Factors associated with the consumption of fruits and vegetables in schoolchildren aged 7 to 14 years of *Florianópolis,* South of Brazil[1]

Fatores associados ao consumo de frutas, legumes e verduras em escolares de 7 a 14 anos do município de Florianópolis

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ABSTRACT

Objective

To estimate the prevalence of the fruit and vegetable intake of schoolchildren aged 7 to 14 years from *Florianópolis*, *Santa Catarina*, Brazil, and analyze the associated factors.

Methods

This cross-sectional study analyzed food intake, socioeconomic, and biological data of 2,836 schoolchildren. The Chi-square test analyzed the dependent (fruit and vegetable intake) and independent variables; the latter with p-value <0.20 were selected for logistic regression analysis. The level of significance was $p<0.05$.

Results

Only 4.8% of the sample had adequate fruit and vegetable intake. The variables associated with adequate fruit and vegetable intake were school ownership status (private *versus* public), mother's education level, and family income per member. After adjustment only family income *per capita* remained associated with fruit and vegetable intake.

Conclusion

The fruit and vegetable intake of schoolchildren aged 7 to 14 years from *Florianópolis, Santa Catarina,* Brazil, is inadequate.

Indexing terms: Adolescent. Child. Food consumption. Fruit. Vegetables.

RESUMO

Objetivo

Estimar a prevalência e analisar os fatores associados ao consumo de frutas, legumes e verduras em escolares de 7 a 14 anos de idade do município de Florianópolis, Santa Catarina.

Métodos

Estudo transversal com amostra probabilística de 2 836 escolares. Foram analisadas variáveis de consumo alimentar, biológicas e socioeconômicas. Foi aplicado teste Qui-quadrado entre as variáveis independentes e dependentes (consumo de frutas, legumes e verduras), sendo aquelas com valor de p<0,20 incluídas na análise de regressão logística. O nível de significância adotado foi de p<0,05.

Resultados

O consumo adequado de frutas, legumes e verduras foi verificado em 4,8% da amostra. As variáveis associadas com o consumo adequado de frutas, legumes e verduras foram o tipo de escola, nível de escolaridade da mãe e renda familiar per capita. Após o ajuste, apenas a renda familiar per capita manteve a associação.

Conclusão

Verificou-se que o consumo de frutas, legumes e verduras por escolares de 7 a 14 anos de idade residentes no município de Florianópolis encontra-se abaixo das recomendações.

Termos de indexação: *Adolescente. Criança. Consumo de alimentos. Frutas. Verduras.*

INTRODUCTION

Both developed and developing countries consider that low Fruit and Vegetable (FV) intake increases the risk of chronic Non-Communicable Diseases (NCD)[1,2]. The literature provides evidence that adequate FV intake protects against the risk of NCD, such as diabetes *Mellitus* type 2, cardiovascular diseases, dyslipidemia, chronic respiratory diseases, hypertension, and some types of cancer[3]. NCD are the main global cause of mortality and disability. The World Health Organization (WHO) estimates that NCD kill 36 million people annually. In 2007 NCD accounted for 72% of the deaths in Brazil[4].

Inadequate fruit and vegetable intake in children and adolescents has been evidenced by Brazilian[5-8] and foreign studies[9,10].

The *Pesquisa Nacional de Saúde do Escolar* (PeNSE, National Schoolchild Health Survey) conducted in 2009 by the *Instituto Brasileiro de Geografia e Estatística* (IBGE, Brazilian Institute of Geography and Statistics) surveyed 60,973 students aged 13 to 15 years, attending public and private schools throughout the country, and also found low FV intake[11]. A total of 34.3% of the ninth graders attending private schools and 30.4% of those attending public schools had consumed vegetables on five days of the study week. Fruits had been consumed five days a week or more by 31.5% of the schoolchildren[11].

The 2012 *Pesquisa Nacional de Saúde do Escolar* surveyed 109,104 students aged 13 to 15 years and again found low FV intake: 43.4% and 30.2% of the schoolchildren consumed vegetables and fruits, respectively, weekly[12].

In *Santa Catarina,* Costa *et al.*[6] studied 4,964 schoolchildren aged 6 to 10 years and found that only 2.7% of the sample had adequate FV intake (>5 times a day), and that 26.6% had not consumed any FV on the study day.

In *Florianópolis* (SC), Costa *et al.*[7] studied 4,168 children aged 7 to 10 years to assess dietary changes after a five-year period (2002 and 2007) and found that the FV intake of children attending public and private schools decreased significantly by 22.9% and 27.8%, respectively, going from 90.1% in 2002 to 69.5% in 2007 for the former and from 94.1% in 2002 to 67.9% in 2007 for the latter.

The growing prevalence of obesity in children and adolescents[13-15] emphasizes the

importance of promoting a healthy lifestyle, including higher FV intake[9]. The nutritional basis behind the recommendation of higher FV intake is the possibility of FV replacing low-nutrient, energy-dense foods, such as refined grains and sugar, basic ingredients in processed and fast foods. In addition to their contribution to energy balance, they may also provide nutrients that benefit general health significantly[16].

The "Brazilian Food Guide" published in 2006 by the Ministry of Health recommends 3 servings of fruits and 3 servings of vegetables a day to prevent NCD[17]. The WHO[18] recommends a minimum FV intake of 400 grams a day. Global strategies to promote health and encourage higher FV intake began in the early 1990s; one such strategy is the 5-a-Day Program, which recommends 5 FV servings a day[19,20].

The World Health Organization encourages high FV intake to protect and promote health and healthy food habits, improving quality of life and decreasing NCD risk[1]. Knowledge about the importance of FV intake is critical, since childhood habits may persist throughout adulthood[6].

Given the scarcity of studies on the FV intake of children and adolescents, the objective of this study was to estimate the prevalence and analyze the factors associated with FV intake in schoolchildren aged 7 to 14 years from *Florianópolis* (SC).

METHODS

This cross-sectional study investigated a probabilistic sample of schoolchildren aged 7 to 14 years attending private and public schools in *Florianópolis* (SC). Data were collected 2007. The study was sponsored by the *Conselho Nacional de Desenvolvimento Científico e Tecnológico* (CNPq - National Council for Scientific and Technological Development) (Process number 402322/2005-3).

The methods used for determining sample size and sampling are described elsewhere[13]. In summary, sample size was based on a prevalence

of obesity of 10% for children aged 7 to 10 years[21] and of 17% for children aged 11 to 14 years[22], an error margin of 2%, and a design effect of 1.3, resulting in a sample size of 2,800 schoolchildren, 1,100 seven- to ten-year-olds and 1,700 eleven- to fourteen-year-olds. Considering a sample loss of 10%, the final sample should include 3,100 schoolchildren aged 7 to 14 years. Sampling consisted of two stages. In the first stage, the schools in *Florianópolis* (SC) were stratified by location (North, South, East, downtown, and continent) and ownership status (public or private). Schools in each geographical stratum were selected randomly, with probability proportional to stratum size. Thus, 11 public and 6 private schools were selected from the 87 schools in the municipality, 33 private and 54 public. In the second stage, the schoolchildren were randomly selected by age group, with equal probability, in each of the selected schools. The analyses to estimate prevalence and associated factors considered both the design effect and sampling plan. A total of 2,863 schoolchildren were surveyed. Children aged less than seven years (n=15) and more than fourteen years (n=12) were excluded, resulting in a sample size of 2,836 (99%) schoolchildren.

The study collected biological (gender, age, weight, and height), socioeconomic (family income, mother's education level, and school ownership status), and food intake (FV intake) data.

Gender, age, and school ownership status were collected from the lists provided by the schools, which were included in the questionnaire by a data pre-collection team. Socioeconomic data, such as family income and mother's education level, were collected by a self-administered questionnaire sent to the children's parents or guardians.

Anthropometric data were collected by trained anthropometrists as recommended by the WHO[23] and Lohman *et al*.[24]. This procedure allowed assessment of intra- and interpersonal measurement differences by calculating the Technical Error of Measurement (TEM)[25].

Body weight was measured by the electronic scale Marte® model PP 180 (*Marte Balanças e Aparelhos de Precisão* Ltda, *São Paulo*, Brazil), with a capacity of 180 kg and accuracy of 50 grams. Height was measured by the stadiometer Alturexata® (Alturexata Ltda, *Belo Horizonte*, Brazil), with an accuracy of 1 mm.

The nutritional status of the schoolchildren was given by Body Mass Index (BMI) - for-age and gender, according to Cole *et al.*[26], as proposed by the International Obesity Task Force. BMI was calculated by dividing the weight in kilograms by the square of the height in meters. The children were then grouped into two groups: not overweight/obese and overweight/obese.

The independent variables were age group (children aged 7 to 9 years, adolescents aged 10 to 14 years); gender (male, female); mother's education level (never attended school or incomplete elementary school; complete elementary school or incomplete high school; complete high school or incomplete higher education; and complete higher education); family income per member (quartiles in *reais*); and school ownership status (private, public).

The *Questionário Alimentar do Dia Anterior* (QUADA, Previous Day Food Questionnaire)[27] questionnaire collected the foods consumed on the preceding day by the children. This 24-hour recall is validated and structured to assess the food intake of schoolchildren on a single day. The instrument layout and protocol were developed by dieticians, educators, and artists, taking into account age-related cognitive skills and ease of administration. The meals, foods, and food groups listed in the questionnaire are based on the dietary habits of these age groups, on the foods in the *Programa Nacional de Alimentação Escolar* (PNAE, National School Food Program's) menu, and those in the "Brazilian Food Guide"[27,17].

The questionnaire contains the illustration of 21 foods in four A4 paper sheets, structured into six daily meals (breakfast, morning snack, lunch, afternoon snack, supper, and bedtime snack). This allows identifying the proportion of schoolchildren who ate the 21 foods in the six meals of the preceding day, which can be assessed qualitatively by determining the nutritional profile represented by the different nutrient sources in each food group[27].

The students were informed that they would have to recall everything they ate the day before to fill out the questionnaire. Therefore, the team repeatedly mentioned the day before, and informed the students of meal times. The questionnaires with the students' names were given to the students by the research team and their teachers, who clarified eventual doubts discreetly to avoid distracting others. After the instruments were handed out, each having banners describing each meal and drawings of the foods according to the questionnaire, the research team read the following questions to the students: What did you eat yesterday? For breakfast? For the morning snack? For lunch? For the afternoon snack? For supper? For the bedtime snack? After each question, the students were asked to look carefully at the foods and circle those that they had consumed in that meal. The students were also told that if they had not had that particular meal, they should not circle any food; and that they should circle FV if they had consumed preparations containing FV.

The outcome variable was FV intake determined by QUADA and grouped as follows: adequate when intake was equal to or higher than five times a day and inadequate when intake was less than five times a day, as recommended by the 5-a-Day Program[19,20]. FV intake by the study sample was analyzed as follows: fruit intake; vegetable intake; and FV intake. Fruit intake was adequate when equal to or greater than two times a day, and vegetable intake was adequate when equal to or greater than three times a day.

A database was created in the software EpiData 3.2 and fully checked by trained data entry operators. Consistency and amplitude were checked automatically.

The data were treated by the software Stata version 9.0. The distribution of the population

by socioeconomic and biological variables is described statistically by frequency distribution tables. The Chi-square test (χ^2) measured the association between the independent (gender, age, family income *per capita*, mother's education level, and school ownership status) and dependent (FV intake) variables. All variables with $p<0.20$ in the χ^2 were included in unconditional multiple regression analysis. The prevalence *ratios* were estimated along with their respective crude and adjusted 95% Confidence Intervals (95% CI). The Mann-Whitney test compared FV intake between the overweight/obese and non-overweight/obese groups.

The design effect was taken into account in all analysis by using Stata's svy command, which analyzes data from complex samples. Associations with *p*-value <0.05 were considered significant.

The study protocol was approved by the Human Research Ethics Committee of the *Universidade Federal de Santa Catarina* (n° 028/2006). The subjects were included in the study after their parents or guardians signed an Informed Consent Form.

RESULTS

Of the 2,836 study schoolchildren, 1,478 (52.1%) were females, and 2,315 (75.3%) attended public schools. A total of 899 (32.8%) mothers had completed high school or some higher education. The family income per member of 722 (29.8%) schoolchildren was in the first quartile (≤540.00 *reais*) (Table 1). The mean age and standard deviation of the children was

11.3±2.2 years, the minimum age was 7 years and the maximum, 14 years. According to BMI, 2232 (78.0%) schoolchildren were not overweight/obese and 629 (22.0%) were overweight/obese.

Nearly everyone (n=2,700, 95.2%) had inadequate FV intake (<5 times a day). Moreover, 990 (34.9%) students reported not having eaten FV the day before. Fruits and vegetables were not

Table 1. Absolute and percentage distribution of the study schoolchildren aged 7-14 (n=2,836) by independent variables. *Florianopolis* (SC), Brazil, 2007.

Variables	n	%
Gender		
Female	1,478	52.1
Male	1,358	47.9
School ownership status		
Public	2,135	75.3
Private	701	24.7
Age (years)		
Children (7-9)	909	32.09
Adolescents (10-14)	1,924	67.91
Mother's education level		
IES	692	25.2
CES	545	19.9
CHS	899	32.8
CHE	605	22.1
Family income per capita *(reais)*		
1st quartile (≤540.00)	722	29.8
2nd quartile (540.01 to 1,000.00)	529	21.8
3rd quartile (1,000.01 to 2,000.00)	580	23.9
4th quartile (<2,000.00)	592	24.5

Note: IES: Incomplete Elementary School or never attended school; CES: Complete Elementary School or incomplete high school; CHS: Complete High School or incomplete higher education; CHE: Complete Higher Education.

Table 2. Absolute and percentage distribution, Confidence Interval of 95% (95%CI), mean, and Standard Deviation (SD) of adequate Fruit and Vegetable (FV) intake by students aged 7-14 years (n=2,836) by food group. *Florianopolis* (SC), Brazil, 2007.

Food groups	Adequate intake		95%CI	Mean		SD
	n	%				
Fruits	543	19.2	15.5 - 22.8	0.8	±	1.0
Vegetables	144	5.1	4.1 - 6.1	0.7	±	1.0
FV	135	4.8	3.7 - 5.9	1.5	±	1.6

consumed by 1,531 (54.0%) and 1,602 (56.5%) schoolchildren, respectively.

Only 135 (4.8%) schoolchildren had adequate FV intake (95%CI=3.7-5.9%). FV, fruits, and vegetables were consumed a mean of 0.8±1.0, 0.7±1.0, and 1.5±1.6 times a day, respectively (Table 2).

The fruit (p=0.220), vegetable (p=0.25), and FV (p=0.250) intakes of overweight/obese and non-overweight/obese children did not differ. The medians for fruit and vegetable intakes were zero, regardless of nutritional status. On the other hand, the median FV intake was 1 in both groups.

Table 3 shows the crude and adjusted prevalence ratios of the study associations. The variables associated with adequate FV intake were school ownership status, mother's education level, and family income per member. The mother's

education level was positively associated with FV intake in the intermediate education level strata (complete high school or incomplete higher education, p=0.027; complete elementary school or incomplete high school, p=0.04).

Variables with p<0.20 (school ownership status, mother's education level, and family income per member) were included in the adjusted analysis model. After adjustment, the only variable associated with outcome was family income per member (Table 3).

DISCUSSION

The study found that only 4.8% of the schoolchildren had adequate FV intake. This finding is concerning and indicates the need of creating and reassessing strategies that focus on a healthier diet for this population.

Table 3. Distribution of prevalence, Prevalence *Ratio* (PR), crude and adjusted Confidence Interval of 95% (95% CI), and *p*-value of the association between adequate fruit and vegetable intake and the independent variables of schoolchildren aged 7-14. *Florianopolis* (SC), Brazil, 2007.

Variables	% (95%CI)	Crude		Adjusted[*]	
		PR (95%CI)	*p*-value	PR (95%CI)	*p*-value
Gender					
Male	5.0 (3.0 -7.0)	1			
Female	4.5 (3.4-5.7)	0.90 (0.5-1.5)	0.670	-	-
School ownership status					
Public	4.3 (3.1-5.4)	1			
Private	6.3 (3.0-9.6)	1.50 (0.8-2.5)	0.126	-	-
Age (years)					
7-9	4.7 (2.8-6.7)	1			
10-14	4.7 (3.2-6.3)	1.00 (0.5-1.8)	0.337	-	-
Mother's education level					
CHE	6.5 (4.3-8.6)	1			
CHS	4.3 (2.8-5.9)	0.66 (0.4-0.9)	0.027	-	-
CES	4.0 (2.8-5.3)	0.61 (0.3-0.9)	0.040	-	-
IES	4.9 (2.8-5.3)	0.75 (0.4-1.4)	0.350	-	-
Family income per capita *(reais)*					
4th quartile (<2000.00)	6.9 (4.3-9.6)	1		1	
3rd quartile (1000.01-2000.00)	3.5 (1.9-5.0)	0.48 (0.2-0.8)	0.019	0.48 (0.2-0.8)	0.019
2nd quartile (540.01-1000.00)	3.2 (2.3-4.2)	0.45 (0.2-0.7)	0.007	0.45 (0.2-0.7)	0.007
1st quartile (≤540.00)	5.4 (2.7-8.1)	0.77 (0.7-1.4)	0.382	0.77 (0.7-1.4)	0.382

Note: [*]The adjusted analysis contains the variables with *p*-values <0.20.

CHE: Complete Higher Education; CHS: Complete High School or incomplete higher education; CES: Complete Elementary School or incomplete high school; IES: Incomplete Elementary School or never attended school.

Low fruit and vegetable intake in schoolchildren was also found by another Brazilian cross-sectional study of 390 adolescents aged 10 to 17 years conducted by Toral et al.[28] in *Piracicaba* (SP), which reported that roughly 28% of the adolescents did not reach the minimum intake of 3 servings of fruits and 3 servings of vegetables a day, as recommended by the Brazilian Ministry of Health's "Brazilian Food Guide"[17].

In agreement with these data, a study conducted by Costa et al.[6] in 8 municipalities of *Santa Catarina* with 4,964 schoolchildren aged 6 to 10 years found that FV were consumed a mean of 1.5 times/day; that only 2.7% of the sample had adequate FV intake (≥5 times per day); and that 26.6% had not consumed FV the day before.

Low fruit and vegetable intake was also found by Assis et al.[5] when they studied the food intake of 1,232 schoolchildren aged 7 to 10 years from *Florianópolis* (SC): 27.2% consumed fruits three times a day, 5.5% consumed vegetables two times a day, and 15% consumed FV five times a day.

Riediger et al.[9] studied 18,524 Canadian adolescents aged 12 to 19 years and found that almost 60% of them consumed FV less than five times a day.

Likewise, Pérez-Lizaur et al.[10] found that only 11.0% of 327 Mexican children aged 7 to 10 years consumed fruits three or more times a day, indicating low FV intake, and that girls consumed more FV than boys (15.2% and 6.7%, respectively).

The fruit and vegetable intake of the study overweight/obese and non-overweight/obese groups did not differ. Fagundes et al.[29] studied 218 children and adolescents aged 6 to 14 years from *Parelheiros*, a neighborhood in the municipality of *São Paulo*, and found that the obese, followed by the overweight, had the lowest FV intakes.

Hassapidou et al.[30] studied 512 Greek adolescents aged 11 to 14 years and found that overweight/obese adolescents adhered more to the Western diet and less to the traditional Mediterranean diet than normal weight adolescents. Overweight/obese adolescents consumed less fruits ($p<0.001$), leaf vegetables ($p<0.001$), and non-leaf vegetables ($p<0.001$) than normal weight adolescents.

In the present study, mother's education level and family income by member were associated with FV intake.

The association between parents' education level and FV intake was also found by other studies[9,31]. Godoy et al.[31] studied 437 male and female adolescents from the neighborhood of *Butantã*, municipality of *São Paulo*, aged 12 to 19 years and found that FV intake increased with the education level of the family head. The authors concluded that higher education level leads to better food-related knowledge, increasing food variety and promoting higher FV intake. Additionally, the present study found that adolescents in the fourth quartile of family income per member consumed significantly more FV than those in other quartiles.

A study of 18,524 Canadian adolescents aged 12 to 19 years found that family income was significantly associated with FV intake ($p<0.001$), and that higher parents' education level was associated with higher FV intake frequency ($p<0.001$)[9].

Similarly, Kristjansdottir et al.[32] studied 1,179 Icelandic adolescents and found that the parents' socioeconomic level was positively associated with the FV intake of boys ($p=0.04$) but not of girls ($p=0.43$), and with the fruit intake of girls ($p<0.01$) but not of boys ($p=0.25$).

Toral et al.[28] studied 390 adolescents aged 10 to 17 years from *São Paulo* but did not find differences in FV intake by gender.

Instituto Brasileiro de Geografia e Estatística 2009 PeNSE survey of 60,973 students aged 13 to 15 years found that vegetable intake was not affected by gender (31.3% for females and 31.2% for males); in state capitals and the Federal

District, 31.5% of the sample consumed fruits five or more days a week, regardless of gender[8].

A study with Canadian adolescents aged 12 to 19 years found that the percentage of girls (31%) who consumed fruits two to four times a day was significantly higher than that of boys (26%) ($p<0.05$). The percentage of girls (41%) who consumed FV five to ten times a day was also significantly higher than that of boys (35%) ($p<0.05$)[9].

The present study did not find association between age and outcome, contrary to a Canadian study of adolescents aged 12 to 19 years that found significantly different fruit ($p<0.05$) and FV ($p<0.001$) intakes between two age groups[9].

One of the study limitations was the use of FV intake frequency (times per day), considering adequate an intake frequency equal to or greater than five times a day. As mentioned earlier, the Brazilian Ministry of Health[17] and the WHO[18] recommend intake in grams and number of servings, respectively. Thus, this methodological strategy may have over- or underestimated FV intake. However, other studies have used 'FV intake frequency (times per day)' as proxy of 'number of FV servings per day'[5-7].

Another limitation regards the use of QUADA to investigate FV intake, a questionnaire based on the 24-hour recall[27]. The present study used the questionnaire for assessing a single food intake day of the schoolchildren, which may estimate a day's FV intake accurately, but not the habitual FV intake. However, single-day assessment has been proven adequate and is often preferred by some studies, especially those that involve large, complex samples[6,7,23,33].

CONCLUSION

Schoolchildren aged 7 to 14 years from the municipality of *Florianópolis* (SC) do not meet the FV intake recommended by the 5-a-Day

Program. Of the study variables, only family income *per capita* was associated with FV intake.

More knowledge is needed about the FV intake of children and adolescents and its associated factors, which can then be used for guiding and implementing local health policies that encourage FV intake, promoting healthy eating practices and consequently, preventing NCD.

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CONTRIBUTORS

CR GALEGO analyzed and interpreted the results and wrote the manuscript. GL D'AVILA wrote and reviewed the manuscript. FAG VASCONCELOS conceived the study, and structured and reviewed the manuscript.

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