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Food advertising and television exposure: influence on eating behavior and nutritional status of children and adolescents

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SUMMARY. This study aimed to evaluate the influence of food advertising and television exposure on eating behaviour and nutritional status of children and adolescents. It was a cross sectional study developed among 116 students from a private school in Brazil. Socio-demographic and health conditions were evaluated. Anthropometric data, food consumption, physical activity, television viewing habits and behaviour in relation to food advertising were also investigated. Among the results, a 1:2 relationship was identified between the number of televisions and residents per household. Excessive weight was present in 25.8% of subjects and 66.4% of children watched television while eating. Children were exposed to television for a median of 3.0 hours daily (95% CI: 2.9 to 3.6). There was a direct association between attraction to foods advertised and purchasing the product ($p<0.001$) and a positive relationship between the number of televisions per household and body weight ($r=0.246$, $p=0.015$) and the amount of liquid consumed during meals ($r=0.277$, $p=0.013$). Findings also highlighted the association between watching television while eating and the reduced probability of fruit consumption ($p=0.032$), contrasted with a greater likelihood of daily artificial juice intake ($p=0.039$). In conclusion, watching television is associated with lower probability of daily consumption of fruits and the number of television at household is positively related to BMI in children and adolescents.

Key words: Anthropometry, food consumption; food publicity, television.

RESUMEN. Publicidad de los alimentos y la exposición a la televisión: Influencia sobre la conducta alimentaria y el estado nutricional de los niños y adolescentes. El estudio objetivó evaluar la influencia de la publicidad de alimentos y la exposición a la televisión en la conducta alimentaria y estado nutricional de niños y adolescentes. El estudio es transversal con 116 estudiantes de una escuela privada en Brasil. Información sociodemográfica y de la condición de salud fueron evaluadas. Antropometria, el consumo de alimentos, practica de actividad física, hábitos de ver la televisión y el comportamiento en relación con la publicidad de alimentos también fueron investigados. Entre los resultados, una relación de 1:2 fue identificada entre el número de televisores por hogar y los residentes. El exceso de peso estaba presente en 25,8% de los sujetos y 66,4% de ellos veían la televisión mientras comían las refecciones. Los niños fueron expuestos a la televisión por un promedio de 3,0 horas al día (95% IC: 2,9-3,6). Se observó una asociación directa entre la atracción de los alimentos anunciados y la compra del producto ($p<0,001$) y una relación positiva entre el número de televisores por hogar y el peso corporal ($r=0,246$; $p=0,015$) y la cantidad de liquido consumido durante las refecciones ($r=0,277$; $p=0,013$). Los resultados presentó la asociación entre ver la televisión mientras se alimenta y la probabilidad de reducción del consumo de frutas ($p=0,032$), en contraste con una mayor probabilidad de consumo de jugo artificial ($p=0,039$). En conclusión, ver la televisión en demasiado se asocia con una menor probabilidad de consumo diario de frutas y el numero de televisores en el hogar se relaciona positivamente con el índice de masa corporal.

Palabras clave: Antropometría, consumo de Alimentos, publicidad de alimentos, televisión.

INTRODUCTION

The last decades were marked by an increase in the occurrence of childhood and adolescent obesity in developing countries, such as Brazil (1). This condition is defined as multifactorial and is influenced by biological, psychological, socioeconomic and environmental factors (2). Among these, the role of television exposure and food advertising with poor nutritional content has been shown to contribute to excessive weight gain and inappropriate food consumption (3).

Statistical projections show that if children and adolescents were less exposed to food advertising from 80.5 minutes per week (United States average)

to zero, which is not a feasible format to allow analysis of the effect of these advertisements on the obesity rate, the total food consumption by American children and adolescents would drop by 4.5%. This reduction represents a decrease of 0.38 kg/m² in the body mass index (BMI) average of this population and a decrease in the prevalence of obesity among boys from 17.8 to 15.2% and in girls from 15.9 to 13.5%. In addition to these estimates, some experts believe that these figures could eventually drop to 11 and 9%, respectively (4).

Literature has also indicated that exposure to food advertising corresponds to a greater likelihood of daily consumption of sweets and soft drinks to the detriment of fruit and vegetable consumption (5).

Considering the current debate over television exposure and food advertising and their influence on food intake and body weight, in addition to the facts that a) during a period of one year, an individual is exposed to more than 40,000 advertisements and b) food industries spend around $9.6 billion in marketing their products, of which $1.7 billion is specifically targeted to children and adolescents (6), the present study aimed to evaluate the influence of food advertising and television exposure on the eating behaviour and nutritional status of children and adolescents.

MATERIALS AND METHODS

Study design and sample

This was a cross-sectional study developed among children and adolescents enrolled in a private school in Belo Horizonte, Minas Gerais, Brazil. Three hundred and fifty students were enrolled in the school, who attended either in the morning (n=200) or evening (n=150), and whose ages ranged from kindergarten through high school.

A convenience sample was adopted. All children and adolescents who were enrolled in elementary school (n=250, 71.4% of total students) and answered the questionnaire of data collection and whose parents or guardians authorized their participation in the study were included in the sample. This authorization was obtained by signing a term of informed consent after reading an explanation of the research objectives, measures and information to be collected and the risks and discomforts involved in the research, according to the guidelines laid down in the Declaration of Helsinki. The present study was approved by Research Ethics Committee of the Federal University of Minas Gerais under protocol number 091/09.

The age group from 7 to 15 years was studied, taking into consideration that it is the group most exposed to food advertising and television (7), in addition to the fact that children under seven have more difficulty understanding the advertising content (8).

Data collection

Data were collected by applying a self-administered and self-explanatory questionnaire. Socio-demographic and economic variables, levels of regular physical activity and food consumption were evaluated. Parents or guardians of children (7 to 09 years) were given the task of answering the questionnaire, and adolescents (10 to 15 years) responded to questions by themselves.

Concerning socio-demographic and economic variables, the sex and age of the students and the nature of the family head (father, mother or other) and his/her educational level were investigated. In addition, the number of residents and televisions per household and family income were also evaluated.

TABLE 1
Socio-demographic and economic conditions of children and adolescents from a private school in Brazil in 2009.

Socio-demographic and economic conditions	Frequency (%)
Sex - Female	67.2
Age group - Adolescent	72.4
Family head	
Father	60.5
Mother	31.6
Other	7.9
Family head schooling	
Elementary school	20.2
High school	37.7
Higher education	42.1
Family Income (R$)	
≤1,000.0	29.7
1,000.1-1,999.9	32.7
2,000.0-2,999.9	15.8
≥3,000.0	21.8

The respondents were also asked about their weekly frequency of physical activity, time (in hours) spent in physical activity per day and the place where physical activity most commonly occurred (such as school or home, for example).

Food consumption was investigated by applying a Food Frequency Questionnaire (FFQ) and focused on eating habits. The FFQ, which was qualitative and designed specifically for this study, referred to the six months preceding the interview and contained 14 types of food from different food groups, including the most common products consumed by Brazilian children and adolescents (9).

The evaluation of food habits included the number of daily meals, self-perception of chewing quality, drinking liquids during meals and characteristics of school meals (packed lunch, purchased or not eaten).

As soon as students returned the questionnaire, it was checked for data consistency. After verifying all questionnaires, students' anthropometric data were measured by two properly trained nutrition faculty members from the Federal University of Minas Gerais.

The anthropometric evaluation consisted of measuring weight and height to obtain BMI, according to techniques described in the literature (10). This index was classified according to students' age and sex, adopting growth curves published by the WHO (11).

Television exposure and eating behaviour in relation to food advertising

Television exposure and eating behaviour in relation to food advertising was evaluated by applying another self-administered and self-explanatory questionnaire. This questionnaire included questions about habits of television-watching, time (in hours) spent in this activity and food intake concomitant with this practice.

Additionally, the questionnaire included questions about the habit of acquiring food advertised on television and, if applicable, the main types of products purchased. Finally, the attraction to a new food product advertised on television and this acquisition were also investigated by this study.

Data analysis

Food frequency consumption reported by the child or adolescent was transformed to units of daily frequency to obtain the probability of consumption of a given food type in one day. For example, if the respondent reported a food frequency consumption of twice a week, this measure was converted into 0.29 (two divided by seven), representing a 29% chance of consuming this product in a day. Similar transformations were conducted for weekly and monthly frequencies, keeping the ratings rare or non-ingestion (option "never") intact. For those individuals who consumed fruit daily, regardless of the amount, a 100% probability of consumption was adopted.

Statistical analysis included Pearson and Spearman correlations, simple Student's t-test, ANOVA, the Mann-Whitney test and the Kruskal-Wallis test. These analyses were performed using the Statistical Package for Social Sciences (SPSS) 15.0 for Windows, Student Version (2006). A significance level of 5% ($p<0.05$) was adopted. The results were presented as the mean (standard deviation) for variables with normal distribution and as median (confidence interval - 95%) for others.

RESULTS

The sample consisted of 116 students (46.4% of all students invited), with the majority being females (67.2%), with a mean age of 11.6 (3.3) years. The table 1 presents all the other socio-demographic and economic conditions evaluated. The median of residents per household observed was 4.0 (CI 95%: 3.8-4.2) and there were a median of 2.0 (CI 95%: 2.1-2.6) televisions per household.

Physical activity was reported by 98.2% of children and adolescents, and in 74% of cases it took place in the school environment. In addition, students exercised 2.0 (95% CI: 2.3 to 2.7) times per week for 0.8 (95% CI: 1.0 to 1.3) hours at a time.

Regarding the anthropometric findings, 10.3% of the students were underweight, while 25.8% were overweight, and 12.9% were obese.

Food consumption data corroborate anthropometric inadequacy, with 33.6% of students referring chewing food poorly, 87.6% drinking liquids during meals (250.0 mL, 95% CI: 212.1 to 256.9) and 66.4% consuming food while watching television. Moreover, there was a daily median number of 4.0 (95% CI: 3.9 to 4.4) meals.

As for feeding fractionation, 21.4% of students said they did not eat meals at school, which corresponds to

more than four hours of fasting. Among the students remaining, 26.8% reported buying a snack at the school canteen, and 48.1% brought meals from home.

An analysis of food consumption frequency revealed a higher probability of daily consumption of sweets, candies and chocolates compared to those observed for vegetables. It is notable that there were a percentage of students who never consumed vegetables and fruits, but there was no such category for the consumption of sweets, candies and chocolates, ice cream or sandwiches (Table 2).

Watching television was practiced by the students for a median of 3.0 (95% CI: 2.9 to 3.6) hours per day. Additionally, 46.9% of children and adolescents reported obtaining foods advertised in the television media, and 54.9% were attracted by new products they had seen advertised. As a result, 25% reported buying food, and there was a statistically significant association ($p<0.001$) between being attracted to a product and purchasing it.

Analysis of the influence of food television advertising on the eating behaviour and nutritional status of the students showed a positive relationship between the total number of hours spent watching television and body weight ($r=0.246$, $p=0.015$) and the amount of liquid ingested during meals ($r=0.277$, $p=0.013$) (Table 3).

A positive relationship between the number of televisions per household and the probability of daily consumption of both artificial juice ($r=0.277$, $p=0.029$) and beans ($r=0.246$, $p=0.027$) was also found (Table 3).

Moreover, we found that children and adolescents who have the habit of eating while watching television were less likely to consume fruits daily - 60% of students who had this practice presented a 50 to 100% probability of consuming fruits daily, whereas in students who did not have this habit, the percentage was 74.3% ($p=0.032$). In contrast, the consumption of artificial juices was more frequent for students who ate while watching television - it was found that 45.7% of children and adolescents who did not watch television while eating consumed artificial juices rarely, in comparison with 30% who had this habit ($p=0.039$).

With respect to food acquisition through television advertising, those students who had this habit were more likely (50 to 100%) to consume ice cream daily in relation to others: 10.2% versus 3.6%, respectively ($p=0.033$).

DISCUSSION

Among the results of the study, there was a high prevalence of habitual television watching and a long duration of this practice in a given day. Nutritional di-

TABLE 2
Probability of daily food consumption of children and adolescents from a private school in Brazil in 2009.

Food	Probability of daily food consumption					
	100-75,1%	75-50,1%	50-25,1%	≤25%	Rarely	Never
Green vegetables	31.7	7.7	13.5	23.1	14.4	9.6
Other vegetables	36.3	4.9	11.8	28.4	10.8	7.8
Fruits	60.4	4.7	7.5	20.8	4.7	1.9
Milk	70.7	2.0	2.9	13.7	2.9	7.8
Dairy products	48.5	6.1	10.1	24.2	8.1	3.0
Beans	70.3	2.0	5.9	11.9	6.9	3.0
Processed meats	8.9	3.0	9.9	48.5	26.7	3.0
Sweets, candies and chocolates	42.3	1.9	12.5	33.7	9.6	0.0
Ice cream	5.8	1.0	6.7	69.2	17.3	0.0
Fried food	17.3	4.8	17.3	48.1	11.5	1.0
Sandwiches	2.8	1.0	2.8	60.4	33.0	0.0
Regular soft drinks	20.1	5.8	18.3	41.3	8.7	5.8
Natural juice	27.9	1.9	11.5	40.4	12.5	5.8
Artificial juice	28.6	5.7	6.7	23.8	25.7	9.5

sorders and poor eating habits were also found in the sample, which related to television exposure and food advertising influence. These findings suggest the need for intervention, which should be directed towards improving the control of television advertising and reducing the exposure of children and adolescents to television.

This study describes the important role that television exerts in the daily lives of Brazilian people, as a 1:2 relationship was identified between the number of televisions and the number of residents. Moreover, the median number of hours spent watching television we observed, although similar to that seen in other studies (5,12), was considered elevated according to recommendations for Brazil's population (13).

It is noteworthy that this study also found a positive relationship between time spent watching television and body weight. Weels et al. (14) previously reported similar evidence in a cohort study conducted with 4,452 adolescents aged 10 to 12 years in Pelotas, Brazil. However, in their study these authors observed a contribution of television exposure on increases in body fat and blood pressure (14).

The prevalence of nutritional disorders in the sample exceeded the data verified for the Brazilian population aged 10 to 19 years (15). One possible explanation for the high prevalence of nutritional disorders among children and adolescents under study is their inadequate food intake, as evidenced by the practice of unhealthy eating habits. We found inadequate fractionation of feeding with omission of meals, which results in lower consumption of healthy foods (16). Furthermore, drinking liquids during meals and chewing food improperly can promote excessive weight gain because of a reduced stimulation of satiety central controls (16,17).

Regarding this last habit, drinking liquid during meals, students who spent longer periods per day watching television also showed a higher intake of liquid on these occasions. One possible explanation for this

TABLE 3
Relation between food advertising and television exposure and eating behavior and nutritional status of children and adolescents from a private school in Brazil in 2009.

Variables	Hours spent watching television		Number of televisions	
	r	p-value	r	p-value
Anthropometric variables				
Weight	0.246	0.015*	0.101	0.310
Height	0.191	0.061	0.098	0.326
Body Mass Index	0.156	0.127	0.086	0.385
Number of daily meals	-0.113	0.282	-0.101	0.327
Liquid ingested during meals	0.277	0.013*	0.190	0.080
Probability of daily food consumption				
Green vegetables	-0.171	0.177	0,205	0.082
Other vegetables	0.030	0.809	0.065	0.579
Fruits	-0.106	0.330	0.013	0.906
Milk	-0,15	0.194	-0.057	0.612
Dairy products	0.033	0.777	0.098	0.394
Beans	-0.018	0.876	0.246	0.027*
Processed meats	0.059	0.652	-0.038	0.769
Sweets, candies and chocolates	0.077	0.498	0.105	0.336
Ice cream	-0.181	0.122	0.071	0.545
Fried food	0.034	0.766	0.074	0.514
Sandwiches	-0.100	0.439	0.099	0.443
Regular soft drinks	-0.137	0.240	0.066	0.563
Natural juice	-0.054	0.641	0.003	0,98
Artificial juice	0.230	0.094	0.277	0.029*

*p<0.05

relationship might be frequent student exposure to scenes of children and adolescents drinking beverages during meals in cartoon food advertisements and other television program commercials.

Another important habit observed in this sample is eating while watching television. A study conducted with 4,746 teenagers attending American public schools observed that children who ate while watching television had a lower intake of vegetables in general, especially dark green and yellow vegetables, grains and products high in calcium; this habit was also associated with higher consumption of regular soft drinks compared to those children who did not watch television while eating(18). Similar findings were verified by this study with regard to this habit and the intake of fruit, artificial juices and ice cream.

However, the study found a relationship between bean consumption and the number of televisions per household. It may have been a function of the study design bias and the fact that beans constitute a major component of the Brazilian people's daily diet(9).

This study also pointed to the relationship between being exposed to advertisements of new products and purchasing them. In this sense, food industries have worked hard to attract consumers to the product long enough to hold their interest in acquiring it. The use of jingles is common in 35% of television food advertisements and in the commercials is associated with the use of 39% of cartoons and 42% of children consuming the product (19).

Facing these problems, the Brazilian Ministry of Health issued Resolution number 24, dated 15 June 2010, which laid down minimum requirements for supply, advertising, publicity, information and other related practices, that address the dissemination and trade promotion of food and beverages containing high amounts of sugar, saturated fat, trans fat, and sodium and low nutritional content (20).

In addition to this type of approach, there is another that has been undertaken by Escobar-Chaves et al.(21) with children's parents, aiming to reduce media exposure. Families of 202 children from six to nine years were recruited to participate in the study for a duration of six months; 101 families constituted the study group. Intervention consisted of a two-hour workshop and delivery of six letters bi-monthly. The intervention proposed to: 1) reduce the daily time spent watching television, 2) turn off the television when nobody is watching it, 3) not watch television during meals, 4) not have television in children's room; and 5) realize diversionary activities not related to media vehicles. Among the results, goals two, three and four were achieved to a greater extent among the intervention group.

Despite its limitations, such as an adopted study design, a reduced sample size (less than 50% of eligible individuals of the study), the use of self-applied questionnaires that was applied differently considering age group, and the lack of assessment of caloric intake and nutrients, this study describes the contribution of television exposure and food advertising to increased body weight and inappropriate eating habits among students in a private school in Brazil.

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