

Nutritional status of children attending kindergarten in Kosovo

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Abstract

Given the importance of healthy nutrition during the early stages of life when among others, also eating habits are sharpened, the current study aimed to provide an overview of the nutritional status of Kosovo kindergarteners. This study involved 301 preschool children of both genders aged 2 to 6 years old, from five randomly selected kindergartens in Kosovo. A two-week surveillance was conducted at each of the five involved kindergartens, where data such as age, sex, and anthropometric measurements were collected to calculate body mass index (BMI) such as height and weight. Moreover, their menu, the quantity and types of foods consumed are analyzed. Then, it was calculated for each child: mean calorie intakes and means of macronutrient intakes (protein, fat and carbs), and compared to Food and Agriculture Organization/World Health Organization (FAO/WHO) recommendations for each age group. The findings of this study on BMI demonstrated a decrease in stunting occurrences and a tendency toward increased obesity in Kosovo children compared to previous studies. Also, it has been ascertained lack of balanced nutrition of children throughout their stay in kindergarten with a significant deviation ($p < 0.05$) in total calories, carbohydrates, proteins, and fats intake from the FAO/WHO recommendations.

1. Introduction

Nutrition is an essential activity in human life that has an impact on many physiological, psychological, and health aspects (Olsson *et al.*, 2015; Marx *et al.*, 2017; Adan *et al.*, 2019; Eaton *et al.*, 2020). A healthy nutritional state is essential for sustaining normal physiological function and avoiding or minimizing dysfunction caused by internal or external influences. A balanced dietary pattern can impact mental health and well-being via anti-inflammatory, antioxidant, neurogenesis, microbiome- and immune-modifying processes, as well as epigenetic alterations (Marx *et al.*, 2017), playing a significant role in stress and inflammation control and cognitive function maintenance (Adan *et al.*, 2019). Human nutrition begins with breastfeeding, which is an ideal source of all nutrients for babies during the first six months (Boland, 2005), and continues (from six months to two years) with the integration of different types of food, which allows the child to become accustomed to adult-type foods gradually and become familiar with a wide range of

textures and tastes (UNICEF/WHO/The World Bank Group joint, 2021). Furthermore, children between the ages of 3 and 5 are still developing their eating habits (Bowne, 2009) and require encouragement to eat healthful meals. These age groups include preschoolers, eager to learn from others and frequently replicate adult eating habits. They are still working on their chewing and swallowing abilities, so meal supervision is essential in kindergarten (Brittany *et al.*, 2022). Given that food consumed in kindergarten constitutes a significant portion of the children's daily food intake, as they typically eat three meals daily (breakfast, lunch and afternoon meal), five days a week, it is critical to supervise various food and nutrition experiences in kindergarten, as the establishment of children's food preferences is linked to their familiarity with food during early childhood (Skinner *et al.*, 2002; Wardle and Cooke, 2008; Aldridge *et al.*, 2009; Wergedahl *et al.*, 2020). Another important factor that affects the eating habits of the children in the kindergarten is the feeding style of the kindergarten staff (Gubbels *et al.*, 2015; Ward *et al.*,

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2015, Ward *et al.*, 2017). Kindergarten staff may influence children's food choices and consumption during meals by employing various feeding styles, such as staff having adequate control over children's eating through reasoning and involvement, as well as applying extensive external control with high use of restrictive behavior and power-assertive directives or feeding style with little or no structure provided (Dev *et al.*, 2014; Ward *et al.*, 2017; Wergedahl *et al.*, 2020).

Ensuring food security and improved nutrition and concentrating on health promotion beginning at a young age is addressed in two of the United Nations Millennium Development Goals for 2030, Zero Hunger and Good Health and Wellbeing (United Nations, 2015). Given the significant impact of childhood malnutrition on long-term health, institutions and professionals working in nutrition and health must assess changing scenarios and redefine their priorities for action accordingly. Additionally, there is a need to provide updated information to decision-makers, program planners, and the public on promoting and achieving healthy food consumption and active living while considering the local context (Garmendia *et al.*, 2013). The body mass index (BMI) is the current measure for measuring anthropometric height/weight features in humans and categorizing (grouping) them. The most popular interpretation is that it represents a measure of a person's fatness. It is also commonly utilized as a risk factor for the development or occurrence of various health problems (Nuttall, 2015). A kindergarten's nutrition-related practices influence children's food choices, attitudes about food, and eating habits. According to Skinner *et al.* (2002), adiposity rebound occurs between three and five, and children adopt food and physical activity routines that will impact their lifetime habits. Furthermore, preschool children are deemed at high risk for obesity and overweight development, with a body mass index for age at or above the 85th percentile based on Centers for Disease Control and Prevention guidelines (McGrady *et al.*, 2010). Childhood obesity predicts adult obesity (Whitaker *et al.*, 2009), and overweight and obese children are more prone than non-overweight classmates to face psychosocial challenges such as depressive symptoms and impairments in health-related quality of life (Stradmeijer *et al.*, 2000).

The problem of overweight and obesity in children continues to be a significant public health issue in developed countries (Olds *et al.*, 2011; Wabitsch *et al.*, 2014) and it is also a problem in developing countries because the family, community, minority race, and low socioeconomic status serve as high-risk factors for obesity (Hawkins and Law, 2006).

To the best of our knowledge, there have only been a few studies on the BMI of preschoolers in Kosovo (Rysha *et al.*, 2017; Tishukaj *et al.*, 2017) and there is no data about the nutrition-related practices, including type and amount of food served, and if there is in place a balanced diet that meets the recommendation of proper nutrition. Nutritional habits formed at this stage of life have a lifetime impact and lack of evidence on it is of crucial importance to undertake this study. FAO/WHO nutrition recommendations are met as a prerequisite for children's health and well-being. This study aims to provide an answer that will enable respective authorities to undertake measures and act accordingly.

The objective of this study is to assess the nutritional status of children attending Kosovo kindergartens by monitoring their nutritional-related practices during their stay at those daycare institutions, as well as to assess BMI to determine the level of stunting, overweight, and obesity among preschoolers and kindergarteners from selected kindergartens in Kosovo.

2. Materials and methods

2.1 Research design and data collection

The main question answered by this research is the nutritional status of preschool children attending selected kindergartens of Kosovo broken down into two components: the BMI assessment and the related nutritional practices of Kosovan kindergarteners in day-care institutions compared to FAO/WHO recommendations for each group aged from 2 to 6 years old involved in this study. For this purpose, 301 preschool children of both sexes, aged 2 to 6 years old, from five randomly selected kindergartens in Kosovo were involved in this study. The study took place during the frame time between January to December 2021. A two-week-long surveillance was conducted at each of the five involved kindergartens. Five kindergartens from urban and suburban areas were randomly selected from five different municipalities. The reason for not inclusion of rural kindergartens is the lack of ones. Meanwhile, the reason for the two-week time extension of nutrition surveillance is that according to kindergarten management, after two weeks, the menu is repeated. It is noted that, due to lack of funding, the sampling size in this research may not be that representative to give an exact state of the nutritional status of children attending kindergartens all over Kosovo, but it is considered a pilot project that gives an indication on this issue and serves as a basic initiative to be further developed in the future.

For each kindergartener, a personal child card for data recording was opened. Data such as name, age, sex, weight, and height were recorded and filled in personal

child cards for each subject involved in this study. Furthermore, the same card was recorded also the type of food and amount of food consumed during the three meals (breakfast, snack and lunch), offered in kindergartens each day during the length time of the surveillance.

Besides BMI determination for each kindergartener, the two-week menu of five kindergartens was analysed, and the quantity and types of foods consumed during their stay in kindergarten. During this time, three food-serving meals were monitored by researchers: breakfast, lunch, and snacks, and records were kept on the sort of food served and the amount consumed by each child. Then it was calculated for each child for a two-week monitoring time: mean calorie intakes and means of macronutrient intakes (protein, fat and carbs). Those means were then compared to FAO/WHO recommendations for each age group to understand if kindergartens meet the FAO/WHO recommendation for children's nutrition.

2.2 Determination of body mass index centile for each child

Following the WHO Child Growth Standard guidelines, child growth assessment was performed as an instrument to determine whether children have normal growth, have any growth problems, or tend to develop them (World Health Organization, 2008). For this purpose, anthropometric measurements of the children were also done, and the body mass index (BMI) centile was calculated using a BMI calculator to estimate the percentage of children who were normal weight, underweight, overweight and very overweight or obese (Table 1). The BMI centile was calculated using the children's weight, height, gender, and age, and then the generated BMI centile was compared to growth standards (NHS, 2021).

Table 1. BMI centile scores and weight status.

Weight status	BMI centile score
Underweight	On the 2 nd centile or below
Healthy weight	Between 2 nd and 91 st centiles
Overweight	Between 91 st and 98 th centiles
Very overweight or obese	98 th centile or above

*Source: NHS (2021).

2.3 Review of the menus

Table 2 gives data for the menus of the five kindergartens for two weeks for the timeframe of surveillance. Managers of all kindergartens declared that menus were drafted by them and highlighted the lack of involvement of professionals in this process. During two weeks of observation, the meals offered complied with previously drafted menus.

2.4 Comparison of children's nutrition at kindergartens with FAO/WHO recommendations

The data collected for each child, for two weeks, regarding the type and amount of food consumed during their stay at daycare was registered in each child's personal card opened for this study. The Food Data Central of the United States Department of Agriculture (United States Department of Agriculture, 2022) was used to compute the overall number of calories, proteins, fats, and carbs consumed every day in kindergarten, and the average of the ten observed days was calculated. The distribution of macronutrients: proteins, carbs, and fats, as well as total daily calories, is estimated using the collected data. Given that children take three of the five necessary daily meals during their kindergarten stay, the limitation of our research is that we did not perform 24-hour monitoring for each kid to get exact data, including the food children have consumed at home that would give an overview on complete child nutrition and it may be subject for further research. However, this study aimed to conduct research on the nutritional status during the stay at daycare and for this purpose as a reference value, the averages of 10 monitored days were compared for the total intake of calories, carbohydrates, proteins, and fats, with 2/3 of the recommended daily intake by the FAO/WHO for each age group and gender. The 2/3 of FAO/WHO daily recommendations were taken as a reference based on 3 out of 5 daily meals children consumed at the kindergarten (Table 3).

Table 3. FAO/WHO recommended the daily requirement of total calories, protein, carbohydrates, and fat for each age group and gender (FAO/WHO, 1973).

	Boys	Girls
Group 1-3 years	Daily recommendation	
Total calories (kcal)	1253	1164
Protein (g)	43	43
Carbohydrates (g)	172.3	160
Fat (g)	41.7	38.8
Group 3-4 years	Daily recommendation	
Total calories (kcal)	1560	1444
Protein (g)	58.5	54
Carbohydrates (g)	214.5	198
Fat (g)	52	48
Group 4-5 years	Daily recommendation	
Total calories (kcal)	1690	1540
Protein (g)	63.3	58
Carbohydrates (g)	232	212
Fat (g)	56	51
Group 5-6 years	Daily recommendation	
Total calories (kcal)	1810	1630
Protein (g)	67.8	61
Carbohydrates (g)	248	224
Fat (g)	60	54.3

Table 2. Menus of the kindergartens.

Kindergarten/ meals	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
Kindergarten 1	Breakfast	Biscuits with milk	Eggs, cheese, tea	Bagel, tea	Pâté, bread, tea	Bread, Choco-cream	Eggs, cheese tea	Tuna fish, tea	Pâté, bread, tea	Vegetable cream soup
	Lunch	Potatoes Soup and ground beef	Cheese pie and yoghurt	Pasta with cheese	Beans	Meatballs, sauce rice and salad	Cheese pie and yoghurt	Pasta with cheese	Beans	“Goulash”
	Snack	Banana	Fruit juice	Fruit yoghurt	Cake	Banana	Pudding	Pear	Cake	Banana
Kindergarten 2	Breakfast	Croissant with milk	Choco cream, milk	Soup	Eggs, cheese, tea	Jam, margarine, tea	Cheese, tea	Biscuits with milk	Pizza, yoghurt	Noodle Soup
	Lunch	Beans	Goulash, beef	Rice, spinach	Potatoes, ground beef, salad	Pasta, cheese	Beans	Yellow beans, beef meat	Cooked Cabbage with beef meat	Pasta, cheese
	Snack	Cake	Peach	Fruit Yoghurt	Banana	Cake	Fruit Yoghurt	Cheery	Banana	Cake
Kindergarten 3	Breakfast	Omelette, cheese, tea	Croissant, milk	Biscuits, milk	Soup, bread	Tuna Fish, tea	Omelette, cheese, tea	Soup, bread	Cheese, tea	Fish, tea
	Lunch	Beans	Summer soup, ayran	Goulash, beef meat	Vegetable dish	Pasta with cheese	Beans	Risotto	Puree with chicken thighs	Pasta with cheese
	Snack	Pear	Banana	Fruit Yoghurt	Pudding	Cake	Cheery	Banana	Croissant	Pudding
Kindergarten 4	Breakfast	Biscuits with tea	Soup	Choco cream, tea	Pâté, bread, tea	Pancakes, tea	Noodle Soup	Choco cream, tea	Pâté, bread, tea	Pancakes tea
	Lunch	Potatoes soup	Pasta with cheese	Beans	Chicken meat, rice	Pasta	Potatoes soup	Beans	Goulash puree	Pasta
	Snack	Choco banana	Fruit yoghurt	Home-made Cake	Fruits	Fruit juice	Cake	Fruit juice	Fruit yoghurt	Choco banana
Kindergarten 5	Breakfast	Pâté, bread, tea	Choco cream, tea	Soup	Eggs, cheese, tea	Croissant, tea	Bread with Choco cream, tea	Biscuits with milk	Sausage, tea	Croissant, tea
	Lunch	Beans	Goulash	Meatballs, potato puree, salad	Beef meat pic, yoghurt	Pasta with cheese	Beans	Vegetable's soup	Beef meat pic, yoghurt	Pasta with cheese
	Snack	Cake	Banana	Pudding	Mandarin	Chocolate	Cake	Fruit juices	Apple	Cake

2.5 Statistical analysis

The statistical analysis was performed by IBM SPSS 25 software (George and Mallery, 2019). Descriptive analysis data is given. To compare the total calorie, carbohydrate, protein, and fat intake between the kindergartens, Multivariate Analysis of Variance (MANOVA) was used at $p < 0.05$. A T-test analysis is used to determine the difference between the average daily intake of calories and macronutrients and the recommended values. The normality of the differences was accepted by Leven's tests.

3. Results and discussion

According to data from Table 4, 66.8% of the 301 children who participated in this study have normal weight, while 43.2% are unhealthy weight, which includes: underweight (5%), overweight (13.6%), and obese (14.6%), and none of the children is stunting.

In comparison to earlier studies done in Kosovo with the same population included, for BMI measurement, this study reveals an improvement in the decrease of underweight, stunting, and wasting of preschool-aged children. This research showed no child stunting or wasting when compared to prior data from the United Nations Children's Fund in 1999 (UNICEF, 1999), which reported acute malnutrition in 3.1% of children aged 0–5 years and chronic malnutrition in 10.7% of children. Two years later, in a study by UNICEF and Kosovo's Institute for Public Health (UNICEF, 2001), it was revealed that 4% of children are underweight, and 10% are stunted children. Even when compared to more recently published data by Rysha *et al.* (2017) this study reveals an improvement in who reported stunted children (3%) and child wasting (1.9%). In comparison, the opposite can be concluded for overweight and obese children with an increase of 4.7% for overweight children and 12.6% for obese children compared to data shown by Rysha *et al.* (2017) that found 8.9% overweight and 2.3% obese among kindergarten children

in Kosovo. This study shows that the prevalence of overweight and obesity in children is constantly increasing, which is consistent with findings from around the world, indicating that there is a worrying trend in the increasing prevalence of overweight and obese children all over the world (Abdullah, 2015; Center for Disease Control and Prevention, 2021; Harvard T.H. Chan School of Public Health, 2022). There is a shortage of information on the obesity rise in Europe, particularly in Eastern Europe. Preschooler obesity has increased during the past 20 years in a number of countries. Comparing data from different countries was difficult because this data was not consistently collected.

Table 4. Descriptive data for BMI centile.

BMI centile	Number of children	%
Underweight	15	5.0
Healthy weight	201	66.8
Overweight	41	13.6
Obese	44	14.6

Table 5 shows the differences in total calorie, carbs, proteins, and lipids intake from kindergarten children compared to FAO/WHO recommendations. Significant dietary intake variations were found compared to the guidelines ($p < 0.05$), with children receiving daily 259.89 kcal, 27.82 g carbs, 9.05 g protein, and 9.06 g fat less on average than the FAO/WHO recommendations.

Based on the presented data in Table 2, the menu is not well nutritionally balanced. There are days (D) when the daily menu is, for example, carb-based. This happened in all kindergartens (K1, K2, K3, K4 and K5), with K4 leading in exceeding the nutritional need for carbs. This finding correlates with the data presented in Table 6, where K4 has the highest statistical variation from the FAO/WHO recommendations for carb intake. Carb days identified are: day 3 kindergarten 1 (D3K1); D5/K2; D10/K2; D7/K3; D1/K4; D2K4; D5/K4; D6/K4; D8 and D /K4; D10/K4D5/K5; D10/K5. While there are also noted protein-based menus at K1, K4 and K5 during both main meals served, such as: D4/K1; D9/K1; D4/K4;

Table 5. Comparison of mean total calorie, carbohydrate, protein, and fat intake in kindergarten with FAO-WHO recommendations.

	Mean	Std. Deviation
Total of intake calories*	738.59	236.51
Recommendations of FAO/WHO for the total calorie intake	997.48	137.26
Carbohydrate intake*	109.35	31.11
Recommendations of FAO/WHO for carbohydrate intake	137.17	18.84
Protein intake*	28.34	9.81
Recommendations of FAO/WHO for protein intake	37.39	5.22
Fat intake*	24.17	8.26
Recommendations of FAO/WHO for fat intake	33.23	4.55

*Significantly different $p < 0.05$.

D9/K4. Therefore, the involvement of professionals in drafting the menu is highly recommended.

Given that proteins are the fundamental "unit" of building muscle and organs, and that most amino acids (which make up dietary proteins) are essential, the body cannot utilize them but must obtain them via food. Further, it is well known that carbohydrates are the primary source of energy for humans; additionally, the human body stores energy reserves in body fat and regulates/balances the amount of blood sugar. Additionally, fats aid in the absorption of many vitamins; therefore, it is critical to quickly and adequately adjust the menu of meals offered in kindergartens in Kosovo, keeping in mind that proper nutrition at this early age of life has a long-term impact on human growth, health, and wellbeing. The comparison of 2 weeks' means for total calorie, carbohydrates, proteins and fat intakes among five kindergartens involved in this research is presented in Table 6.

Table 6. Comparison of total calorie, carbohydrate, protein, and fat intake between kindergarten (Numbers 1-5 represent kindergarten).

Kindergarten	Mean±SD	Mean of FAO/ WHO	p-value
Total of intake calories	1 521.10±52.31	997.00	p<0.05
	2 713.35±66.07		
	3 757.67±21.13		
	4 1177.29±352.67		
	5 662.31±129.43		
Carbohydrate intake	1 76.62 ±4.15	133.17	p<0.05
	2 111.98±14.55		
	3 104.12±2.38		
	4 161.87±48.49		
	5 104.58±16.49		
Protein intake	1 18.34±2.28	37.39	p<0.05
	2 26.75±1.81		
	3 35.27±2.05		
	4 44.14±13.22		
	5 22.74±4.33		
Fat intake	1 17.08±2.01	33.23	p<0.05
	2 23.26±1.20		
	3 22.53±0.90		
	4 39.23±11.75		
	5 23.13±6.59		

As shown in Table 6, statistically significant differences were observed between kindergartens ($p<0.05$) while comparing the total calorie, carbs, protein, and fat intake compared to the FAO/WHO recommendations. These variations in the examined data indicate that Kosovo's kindergartens' meals are not

consistent and well-balanced. Kindergarten managers prepare the menu without consulting nutritionists/diet professionals. An improper and unbalanced combination of foods offered to the children during the monitoring days, as presented in Table 2, was obvious. During the two-week monitoring, it was noticed irregularities such as on some days children are fed mainly with protein-based foods in the two meals taken during the same day (e.g., tuna at breakfast and bean at lunch), while the next day they are fed with only carbohydrate-based food (e.g., a croissant at breakfast and pasta at lunch). A rearrangement of the meals between days would enable an improvement with no cost, although for a higher accuracy, in this study we used for comparison of total calories and macronutrient intake with FAO/WHO the means of 2 weeks surveillance and not daily nutrition practices.

These disparities in total calorie, carbs, proteins, and lipids intake show an urgent need for an immediate nutrition strategy that includes nutrition, health, and physical activity for this population. As a result, although there are international guidelines for preschool children's nutrition, it is strongly advised that policy and decision-making respective institutions, draft a national guideline for preschool children's nutrition and implement kindergartens menus and panning by professionals following the international guidance for children attending kindergarten and preschool institutions. While non-severe child growth issues may be resolved by consultation, correct nutrition, and physical activity, instances of obesity are more troublesome, and the goal of national policy should be to avoid nutrition-related growth disorders.

The role of research institutions and universities', governmental and local decision/policymaking institutions is undeniable in regulating this situation. This can be done through drafting regulations and guides on children's nutrition. It also takes cooperation among all the above-mentioned institutions and preschool institutions and kindergartens and parents to ensure healthy feeding that meets the energetic and nutritional needs of children and prevents health issues related to malnutrition.

The institutionalized nutrition specialist participation in this process is helpful because it mitigates other risks perceived by parents' children in developing countries (Karauli *et al.*, 2021).

The failure to exercise the role of relatively new institutions, the lack of information from kindergarten management and the lack of cooperation between the various stakeholders in Kosovo reflect these changes. It shows that this phenomenon is demeaning to public

health. An inter-institutional commitment and cooperation between research institutions, central and local government decision-making institutions, preschool institutions, kindergartens on one side and parents would yield tangible results in improving the situation to resolving this issue.

4. Conclusion

This study's findings revealed a decrease to zero cases of stunting cases compared to the most recent studies involving the same population, who reported in 2017 stunted children (3%) and child wasting (1.9%), while the opposite can be concluded for overweight and obese children with an increase of 4.7% for the overweight children and 12.6% for obese children compared to the same data.

The lack of balanced nutrition of children throughout their stay in kindergarten is also noted by this study. There is a significant deviation ($p < 0.05$) of our subjects' two weeks surveillance means of total calories, carbohydrates, proteins, and fats intake from the FAO / WHO recommendations, with children receiving daily approximately less 259.89 kcal, 27.82 g carbs, 9.05 g protein, and 9.06 g fat on average than the FAO/WHO recommendations.

To mitigate these shortcomings, a scientifically based children's healthy menu should be standardized as soon as possible, balanced with nutrients that would fully meet each group's energy and nutritional needs. Kindergartens should hire or consult a nutritionist to ensure the right selection of foods and the proper amounts needed to promote healthy growth in children. Constant consulting with nutritionists regarding children's health and what they enjoy and dislike for improved nutrition and well-being is highly recommended.

Findings from this research may be beneficial for public health, representing the nutritional status of the children attending kindergartens, as well as to policy and decision-making institutions as a stimulus to impose necessary measures and act accordingly to regulate underlined shortcomings from this research on the children's nutrition in day-care institutions in Kosovo. The study can be a sound basis for conducting more representative studies involving a more significant number of kindergartens and children and for a longer time frame.

Conflict of interest

The authors declare no conflict of interest.

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