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Original article

CHARACTERIZING FOOD, DAIRY, AND BEVERAGE AVAILABILITY IN PRIMARY SCHOOL PREMISES IN NORTH MACEDONIA - COSI STUDY

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Abstract

Introduction: Childhood obesity remains a global public health challenge. As part of the World Health Organization's (WHO) Childhood Obesity Surveillance Initiative (COSI), North Macedonia participates in each data collection round to monitor primary school nutritional environments across the country. School nutrition environment characteristic exploration is necessary for managing and tracking childhood obesity and associated risk factors over time.

Aim: Using WHO COSI-6th round data, the aim of this study was to depict availability of select foods, dairy and beverages in a nationally representative sample of primary schools across North Macedonia.

Material and methods: Data were drawn from the WHO COSI-6th round conducted in North Macedonia in 2022. A designated official (n=111) at the respective primary school reported availability of the following: (1) food (fruits, vegetables, ice cream, sweet snacks, and savory snacks), (2) dairy (milk, yogurt, and/or ayran), (3) beverages without added sugar (water, tea, and fruit juices), and (4) beverages with added sugar (non-carbonated fruit juices, carbonated drinks, hot drinks [e.g., cocoa], and flavored milk). Additionally, the designated school official reported whether their primary school had a canteen and/or shop/cafeteria where foods or beverages could be purchased.

Results: Across primary schools in North Macedonia, availability of healthy options (i.e., fruits and vegetables) was lower as compared to energy-dense selections (i.e., sweet and savory snacks). Overall, 18.3% of schools offered dairy products (including milk, yogurt, and ayran). Water was the most commonly available (69.0%) beverage. No significant differences emerged in availability of food, dairy, beverages without added sugar or beverages with added sugar across primary school enrollment (small *versus* large). Less than one-fifth of primary schools had a canteen (17.4%) and/or shop/cafeteria (14.4%) where foods or beverages could be purchased.

Conclusion: In conclusion, access to food, dairy, and beverages for primary school children in North Macedonia was limited.

Keywords: primary schools, children, childhood obesity, nutrition environment, school food environment

Introduction

Obesity is a complex problem affecting children of all age groups[1-3] and occurs when a child's body mass index (BMI) exceeds established limits for their age and height. Given the rise of childhood obesity across the globe[4], primary schools have the potential to offer an environment which supports adoption and maintenance of healthy eating habits. A United Nations International Children's Emergency Fund report highlighted alarming global trends where many school-age children consume inadequate amounts of fruits and vegetables while overindulging in unhealthy snacks[5]. A recent systematic review underscored the importance of school nutrition policies in not only successfully increasing fruit and vegetable consumption, but also limiting sugary drinks, unhealthy snacks, fats, saturated fats, and sodium[6].

The World Health Organization (WHO) established the European Initiative for Child Obesity Monitoring (COSI) in 2007[7]. COSI includes a battery of standardized procedures and questions to assess and objectively track obesity-related population health markers such as anthropometric measurements and home and school nutritional environments in primary school children.

Aim

Using COSI-6th round data, the aim of this study was to depict availability of select foods, dairy and beverages in a nationally representative sample of primary schools across North Macedonia.

Materials and methods

Data used in this study were from the WHO COSI-6th round. Detailed information regarding COSI's objectives and methodologies has been previously published[8]. The COSI study protocol for North Macedonia was approved by the Ss. Cyril and Methodius University - Faculty of Medicine's Ethics Committee (approval: 03-2140/1 from 06.05.2022). In North Macedonia, COSI-6th round included a nationally representative sample of primary schools within each of the ten regional Centers of Public Health. School size was based on total second grade enrollment and categorized as small (≤25 pupils) or large (>=30 pupils). A designated representative (headmaster/headmistress, principal) completed the mandatory COSI-6th round school form between October and December 2022.

Excluding lunch provided by the school, availability of various foods, dairy products, and beverages within primary school premises was reported as free, paid, or not available. Using Korzycka's study as a guide[9], we categorized food, dairy and beverages as either available (i.e., free or paid) or unavailable. The designated school official reported availability of the following: (1) food (fruits, vegetables, ice cream, sweet snacks, and savory snacks), (2) dairy (milk, yogurt, and/or ayran), (3) beverages without added sugar (water, tea, and fruit juices), and (4) beverages with added sugar (non-carbonated fruit juices, carbonated drinks, hot drinks [e.g., cocoa], and flavored milk). Additionally, the designated school official reported whether their primary school had a canteen and/or shop/cafeteria where foods or beverages could be purchased.

Upon COSI-6th round data collection completion, Institute of Public Health of North Macedonia research assistants verified mandatory school forms for accuracy. School data were entered into the WHO-COSI electronic software system, Open Clinica (OpenClinica LLC, Waltham, MA, USA) and electronically transferred to the Regional WHO office for quality review.

Descriptive analyses were calculated to depict availability of select food, dairy, and beverages and whether there was a canteen and/or shop/cafeteria within primary school

premises. Chi-square (χ^2) analyses were conducted to explore differences in availability of select food, dairy, and beverages within school premises across enrollment size. Statistical significance was set at $p<0.05$ *a priori*. All data were analyzed using the IBM® Statistical Package for the Social Sciences, ®Version 28.0.1.1(14) (SPSS+, Chicago, Illinois).

Results

A total of 111 schools were included in COSI-6th round in North Macedonia. With ≥30 pupils, just over half of schools were considered to have large second grade enrollment (Table 1).

Table 1. Second grade primary school enrollment in North Macedonia (n=111)

Second Grade Enrollment	Schools %	Pupils M±SD
Small (≤29 pupils)	47.7	20.5±5.5
Large (≥30 pupils)	52.3	45.2±14.7

As shown in Table 2, overall availability of healthy options (i.e., fruits and vegetables) was lower as compared to energy-dense selections (i.e., sweet and savory snacks). Sweet snacks were available in 22.6% of primary schools, while savory snacks were available in 17.6% of primary schools. Overall, 18.3% of schools offered dairy products (including milk, yogurt, and ayran). Water was the most commonly available (69.0%) beverage. Fruit juices or other non-carbonated drinks (19.0%) and hot drinks (19.0%) were available at approximately one-fifth of primary schools. No significant differences emerged in availability of food, dairy, beverages without added sugar or beverages with added sugar across primary school enrollment (small *versus* large). Less than one-fifth of primary schools had a canteen (17.4%) and/or shop/cafeteria (14.4%) where foods or beverages could be purchased.

Table 2. Availability of select food, dairy, and beverages within primary school premises overall and across second grade enrollment in North Macedonia (n=111)

Food, Dairy, and Beverage Availability	Overall %	Second Grade Enrollment	
		Small (≤29 pupils) %	Large (≥30 pupils) %
Foods			
Fresh fruit	16.3	14.0	18.6
Vegetables	15.3	12.2	18.2
Sweet snacks (e.g., cakes)	22.6	15.4	28.9
Savory snacks (e.g., potato crisps)	17.6	12.8	21.7
Ice cream	9.9	10.3	9.5
Dairy			
Milk, yogurt, ayran	18.3	15.4	20.9
Beverages - without added sugar			
Water	69.0	73.2	65.2
Tea	23.5	18.4	27.9
100% fruit juice	17.5	10.8	23.3
Beverages - with added sugar			
Fruit juice or other non-carbonated drinks	19.0	10.8	26.2
Carbonated (soft) drinks	15.5	12.8	17.8
Flavored milk	13.4	12.8	14.0
Hot drinks (e.g., cocoa)	19.0	12.8	24.4

Discussion

A key finding to emerge from the COSI-6th round in North Macedonia was there were no differences in availability of food, dairy, beverages without added sugar and beverages with added sugar across primary school enrollment (small *versus* large). Additionally, except for water, availability of foods, dairy, beverages without added sugar or beverages with added sugar was limited in primary schools across North Macedonia. In their 2016 COSI study of Polish primary schools[9], Korzycka and colleagues reported widespread availability of fruit (94.4%), vegetables (93.8%), milk and yoghurt (88.4%), and water (84.9%). While food, dairy and beverage availability in North Macedonia was much lower than in Poland[9], these findings could be attributed to the relatively low number of canteens, shops, and cafeterias within primary schools. In contrast, canteens were present in 90.4% of Polish primary schools[9].

Our study findings should be considered within the context of several limitations. Firstly, although the WHO COSI-6th round includes a nationally representative sample of Macedonian primary schools, the cross-sectional format limits causality. Secondly, as with all observational studies that rely on self-reports, response bias remains a possibility. Thirdly, because of the nature of secondary analyses, it is not possible to alter WHO COSI-6th questions.

To our knowledge, this is the first study to explore food, dairy, and beverage availability in primary schools throughout North Macedonia. In conclusion, access to food, dairy, and beverages for primary school children in North Macedonia, was limited. As a next step, further exploration should be undertaken to identify strategies and policies to expand healthy food (e.g., fruit and vegetables) access for primary school children living in North Macedonia.

Conflict of interest statement. None declared.

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