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Caloric Value of Breakfast and Nutritional Status in Schoolchildren at an Educational Center in the Palestina District, Guayas Province, Ecuador

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Abstract

Objective: The purpose of this study was to analyze the direct effect of the caloric value of breakfast on the nutritional status of schoolchildren in an educational center.

Method: Descriptive and cross-sectional study. The sample was 699 students from the "Clara Prado Olvera" Basic Private School, it was developed in the period October 2024. For statistical analysis, the Minitab 18 software was used. The linear regression test was used.

Results: 341 were females ($\bar{x}$=6.72 years, SD=0.09) and 358 were males ($\bar{x}$=7.38 years, SD=0.07).14.7% of the children are underweight and 36.89% are overweight and obese, likewise 48.9% presented a caloric value of breakfast of 342 kcal and 39.9% obtained 180 kcal and there is an association between BMI and caloric value of breakfast with weight (p=0.001).

Conclusion: There is an association between BMI and breakfast caloric value with weight. Nutritional educational interventions for parents, children, and teachers are essential to enhance the food and nutrition of school children.

Keywords: Breakfast; Schoolchildren; Calories; Body mass index

Introduction

The belief that breakfast is the most important meal of the day remains [1], but a percentage of schoolchildren under the age of 11 and adolescents skip breakfast [2]. According to the 2018 National Health and Nutrition Survey conducted by INEC, 35 out of every 100 children aged 5 to 11 in Ecuador are overweight or obese; The rates of malnutrition and anemia are 24% in the child population [3].

It became important to research the quality of breakfast in a private school to determine its nutritional value, since the school breakfast program is only aimed at public, municipal, and community elementary schools in both rural and urban areas. This is done to reduce school dropout rates and improve students' learning abilities [4].

Food environments in rural areas are affected, gaps still exist, and food programs must be uniform for the entire school population [5].

Children aged 7 to 12 should consume 2,000 kcal/day (70 kcal/kg weight/day). This energy intake should be spread over 4 meals, in the following proportions: 25% should be consumed at breakfast (4). This age group is ideal for promoting healthy eating and eating behaviors [6].

A recent definition by O'Neil has proposed a consistent approach, stating that "Breakfast is the first meal of the day that breaks the fast after the longest period of sleep and is consumed within 2 to 3 hours after waking up [7].

The objective of this article is to present breakfast consumption patterns, nutrients, and foods, represented by their caloric intake and their direct impact on nutritional status, in a representative sample of schoolchildren from the Clara Prado Olvera Educational Center in the Palestine Canton, Guayas Province.

Materials and Methods

Design and sample

This is an exploratory cross-sectional study. The educational population was randomly selected by school grade. The sample consisted of 699 students aged between 5 and 11 years old from the Clara Prado Olvera Private Primary School.

Procedures

Information was obtained on sociodemographic characteristics (age, sex), anthropometric measurements (height, weight, body mass index). A platform beam scale (Tanita Digital Scale WB-3000 Digital) was used. The children were placed in the center of the scale, distributing their weight on both legs, arms at their sides, wearing minimal clothing, and barefoot. To measure height, they were measured standing upright with their arms at their sides, heels together, and against the back of the stadiometer. Their heads were in the Frankfurt plane, with their backs straight and their buttocks against the vertical board of the stadiometer.

Nutritional status was assessed in this age group of 5–19 years using BMI percentile values (BMIp). BMI is first calculated in absolute values (weight/h^2), and the result is compared with the child's age. Depending on where the ratio falls, a nutritional diagnosis is made: < P5 = underweight; P5–84.8 healthy weight; P85–94.9 overweight; and ≥ P95 obesity [8].

A breakfast food survey was conducted, and the grams of each food item were standardized according to the food composition table based on nutrients of interest to the Ecuadorian population (9). In the qualitative analysis, a caloric distribution of 20-25%

was considered, and breakfasts were classified as 'no breakfast' (type 0), 'poor quality breakfast' (type 1), 'incomplete breakfast' (type 2), and 'complete breakfast' (type 3). The classification of this variable is detailed below in Table 1.

Table 1: Caloric distribution of breakfast

Category	Tipe	Macronutrient distribution 20 - 25%	Caloric value
without breakfast	0	0	0
Poor quality breakfast	1	15 gr carbohydrates6,9 gr fats7 gr proteins	150 caloríes
Incomplete breakfast	2	37 gr carbohydrates 10 gr fats10 gr proteíns	250 – 280 caloríes
Full breakfast	3	50 gr carbohydrates10 gr fats14 gr proteíns	>350 caloríes

Data Analysis

The data were analyzed using the Minitab 18 statistical package. All anthropometric variables under study were checked for normality using the Kolmogorov-Smirnov test to see if they met the parametric assumptions. Spearman's test and linear regression were used, with BMI as the predictor for the variables of weight and caloric value. A significance level of 0.05 was considered.

Ethical Considerations

Approval was obtained from the highest authority and the Institutional Committee of the Clara Prado Olvera Private Elementary School in the Canton of Palestina, Province of Guayas. The bioethical standards established by the Declaration of Helsinki were applied. Verbal consent was obtained from the participants and informed consent from their parents. Before the anthropometric study was conducted, the purpose of the research was explained and the confidentiality of the data was guaranteed.

Results

The sample consisted of 699 students, of whom 341 were female ($\bar{x}$=6.72 years, SD=0.09) and 358 were male ($\bar{x}$=7.38 years, SD=0.07).

The average weight was 24.48 kg (SD=7.51), height was 1.2 m (SD=0.1), and BMI was 16.6 kg/m2 (SD=2.89).

An attempt was made to relate nutritional status between BMI/age according to percentiles, and it was found that 14.7% were underweight and 36.89% were overweight or obese. (Table 2).

Table 2: Nutritional diagnosis according to BMI/Age

BMI/Age	boys	%	girls	%	Total
Normal	210	30.05	197	28.18	58.23
Underweigth	49	6.98	39	5.59	7.72
Overweigth	54	7.72	72	10.30	18.02
Obesity.	45	6.43	33	4.72	11.15
Total	358	51.21	341	48.79	100.00

Table 3 shows that 48.9% had a breakfast calorie count of 342 kcal, and 39.9% had 180 kcal.

Table 3: Caloric value of children's breakfast

Caloric value of breakfast(Kcal)	n	%
0	37	5,3
180	279	39,9
230	342	48,9
320	41	5,9
Total	699	100,0

The study showed that there is an association between BMI and the caloric value of breakfast with weight (p=0.001). Table 4 shows that the coefficient indicates that for every additional kilogram in BMI, weight can be expected to increase by an average of 0.087 kg. Likewise, for every kilocalorie decreased in BMI, the caloric value of breakfast can be expected to decrease by an average of 0.3223 kilocalories.

Table 4: Regression between BMI and the caloric value of breakfast and weight

Term	Coef	EE delcoef.	Value T	Value p
Constante	0,899	0,146	6,16	0,001
Valor calórico	-0,3223	0,0357	-9,03	0,001
Peso (kg)	0,08672	0,00327	26,54	0,001

*R^2=0,52

Discussion

Breakfast provides the energy needed to start the day's activities, which is why it is one of the most important meals of the day. It should cover 25-30% of daily nutritional needs and include foods from three of the basic food groups: dairy, cereals, and fruit [9, 10].

Breakfast is still considered the most important meal of the day for the body's performance, as it is linked to healthy nutrient intake, body mass index (BMI), and lifestyles [11].

The study also reported that schoolchildren consumed a breakfast with a caloric value of 342 kcal, with 39.9% consuming 180 kcal, and that there is an association between BMI and the caloric value of breakfast with weight (p=0.001). In this regard, Berta et al. [12] found that obese schoolchildren were 2.91 times more likely not to have eaten breakfast that day than those with normal weight.

On the other hand, the quantity of breakfast is important and should be based on the characteristics of schoolchildren and their nutritional status [13], as this can influence academic performance. In this regard, one study showed that 78.7% had poor-quality breakfasts, which was related to poor school performance [14]. Breakfast provides adequate nutrition and prevents nutritional deficiencies that could affect cognitive function and physical and intellectual performance. It has also been associated with better academic performance, attention span, and class participation [15].

Breakfast at this stage is considered one of the most important meals of the day, and inadequate consumption affects health and school performance. Children attend school without having eaten breakfast or even on an empty stomach, and this situation

has also been linked to the risk of obesity [16].

A good breakfast is a determining factor in students' cognitive development and academic performance, promoting concentration and learning ability, while a poor diet can negatively affect these functions [17].

Good public management is important and should have an impact on school feeding programs. It should also be considered for private school groups in rural areas where access to food is difficult.

The limitations of the study are that there are few studies on the caloric value of breakfast, and the results cannot be extrapolated to other contexts.

Conclusion

There is an association between BMI and the caloric value of breakfast with weight. Nutritional education interventions for parents, children, and teachers are necessary to improve schoolchildren's diet and nutrition. The recommended calorie intake for breakfast should be between 350 and 500 calories.

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