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Daily menus can result in suboptimal nutrient intakes, especially calcium, of adolescents living in dormitories

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Abstract

The aims of this study were to evaluate daily menus in Croatian dormitories and to assess the overall intake of dairy products among resident adolescents. For this purpose, 168 daily menus were chosen for nutritional evaluation by random sampling. In addition, 227 adolescents (133 girls and 94 boys) participated in a questionnaire focused on food intake in addition to the meals supplied in dormitories with the aim to assess the amount and the type of dairy products consumed. The results showed that only 35% of the daily menus were nutritionally balanced. Most of the menus provided an excess of energy, protein, carbohydrate, saturated fat, phosphorus, riboflavin, and vitamin A. The levels of calcium and magnesium in the menus were suboptimal. The menus offered to adolescents provided approximately 2 servings of dairy products per day. Milk was the most often supplied dairy product (1.1 servings per day), whereas yogurt had the lowest frequency of serving (0.2 servings per day). The most preferred dairy-based snack for both sexes was milk. Dairy-based snacks provided about 1 serving per day for both sexes and contributed to about 30% of the recommended dietary allowances for calcium. Adolescents who regularly consumed dairy-based snacks meet the recommendations (3.2 servings of dairy products per day and about 98% recommended dietary allowances for calcium). We conclude that the institutional menu planning should be improved because the intake of dairy snacks will continue to be a problem for achieving a healthy diet in adolescences.

Keywords: Adolescents; Menu; Food services; Dairy products; Eating; Milk
Abbreviations: BMI, body mass index; DRI, dietary reference intakes; MUFA, monounsaturated fatty acids; PUFA, polyunsaturated fatty acids; RDA, recommended dietary allowances; SFA, saturated fatty acids.

1. Introduction

Adolescence is a time of transition and search for independence that can result in poor dietary habits. During this stage of life, young people are easily influenced by their peers, advertisements, and particularly by changes in their social environment [1]. Establishing appropriate dietary habits during adolescence is important because unhealthy eating habits at this stage are directly related to the risk of chronic disease development during adulthood and later in life [2]. Attending school away from home and residing in institutions that should provide adequate daily nutrition and health care place adolescents in a situation of being "captive consumers" who are limited by institutional food choices. Therefore, the institution is primarily responsible for the quality of nutrition provided to its students, and foods served and made available through nutrition programs in

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dormitories must be consistent with nutrient recommendations. In addition to ensuring nutrients for adequate growth and development, providing adequate meals in dormitories is therefore a logical springboard from which to effect changes in food preferences and consumption patterns of pre-adults.

From a nutritional point of view, adolescents are vulnerable due to their particular lifestyle and dietary habits and to their high energy and nutrient requirements [3]. Dietary intake during adolescence is crucial for supporting growth and development to achieve a healthy adult body. Moreover, adolescents gain 20% of their adult height and 50% of their adult weight and skeletal mass in a few years while developing the adult sex phenotype [4]. Deficiency of specific nutrients during this stage of life can lower energy stores, reduce muscle mass and compromise height, and contribute to disorders such as anemia and immune dysfunction. Nutrient deficiencies may contribute to long-term health problems including osteoporosis and delayed sexual maturation [5]. Adequate intakes of milk and dairy products serve as excellent sources of protein, calcium, phosphorus, magnesium, riboflavin, and vitamin B_{12} to support adolescence especially because this stage of life is a critical period for bone mass accumulation [6,7]. Generally speaking, the dietary habits of Croatian adolescents are characterized by high levels of total and saturated fats and cholesterol and lower levels of carbohydrates. In addition, their consumption of vegetables and fruits is low, yet they consume sweets and soft drinks in excess [8]. Furthermore, inadequate dairy consumption and calcium intakes below the recommendations for populations in Croatia have been reported by several investigators [9,10].

Although adequate institutional nourishment of young people is a matter of special public health interest, the Croatian Ministry of Health has established standards and nutritional recommendations pertaining only to organized meal planning in kindergartners [11] but unfortunately not in dormitories. Other than the isolated effort [12], little is known about the nutritional status of Croatians living in dormitories. Thus, there is a need for comprehensive nutritional assessment studies that will aid the development of healthy meal standards for adolescents.

In view of the above and also because of the paucity of national data on dietary intakes of adolescents in Croatia at present, the purpose of this research was to evaluate the overall nutritive value of meals supplied in dormitories with emphasis on the nutrients derived from dairy sources. The hypothesis to be tested was, "Do adolescents in dormitories need to consume additional dairy products beyond that provided by the institution to ensure adequate intakes of some essential nutrients?" For this purpose, the type and quality of adolescent snacks consumed in addition to supplied meals was investigated and the overall dairy intake compared with the established recommendations.

2. Methods and materials

2.1. Study population

This survey was conducted from autumn 2004 to summer 2005 in the territory of the Primorsko-goranska County, Croatia. In the school year 2004/2005, there were 6 dormitories operating in the Primorsko-goranska County, with the following distribution according to towns: Rijeka (3), Bakar (1), Lovran (1), and Brod Moravice (1). The adolescent population in the dormitories numbered 1018 [13]. Upon approval of the heads of dormitories, adolescents from all 6 dormitories participated in our survey. The sample, representing both boys and girls, consisted of 227 subjects (133 girls and 94 boys), that is, 22.30% of the target population. The share of participants per towns listed above was as follows: Rijeka (n = 101 adolescents; 44.49% of total sample), Bakar (n = 29 adolescents; 12.78% of total sample), Lovran (n = 62 adolescents; 27.31% of total sample), and Brod Moravice (n = 35 adolescents; 15.42% of total sample). The study population was recruited from a larger group of 367 adolescents (134 boys and 233 girls) selected by random sampling from the named dormitories, against the criterion of the regular consumption of all 3 dormitory meals. The mean age of the study population was 16.49 ± 1.68 years. The self-reported weights and heights were used to calculate body mass indexes (BMIs; kg/m^2). Because Croatia has no national cutoff points for identifying underweight, overweight, and obesity in the adolescent population, in this study, we have used the percentile distribution of BMI established in a population of 7- to 19-year-old schoolchildren in the Croatian capital (Zagreb) [14]. In that paper, the 5th, 85th, and 95th percentiles of BMI, in accordance with World Health Organization recommendations for screening underweight, overweight, and obesity were used [15]. The study was reviewed and approved by the appropriate institutional review board (Scientific Committee of Faculty of Food Technology, University J.J.Strossmayer in Osijek).

2.2. Dietary assessment

For the purpose of determining the nutritional evaluation of served meals, data on the daily menu offered in each dormitory were collected once per season (ie, spring, summer, autumn, and winter). Each data point included 7 consecutive days of daily menu reports [16]. In total, for each season, 42 complete daily menus (breakfast, lunch, and dinner) were analyzed (n = 168) using the nutritional database created based on Croatian tables of chemical compositions of food and drinks [17]. To assess season-related differences, the analyzed menus were grouped into 2 categories: spring-summer (n = 84) and autumn-winter (n = 84). The nutrient contents were calculated for each of the season groups and also for all analyzed daily menus. Quantification of the share of dairy products in selected menus was based on the serving size as defined by the *Food*