Original Research
Nutrafoods (2016) 15:213-217
DOI 10.17470/NF-016-1039-3

Can nutrition education in primary school students affect dietary habits?

Masha Mohajeri[1], Sepideh Sepahi[2], Ali Nemati[1]*, Farideh Iranpour[3]

Correspondence to:
Ali Nemati
mahsa.mohajeri.93@gmail.com

Keywords:
Nutrition education,
Dietary habits,
Students

Abstract

Objective: To investigate the impact of school nutrition education on children's dietary habits in Ardabil, Iran.

Design: A 12-week intervention with nutrition education was conducted in three primary schools in Ardabil. A total of 600 female students in grades 4 and 5 (10–12 years old) were enrolled in the study and divided into an intervention group and a control group. Dietary data were recorded in a food diary and the amount of different types of food consumed was noted. Data were analysed using independent and paired t-tests, and Wilcoxon and Mann-Whitney tests.

Results: The children in the intervention group reported significantly ($p \leq 0.05$) increased consumption of fruit, vegetables and dairy products following education: the mean±SD number of servings of fruit and vegetables after education was 3.2±0.02 and 1.02±0.03, respectively,i n the intervention group. The consumption of chips and sugar-sweetened drinks was significantly ($p \leq 0.05$) decreased in intervention group children, while the consumption of oily seeds was significantly ($p=0.042$) increased. There was a significant difference in the diet diversity score of the intervention group ($p=0.032$) which had a mean±SD diet diversity score of 5±0.06 groups/day. Nutrition education can affect dietary habits, such as the consumption of fruit, vegetables and dairy products, and can improve diet diversity in school students.

Introduction

Nutrition education in schools teaching children about nutrition and food choices is recommended as part of all school learning. Promoting healthy food choices throughout the school environment is an important step in developing lifelong healthy eating among children [1]. Chronic malnutrition is widespread among primary school children in many developing countries. Indeed, some studies have indicated that children in Ardabil suffer from chronic malnutrition [2]. The main nutritional problems are stunting, underweight and wasting, resulting from poor nutrition in utero and from inadequate dietary intake and infectious diseases during early childhood [3]. Micronutrient deficiencies, mainly of iron, iodine and vitamin A, slow growth and mental development and increase susceptibility to infection [4]. Most studies recommend the participation of nutritionists

[1]Department of Nutrition, Ardabil University of Medical Sciences, Ardabil, Iran
[2]Department of Health, Ardabil University of Medical Sciences, Ardabil, Iran
[3]Sabalan School, Ardabil, Iran
*Ali Nemati, Department of Health, Ardabil University of Medical Sciences, Ardabil, Iran, tel: +98 914 359 2703

Received: November 26, 2015 / Accepted: December 25, 2015

in nutrition education [5]. Some studies describe the presence of nutritionists in the classroom to support the teacher, while others report interventions whereby nutritionists train teachers who then conduct the intervention. Published studies on school-based nutrition education to reduce risk factors for obesity have shown conflicting results [6]. Our study aimed to evaluate the effectiveness of classroom nutrition education by a nutritionist compared to no intervention in promoting the consumption of fruit, vegetables, oily seeds and dairy products in elementary school-age children in Ardabil. The aim of this study was to increase children's consumption of fruit, vegetables oily seeds, dairy products and pulses.

Methods and materials

This was a group randomized controlled trial. Six hundred school children in three schools were randomly assigned to one of two groups: an intervention group (300 children) and a control group (300 children). A nutritionist participated in a 12-week nutritional training course and, during the following 12 weeks, conducted the educational dietary programme with activities in the classroom. Children participating in both groups recorded their daily food and snack consumption throughout the 12-week intervention and for an additional 12 weeks.

Subjects and design

Six hundred children aged 10–12 years were enrolled in this study. These children attended school from 8:30 am until 1:30 pm and ate their lunch at home. One team of three nutritionists participated in the intervention. The exclusion criteria were children below 10 years or above 12 years of age, children attending full-time school (8:30 am to 4:30 pm), previous participation in a health promotion programme, and children with serious chronic illness.

Throughout the 12-week study, all participating children completed a daily dietary diary by recording what they had eaten during the previous day. The food records were collected each day in the classroom. The total number of daily dietary portions of each of five food groups was calculated weekly. Food group frequencies were determined for the 12-week period (number of dietary portions in the reference period divided by 12). The participants also filled out a daily diary in which they noted the hours of physical activity spent in sports outside school, such as soccer, basketball, volleyball and swimming. Each child's height and weight were measured at the beginning and at the end of the 12-week intervention.

Interventions

During the 12 weeks, the nutritionist took part in a training course (one 2 h meeting each week) aimed at improving the dietary habits of children. The course covered topics such as macronutrients and micronutrients, digestion, the nutritional needs of school children, obesity, physical activity, communication guidelines and strategies to modify dietary habits. In the classroom, the nutritionist used PowerPoint, discussed the food groups, and gave the students one small book and a CD that explained the food groups and their importance for the body.

Measuring dietary diversity

Dietary diversity was measured by summing the number of food groups consumed over 12 weeks. The food intake data of the subjects were collected using individual food records.

Statistical analysis

Data analysis was performed using SPSS software (version 16). Data were analyzed using the independent sample t-test and paired samples t-test for comparing normal quantitative data. Descriptive statistical analysis (mean, standard error) was used to report normal quantitative data. The data were tested for normality with the Kolmogorov-Smirnov sample test. Non-normative quantitative data were compared using the Mann-Whitney test and Wilcoxon test. In all analyses, $p<0.05$ was considered significant.

Results

Recruitment began in June 2014. The intervention started in September 2014 and ran for 12 weeks. A total of 600 students completed the study (300

in an intervention group, and 300 in a control group). The baseline characteristics were similar for the two treatment groups (Table 1).

The children in the intervention group reported significantly ($p \leq 0.05$) increased consumption of fruit, vegetables and dairy products after education. The mean±SD number of servings per day of fruit and vegetables after education was 3.2±0.02 and 1.02±0.03, respectively, in the intervention group. The consumption of chips and sugar-sweetened drinks was significantly ($p \leq 0.05$) decreased in the intervention group, while the consumption of oily seeds was significantly ($p=0.042$) increased at 0.1±0.023 serving/day after education. After the intervention there was significant difference in the diet diversity score ($p=0.032$) which was a mean±SD of 5±0.06 in the intervention group. There was no significant difference in diet diversity in the control group. After education there was a significant difference between study groups in diet diversity (intake of fruit, vegetables, legumes, oily seeds and dairy products) ($p \geq 0.05$). The intake of legumes was not significantly changed in either group after the intervention ($p \geq 0.05$).

	Intervention group (N=300)	Control group (N=300)	*p* Value*
Age (years)	11.30±0.45	11.26±0.33	0.256
Weight (kg)	44.56±2.38	44.44±3.42	0.148
Height (cm)	153.92±14.35	153.75±12.86	0.129
BMI (kg/m^2)	19.02±3.56	19.08±4.88	0.146

Values are mean ± SD
*Based on the independent t-test

Table 1 - Baseline characteristics of the 600 subjects

Discussion

Childhood growth and nutrition is very important for child development, and it is essential to promote nutrition among young people as health promotion starting from early in life has a large impact on health and well-being during childhood and in later life [7]. Nutritional information is a vital component of student training [8]. Nutrition education in childhood is very important as many dietary habits are established in childhood.

We have tested the hypothesis that a dietary education intervention conducted by a nutritionist can change the dietary habits of school children. Analysis of the results indicates that children who received a nutrition education programme positively changed their dietary habits. They increased their consumption of fruit, vegetables and dairy products and decreased their consumption of chips

	p Value#	Intervention group			Control group		
		Before	After	*p* Value*	Before	After	*p* Value*
Fruit (servings/day)	0.023	1.5±0.03	3.2±0.02	0.0001	1.4±0.08	1.42±0.02	0.125
Vegetables (servings/day)	0.050	0.5±0.01	1.02±0.03	0.023	0.8±0.04	0.8±0.02	0.852
Legumes (servings/day)	0.038	0.1±0.03	0.12±0.05	0.085	0.2±0.05	0.2±0.03	0.563
Oily seeds (servings/day)	0.041	0.05±0.001	0.1±0.023	0.042	0.02±0.002	0.02±0.005	0.365
Dairy products (servings/day)	0.028	1.02±0.01	2.36±0.08	0.041	1.5±0.07	1.4±0.03	0.062
Chips (servings/day)	0.015##	1.5±0.02	0.7±0.03	0.033	1.2±0.02	1.3±0.4	0.086**
Sugar-sweetened drinks (servings/day)	0.018##	0.1±0.02	0.05±0.003	0.021	0.2±0.05	0.3±0.06	0.051**
Diet diversity score (groups/day)	0.044	4.2±0.09	5±0.06	0.032	4.1±0.09	4.03±0.08	0.122

*Based on paired samples t-test **Based on the Wilcoxon test #Based on independent samples t-test (after education) ##Based on the Mann-Whitney test

Table 2 - Diet diversity: intake of fruit, vegetables, legumes, oily seeds and dairy products before and after nutrition education

and sugar-sweetened drinks after a 12-week intervention. In contrast, the control group children did not change their dietary habits. Should the results of our work be confirmed by other studies, they emphasize that the role of the nutritionist is central to dietary education and changing food choices [9]. The formation of healthy dietary habits is a lengthy process and is not accomplished by a few hours, or even days, of instruction [10]. Yujin *et al.* in one study in primary school students indicated that nutritional knowledge about snacks was significantly increased in an intervention group [11]. In another study, Marr indicated that nutrition education can play a key role in developing wide-ranging and diverse partnerships, including food and beverage companies, designed to affect social change aimed at achieving a healthy weight [12]. Consumption of a wide variety of foods has been recommended for achieving adequate nutrient intake. Japanese authorities advocate the consumption of 30 different food items per day, while US authorities advise the consumption of a variety of foods and beverages from the five basic food groups, with items from each food group consumed daily [13]. Legume intake did not change in our intervention group, maybe because the nutritionist did not deliver sufficient education about the benefits of legumes, or not enough legumes were consumed in the students' homes, so they were unable to change this aspect of their diet. Dietary diversity is recognized by nutritionists as a key element of high quality diets. Most dietary guidelines recommend an increase in the variety of foods consumed across and within food groups [14]. Dietary factors are associated with increased or decreased risks of chronic disease. Lack of dietary diversity is a major problem among populations in the developing world [15].

Our results indicate that education can increase diet diversity among students. After the education programme, diet diversity in the intervention group was increased and they ate from all five food groups. Cheadle *et al.* indicated that the implementation of educational theatre programmes resulted in statistically significant increases in knowledge of nutrition [16]. Silveira *et al.* asserted that school-based nutrition education can reduce the prevalence of overweight and increase fruit and vegetable consumption [17].

Limitations

The main limitation of the study was the lack of blinded randomization. Another limitation was that the amount of food consumed was declared but not verified, so that students could have given a better answer just to show that they had understood the lessons without really changing their dietary habits.

Conclusions

Based on our study, school-based nutrition education can affect students' dietary habits, can increase the consumption of fruit, vegetables, oily seeds and dairy products, and can improve dietary diversity.

Acknowledgements

The authors gratefully acknowledge the Ardabil University of Medical Sciences, the Nutrition Research Center, and the Student Research Center of Ardabil University of Medical Sciences for their financial support and thank all the participants in this study.

Conflict of Interest

The authors declare that they have no conflicts of interest.

References

1. Dalton S (2004) Our overweight children. What parents, schools, and communities can to do control the fatness epidemic. University of California Press, Berkeley, pp 200–237
2. Nemati A, Naghizade A (1986) Malnutrition of children in Ardebil. Health J 12:14–20
3. Sherman J, Muehlhoff E (2007) Developing a nutrition and health education program for primary schools in Zambia. J Nutr Educ Behav 39:335–342
4. Giles C, Kenney E, Gortmaker S, Thayer J (2012) Increasing water availability during afterschool snack. Am J Prev Med 43:136–142
5. Kain J, Uauy R, Albala C, Vio F, Cerda R, Leyton B (2004) School-based obesity prevention in Chilean primary school children: methodology and evaluation of a controlled study. Int J Obes Relat Metab Disord 28:483–493

6. Piffer S, Kaisermann D, Pasquazzo M (2003) Dietary habits in primary school children. Role of school meals and parents's social class. Ann Ig 15:1097–1108
7. McVey G, Tweed S, Blackmore E (2007) Healthy Schools–Healthy Kids: a controlled evaluation of a comprehensive universal eating disorder prevention program. Body Image 4:115–136
8. Ball J, Crowley C, Rajput-Ray L, Ray G (2014) Nutrition in medical education: reflections from an initiative at the University of Cambridge. J Multidiscip Healthc 7:209–215
9. Klepp K, Perez-Rodrigo C, De Bourdeaudhuij I, Due P, Elmadfa I, Haraldsdottir J *et al.* (2005) Promoting fruit and vegetable consumption among European schoolchildren: rationale, conceptualization and design of the Pro Children Project. Ann Nutr Metab 49:212–220
10. Bartrina J, Pérez-Rodrigo C (2006) Resources for a healthy diet: school meals. Br J Nutr 96:78–81
11. Yujin O, Jung-Hyun K, Youngmee L (2011) Nutrition education program in a classroom-based curriculum. J Nutr Educ Behav 43:17–18
12. Marr L (2004) Soft drinks, childhood overweight, and the role of nutrition educators: let's base our solutions on reality and sound science. J Nutr Educ Behav 36:258–265
13. Steyn N, Nel J, Nantel G, Kennedy G, Labradarios D (2006) Food variety and dietary diversity scores: are they good indicators of dietary adequacy? Public Health Nutr 9:644–650
14. Ruel M (2003) Operationalizing dietary diversity: a review of measurement issues and research priorities. J Nutr 133:3911–3926
15. Slattery M, Berry T, Potter J, Caan B (1997) Diet diversity, diet composition, and risk of colon cancer. Cancer Causes Control 8:872–882
16. Cheadle A, Cahill C, Schwartz P, Edmiston J, Johnson S, Davis L, *et al.* (2012) Engaging youth in learning about healthful eating and active living: an evaluation of educational theater programs. J Nutr Educ Behav 44:160–165
17. Silveira J, Taddei J, Guerra P, Nobre M (2013) The effect of participation in school-based nutrition education interventions on body mass index: a meta-analysis of randomized controlled community trials. Prev Med 56:237–243