Nutritional Assessment of Primary School Menus in Istanbul

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ABSTRACT

Background: Adequate and balanced nutrition in school-age children is highly important due to its association with growth, development and academic success. This study was conducted to assess the food groups and nutrient contents of the lunch menus in some primary schools in Istanbul.

Methods: The study was conducted in İstanbul and included 15 randomly selected private primary schools. Each school's one-month (20-day) lunch menus were assessed in terms of food groups, energy and nutrient contents. Nutrition Information System (BEBIS) 8.2 package program was used to calculate energy and nutrients. Türkiye Dietary Guidelines (TUBER) 2022 reference intake ranges were used to determine whether energy and nutrients were sufficient.

Results: In the study, it was determined that all nutrients, except for calcium, met one-third of the recommended intake levels. The average saturated fat and sodium content of the menus exceeded both TUBER and the United States Department of Agriculture (USDA) recommendations. When the menus were evaluated according to food groups, it was determined that the grain and meat groups were at sufficient levels, while the vegetable, fruit and dairy groups were found to be insufficient.

Conclusion: As a result of the research, it was determined that school lunch menus were inadequate in terms of some nutrients and food groups that should be consumed daily. In order to support the healthy growth and development of children, it is of great importance to expand and develop school lunch programs and improve the nutritional content and quality of these programs.

Keywords: child, menu planning, nutrition, nutritional assessment.

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İstanbul'daki İlkokul Menülerinin Beslenme Açısından Değerlendirilmesi

ÖZ

Amaç: Okul çağındaki çocuklarda yeterli ve dengeli beslenme, büyüme, gelişme ve okul başarısı ile ilişkili olması nedeniyle oldukça önemlidir. Bu çalışma, İstanbul'daki bazı ilkokulların öğle yemeği menülerinin besin grubu ve besin içeriklerini değerlendirmek amacıyla yapılmıştır.

Yöntem: Araştırma İstanbul'da rastgele seçilen 15 özel ilkokul ile gerçekleştirilmiştir. Okulların bir aylık (20 gün) öğle yemeği menüleri besin grubu, enerji ve besin içerikleri açısından değerlendirilmiştir. Enerji ve besin öğelerinin hesaplanmasında Beslenme Bilgi Sistemi (BEBİS) 8.2 paket programı kullanılmıştır. Enerji ve besin öğelerinin yeterli olup olmadığını belirlemek için Türkiye Beslenme Rehberi (TÜBER) 2022 referans alım aralıkları kullanılmıştır.

Bulgular: Araştırmada kalsiyum dışında tüm besin ögelerinin yeterli alım miktarının üçte birini karşıladığı belirlenmiştir. Menülerin ortalama doymuş yağ ve sodyum içerikleri TÜBER ve Amerikan Tarım Bakanlığı (USDA) önerilerinin üzerinde bulunmuştur. Menüler besin gruplarına göre değerlendirildiğinde tahıl ve et grubunun yeterli düzeyde olduğu, sebze, meyve ve süt grubunun ise yetersiz miktarda olduğu saptanmıştır.

Sonuç: Araştırma sonucunda okul öğle yemeği menülerinin günlük tüketilmesi gereken bazı besin ögeleri ve besin grupları açısından yetersiz olduğu belirlenmiştir. Çocukların sağlıklı büyüme ve gelişmelerinin desteklenmesi amacıyla okul öğle yemeği programlarının genişletilmesi, geliştirilmesi, bu programların besin içeriği ve kalitesinin iyileştirilmesi büyük önem taşımaktadır.

Anahtar Kelimeler: *Çocuk, Menü planlama, Beslenme, Beslenmenin değerlendirilmesi.*

INTRODUCTION

Childhood is an extremely critical period for the acquisition of healthy eating habits. Nutritional habits acquired during this period form the basis for children's growth, cognitive development, general well-being and school performance. In addition, the nutritional habits acquired during this period play a major role in preventing diseases related to early nutrition that may occur in later ages. It has been shown that eating habits acquired during childhood continue into adolescence and adulthood (Buja et al., 2020). In the last decade, it has been determined that primary school-aged children typically consume low-quality foods with high fat and sugar content, with insufficient whole grains, fruits and vegetables in

their diets (Charlton et al., 2021). Malnutrition leads to serious diseases such as stunting, physical weight loss and anemia. On the other hand, overnutrition of children can lead to problems such as overweight and obesity, which can significantly increase the risk of chronic diseases in adulthood. Addressing the problem of child malnutrition, especially in developing countries, can contribute to a reduction in the country's disease burden by about one-third (Gao et al., 2022).

It is important for all children to acquire healthy eating habits at an early age and to provide a supportive environment for healthy eating in order to improve public health (Eustachio et al., 2020). Schools have a strong influence on children's behaviour and are a suitable environment for the formation and reinforcement of healthy habits. School meals are crucial for promoting healthy and sustainable eating behaviours among students (Cupertino et al., 2021). School feeding programs are initiatives designed to consistently deliver nutritious meals to children and adolescents of school age (Food and Agriculture Organization, 2019). These programs have numerous benefits, including mitigating hunger, addressing micronutrient deficiencies and anemia, reducing the risk of overweight and obesity, enhancing school enrollment and attendance, boosting cognitive abilities and academic achievement, and promoting gender equality in education Although common in high-income countries, many countries around the world are implementing such programs (Wang et al., 2021; Global Nutrition Foundation, 2022). In Turkey, school meals mainly consist of open buffet-style lunches. While there is no national school meal program in Turkey. Public schools generally do not provide lunch services, and students either bring food from home or purchase meals from school canteens, where nutritional quality varies (Food and Agriculture Organization of the United Nations, 2023). In contrast, private schools typically offer lunch services, often through in-house kitchens or catering companies. However, data on the nutritional content and adequacy of these meals remain limited. Therefore, this study aimed to analyse the nutritional composition and assess the adequacy of lunches served in the canteens of ten private schools in Istanbul.

METHOD

This study was conducted between February and March 2023 in 15 private primary schools in Istanbul, affiliated to Istanbul Provincial Directorate of National Education, which have monthly lunch lists on their websites. Private schools were chosen for this study due to their structured meal services and the availability of menu data, as public schools in Turkey generally do not provide lunch services. The study was carried out based on menu samples made publicly available by schools online. The selection process was conducted in two stages.

First, all private primary schools in Istanbul were screened for the availability of online lunch menus. Schools that did not provide publicly accessible menu data were excluded from the study. Second, only schools that had complete menu information covering an entire month were included, ensuring consistency in the analysis. The one-month (20-day) lunch menu of each school for February 2023 was evaluated in terms of food groups, energy and nutrients. Lunch menus of all schools consisted of 4 types of meals. The energy and nutrient composition of the school menus was determined using the "institutional standard recipes" included in the Nutrition Information System (BEBIS) Program (version 8.0, Windows Turkish Version). The values obtained were compared with the reference intake ranges for food groups, energy and nutrients specified in the Turkey Dietary Guidelines 2022 (TUBER) for children aged 6-10 years Furthermore, the average energy and nutrient values of the school menus were evaluated in comparison with the daily averages of five key nutrients recommended by the United States Department of Agriculture (USDA) Food and Nutrition Service for lunch menus in the school meal program (USDA, 2012). The mean, standard deviation (SD), minimum and maximum values of the data were calculated using IBM SPSS for Windows Version 26 (SPSS Inc., Chicago, IL, USA). Since this study was conducted on menu lists, ethics committee approval was not obtained for this article.

RESULTS

The mean, standard deviation, minimum and maximum values of energy and nutrients of the evaluated menus are shown in Table 1. The percentages of carbohydrate, protein and fat in the menus were found to be 49.7%, 17.2% and 32.8%, respectively. The minimum energy value of the menus was 444.5 kcal and the maximum energy value was 792.0 kcal.

Table 1. Energy and nutrient contents of school lunch menus

Energy and Nutrients	Mean ± SD	Minimum	Maximum
Energy (kcal)	576.5 ± 152.7	444.5	792.0
Carbohydrate (g)	69.5 ± 13.9	56.1	87.2
Carbohydrate (%)	49.7 ± 3.9	45.3	55.5
Protein (g)	24.7 ± 7.5	17.6	34.3
Protein (%)	17.2 ± 1.6	14.7	18.6
Fats (g)	21.8 ± 8.1	14.1	34.0
Fats (%)	32.8 ± 2.9	28.6	37.2
SFAs (g)	8.1 ± 2.2	5.5	11.3
SFAs (%)	12.6 ± 0.9	11.1	13.9
MUFAs (g)	11.3 ± 0.7	10.2	12.0
PUFAs (g)	4.5 ± 2.3	2.8	8.7
Cholesterol (mg)	67.8 ± 25.8	38.9	103.3
Fibre (g)	7.4 ± 1.7	5.9	9.9
Vitamin A (mcg)	448.9 ± 311.8	161.1	1020.4
Vitamin E (mg)	3.8 ± 2.4	1.9	8.5

Vitamin C (mg)	26.9 ± 11.1	13.1	43.3
Vitamin B1 (mg)	0.3 ± 0.1	0.2	0.4
Vitamin B2 (mg)	0.4 ± 0.2	0.2	0.6
Vitamin B3 (mg)	6.7 ± 0.5	6.3	7.6
Vitamin B12 (mcg)	2.5 ± 0.7	1.9	3.8
Sodium (mg)	1848.4 ± 1042.6	963.6	3907.9
Potassium (mg)	830.4 ± 245.9	575.5	1169.7
Calcium (mg)	188.2 ± 52.3	110.4	252
Iron (mg)	3.8 ± 1.1	2.9	5.4
Zinc (mg)	4.3 ± 1.6	2.8	6.7

SFAs:saturated fatty acids, MUFAs:monounsaturated fatty acids, PUFAs: polyunsaturated fatty acids. All menus included one portion of white bread (50 g).

The percentages of the energy and nutrient values of the menus meeting the adequate intake recommended in TUBER are shown in Figure 1. It was determined that energy and all nutrients, except calcium, met one third of the adequate intake.

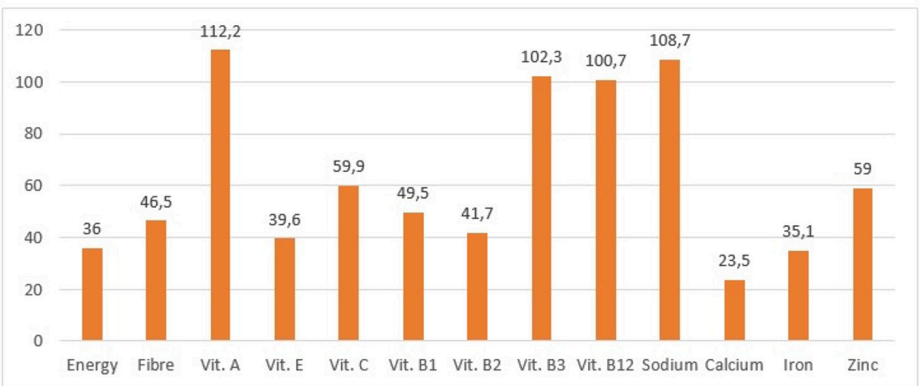

Figure 1. Percentage of energy and nutrient values of menus meeting TUBER recommendations

The mean, standard deviation, minimum and maximum values and daily recommended amounts of the food groups included in the menus are shown in Table 2. It was found that dairy products and vegetables and fruit groups were inadequate in the menus and did not meet one third of the daily requirement (Figure 2).

Table 2. Food group contents of the menus and TUBER recommendations

Food Group	Mean ± SD	Minimum	Maximum	Recommendations
Dairy Products (g)	118.3 ± 21.7	92.1	150.2	600
Meat (g)	105.0 ± 30.4	74.5	146.4	120
Bread and Cereals (g)	217.9 ± 126.6	120.4	397.0	175
Fruit and Vegetables (g)	142.3 ± 186.7	124.3	175.6	650

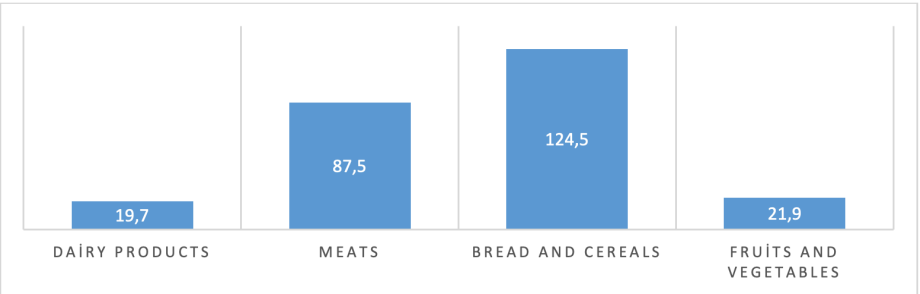

Figure 2. Percentages of food group contents of menus meeting TUBER recommendations

When comparing the energy and nutrient content of the menus with USDA recommendations, it was found that energy, protein, dietary fiber, vitamin A, vitamin C, and iron levels met the recommendations. However, fat, saturated fat, and sodium levels exceeded the recommendations. Calcium content remained below the recommended amount in all school menus (Table 3).

Table 3. Comparison of energy and nutrient values of menus with USDA recommendations

Energy and Nutrients	Menus offered	Recommendations
Energy (kcal)	576.5	550-650
Protein (g)	24.7	10
Fats (%)	32.8	<30
SFAs (%)	12.6	<10
Cholesterol (mg)	67.8	<75
Fibre (g)	7.4	4
Vitamin A (RE)	448.9	224
Vitamin C (mg)	26.9	15
Calcium (mg)	188.2	286
Iron (mg)	3.8	3.5
Sodium (mg)	1848.4	<640
Trans fat (g)	do not contain	should not contain

SFAs:saturated fatty acids

DISCUSSION

In this study, randomly selected primary school menus in Istanbul were examined and it was determined that the menus were inadequate in terms of some nutrients and food groups that should be consumed daily. Meals served in schools should be prepared in accordance with menu planning principles. Menu planning principles aim to ensure that children consume healthy foods that will support their growth and development at an early age. In this context, it is important that school menus are balanced in terms of nutritional elements. It should be aimed to meet 2/5 of the energy and nutrient requirements recommended by TUBER in part-time schools (National Menu Planning and Implementation Guide for Institutional Food Systems, 2020). In this study, the average energy content of primary school menus was below this rate, but it was determined to be sufficient according to USDA recommendations.

The average fat and saturated fat ratios of the menus analysed (32.8% and 12.6%) were similar to the results of Ongan et al. (35.3% and 12.2%) and above the recommendations (Ongan et al., 2014). It is recommended that 30% or less of the energy taken from food consumed in a meal should be provided from fats and less than 10% from saturated fats. The mean sodium content of the menus (1848.4 mg) was found to be above the recommendations. Daily sodium intake of children is recommended to be 2400 mg or less (National Menu Planning and Implementation Guide for Institutional Food Systems, 2020). In USDA school lunch menus, sodium intake recommendation is <640 mg. When the evaluated menus are examined, it is seen that the recommended sodium intake is exceeded in all cases. The amount of sodium mentioned in this study is the amount coming from the foods specified in standard recipes. The amount of salt added to menus was not calculated. In a similar study evaluating school menus in Spain, sodium intake was found to be 1377±29 mg (Lavall et al., 2020). It has been shown that high blood pressure is associated with subclinical target organ damage starting in childhood and that this relationship continues into adulthood. Therefore, the development and implementation of strategies to reduce sodium intake in the first two decades of life is of great importance (Appel et al., 2015). Reducing sodium intake in children can lower lifetime blood pressure and reduce the risk of morbidity/ mortality, especially in overweight children (Yang et al., 2012).

Samson et al. (2022) analysed the effects of iron status on academic performance and cognitive functions by evaluating 50 studies in their systematic review . They concluded that iron status can be associated with academic performance and iron supplements can improve performance, attention and concentration. The average iron content of all menus evaluated in this study appears to meet 1/3 of the TUBER recommendations and USDA recommendations. Adequate levels of meat and meat products, which are important sources of iron, helped to meet iron

requirements. Iron is an essential nutrient with its basic biochemical functions such as tissue oxygenation, DNA synthesis and enzyme activities as well as providing oxygen transport through haemoglobin. It has been reported that iron deficiency in childhood can increase the risk of anaemia or lead to significant public health problems such as poor neurodevelopment (Chouraqui, 2022).

Calcium is an important nutrient to support bone development in childhood and adolescence. Adequate calcium intake during this period plays a critical role in reducing the risk of osteoporosis in later ages by increasing bone mineral density (Pan et al., 2020). Milk consumption, which is the main source of calcium, has been associated with positive effects on bone density, growth, development and physical strength in children and adolescents (Kim, 2016). In this study, it was determined that the calcium content of the menus was below the TUBER and USDA recommendations. Similar results were found in studies evaluating primary school menus in China, Korea and New Zealand (Kim et al., 2019; Huang et al., 2017; de Seymour et al., 2022).

A study conducted in Sweden examined the lunch menus of 79 primary schools and showed that approximately half of the daily vegetable intake was met (Eustachio Colombo ET AL., 2020). In our study, it was determined that vegetable and fruit content was insufficient in all menus. High vegetable intake plays an important role in reducing the risk of overweight or obesity. Dietary fibre, which is especially high in vegetables and fruits, plays an important role in reducing the risk of non-communicable diseases, and therefore, it is very important to promote the consumption of foods rich in dietary fibre in schools (Sampaio et al., 2017). The American Health Foundation suggests that children aged 2 to 18 should consume a minimum daily amount of dietary fiber equal to "age plus 5" grams (Williams et al., 1995). In this study, fibre intake was found to be sufficient in all menus evaluated. Although the vegetable and fruit group was insufficient in the menus, this positive result is thought to be due to the high cereal content of the menus. Dietary fibre is known to have positive health effects such as supporting digestive health and reducing the risk of chronic diseases such as cardiovascular diseases, type 2 diabetes and obesity (Hojsak et al., 2022). Therefore, offering more fibre-containing foods such as vegetables and fruits in school menus may be a critical step in developing healthy eating habits and promoting healthy lifestyles of students.

CONCLUSION

In conclusion children's nutrition is determined by many socioeconomic and sociocultural factors, including the home and school environment. The school environment provides an important opportunity for children to be exposed to and learn healthy eating habits. School meals, particularly those provided for

free or at a low cost, play a significant role in children's nutritional intake during a critical growth period and reach children from diverse socioeconomic backgrounds. This positions them as a vital tool for fostering healthy eating habits and reducing long-term social health disparities. In Turkey, the absence of a comprehensive school lunch program may limit children's ability to establish these essential dietary habits. Expanding and improving school meal programs is essential to support children's healthy growth and development. Employing dietitians in school menu planning would help ensure that meals meet health standards, while efforts to reduce saturated fat and sodium content in menus would contribute to better public health outcomes. Additionally, increasing the inclusion of vegetables, fruits, and dairy products and enhancing menu diversity should be encouraged to better meet children's nutritional needs. Future studies could evaluate the feasibility of implementing school meal programs in Turkey, while also investigating how menu content aligns with students' food preferences and identifying strategies to promote healthy choices.

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