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School nutrition program about fruits and its impact on knowledge, fruit preference and fruit intake in 8–10 year old Slovak children

Q1 *Slávka Mrosková* *, *Alena Schlosserová*, *Martina Reľovská*, *Ľubomíra Lizáková*

University of Prešov, Faculty of Health Care, Prešov, Slovak Republic

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ABSTRACT

Introduction: Fruit plays an important role in the prevention of various diseases. Eating fruit in Slovak children is not entirely adequate. Nutrition programs include the possibility of improving children's eating habits.
Study design: Non-randomized controlled trial.
Aim: To create a nutrition education program, implement it and analyze its effectiveness on children's eating habits.
Methodology: The school nutrition program was focused on fruit and fruit intake for health. We assessed the knowledge level of fruit, fruit preference and fruit intake in an intervention and control group. Before the nutrition program children reported their home availability of fruit, and fruit model (parent/teacher/friend as a model of fruit intake). We used Chi-square test, *t*-test, and analysis of covariance (ANCOVA).
Sample: The research enrolled 136 children aged 8–10 years (M = 8.67, SD = 0.55). The school nutrition program has been accomplished in 68 children (intervention group), the control group consisted of 68 children.
Results: We found a higher level of knowledge ($p = 0.000$) and higher fruit preference ($p = 0.001$) in the intervention group. The fruit intake in the intervention and control group was similar ($M = 7.51$ vs. $M = 6.74$, $p = 0.059$). There is not a significant effect of the nutrition program on the frequency of eating fruits in children after controlling for the effect of covariate – "fruit availability" [$F(1.133) = 3.254$, $p = 0.074$], but the program has a significant effect on the frequency of fruit eating in children after controlling for the covariate – "parent as a fruit model" [$F(1.133) = 5.033$, $p = 0.027$] and "teacher as a fruit model" [$F(1.133) = 4.071$, $p = 0.046$].
Conclusion: Parents and teachers play an important role in supporting the effectiveness of a nutrition program and the modification of children eating habits.

* *Corresponding author at:* University of Prešov, Faculty of Health Care, Partizánska 1, 080 01 Prešov, Slovak Republic.
E-mail address: slavka.mroskova@unipo.sk (S. Mrosková).

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Introduction

Fruit is a source of a wide range of protective substances [1]. Insufficient consumption of fruit and vegetables is associated with the occurrence of various chronic diseases [2–4].

Fruit intake among Slovak children aged 6.3–15.9 years is not entirely adequate [5], with the increasing age of children, their intake of fruits decreases [6]. Adopting healthy eating habits in childhood is considered to be one of the most effective forms of prevention of nutrition-related diseases. Many factors are involved in shaping eating habits. The most important role is played by parents [7,8] who, through the use of a wide range of feeding practices (e.g. home availability of healthy/unhealthy food, modeling of healthy eating, pressure to eat, restriction, ...) are able to shape the eating habits of children. Other determinants include teachers [9,10], friends [11], taste preferences [12], or the knowledge level of children about meals [13].

The American Dietetic Association, the School Nutrition Association and the Society for Nutrition Education confirm that schools are important partners in health promotion, so it is appropriate to integrate specific strategies, such as nutrition programs, in the school environment [14]. Systematic review and meta-analysis have shown that school nutrition programs lead to a moderate increase in fruit intake in children aged 5–12 years (increase in fruit intake by 0.25 portions) [15]. The nurse plays a strategic role in primary prevention. Fulfilling the role of the educator, the nurse can proactively be involved in the creation, realization, and evaluation of nutrition programs for children, and thus participate in the attitudes of parents and their children to meals and eating [16].

In the foreign literature we find a wide range of implemented educational programs and data on their impact on selected attributes of children's eating habits. The positive impact of school nutrition programs was demonstrated, for example, by the level of fruit preferences [17], knowledge level of fruit and vegetables [18–20], attitudes and beliefs toward fruit and vegetables [19,20], and the consumption of fruit and vegetables [20–23].

Health education in the Slovak Republic, including education on healthy eating, is mainly carried out through two national projects: ''School fruit'' and ''Schools promoting health''. The first one is focused on the availability of fruit for children in kindergartens and primary schools. The project ''Schools promoting health'' is focused on raising awareness about children's health, shaping children's attitudes toward their own health and the prevention of diseases. Teachers in this project also integrate information that has to do with health and healthy lifestyle into the educational content of the various subjects (e.g., science, ethics, and physical education). The diffuseness, the diversity, the lack of systematic provision of information given to children by teachers, the differentiation in intensity and content of activities undertaken by schools in relation with the program being implemented, are causes that so far are failing to achieve the adoption of the recommendations and the principles of a healthy lifestyle by the children. Therefore, some experts in Slovakia are of the opinion that the easiest and most effective measure would be to integrate into the curriculum a compulsory, non-classified subject on healthy eating/healthy lifestyles for children in primary schools [24,25], which would teach children about healthy shopping, healthy cooking, in the event that such information is not provided to them at home by parents [24].

The implementation of school nutrition programs can shape and modify the eating habits of children, therefore, the main objective of the present article was to create a nutritional educational program, to implement it and analyze its effectiveness on the dietary habits of children, i.e. on children's knowledge of fruit, children's preference for fruit and fruit consumption.

Materials and methods

Study design – *non-randomized controlled trials*

The nutrition program was created by a team of experts. It was focused on fruit and its importance for health. The content of the program integrated the following areas: recommended daily fruit intake, essential fruit ingredients (water, sugar, vitamins, and fiber), change in fruit quality in different processing, the principle of fiber functioning in the human body, the importance of fruit for health, and the protective function of vitamins. Education was performed in small groups (12–15 children). The nutrition program lasted 4 weeks in each group, and its contents were divided into 4 units (1 unit was realized for approximately 1–1.5 h). A wide range of methods and tools have been used in the education process to make children an active part of education (e.g. fairy tales about fruit, drawing, sticking pictures, posters, brainstorming, accessories, making fruit juices, physical activities). The choice of methods and tools was adapted to the age category of children (7–10 years).

Data collection

The study was approved by the Ethics committee of Prešov Municipality in Slovak Republic. The research was realized in 5 primary schools in the town of Prešov. Several schools in Prešov were addressed, and the main inclusion criterion was that the pupils had not experienced a nutrition program similar to that in the research in the past.

The nutrition program ran from November 2015 to April 2016, and was implemented in cooperation with elementary school teachers. Teachers were instructed not to change their eating habits in the school environment until the beginning of the nutrition program. Parents of children were informed orally and in writing of the purpose of the nutrition program, its content, timing, and research focus. They were instructed not to change the diet and eating habits of their children before starting the nutrition program (specifically in relation to fruit intake). The nutrition program included 80 children, whose parents gave written consent. Twelve children did not complete the program, so they were not included in the research process. Children integrated into the research have no restrictions on fruit consumption – e.g. allergic reaction.

Knowledge level, fruit preference and fruit intake was assessed in a control group of children and 2 weeks after the nutrition program in the intervention group finished. Availability

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