Evaluation of food frequency, nutritional and anthropometric profile in adolescents

Avaliação da frequência alimentar, perfil nutricional e antropométrico de adolescentes

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ABSTRACT

To evaluate food frequency and verify the association with nutritional and anthropometric profile in adolescents. Sociodemographic and anthropometric data were collected, as well as a three-day food record to identify food frequency, whether or not breakfast was served and the average consumption of dairy products and ultra-processed foods. Sixty-three adolescents aged 14 to 16 years, mostly females (61.9%), participated in the study. In none of the associations it was possible to identify significant differences, however it was observed: consumption of ≥4 meals a day present in 60.3% of the adolescents, being linked to overweight; low consumption of dairy products in both genders and high consumption of ultra-processed foods among younger people. The breakfast variable did not establish an association with the nutritional status of the sample. There was no relation found between food frequency and the nutritional and anthropometric profile in adolescents. However, further studies should be encouraged.

Descriptors: Adolescent. Breakfast. Nutritional status.

RESUMO

Avaliar a frequência alimentar e verificar a associação com o perfil nutricional e antropométrico em adolescentes. Realizou-se a coleta de dados sociodemográficos, antropométricos e registro alimentar de três dias, afim de identificar a frequência alimentar, a realização ou não do desjejum e a média de consumo de lácteos e ultraprocessados. Participaram 63 adolescentes com idade entre 14 e 16 anos, a maioria do sexo feminino (61,9%). Em nenhuma das associações foi possível identificar diferenças significativas, porém observou-se: consumo ≥4 refeições diárias presente em 60,3% dos adolescentes, estando ligado ao excesso de peso; baixo consumo de lácteos em ambos os sexos e consumo alto de ultraprocessados entre os mais jovens. A variável desjejum não estabeleceu associação com relação ao estado nutricional da amostra. Não foi encontrada relação entre a frequência alimentar e o perfil nutricional e antropométrico dos adolescentes. Todavia novos estudos precisam ser incentivados.

Palavras-chave: Adolescente. Desjejum. Estado nutricional.

INTRODUCTION

Overweight and obesity diagnoses have become increasingly frequent in Brazil and several locations worldwide in recent years. For adults, having a body mass index (BMI) above 25 kg/m² and 30 kg/m², respectively, is classified as overweight or

obese[2]. For adolescents, overweight is a z score greater than or equal to $+1$[3]. The existence of these conditions is a risk factor that is associated with metabolic changes, the development of diabetes, cardiovascular diseases, and other non-communicable chronic diseases[4].

The nutritional status of overweight is mainly due to low physical exercise and excessive caloric consumption[5]. It is estimated that the prevalence of obesity increased threefold between 1975 and 2016 in the general population[5]. Data from children and adolescents aged 5 to 19 years are worse since there was a leap from 4% to 18% in the prevalence of overweight and obesity in the same period[5].

During adolescence, there is an increase in appetite due to the significant growth and biological changes inherent to this age. With increased nutritional needs, there is a greater search for food, where a good diet - or not - can be practiced, fulfilling the individual's eating pattern[6]. The adolescents' eating habits influence the worsening of their nutritional status. Studies show that the consumption of vegetables and fruits has been insufficient while the intake of ultra-processed foods with high presence of saturated fat, trans fats, sugar, and sodium, has been above the recommended levels, which contributes to being overweight and is a risk for the development of non-communicable chronic diseases[7]. Low consumption of dairy products in adolescence also seems to interfere negatively with body adiposity

indexes, in addition to being associated with inadequate bone development[8,9].

In addition, skipping meals is commonly adopted by younger individuals, and skipping breakfast is associated with a worsening in the lipid profile, as well as in blood pressure levels, insulin resistance, and metabolic syndrome[10]. On the other hand, regular food frequency results in a healthier and better-quality diet throughout the day, preventing overweight and obesity conditions[11]. Knowing then that food frequency can influence the pattern of food consumption, and both interfere with adolescents' nutritional and anthropometric profile, the objective of this study was to evaluate food frequency and verify the association with the nutritional and anthropometric profile in ninth-grade adolescents from the municipal school network of a city in southern Brazil.

METHODS

A cross-sectional study was carried out with adolescents in the ninth grade of municipal, urban, and rural public schools in a city in southern Brazil during April and May 2022. The sample was defined by convenience and included adolescents from both genders, aged 14 to 16 and enrolled in educational institutions, excluding those who had any physical disability that made it difficult to take anthropometric measurements or who were on special restrictive diets, in treatment of chronic diseases, and/or with any disability or mental disorder making it impossible to

answer the questionnaire. The present study was considered and approved by the Research Ethics Committee of the Centro Universitário da Serra Gaúcha (FSG) under opinion No 5,337,953.

Sociodemographic data were assessed using a standardized questionnaire, applied in the classroom individually to each student participating in the study, considering the sociodemographic data gender, age (completed), and area of school location (urban or rural).

We performed the anthropometric assessment according to the methodology recommended by the Food and Nutrition Surveillance System (SISVAN)[3]. To obtain the weight, the individual was barefoot and wearing light clothes. Weight measurement was performed on a Speedo® digital electronic scale, with a capacity of 150 kg and an accuracy of 100 g. For height, a WISO® brand portable compact stadiometer was used, with a capacity of 200 cm and accuracy of 0.1 cm, fixed to a smooth wall with adhesive tape, according to standard procedure[2]. We assessed the above measures in a reserved environment to avoid possible embarrassment. For the classification of nutritional status, the AnthroPlus software was used according to height-for-age and BMI-for-age indicators, as recommended by SISVAN[3]. For statistical analysis, the nutritional status variable was categorized into thinness, eutrophy, and overweight (grouping overweight and obesity).

The estimated food consumption was performed through a three-day food record, one being a weekend day. Participants received prior instructions on how to complete the registration. Based on the record, it was decided to assess the frequency of consumption of specific foods (average intake of processed and ultra-processed foods and average consumption of dairy products) and whether or not to have breakfast.

The number of meals was investigated as a continuous quantitative variable. However, for data analysis, the mean value between the three days of food record was calculated, being categorized by the mean and median value in: < 4 and ≥ 4 meals.

Dairy products consumption was investigated by the frequency ingested per day of food record, ranging from none to three times. However, to respond to the objectives of this study, a new variable was calculated, estimating the three-day average consumption categorized into < 1 portion, 1 to < 2 portions, and 2 to < 3 portions.

High consumption of processed and ultra-processed foods was considered by the intake of 5 or more portions/types of these foods[12]. An average of consumption as identified in the three days of food record was considered.

Initially, it was verified the mean consumption of breakfast to categorize the breakfast variable, considering the final range of 0 to 1 point. Then it was categorized into frequency, setting consumption at never (average of 0 points),

rarely (average of 0.33 points), sometimes (average of 0.67 points), and always (average of 1 point).

STATISTICAL ANALYSIS

Initially, data was entered into the Microsoft Excel® program and stored in a spreadsheet. Statistical analysis was performed using the Statistical Package for the Social Science® (SPSS), version 25.0 for Windows (SPSS Inc, Chicago, IL). Quantitative data were described as mean and standard deviation (SD) and qualitative variables as absolute (n) and relative (n%)

frequencies. The chi-square test was used in possible associations between outcomes and exposure variables, and differences were considered significant for values of p<0.05.

RESULTS

Sixty-three adolescents participated in the study, 84.1% (n=53) aged 14, the majority, 39 (61.9%), were female, and 50.8% (n=32) attended rural schools (Table 1).

Table 1. Description of socioeconomic, demographic, and school area variables in relation to adolescents' consumption of portions of dairy products in a city in the South of Brazil, 2022 (n=63)

Variables	Total n (n%)	Consumption of dairy products (portions)			p-value*
		< 1 n (n%)	1 to < 2 n (n%)	2 to <3 n (n%)	
Gender					0.132
Female	39 (61.9)	32 (82.1)	5 (12.8)	2 (5.1)	
Male	24 (38.1)	15 (62.5)	8 (33.3)	1 (4.2)	
Age (years)					1.000
14	53 (84.1)	39 (73.6)	11 (20.8)	3 (5.7)	
15	8 (12.7)	6 (75)	2 (25)	0 (0)	
16	2 (3.2)	2 (100)	0 (0)	0 (0)	
Siblings					0.766
None	12 (19)	10 (83.3)	1 (8.3)	1 (8.3)	
1	29 (46)	22 (75.9)	6 (20.7)	1 (3.4)	
2	9 (14.3)	5 (55.6)	3 (33.3)	1 (11,1)	
3	4 (6.3)	3 (75)	1 (25)	0 (0)	
≥ 4	9 (14.3)	7 (77.8)	2 (22.2)	0 (0)	
Living with					0.347
Parents	59 (93.7)	45 (76.3)	11 (18.3)	3 (5.1)	
Grandparents	2 (3.2)	1 (50)	1 (50)	0 (0)	
Uncles/Aunts	1 (1.6)	0 (0)	1 (100)	0 (0)	
Others	1 (1.6)	1 (100)	0 (0)	0 (0)	
School area					0.728
Urban	31 (49.2)	22 (71)	7 (22.6)	2 (6.5)	
Rural	32 (50.8)	25 (78.1)	6 (18.8)	1 (3.1)	

Legend: n, Absolute frequency. n%, Relative frequency. p-value, statistical significance index. Categorical variables were described by absolute and relative frequency. *Chi-square test of association. Values in bold showed statistical significance (p≤0.05).

The consumption of 4 or more meals a day was present in 60.3% (n=38) of the

adolescents participating in the study. The consumption of fewer than four meals and

the daily consumption of 4 or more meals a day was associated with the nutritional status of eutrophic, 80% and 68.4%, respectively. However, when overweight was analyzed separately, this condition was linked to adolescents who ate four or more daily meals (31.6%). The breakfast variable did not establish an association with the nutritional status of the sample (Table 2).

Table 2. Description of food consumption variables associated with nutritional status in relation to adolescents in a city in southern Brazil, 2022 (n=63)

Variables	Total n (n%)	Nutritional status			p-value*
		Thinness n (n%)	Eutrophyn (n%)	Overweight n (n%)	
Number of meals					0.143
< 4	25 (39.7)	1 (4)	20 (80)	4 (16)	
≥ 4	38 (60.3)	0 (0)	26 (68.4)	12 (31.6)	
Breakfast					0.436
Never	9 (14.3)	0 (0)	7 (77.8)	2 (22.2)	
Rarely	5 (7.9)	0 (0)	4 (80)	1 (20)	
Sometimes	18 (28.6)	0 (0)	16 (88.9)	2 (11.1)	
Always	31 (49.2)	1 (3.2)	19 (61.3)	11 (35.5)	

Legend: n, Absolute frequency. n%, Relative frequency. p-value, statistical significance index. Categorical variables were described by absolute and relative frequency. *Chi-square test of association. Values in bold showed statistical significance (p≤0.05).

When verified the association of socioeconomic, demographic and school-related variables in relation to dairy products consumption, no statistical significance was identified, but it was observed that all study participants consumed less than 3 portions a day. The consumption of less than 1 portion was more relevant among the majority when observed by the variable gender, where both girls (82.1%) and boys (62.5%) consumed less than 1 portion of dairy products a day. As for the school area, adolescents studying in the rural area consume less than one portion of dairy products, 78.1% (n=25), compared to those who study in schools in the urban area; however, among the latter group, higher consumption of 1 to <2 portions were identified, 22.6% (n=7) and from 2 to <3 portions, 6.5% (n=2) compared to students from schools in the countryside, however, without statistical significance (Table 1).

Regarding the age of adolescents and the consumption of ultra-processed foods, there was a tendency towards an association, where p-value equals 0.053, among 14-year-olds, who show 58.5% (n=31) of high consumption of ultra-processed foods when compared to students aged 15 and 16. There was no significant difference in the other variables about the high consumption of ultra-processed foods (Table 3). There was no significant difference in the other variables regarding the high consumption of ultra-processed foods (Table 3).

Table 3. Description of socioeconomic, demographic and school-related variables in relation to high consumption of ultra-processed foods among adolescents in a city in southern Brazil, 2022 (n=63)

Variables	Total n (n%)	High consumption of ultra-processed foods n (n%)	p-value*
Gender			0.970
Female	39 (61.9)	21 (53.8)	
Male	24 (38.1)	12 (50)	
Age in years			0.053
14	53 (84.1)	31 (58.5)	
15	8 (12.7)	2 (25)	
16	2 (3.2)	0 (0)	
Siblings			0.713
None	12 (19)	7 (58.3)	
1	29 (46)	15 (51.7)	
2	9 (14.3)	5 (55.6)	
3	4 (6.3)	3 (75)	
≥ 4	9 (14.3)	3 (33.3)	
Living with			0.864
Parents	59 (93.7)	31 (52.5)	
Grandparents	2 (3.2)	1 (50)	
Relatives	1 (1.6)	0 (0)	
Others	1 (1.6)	1 (100)	
School area			1.000
Urban	31 (49.2)	16 (51.6)	
Rural	32 (50.8)	17 (53.1)	

Legend: n, Absolute frequency. n%, Relative frequency. p-value, statistical significance index. Categorical variables were described by absolute and relative frequency. *Chi-square test of association. Values in bold showed statistical significance (p≤0.05).

The variables consumption of dairy products in portions and high consumption of ultra-processed foods did not show statistically significant differences in the nutritional status of the adolescents. (Table 4).

Table 4. Description of the consumption of dairy products and high consumption of ultra-processed foods variables in relation to nutritional status in adolescents in a city in southern Brazil, 2022 (n=63)

Variables	Total n (n%)	Nutritional status			p-value*
		Thinness n (n%)	Eutrophyn (n%)	Overweight n (n%)	
Consumption of dairy (portions)					0.441
< 1	47 (74.6)	0 (0)	35 (74.5)	12 (25.5)	
1 a < 2	13 (20.6)	1 (7.7)	9 (69.2)	3 (23.1)	
2 a < 3	3 (4.8)	0 (0)	2 (66.7)	1 (33.3)	
High consumption of ultra-processed foods					0.672
No	30 (47.6)	1 (3.3)	21 (70)	8 (26.7)	
Yes	33 (52.4)	0 (0)	25 (75.8)	8 (24.2)	

Caption: n, Absolute frequency. n%, Relative frequency. p-value, statistical significance index. Categorical variables were described by absolute and relative frequency. *Chi-square test of association. Values in bold showed statistical significance (p≤0.05).

DISCUSSION

The present study aimed to verify associations between nutritional status, the average consumption of dairy products, and the high consumption of ultra-processed foods with students' sociodemographic, demographic, and food frequency aspects. Low dairy product consumption was observed among the groups divided by gender. Although no statistically significant differences were found, the consumption of ultra-processed foods among younger individuals was higher, and the intake of 4 or more meals a day seems linked to a worse nutritional profile among adolescents.

For this investigation, having four or more meals a day was related to 60.3% of the sample, to which a similarity can also be observed in a systematic review[13] with Brazilian adolescents, where the prevalence of those having four or more meals per day was above 55%. Regarding nutritional status, having more than 4 meals a day showed a higher prevalence of being overweight, although without statistical significance. But a Brazilian study[14] carried out with individuals aged 10 to 14 showed an opposite association with this result, noting that eating less than 4 meals a day was related to higher BMI rates among the sample. In this way, a lower food frequency, linked to being overweight, may be related to the consumption of larger portions at meals throughout the day, especially snacks, and as a consequence, a higher

caloric intake with a lower predominance of whole grains, fruits, and dairy products[15].

This investigation did not find an association between skipping breakfast and nutritional status, but studies have indicated that not having breakfast not only seems to contribute to adolescents becoming overweight[16] but also to greater abdominal adiposity[17]. Likewise, Ricotti et al.[18] observed a connection between weight gain, BMI, and abdominal obesity in non-breakfast consumers.

In addition to negative body changes, biochemical disorders can affect adolescents who skip breakfast. Changes in glucose and lipid profiles, such as increased fasting insulin, fasting glucose, glycated hemoglobin, and total cholesterol levels, can be observed[19]. Such findings evidence the association of skipping breakfast with cardiometabolic risk factors. In conjunction with these findings, it was identified in a Spanish study[20] that having breakfast, and even more when it is with good quality food, is associated with lower levels of depression and stress compared to adolescents who eat breakfast with poor quality food. In this way, choosing good foods is as important, if not more, than just having breakfast or not.

As a result, not skipping breakfast is related to an adequate consumption of energy, carbohydrates, proteins, and fats, in addition to sugar, fiber, and calcium[21]. Additionally, eating breakfast improves the quality of nutrition during the day since

individuals who do not skip this meal reach the daily recommendations of fruits and vegetables easily, avoiding the intake of foods with added sugar in meals throughout the day[22]. Given the above, it is appropriate to emphasize that the nutritional status of the adolescents participating in the present study, as previously mentioned, has not shown a significant association with daily food frequency or whether having or not breakfast. That does not mean they can no longer display negative health factors such as a high body fat percentage, high waist circumference, or biochemical changes, especially lipid and glucose profiles or other indications of cardiovascular risk.

Similar to this, another Brazilian study, carried out with adolescents in public schools in Niterói, Rio de Janeiro, observed that the daily consumption of dairy products was below the recommended levels[23]. The consumption of 0 to 2 portions of dairy products a day was related to lower values of calcium, vitamin D, phosphorus, and potassium among girls compared to those who had at least 4 portions of dairy products daily[24]. This finding seems to agree with the Food Guide for the Brazilian Population[25], which recommends the ideal consumption of at least three portions/day of dairy products, which is such an important food group to support musculoskeletal growth and promote healthy body composition.

The association of high consumption of ultra-processed foods with age, with an intake considerably higher among adolescents aged 14 compared to older individuals, was also found in another study carried out in Brazil[12], which points to a possible reason for this situation: better care with food and health as one ages. In a Colombian study[26], carried out with people of all age groups, this association was also observed, where younger individuals had a higher consumption of ultra-processed foods, while the older population had higher consumption of natural or minimally processed foods.

As in this study, the association of high consumption of ultra-processed foods with overweight was also not possible to be evidenced in an investigation with adolescents aged 14 to 19 in Murici, Alagoas[27]. On the other hand, Neri, et al.[28] observed that the high intake of this food class increased the chances of overweight/total obesity among adolescents by 45%. Regardless of the relationship with nutritional status, a Brazilian study verified the poor quality of food among young people and identified the consumption of industrialized cakes and bread, sweets, pasta, and sweetened beverages as the main ultra-processed foods ingested[29]. In any case, the high consumption of ultra-processed foods in any age group seems to bring numerous damages to the individual's health, showing a high association with negative changes in the lipid profile of cardiovascular diseases, diabetes, depression, and even cancer[7]. In this way, promoting actions that guide the consumption of ultra-processed foods with a motivational approach can be worthwhile and capable of bringing benefits to adolescents[30].

The low number of participants in the sample was the main limitation, which may have interfered with the statistical power of our results. Another consideration is the type of method to estimate food consumption. Although recording food consumption is a widely used technique, and we collected our data carefully following a standardized protocol, the lack of interest in part of the study population may have led to errors in the records, such as food omissions and changes in the participants' eating behavior. The strong point of the study is the relevance of the subject addressed since the nutritional status of adolescents is a risk factor for several complications in the future and is strongly linked to their intake and eating behavior.

CONCLUSION

Based on the results found in this study, there was no relationship found in our sample between food frequency and the nutritional and anthropometric profile of ninth-grade adolescents from municipal schools of Flores da Cunha/RS. Thus, it would be interesting to conduct further studies since the factors addressed in this investigation play significant roles in the adolescents' quality of life, both at present and in the future.

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