-9.
15. King AC, Saylor KE, Foster S, Killen JD, Telch MJ, Farquhar JW, Flora JA(1988). Promoting dietary change in adolescents: a school-based approach for modifying and maintaining healthful behavior. *Am J Prev Med*, 4(2):68-74.
16. Reynolds KD, Franklin FA, Leviton LC, Maloy J, Harrington KF, Yaroch AL, Person S, Jester P(2000). Methods, results, and lessons learned from process evaluation of the high 5 school-based nutrition intervention. *Health Educ Behav*, 27(2): 177-86.
17. Cullen KW, Baranowski T, Owens E, Marsh T, Rittenberry L, de Moor C(2003). Availability,

- accessibility, and preferences for fruit, 100% fruit juice, and vegetables influence children's dietary behavior. *Health Educ Behav*, 30(5): 615-26.
18. Lindsay AC, Sussner KM, Greaney ML, Peterson KE (2009). Influence of social context on eating, physical activity, and sedentary behaviors of Latina mothers and their preschool-age children. *Health Educ Behav*, 36(1): 81-96.
  19. Min C, Noh H, Kang YS, Sim HJ, Baik HW, Song WO, Yoon J, Park YH, Joung H (2012). Breakfast patterns are associated with metabolic syndrome in Korean adults. *Nutr Res Pract*, 6(1): 61-7.
  20. Lagstrom H, Seppanen R, Jokinen E, Niinikoski H, Ronnema T, et al. (1999). Influence of dietary fat on the nutrient intake and growth of children from 1 to 5 y of age: the Special Turku Coronary Risk Factor Intervention Project. *Am J Clin Nutr*, 69(3): 516-23.
  21. Tal A, Wansink B (2013). Fattening fasting: hungry grocery shoppers buy more calories, not more food. *JAMA Intern Med*, 173(12): 1146-48.
  22. Patel BP, Luhovyy B, Mollard R, Painter JE, Anderson GH (2013). A premeal snack of raisins decreases mealtime food intake more than grapes in young children. *Appl Physiol Nutr Metab*, 38(4): 382-9.
  23. Skinner JD, Ziegler P, Pac S, Devaney B (2004). Meal and snack patterns of infants and toddlers. *J Am Diet Assoc*, 104(S1): s65-70.
  24. Darmon N, Darmon M, Maillot M, Drewnowski A (2005). A nutrient density standard for vegetables and fruits: nutrients per calorie and nutrients per unit cost. *J Am Diet Assoc*, 105(12):1881-87.
  25. Patro B, Szajewska H (2010). Meal patterns and childhood obesity. *Curr Opin Clin Nutr Metab Care*, 13(3): 300-4.
  26. Roe LS, Meengs JS, Birch LL, Rolls BJ (2013). Serving a variety of vegetables and fruit as a snack increased intake in preschool children. *Am J Clin Nutr*, 98(3): 693-9.
  27. Gao Y, Gordon J, Sun W (2014). Is poverty associated with obesity among American children? *Proc Natl Acad Sci U S A*, 111: E2237.