



The gap between parental perception and actual dietary habits of younger school-age children in northwestern Bosnia and Herzegovina

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schoolchildren; dietary habits; parental perception; nutritional status; body mass index (BMI)

KEY CONTRIBUTION

This study provides the first data on nutritional status and dietary habits of younger school-age children in northwestern Bosnia and Herzegovina. The study reveals significant discrepancies between parental perceptions and children's actual eating behaviours, and highlights dietary deficiencies, including low vegetable and milk intake, insufficient meat consumption, and frequent sweets/snacks consumption. In addition, this study offers evidence to support targeted nutrition education and public health interventions in the region.

ABSTRACT

This study aimed to determine the nutritional status and dietary habits of younger school age children and to assess the accuracy of parental perception regarding their children's eating behaviours. A total of 300 children aged 7–11 years from northwestern Bosnia and Herzegovina participated in this cross sectional study. Nutritional status was evaluated using anthropometric measurements and age and sex specific body mass index (BMI) percentile curves. Dietary habits were assessed using an anonymous, adapted, structured questionnaire consisting of 24 questions, incorporating a 24-hour dietary recall and a food frequency questionnaire (FFQ). The questionnaires were independently completed by both children and their parents to assess self-reported dietary intake and eating behaviours. Overall, 60.6% of children were classified as having normal body weight, while 8.7% were underweight, 17.0% were overweight, and 13.7% were obese. According to dietary habits evaluated relative to the USDA MyPlate guidelines (USDA, 2019), 81.3% of children consumed breakfast daily, 69.8% had three meals per day, 52.9% consumed two or more servings of fruit, and 83.7% reported water as their primary beverage. However, 52.9% consumed only one serving of vegetables daily, 51.0% consumed less than 250 mL of milk per day, 69.3% had insufficient meat intake, and 46.7% consumed sweets and snacks daily. Statistically significant differences between children's and parents' responses were identified in 79% of the assessed items. These findings indicate a substantial discrepancy between parental perceptions and children's self-reported dietary intake, emphasizing the need for targeted nutrition education programmes for both children and parents to support healthier eating habits.



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Introduction

A very interesting, yet insufficiently researched, topic in nutrition science is the parental role in the quality of their children's diet, particularly considering two important facts: first, that dietary habits are acquired during childhood within the parental environment, and second, that parents are primarily responsible for their children's eating habits (Savage et al., 2007; Ventura and Birch, 2008). Parents, the immediate family, and kindergartens remain the dominant influences on a child's eating habits until the child starts school, when new influencing factors appear, such as peers and teachers, school meals, and general eating patterns (Scaglioni et al., 2018). These habits tend to change significantly only when the child leaves the parental home, either to attend university or begin independent living. At that point, dietary habits are shaped by various other influences, well defined in the literature (Tao et al., 2024). During the period of growing up under parental influence, one of the key questions for developing healthy eating habits is whether parents can recognize the quality of their children's diet and whether they know when and what measures to take, especially considering various misconceptions originating from misinformation sources such as mass media, advertising, or informal communication. Adamo and Brett (2014) reviewed research that systematizes parental misconceptions and the risks arising from them. For example, a common misconception in early childhood is that baby food is healthier than regular food, even though such products may contain more sugar, or that children should avoid sandwiches and sweets, which is not true – these foods simply need to be balanced with other meals. Gketsios et al. (2022) concluded that parental misperceptions are significantly associated with children's eating habits as well as their body weight. They particularly emphasized that parental perceptions of children's weight are influenced by cultural, socioeconomic, and psychological factors, noting that the level of education – especially of mothers – positively affects the accuracy of assessing a child's nutritional status. A study conducted in 2019 in New Jersey, involving parents of children aged 3-18, showed that most parents overestimated the quality of their children's diet. The children consumed less fruit and vegetables and added more sugar to their meals than their parents believed (Eliason et al., 2020). To help parents gain a more realistic picture of their children's diet, educational programs should provide guidance on proper child nutrition and teach parents how to monitor their children's diet and encourage healthy eating habits (Kitzman-Ulrich et al., 2010; Xu et al., 2024).

Assessing dietary intake in younger school-age children presents specific methodological challenges, as their cognitive development, memory capacity, and ability to estimate portion sizes may limit the accuracy of self-reported data (Livingstone and Robson, 2000). However, children aged 7–11 years are generally considered capable of providing meaningful information about their eating habits, particularly when using structured questionnaires and age-appropriate assessment tools (Livingstone and Robson, 2000). Previous studies have shown that combining children's self-reports with parental reports improves the reliability and validity of dietary assessment in this population (Eliason et al., 2020; Gketsios et al., 2022). Therefore, dietary intake data in this study were interpreted as self-reported dietary behaviours rather than direct objective measurements, while the inclusion of both children's and parents' responses provided a more comprehensive evaluation of dietary patterns.

Given the lack of similar research in Bosnia and Herzegovina, the aim of this study was to determine the nutritional status and dietary habits of younger school-age children and to assess whether there are differences between parents' perceptions of their children's diet and the self-reported dietary behaviours reported by children through questionnaires. In designing the research, the following questions were posed:

What is the nutritional status of younger school-age children (7 to 11 years), overall and with respect to sex and area of residence (rural/urban)?

What do children think about their own diet, and how do parents perceive their children's eating habits?

Is there a significant difference between parents' perceptions and the dietary patterns reported by children in the questionnaire – and if so, in what way?

Materials and methods

Participants

The research was conducted in primary schools in three larger towns (Cazin, Bihać, and Bosanska Krupa) in the Una-Sana Canton, one of the ten cantons of the Federation of Bosnia and Herzegovina. This cross-sectional study was conducted as part of a master's thesis during the 2023/2024 school year, and the survey was carried out in September and October 2023.

The study was approved by the Ethics Committee of the Pedagogical Institute of the Una-Sana Canton (approval ID 03-34-468-3/23, 5 June 2023) and by the Ministry of Education, Science, Culture, and Sports of the Una-Sana Canton (approval ID 10-34-4768-3/23, 13 June 2023).

Written informed consent was obtained from parents or legal guardians as well as from the participating children prior to data collection. Participation in the study was voluntary and anonymous.

The study area is located in the northwestern part of the country, bordering Croatia. Since 61% of the population in this region lives in rural settlements (Agency for Statistics of Bosnia and Herzegovina, 2013), place of residence (rural/urban) was used as a key variable for analysing children's eating habits. A total of 300 children were included in the study, with 49.6% from rural areas and 50.4% from urban areas. Additionally, 278 parents participated and were grouped according to place of residence (50.7% rural and 49.3% urban).

Anthropometric measurements of children

Anthropometric measurements were conducted by the researcher, who is also a pediatrician, together with teachers, in the classroom during the early morning hours. Body weight was measured using a medical digital scale, and body height was assessed with a stadiometer. All measurements were taken in a standing position, without shoes. Body Mass Index (BMI), calculated as body weight divided by the square of height in meters (kg/m^2), was used to assess the nutritional status and growth of children. Monitoring BMI progression with percentile curves enabled comparisons between groups according to place of residence and gender. Weight and height of each child were measured once, and BMI was evaluated using age- and sex-specific percentile curves, with the 50th percentile representing the population median (Jureša et al., 2012). According to this method, overweight children are those whose BMI falls between the 85th and 95th/97th percentile, while obese children are those with BMI values above the 95th/97th percentile (Cattaneo et al., 2010).

Questionnaires

The study of children's eating habits and parents' perceptions of their children's diet was conducted using two questionnaires. One was designed for children, tailored to their age, and the other for parents, aligned with the questions for children. In both cases, the questionnaires were adapted from examples used in similar studies and were based on validated 24-hour recall and food frequency questionnaires (FFQ) (Lynch et al., 2024; Bilić-Kirin, 2017). Both questionnaires were specifically adapted for this study to ensure they were appropriate for the target population and the research objectives.

The questionnaire for children, in addition to general information such as age, sex, and place of residence, included 24 questions about eating habits, while the questionnaire for parents contained 23 questions regarding their child's diet. The questions covered breakfast consumption before school, total number of daily meals, and the frequency of consumption of different food groups according to the FFQ method (fruit, vegetables, milk, meat and meat products, sweets and snacks, beverages).

Statistical data analysis

Descriptive statistics was used to describe the basic characteristics of children and their eating habits, as well as the characteristics of the parents and their perceptions of the children's eating habits. To determine statistically significant differences in the responses of children and parents according to place of residence, an ANOVA test was used to confirm or refute the existence of statistically significant differences. Subsequently, Duncan's post-hoc test was applied to compare the significant differences between responses and the selected comparison variables at a $p < 0.05$ significance level. Statistical analyses were performed using Microsoft Office 2016 and the demo version of the statistical package XLSTAT-Pro 2024 for MS Office (Lumivero, New York, USA).

Results

The nutritional status of younger school-age children (7 to 11 years old) in a sample of 300 children was assessed using percentile curves. Of these, 151 (50.4%) were from urban areas and 149 (49.6%) from rural areas, while 156 (52%) were girls and 144 (48%) were boys. The children's mean age was 9.1 ± 1.01 years. The results are presented in Table 1.

Table 1. Nutritional status of children according to the percentile system, with respect to place of residence and sex

Nutritional status	N	%	Place of residence		Sex	
			Rural (n)	Urban (n)	Boys (n)	Girls (n)
Underweight ($\leq 5^{\text{th}}$ percentile)	26	8.7	12 ^{Da}	14 ^{Da}	12 ^{Da}	14 ^{Da}
Normal (6–85 th percentile)	182	60.7	88 ^{Aa}	94 ^{Aa}	84 ^{Aa}	98 ^{Ab}
Overweight (86–95 th percentile)	51	17.0	24 ^{Ba}	27 ^{Ba}	27 ^{Ba}	24 ^{Ba}
Obese ($\geq 96^{\text{th}}$ percentile)	41	13.7	19 ^{Ca}	22 ^{Ca}	26 ^{Ca}	15 ^{Cb}
Total	300	100	143	157	149	151

Values are presented as number of participants (n).

Different uppercase letters (A, B, C, D) within columns indicate statistically significant differences between nutritional status groups according to Duncan's test ($p \leq 0.05$).

Different lowercase letters (a, b, c, d) within rows indicate statistically significant differences according to place of residence or sex within the same nutritional status category ($p \leq 0.05$).

It was found that a total of 39.4% of children fall into the categories of underweight (8.7 %; $\leq 5^{\text{th}}$ percentile), overweight (17.0%; 86–95th percentile), or obese (13.7%; $\geq 96^{\text{th}}$ percentile), which means that 60.7% of the participants were of normal weight. Statistically significant differences ($p \leq 0.05$) were observed with respect to gender, while no significant differences were found based on place of residence. Girls were more often in the normal weight category (64.9%) compared to boys (56.4%).

Overweight was observed in 18.1% of boys and 15.9% of girls, while obesity was present in 17.4% of boys and 9.9% of girls.

Table 2 presents children's eating habits based on their self-reported responses and parents' perceptions, according to the place of residence. Statistical differences between offered responses are indicated by uppercase superscript letters within columns, while lowercase superscript letters within rows indicate differences between parents' and children's responses, based on ANOVA followed by Duncan's post-hoc test ($p \leq 0.05$).

Table 2. Eating habits of pupils according to the place of residence, from both parents' and pupils' perspectives

Questions	Answers	Parents (%)		Children (%)		Discrepancies	
		Rural	Urban	Rural	Urban	Parents	Pupils
Do children have breakfast before school?	Yes, every day	69.5 ^{Aa}	80.3 ^{Aa}	75.5 ^{Aa}	86.6 ^{Aa}	74.8 ^{Aa}	81.3 ^{Aa}
	No	0.7 ^{Ba}	2.9 ^{Ba}	4.9 ^{Ba}	3.2 ^{Ba}	1.8 ^{Bb}	4.0 ^{Ba}
	Sometimes	29.8 ^{Ca}	16.8 ^{Ca}	19.6 ^{Ca}	10.2 ^{Ca}	23.4 ^{Ca}	14.7 ^{Cb}
How many meals per day do children consume?	2	25.9 ^{Ba}	19.1 ^{Cb}	19.9 ^{Ba}	16.1 ^{Cb}	22.5 ^{Ba}	18.0 ^{Cb}
	3	55.2 ^{Aa}	53.5 ^{Aa}	72.3 ^{Aa}	67.2 ^{Aa}	54.3 ^{Aa}	69.8 ^{Aa}
	4 or more	18.9 ^{Ca}	27.4 ^{Bb}	7.8 ^{Ca}	16.8 ^{Cb}	23.2 ^{Ca}	12.2 ^{Bb}
How many servings of fruit do they eat daily?	Does not eat	2.8 ^{Ca}	8.8 ^{Ca}	2.8 ^{Ca}	4.5 ^{Ca}	5.8 ^{Ca}	3.7 ^{Ca}
	1 serving	46.1 ^{Ba}	39.4 ^{Ba}	47.5 ^{Ba}	39.4 ^{Ba}	42.8 ^{Ba}	43.4 ^{Ba}
	2 or more	51.1 ^{Aa}	51.8 ^{Aa}	49.7 ^{Aa}	56.1 ^{Aa}	51.4 ^{Aa}	52.9 ^{Aa}
How many servings of vegetables do they eat daily?	Does not eat	8.5 ^{Aa}	10.2 ^{Aa}	2.1 ^{Aa}	3.2 ^{Aa}	9.4 ^{Ca}	2.7 ^{Ca}
	1 serving	78.7 ^{Ba}	74.5 ^{Ba}	49.7 ^{Ba}	56.1 ^{Ba}	76.6 ^{Bb}	52.9 ^{Ba}
	2 or more	12.8 ^{Ca}	15.3 ^{Ca}	48.2 ^{Ba}	40.7 ^{Cb}	14.0 ^{Ca}	44.4 ^{Cb}
How much milk do they drink daily?	Does not drink	11.3 ^{Da}	9.4 ^{Da}	4.2 ^{Da}	7.6 ^{Da}	10.4 ^{Ca}	5.9 ^{Db}
	up to 2 dL	68.5 ^{Aa}	63.3 ^{Ab}	53.1 ^{Aa}	49.0 ^{Aa}	65.8 ^{Aa}	51.0 ^{Ab}
	3–4 dL	17.5 ^{Bb}	19.1 ^{Ba}	24.5 ^{Ba}	26.1 ^{Ba}	18.3 ^{Ba}	25.3 ^{Bb}
	0.5 L per day	2.7 ^{Cb}	8.2 ^{Ca}	18.2 ^{Ca}	17.3 ^{Ca}	5.4 ^{Da}	17.8 ^{Cb}
How many times per week do they eat meat?	Does not eat	2.9 ^{Da}	2.9 ^{Da}	2.1 ^{Da}	0.0 ^{Da}	2.9 ^{Da}	1.0 ^{Db}
	3–4 times	70.2 ^{Aa}	65.0 ^{Ab}	35.0 ^{Ba}	42.9 ^{Ab}	67.6 ^{Aa}	39.0 ^{Ab}
	5–6 times	17.0 ^{Ba}	22.6 ^{Bb}	30.0 ^{Ca}	30.6 ^{Ca}	19.8 ^{Ba}	30.3 ^{Bb}
	7 times	9.9 ^{Ca}	9.5 ^{Cb}	32.9 ^{Aa}	26.5 ^{Ca}	9.7 ^{Ca}	29.7 ^{Ca}
How often do they eat salami, sausages, or pâté?	Does not eat	9.7 ^{Ca}	9.1 ^{Ca}	2.1 ^{Ca}	11.5 ^{Cb}	9.4 ^{Ca}	6.8 ^{Cb}
	Rarely	65.2 ^{Aa}	76.6 ^{Ab}	67.8 ^{Aa}	72.0 ^{Ab}	70.9 ^{Aa}	69.9 ^{Ab}
	Every day	25.1 ^{Ca}	14.3 ^{Cb}	30.1 ^{Ba}	16.5 ^{Bb}	19.7 ^{Ba}	23.3 ^{Bb}
Sweets and snacks: how often per week?	Once	4.3 ^{Ca}	14.6 ^{Cb}	16.8 ^{Ca}	23.4 ^{Ca}	9.5 ^{Ca}	18.7 ^{Ca}
	2–3 times	31.2 ^{Ba}	34.3 ^{Ba}	34.2 ^{Ba}	31.8 ^{Ba}	32.7 ^{Ba}	32.0 ^{Ba}
	Every day	64.5 ^{Aa}	51.1 ^{Ab}	49.0 ^{Aa}	44.8 ^{Aa}	57.8 ^{Aa}	46.7 ^{Aa}
What do they drink most often?	Carbon. Drinks	3.0 ^{Ca}	3.4 ^{Ca}	3.6 ^{Ca}	2.9 ^{Ca}	3.2 ^{Ca}	3.3 ^{Ca}
	Fruit products	27.1 ^{Ba}	9.7 ^{Bb}	13.9 ^{Ba}	12.3 ^{Ba}	18.4 ^{Ba}	13.0 ^{Bb}
	Water	69.9 ^{Aa}	86.9 ^{Ab}	82.5 ^{Aa}	84.8 ^{Aa}	78.4 ^{Aa}	83.7 ^{Ab}

Different uppercase superscript letters (A–D) within a column indicate statistically significant differences between the offered responses according to Duncan's ANOVA test ($p < 0.05$). Different lowercase superscript letters (a–c) within a row indicate statistically significant differences between parents' and children's responses ($p < 0.05$). Identical letters indicate that no statistically significant difference was observed.

Most children (81.3%) reported having breakfast every day, while 74.8% of parents reported the same for their children. Differences between parents' and children's responses were observed for the categories "No" and "Sometimes", whereas no differences were found with respect to place of residence. Regarding the number of daily meals, the majority of children (69.8%) reported consuming three main meals per day, compared with 54.3% of parents reporting the same. Differences were observed for the categories "two meals" and "four or more meals", both between parents and children

and with respect to place of residence. Fruit consumption did not differ between parents' and children's responses, with approximately half of the children reporting the intake of two or more servings per day. In contrast, vegetable consumption showed differences between parents and children, particularly for the categories "one serving" and "two or more servings per day". Milk and meat consumption showed differences between parents' and children's responses, as well as among parents depending on place of residence. However, fewer differences were observed among children's responses. For sweets and snacks, differences related to place of residence were observed in parents' responses, while children's responses did not differ significantly. Notably, between 44.8% and 64.5% of children reported consuming sweets and snacks every day. Regarding beverages, the consumption of carbonated drinks was reported by only a small proportion of children. Water was the most frequently consumed beverage (69.9–86.9%), although differences between parents' and children's responses were observed, as well as for fruit-based beverages.

Discussion

The first task of this study was to determine the nutritional status of younger school-age children, in order to inform parents, who are primarily responsible for their eating habits, about the current situation, as well as to highlight their possible misperceptions regarding their children and their dietary habits. Subsequently, through questionnaires for children and parents, the study sought to identify the eating habits of children and to what extent their responses differ, rather than assuming that one source is necessarily "correct." Since the research was conducted within the administrative unit (region) of Una-Sana Canton, the main objective was to use the results to prepare guidelines for the Ministry of Education, which has the authority to implement primary education.

The obtained results on the nutritional status of children in the USC are concerning. 39.4% of children who do not fall into the category of adequately nourished is quite high, with 30.7% being overweight or obese. When compared with the results of a study on the nutritional status of school-age children in 21 countries across Europe and Central Asia, where the proportion of overweight and obese children ranged from 7.7% (Kyrgyzstan) to very high levels of 41% (Bulgaria) and 52.2% (North Macedonia), and the proportion of undernourished children ranged from less than 1% (Albania and Armenia) to as high as 25% (Turkey), it could be said that Bosnian and Herzegovinian children are not among the extremes (Mates et al., 2023). However, the proportion remains concerning, as other studies show lower rates of overnutrition compared to those found in this study, such as the one conducted in Croatia in 2018, where 20.95% of children were found to be overweight, and the study conducted in Slovenia, where the prevalence of overweight and obesity significantly increased from 1989 to 2019 (from 11.6% to 17.9% for overweight and from 1.8% to 5.3% for obesity) (Dragaš-Zubalj et al., 2018; Fras et al., 2023). Another study relevant for comparison is the research conducted within the COSI – WHO European Childhood Obesity Surveillance Initiative, carried out in 33 countries between 2018 and 2022, which showed that the proportion of overweight children in the EU was 29%, approximately similar to the results of this study (WHO, 2023). Although similar results regarding childhood overnutrition have been observed in other countries, the problem should not be underestimated. Measures must be implemented within the child and parental education system, particularly through educational programs, whose effectiveness has been confirmed by numerous examples (Kostanjevec et al., 2013; Meiklejohn et al., 2016; Rosário et al., 2016). Globally, overnutrition has become one of the greatest public health challenges of the 21st century, particularly affecting developed countries. The World Health Organization reports that the

prevalence of overweight and obesity among children and adolescents (aged 5–19 years) increased from 8% in 1990 to 20 % in 2022 (WHO, 2025).

Table 2 indicates that according to the USDA MyPlate guidelines (USDA, 2019), several positive dietary habits were observed among students. For example, 81.3% have breakfast every day, at least 69.8% eat three meals a day, 52.9% meet the recommended intake of two or more servings of fruit, and 83.7% drink water as their main beverage. However, all other eating habits are negative. Particularly high percentage of children consume only one serving of vegetables (52.9%), less than 250 mL of milk per day (51.0%), an insufficient number of meat servings (69.3%), and eat sweets and snacks every day (46.7%). Parents' responses regarding the same positive habits differ statistically significantly from the children's only in the case of water consumption as the main beverage. Other positive habits differ as well, but not at a statistically significant level. For negative habits, statistically significant differences between children's and parents' responses were found for the consumption of vegetable, milk, and meat portions. Parents reported that children consume less vegetables and milk but more meat compared to children's own answers. In any case, differences between parents' and children's responses exist, and in 23 out of 29 possible responses, so these differences were statistically significant ($p \leq 0.05$). It is important to emphasize that available literature also confirms discrepancies between children's and parents' reports, though the degree of disagreement varies depending on the food group, gender, or place of residence (Bilić-Kirin, 2017). For example, Eliason et al. (2020) found that parents of boys and girls aged 9 to 13 believed their children consumed significantly larger amounts of vegetables, while in another study by Lauria et al. (2015), children reported eating sweets daily far less frequently (15.4%) than parents claimed. In contrast, in our study in Bosnia and Herzegovina, 57.8% of parents believed their children eat sweets and snacks every day, whereas fewer children reported doing so. The same study shows that significantly more children stated that they do not eat meat, do not drink milk, and consume sugary soft drinks compared to their parents. This study confirms that to a large extent, children's self-reports differ from parental perceptions, highlighting the need for parental education programs to ensure more accurate understanding of children's dietary behaviours (Wansink et al., 2006).

Strengths and Limitations

A key strength of this study is the combined assessment of younger school-age children's self-reported dietary habits and parents' perceptions, which allowed a detailed evaluation of discrepancies between what children report and what parents perceive. Including participants from both urban and rural areas enhances the representativeness of the sample within the Una-Sana Canton. The questionnaires were specifically adapted for this study and tailored to the age of children, which increases the reliability of their responses. Limitations include the cross-sectional design, which prevents establishing causal relationships, and the reliance on self-reported data, which may be influenced by recall bias. Nevertheless, children aged 7–11 years are generally considered capable of providing meaningful information about their dietary intake, particularly when age-appropriate, structured questionnaires are used (Livingstone and Robson, 2000). The main finding of this study is that parent and child responses differ substantially, and children can often provide more accurate insight into their actual consumption of food and beverages. These findings support the importance of including children as active respondents in nutrition research and designing targeted educational interventions for both, children and parents.

Conclusion

Since parents are primarily responsible for shaping children's eating habits, and literature confirms that parents often have a misperception of these habits, which is also supported by the findings of this study, and given that numerous studies show that intervention-based educational programs have a positive effect in establishing change, the study provides the conclusion that it is necessary to develop and implement institutional support programs to increase knowledge about proper nutrition, both among students and parents. Educational programs aimed at informing parents should include specific quantities and types of meals as outlined in the DGA guidelines and MyPlate resources, and, most importantly, provide guidance on the mechanisms through which parents can better control the quality of their children's diet. It is expected that this research will contribute to the development of such initiatives in the Una-Sana Canton.

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