

DIETARY PATTERNS OF PRIMARY SCHOOL CHILDREN IN CROATIA: CHALLENGES IN IMPLEMENTING NUTRITIONAL GUIDELINES

Lucija Rožić 

Institute of Emergency Medicine of Šibenik-Knin County, Narodnog Preporoda 1, 22 000 Šibenik, Croatia

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ABSTRACT

Nutrition in primary school age is important for growth, development, and health. Although nutritional guidelines for school children are clearly defined, available data from Croatia show that children's dietary patterns often differ from recommended standards. The aim of this review paper was to present the dietary patterns of primary school children in Croatia and to identify the main challenges in the implementation of nutritional guidelines. The paper was based on a narrative review of scientific and professional literature, as well as relevant national and international documents. The reviewed literature showed problems such as skipping breakfast, irregular meal frequency, insufficient intake of fruit and vegetables, and frequent consumption of foods high in salt, sugar, and fat. Earlier Croatian studies and more recent national data indicate that these problems have been present over a longer period and remain an important public health issue. The findings also show that the implementation of nutritional guidelines is influenced by the school food environment, family eating habits, socioeconomic circumstances, and food marketing. Improving children's dietary patterns therefore requires cooperation between schools, families, public health institutions, and wider policy action.

Keywords: dietary patterns, primary school children, nutritional guidelines, child nutrition, Croatia

Corresponding author: Lucija Rožić, univ. mag. med. techn.; lucija.rozic1979@gmail.com

INTRODUCTION

Nutrition in childhood is important for growth, health, and well-being, and healthy dietary practices should be established early in life. During the school-age period, children are exposed to multiple influences that shape food-related decisions and dietary behaviours. In this context, schools represent an important setting for supporting healthy diets and providing a food environment that can encourage healthier choices (1).

A recent systematic review indicated that interventions targeting the school food environment may have modest beneficial effects on selected dietary outcomes in children. The review found that nutrition standards for foods and beverages provided or sold at school, interventions modifying food presentation and placement, and fruit and vegetable provision were associated with improved consumption of healthier foods and beverages. Nutrition standards were also linked to reduced consumption of less healthy foods and beverages, while some school food environment interventions showed beneficial effects on energy intake and food selection (2). In Croatia, this topic is additionally relevant from a public health perspective. According to the 2021/2022 CroCOSI report, 36.1% of children aged 8.0 to 8.9 years had overweight or obesity. The same report indicates that childhood obesity is associated with an increased likelihood of obesity and other non-communicable diseases later in life (3).

In addition, the implementation of nutritional guidelines is influenced by factors beyond the school setting, including family environment, socioeconomic circumstances, and the wider food environment. Parental food habits and feeding strategies are described as important determinants of children's eating behaviour and food choices. The review also emphasizes the role of the family environment and the

relevance of socioeconomic and educational factors in shaping children's eating behaviours (4). Cross-sectional findings from the INPACT study showed that maternal educational level was associated with children's fruit, vegetable, and breakfast consumption, and that these associations were partly mediated by characteristics of the home food environment, including food availability, parental consumption, and food-related rules (5). Review evidence also indicates that food advertising directed at children is widespread, predominantly promotes energy-dense and nutrient-poor products, and that even short-term exposure has been associated with increased food consumption (6).

Although professional guidelines clearly define the nutritional needs of primary school children, deviations from recommended dietary patterns are often observed in practice. Available Croatian data suggest that the dietary patterns of primary school children do not always correspond to recommended standards. Reports and individual studies have indicated problems such as skipping breakfast, irregular meal patterns, insufficient consumption of fruit and vegetables, and frequent intake of foods high in salt, sugar, and fat. Therefore, there is a need to synthesize the available evidence on the dietary patterns of primary school children in Croatia and to interpret these findings in relation to current nutritional recommendations and barriers to their implementation.

AIM

The aim of this review paper was to present the dietary patterns of primary school children in Croatia and to identify the main challenges in the implementation of nutritional guidelines. The paper also aimed to compare the findings from the available literature with relevant

national and international nutritional recommendations.

MATERIALS AND METHODS

This review paper was based on a narrative review of available scientific and professional literature, as well as relevant national and international documents related to the dietary patterns of primary school children and the implementation of nutritional guidelines. Sources were identified by searching titles and keywords and were selected according to their relevance to the topic of the paper. Consideration was given to sources addressing children's nutrition in Croatia, school nutrition, nutritional guidelines, the influence of family and socioeconomic factors on children's eating behaviour, and the impact of food marketing. The review included original scientific articles, review papers, national reports, professional guidelines, and legislative documents relevant to the topic. Preference was given to sources directly related to primary school children, the Croatian context, and recommendations applicable to school-age nutrition. A total of 30 sources were included in the review.

RESULTS

Dietary patterns of primary school children in Croatia

The available literature on dietary patterns of primary school children in Croatia includes both earlier studies conducted in specific school settings and more recent research and national reports that provide a broader public health perspective.

A survey conducted in March 2016 among 120 pupils from the second, third, and fourth grades of Ljudevit Gaj Primary School in Nova Gradiška examined meal patterns and the consumption of different food groups. Data were collected using a questionnaire on

schoolchildren's dietary habits designed for the purposes of the study. The results showed that 43% of pupils ate three meals a day and 36% ate four meals a day, while regular breakfast before school was not established in a substantial proportion of pupils: 32% did not eat breakfast before school, 30% did so very rarely, and only 38% reported breakfast consumption more than once a week. More than 65% of children consumed more than two portions of fruit per day, 60% ate vegetables several times a week, and 90% drank one or more glasses of milk daily. Although 80% reported that they did not eat or only rarely ate fast food, more than 70% stated that they were sometimes hungry during classes and 23% reported being often hungry during school hours (7).

A case-study survey conducted in a primary school in Zagreb examined the influence of media advertising, media exposure, and parent-child communication on children's dietary habits. The study was carried out within a two-year Erasmus project promoting healthy lifestyles among pupils. Data were collected through an anonymous questionnaire with 30 open- and closed-ended questions. The sample included 166 pupils from the fifth to the eighth grade, mostly aged 11 to 14 years, and the data were analysed using inferential statistics and the chi-square test. The findings showed high daily exposure to media, especially television, with older pupils spending more time in front of screens. Although respondents reported that advertisements did not affect their food choices, their answers indicated a preference for frequently advertised products. The study also pointed to insufficient communication between parents and children about advertising and unhealthy dietary habits. The authors noted that the findings should be interpreted as

preliminary because of the sample size and the applied method (8).

A cross-sectional population-based study conducted among 1077 primary school children in Osijek examined dietary patterns and salt intake through commonly consumed snacks. Data were collected using a self-administered questionnaire, and the salt content of 42 bakery products was additionally analysed. The results showed several unfavourable dietary patterns, including skipping breakfast (32.0%), consuming fewer than five meals per day (67.3%), daily consumption of bakery products or sweets as snacks (51.6%), and the absence of at least one cooked meal at home per day (46.7%). The analysis of bakery products indicated a high salt content, suggesting that commonly consumed snacks can significantly contribute to total daily salt intake. The findings highlight excessive salt intake as an important public health issue among school-aged children (9).

National data from the first Croatian CroCOSI round, conducted in the 2015/2016 school year, also indicated that excess body weight was already an important public health issue among children aged 8.0 to 8.9 years. The survey was carried out on a national sample of second- and third-grade pupils and showed that 34.9% of children had overweight or obesity, while the proportion was higher in boys than in girls. Regional differences were also observed, with the lowest prevalence recorded in the City of Zagreb and less favourable results in the Adriatic and Continental regions. The findings additionally suggested a discrepancy between measured nutritional status and parental perception, as parents reported overweight or obesity less often than was shown by anthropometric assessment (10).

A study conducted in the 2020/2021 school year assessed changes in nutritional status, physical activity habits, and dietary patterns

among primary school children during the COVID-19 pandemic. The sample initially included 197 pupils from one primary school in Istria, while 173 were included in the final analysis. Data were collected using a self-administered questionnaire, dietary quality was evaluated using the KIDMED index, and anthropometric and kinanthropological data were retrieved from physical education records. The findings showed moderate adherence to the Mediterranean diet, improved breakfast consumption during online schooling, and a significant reduction in physical activity. No statistically significant changes in nutritional status were observed, but kinanthropological results were poorer after the period of online schooling (11).

National data from the 2018/2019 CroCOSI survey also showed that excess body weight represented an important public health issue among Croatian children aged 8.0 to 8.9 years. According to this report, 35.0% of children had overweight or obesity, with higher proportions observed in boys than in girls. Regional differences were also reported, with the highest combined prevalence of overweight and obesity recorded in the Adriatic region, followed by Continental Croatia, while the lowest prevalence was observed in the City of Zagreb. The report also indicated that obesity was more frequent in less urbanized areas, suggesting the importance of wider environmental and socioeconomic influences on children's nutritional status (12).

Recent national data additionally indicate that excess body weight remains an important public health issue among children in Croatia. According to the analysis presented by the Croatian Institute of Public Health and UNICEF, one in three primary school children in Croatia lives with overweight or obesity, and a gradual increase in prevalence has been observed. The report also indicates that dietary

patterns become less favourable with age, that obesity is more common among children of lower socioeconomic status and those living in rural areas, and that parental awareness of children's nutritional status is often inadequate. The analysis further highlights the influence of food and beverage marketing directed at children as an important challenge in the development of healthy dietary habits (13).

Children are exposed to the marketing of unhealthy food and sugar-sweetened beverages through a wide range of environments and media from an early age. Such marketing does not only promote individual products, but also shapes food-related norms and preferences, increases children's attraction to highly processed foods, and can contribute to higher consumption of products rich in sugars, salt, and unhealthy fats. The literature further indicates that unhealthy food environments, in which such products are highly available, affordable, and intensively promoted, make healthy choices more difficult for children and families. Therefore, restricting the marketing of unhealthy food and beverages to children is considered an important public health measure for supporting healthier dietary patterns and protecting children's health (14).

Nutritional guidelines relevant to primary school children

International and national dietary guidelines provide the framework for assessing whether children's actual dietary patterns are consistent with recommended nutritional standards.

According to the World Health Organization, a healthy diet throughout the life course is essential for the prevention of malnutrition and non-communicable diseases. Although the exact composition of a healthy diet may vary depending on age, sex, level of physical

activity, and local dietary practices, its basic principles remain the same and include adequacy, balance, moderation, and diversity. Current global dietary patterns are increasingly characterized by a high intake of highly processed foods rich in unhealthy fats, free sugars, and salt, together with insufficient consumption of fruit, vegetables, and dietary fibre. In general, dietary recommendations emphasize a varied intake of minimally processed foods, adequate consumption of fruit and vegetables, limitation of free sugars, salt, saturated fats, and trans fats, and the promotion of healthy food environments through coordinated action across the health, education, legislative, and food sectors (15).

In addition to international recommendations, the implementation of healthy nutrition in primary school children in Croatia is supported by national legislative and professional documents. The State Pedagogical Standard for Primary Education requires every primary school in Croatia to organize meals for its pupils. Menus must be publicly displayed on the school notice board, and meals should be served in the school cafeteria. To protect children's health, the sale of fast food and carbonated beverages is not permitted on school premises. Pupils attending extended or full-day programs must be provided with at least 30 minutes to consume their meals. The nutritional guidelines, as well as the conditions and methods for organizing school meals, fall under the responsibility of the school's founder, while hygiene and sanitary supervision are conducted by the county public health inspectorates or the competent city office in Zagreb (16).

The Nutrition Standards for Primary School Pupils prescribe guidelines for planning meals during children's stay in school institutions (17). This document provides recommendations on food types, meal

frequency and distribution, and the optimal daily intake of energy and nutrients according to pupils' age and sex. The standards include daily energy and nutrient requirements, meal timing, the number and portion size of meals, the frequency of specific food groups in daily and weekly menus, and foods whose consumption should be limited or avoided.

These standards are based on internationally recognized professional documents and dietary guidelines. They were developed using planning tools for school nutrition in the European region (18), nutrient intake reference values established by European nutrition societies (19), and scientific references for vitamin, mineral, and electrolyte intake (20). The standards represent an important professional tool for ensuring the quality of school meals and are often used in menu planning and in the training of school staff. Additional professional support in implementing dietary guidelines in schools is provided by the *Croatian Institute of Public Health (HZJZ)*, which has developed specific dietary guidelines for upper-grade primary school pupils (21).

Family-related factors in shaping children's dietary patterns

The family represents the primary environment in which children acquire early behavioural patterns, including dietary habits. Literature suggests that the development of children's eating behaviour is strongly influenced by processes of social learning, with parents acting as the first nutritional educators and role models in everyday food-related situations. Children's eating experiences are not shaped solely by the availability of food, but also by cultural, psychosocial, and emotional factors within the family environment. In this context, parental feeding strategies have an important role, as

they can either support or hinder the development of healthy food preferences and the child's ability to regulate food intake. The literature further indicates that the formation of children's eating behaviour is associated with several interconnected factors, particularly taste-related learning, post-ingestive experiences, and the wider social context in which food is offered and consumed (22).

Review findings indicate that the family environment has an important role in the development of children's eating behaviour and risk of overweight. Parents shape children's early food environment through their own eating habits and child-feeding practices. The literature suggests that restrictive or overly controlling feeding practices may have unfavourable effects on children's eating behaviour, whereas healthier family-based approaches should support the development of food preferences, acceptance of new foods, appropriate portion sizes, and the child's ability to regulate intake (23).

Increasing attention has been directed toward the concept of responsive parenting as an important framework for the development of healthy eating behaviours in children. This approach is based on reciprocal and developmentally appropriate interaction between the child and caregiver. It includes the establishment of a structured and emotionally supportive environment, the child's expression of needs and signals, and the caregiver's timely, sensitive, and appropriate response. Through such consistent interactions, the child develops a sense of predictability and security, which may support healthy growth and contribute to the prevention of both undernutrition and overweight. The literature therefore suggests that responsive parenting provides an important theoretical basis for responsive feeding and for the promotion of healthy dietary habits in childhood (24).

Additional review evidence suggests that children's eating patterns are shaped by both the physical and the social family environment. Food choices are influenced by the availability and accessibility of foods in the home, as well as by portion size, since children tend to consume more when larger amounts are offered. The literature also indicates that broader social factors, including parental education, time constraints, and sociocultural background, affect the types of food children eat. Mealtime structure represents another relevant factor, particularly through family meals, screen use during eating, and the context in which food is obtained or consumed. In addition, parents influence children's eating patterns directly through their own behaviours, attitudes, and feeding styles, which highlights the importance of addressing both family and environmental determinants when promoting healthier nutrition in childhood (25).

Taken together, the available literature indicates that family-related factors have a major role in shaping children's dietary patterns. Parental modelling, feeding strategies, and the emotional and social context of eating can either support or hinder the adoption of healthy dietary patterns. These findings further suggest that the implementation of nutritional guidelines in childhood cannot rely solely on school-based measures, but also requires active involvement of parents and the family environment.

DISCUSSION

The findings of this review show that the dietary patterns of primary school children in Croatia often differ from recommended nutritional standards. The reviewed Croatian literature points to breakfast skipping, irregular meal frequency, insufficient intake of fruit and vegetables, and frequent consumption of foods of poor nutritional quality. Recent national

data also show that these problems need to be viewed in a wider public health context, especially in relation to overweight and obesity, socioeconomic differences, and food marketing.

These findings are consistent with evidence showing that school food environment policies can improve some dietary behaviours in children. A systematic review and meta-analysis found that the provision of healthier foods and beverages was associated with higher fruit intake, while standards for competitive foods and beverages were associated with lower intake of sugar-sweetened beverages and unhealthy snacks. School meal standards were also associated with better intake of some nutritional components, including lower fat and sodium intake. However, effects on adiposity and metabolic risk were not clearly established (26).

The findings should also be considered in relation to socioeconomic differences in children's diet. A multicountry study based on WHO COSI data showed that less favourable food habits in children aged 6 to 9 years were associated with lower socioeconomic status, especially lower parental education and lower perceived family wealth (27). A systematic review also found that children from socioeconomically disadvantaged groups were more likely to have less favourable dietary intake, including lower consumption of fruit and vegetables and higher intake of sweetened beverages and non-core foods. The same review showed that parental modelling, home food availability and accessibility, and children's nutrition knowledge were related to these differences (28).

The available evidence also suggests that school-based measures alone are not enough. A systematic review and meta-analysis found that changes in the school food environment

were associated with improved fruit intake and a small but meaningful effect on body mass index in children, but no clear effect was found for vegetable intake. The authors also stated that broader policy action is needed to improve the food environment around schools and to support sustained healthy dietary behaviours (29).

In addition to school and socioeconomic influences, behavioural and family-related factors should also be taken into account. A systematic review of studies on schoolchildren's dietary patterns found that unhealthy dietary patterns were present in most of the included studies and were associated with higher screen time, meal skipping, weight and fat gain, and aspects of the family environment. In contrast, regular breakfast consumption was associated with greater adherence to healthier dietary patterns. The review also emphasized the importance of food and nutrition education and the regulation of ultra-processed food marketing in public health policies (30).

Taken together, the available evidence suggests that unfavourable dietary patterns among primary school children in Croatia are shaped by several connected factors. Although nutritional guidelines and school nutrition standards are clearly defined, their implementation is influenced by school food provision, socioeconomic circumstances, family environment, and wider food marketing. This means that improving children's dietary patterns requires school-based measures, broader public health action, and cooperation between schools, families, and the wider community.

CONCLUSIONS

The available evidence shows that the dietary patterns of primary school children in Croatia often do not correspond to recommended

nutritional guidelines. The reviewed literature indicates recurring problems such as skipping breakfast, irregular meal patterns, insufficient consumption of fruit and vegetables, and frequent intake of foods high in salt, sugar, and fat. Earlier Croatian studies and more recent national data suggest that these problems have been present over a longer period and remain an important public health issue.

The findings also show that the implementation of nutritional guidelines is influenced by several interconnected factors. In addition to the school food environment, important determinants include family eating habits, socioeconomic circumstances, and the wider food environment, including food marketing directed at children. For this reason, improving children's dietary patterns cannot rely only on school-based measures.

A more effective implementation of nutritional guidelines requires coordinated action involving schools, families, public health institutions, and broader policy measures. Such an approach is necessary to support healthier dietary patterns in primary school children and to reduce the long-term health risks associated with poor nutrition.

GENERATIVE AI STATEMENT

Artificial Intelligence (AI) tools were not used in the preparation of this manuscript. The authors remain responsible for the content's integrity and originality.

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PREHRAMBENI OBRASCI DJECE OSNOVNOŠKOLSKE DOBI U HRVATSKOJ: IZAZOVI U PROVEDBI PREHRAMBENIH SMJERNICA

Lucija Rožić 

Zavod za hitnu medicinu Šibensko-kninske županije, Narodnog Preporoda 1, 22 000 Šibenik, Hrvatska



SAŽETAK

Prehrana u osnovnoškolskoj dobi važna je za rast, razvoj i očuvanje zdravlja. Iako su prehrambene smjernice za školsku djecu jasno definirane, dostupni podaci iz Hrvatske pokazuju da prehrambeni obrasci djece često odstupaju od preporučenih standarda. Cilj ovoga preglednog rada bio je prikazati prehrambene obrasce djece osnovnoškolske dobi u Hrvatskoj i utvrditi glavne izazove u provedbi prehrambenih smjernica. Rad se temelji na narativnom pregledu znanstvene i stručne literature te relevantnih nacionalnih i međunarodnih dokumenata. Pregledana literatura pokazala je probleme kao što su preskakanje doručka, nepravilan ritam obroka, nedostatan unos voća i povrća te česta konzumacija hrane s visokim udjelom soli, šećera i masti. Ranija hrvatska istraživanja i noviji nacionalni podatci upućuju na to da su ti problemi prisutni dulje vrijeme i da i dalje predstavljaju važan javnozdravstveni problem. Nalazi također pokazuju da na provedbu prehrambenih smjernica utječu školsko prehrambeno okruženje, obiteljske prehrambene navike, socioekonomske okolnosti i marketing hrane. Poboljšanje prehrambenih obrazaca djece stoga zahtijeva suradnju škola, obitelji, javnozdravstvenih institucija i šireg djelovanja javnih politika.

Ključne riječi: prehrambeni obrasci, djeca osnovnoškolske dobi, prehrambene smjernice, prehrana djece, Hrvatska

Autor za korespondenciju: Lucija Rožić, univ. mag. med. techn.; lucija.rozic1979@gmail.com