Exclusive breastfeeding, complementary feeding and association with body fat excess among schoolchildren in Florianópolis, Santa Catarina, Brazil

Priscila Schramm Gonsalez [1]
Anabelle Retondario [2]
Liliana Paula Bricarello [3]
David Alejandro González-Chica [4]
Diego Augusto Santos Silva [5]
Francisco de Assis Guedes de Vasconcelos [6]

[1-4,6] Programa de Pós-graduação em Nutrição. Universidade Federal de Santa Catarina. Campus Trindade. Florianópolis, SC, Brasil. CEP: 88.040-900. E-mail: ar.delima.b@gmail.com
[5] Departamento de Edução Física. Universidade Federal de Santa Catarina. Florianópolis, SC, Brasil.

Abstract

Objectives: to analyze the association between exclusive breastfeeding duration (EBF) and the age at which complementary feeding was introduced (CF) with the excess of body fat (BF) in schoolchildren from Florianópolis/SC, southern of Brazil.

Methods:cross sectional study, with probability sample of 1,531 schoolchildren aged 7-10 years from Florianópolis/SC. The percentage of BF was defined based on triceps and subscapular skinfolds. Information about EBF, CF and confounders variables were obtained through a questionnaire sent to parents or guardians. Multivariate analyzes were performed using Poisson.

Results: the prevalence of BF excess was 37.9% (CI95%: 32.4; 43.6), and 30.6% of children received EBF for 4-6 months (CI95%: 17, 3; 48, 2). The duration of EBF less than 4 or more than 6 months was associated with higher prevalence of BF excess, even after adjustment (p=0.015). Introduction of food groups had no association with BF excess.

Conclusions: the association between EBF and the excess of body fat for less than 4 months and higher prevalence of BF excess is probably a consequence of early introduction of others milk types, whilst association between EBF for more than 6 months and higher prevalence of BF excess is because of a catch-up growth situation.

Key words *Child nutrition, Pediatric obesity, Cross-sectional studies*

Introduction

The food intake pattern in the early months of life plays an important role regarding the definition of body composition throughout life.[1] Thus, with the increase of children obesity prevalence, the interest in investigate if breastfeeding (BF) and the handle of complementary feeding introduction are associated with the risk of overweight and obesity in later stages of life.[2,3]

The exclusive breastfeeding (EBF) has been associated to a minor risk of obesity in some studies.[2] Systematic revision which compiled the findings of over 80 surveys suggests that breastfeeding is associated to the reduction of 10-20% on the child obesity prevalence.[2] However, studies which composed this revision show heterogenic graphics and applied distinct methods to eva-luate obesity.

Unlike EBF, an inappropriate introduction of CF seems to increase the risk of obesity development.[3] Because of this, identifying feeding behaviors in childhood that predispose to obesity development is an important task in order to determine what factors can be modified, as well as the planning of interventions.

The body mass index (BMI) is an indirect measure of body fat[3] and constitutes a useful tool for evaluating the nutritional status in epidemiologic studies. However, it presents important limitations. During the childhood and puberty, BMI seems to be more related rather with the growth than with changes related to body fat,[4] and few studies evaluated the relation between skinfold measures in children with the extension of EBF and the age of introduction of CF.[5-9]

Thus, the objective of this article was to analyze the association of EBF duration and age of CF introduction with the prevalence of body fat excess (BFE) in schoolchildren from Florianopolis/SC.

Methods

School-based cross-sectional study performed in Florianopolis, capital of Santa Catarina State, Southern Brazil, with a probabilistic sample of schoolchildren 7-10 years population, enrolled both in public and private elementary school networks inside the municipality. According to the school census of the National Institute of Studies and Researches (http://portal.inep.gov.br/basica-censo), the population of schoolchildren in this age included a total of 19,172 schoolchildren in 2011. The calculation of the sample's size was done considering an expected prevalence for the outcome (overweight) of 38%, margin of error of 5.0% and significance level of 95%. Considering the design effect of 1.8 (estimative based on a previous research in the same city, undertaken on 2007),[10] and an increase of 10% due to possible refuses, the calculated extension for the sample was of 1,440 7-10 years old schoolchildren.

Once the present study aimed to test variables associated with the excess of body fat, later calculations were conducted to estimate minimal detectable differences. Based on the exposition variables prevalence (EBF and CF)and outcome (excess of body fat), yet considering power of study of 80%, level of confidence of 95%, discount of 15% on the size sample due to the adjustment for confounders, and a design effect (Deff) of 3.1 for the outcome, this study has sufficient power to detect prevalence ratio from 0.52 to 0.64 as a protection and from 1.56 to 1.83 as a risk factor.

The sampling process was executed via conglomerates. Based on the administrative regions of Florianopolis municipality (Center, Continent, North, East and South) and the type of administration (public or private), the schools were divided in 10 layers. The schools to be included in the study were randomly chosen in each layer, in a total of 19 public schools and 11 private ones. Later, a selection of each class to be evaluated was executed in each school, through the schedule of schoolchildren given by the institutions. Considering an average of 25 students per class, and that in each school approximately 50 students from 7 to 10 years olds would be evaluated, it was decided to perform a raffle of 2 classes from 30 schools, one from the morning shift and another from the afternoon shift.

Students with any physical disability which would preclude the anthropometric evaluation were excluded, as well as pregnant teenagers. Refusals and losses were considered over the students who did not return with the Consent Form (CF), correctly signed by their parents, and those who, even with consent, did not want to participate in the study.

The project was approved by the Committee of Ethics in Research with Human Beings from Federal University of Santa Catarina, under the register nº 120341/2012, according to the standards established by Resolution n. 466/2012 from the National Health Council.

The data collect occurred between September 2012 and June 2013. The evaluators were previously trained for the assessment of anthropometric measures, observing a research protocol. The technical error of measurement (TEM) from the gold standard to the tricipital and subscapular skinfolds

was of 1.08 and 1.06 mm, respectively. The intra-rater TEM was considered acceptable up to three times this value.[11] A pilot study was yet conducted, applying all of the survey procedures in a school from Florianópolis municipality which was not on the study sample, for adapting the instruments and the CF. The assessment of the anthropometric measures was executed according to the procedures recommended by the literature.[12]

Socio-demographic breastfeeding and complementary feeding information was obtained via application of a standardized questionnaire which was sent to the parents and sent back at the moment of anthropometric measures collect.

Data was entered into two entries and processed by Software EpiData®3.0. Data analysis was executed using survey (svy) command from STATA®Program version 11.0 (StataCorp, Texas, USA), in order to consider the process of cluster sampling, with which sample layer and weight are considered.

The age of introduction of each one of the food groups (variables of CF exposition) was categorized in: introduced before 6 months, between 6 and 11 months and 12 months or over.

The maternal variables analyzed as possible confounding factors were: BMI (build based on self-reported weight and height data and categorized according to the Brazilian Guidelines of Obesity 2009/2010), age (under 15 years old, 15 to 19 years old, 20 to 39 years old and 40 years old and beyond) and schooling (never studied, elementary school, high school, and higher education). Total monthly family income was collected in reais as continuous variable and categorized in tercis for analysis. Parents also provided data regarding birth weight (kg) and the gestational age at birth (weeks) of the student, both collected as continuous variables and analyzed as categorical, according to the cut points from the Brazilian Society of Pediatrics. Gender and age from the child (calculated based on birth date) were obtained from school registries. Age was categorized in 7-8 years old and 9-10 years old.

Fat excess was defined based on the percentage of body fat (%BF): moderately high, high or very high (%BF $\geq$ 20.1% for boys and $\geq$ 25.1% for girls).[13]

Data on breastfeeding was collected based on two questions: "Did the student breastfeed?" and "Until when did the student breastfeed?". Data regarding the food introduction were collected based on questions about the age which the child started to consume other foods different from breast milk. These foods were divided in 11 groups: tea or water, natural fruit juice, other types of milk (cow or formula), fruits, vegetables, cereals, legumes, meats, sweet beverages (soft drinks, box and powdered juice), candies (sweets, candies, cookies) and snacks (pizza, hotdog, hamburger, chips).

All variables related to feeding and breastfeeding had 14 options of answer: less than a month, over twelve months and another 12 monthly options, from 1 to 12 months. The EBF (main exposure variable) was defined as the child's feeding being exclusively on breast milk, without any food or drink 14 and classified in: never breastfed, breastfed less than a month, from 1 to 3 months, from 4 to 6 months, and for 7 months.

In the bivariate analysis, the association between body fat and the independent variables was assessed using the chi-square test with Rao-Scott correction of heterogeneity or tendency, according to the direction of the associations. After bivariate analysis, multivariate analysis was conducted using Poisson's regression. Socioeconomic and demographic variables which obtained $p>0.20$ in the chi-square test were entered in the multivariate model. Prevalence ratio (PR) were estimated, as well as their respective confidence intervals (CI95%). The level of statistical significance used in the analysis was of 5%.

Results

1,531 students from 7 to 10 years old (68.5% from the eligible) participated in this study. Amongst those non-evaluated by loss or/and denial, there was a higher percentage of boys, belonging to attending private schools and enrolled in the early grades from elementary school. There was not difference relating the age (Table 1).

Table 2 shows the distribution of the main characteristics from mothers and students from the population of study and their association with body fat excess via chi-square test. The average age from the mothers was 36.2 years old (±6.9) and 42.3% of them had attended higher education. Regarding the students birth characteristics, 9.7% had low birth weight (under 2.5kg) and 17.1% had been premature (CI95%: 14.8-19.4). The prevalence of body fat excess on the students was of 37.9% (CI95%: 32.4-43.6). Regarding the duration of exclusive breast feeding, 36.6% of the children were exclusively breastfed within a period from one to three years old, 27.5% were breastfed exclusively for less than a month or had never been breastfed at all, and 30.6% were exclusively breastfed within a period from four to six months.

Table 3 presents prevalence of BFE and its

association with the exclusive breastfeeding. The prevalence of body fat excess was higher among the students which had exclusive breastfeeding for seven months (64.71%) and among those breastfed for a period within one to three months (39.63%), when compared to those who were not breastfed. On the adjusted analysis, the prevalence of body fat excess was about two-times higher among those who had received exclusive breastfeeding for seven months in comparison with those who were not breastfed. (RP= 2.34; CI95%:1.44-3.81), and about 1.6 higher among those who received exclusive breastfeeding for less than a month (RP= 1.61; CI95%: 1.07-2.42) and for a period within one to three months (RP=1.66; CI95%: 1.16-2.37), when compared to the students never breastfed (p= 0.015).

Table 4 presents the prevalence of BFE according to the type of food and age of introduction of complementary feeding. Water and tea were the most frequently introduced before six months old (63.3%). Relating to the offer of other liquid food as complement to breast milk, 43.5% of the students were fed with another type of milk and 50.9% with fruit juice before six months old. The majority of the students were fed with vegetables (63.8%), cereals (79.5%), legumes (89.8%) and meat (90.4%) only after six months old. Food considered non-healthy, like sugar drinks, sweets and snacks, were introduced in child feeding after 12 months old for 75.6% of the participants. In the chi-square analysis, the cereal introduction was associated with excess of body fat (p=0.033). For the other food groups, there were not any significant difference between age of their introduction and excess of body fat.

Table 5 presents prevalence of body fat excess and its association with the introduction age on CF. The prevalence of body fat excess was higher among children which age introduction of cereals in the feeding occurred before six months, but there was not significative difference between the groups, even after adjustment (p=0.076).

Discussion

This study aimed to assess the association of EBF duration and age of CF introduction with the prevalence of body fat excess in students from Florianópolis/SC. EBF for less than one month, within a period from 1 to 3 months or 7 months was associated to higher prevalence of body fat excess (p=0.015). The introduction of food groups in children's complementary feeding did not present association with body fat excess.

The prevalence of body fat excess in the observed students (37.9%) is comparable to the one observed in another studies executed in Brazil.[15,16] Considering that BMI may underestimate body fat,[4] it is believed that skinfold measures featured in this research had reach a higher amount of students with body fat excess.

In Brazil, the students from seven to ten years old have been following the nutritional transition,[17] quickly replacing the scarcity problem with the excess. The malnutrition rates had been decreasing, and the obesity ones, rising. Thus, the high prevalence of body fat excess highlighted by this study indicates the necessity of interventions in order to change this pattern, whilst obese children present higher risk of remaining with this condition in their adult life, when compared to the non-obese children.[18] According to a study executed in Boston (United States), which assessed teenagers from Harvard Growth Study, 52% of the individuals who presented body fat excess in the puberty remained in this nutritional status in their adult life, with relative risk two times higher for every cause of heart disease.[18]

A percentage of 64.1% of the students was exclusively breastfed for less than four months or had never been breastfed at all. This time of EBF is inferior to the one recommended both by World Health Organization (WHO)[14] and the Brazilian Health Ministry.[19] It should be noted that WHO and the Brazilian Health Ministry recommend that EBF is maintained until six months old, and consider that breast milk alone is not sufficient to supply the nutritional needs of the baby up to this age. Thus, it is recommended that CF should be introduced after six months, constituted by in natura safe food, culturally accepted, economically accessible and pleasant to children.[19]

The prevalence of EBF observed may also be related to the high prevalence of prematurity in the studied sample (17%), once the breastfeeding rates are lower in prematures.[20] It should be noted that the prematurity rates in Santa Catarina in the 2003-2012 period, according available information on the System of Information about Live Births (SINASC), presented low variation until the year of 2010 (6.1%-7.2%), with the much higher rates beginning from 2011-2012 (9.1%-10.6%).[21]

The EBF duration for less than one month or for a period from one to three months, in this study, was associated to body fat excess. There is a hypothesis that this association can occur due the early using of cow milk or infant formulas as complements to breast milk. In the questionnaire of introduction of CF, 43.5% of the parents had related having offering

Table 1

Comparison of the students from 7 to 10 years old evaluated and non-evaluated in the study. Florianópolis, SC, 2012/2013.

	Evaluated (n=1531)		Non-evaluated (n=703)		*p**
	n**	%	n**	%	
Gender					
Male	687	44.9	383	54.5	<0.001
Female	844	55.1	320	45.5	
Age range (in years)					
7and 8	866	56.6	374	53.2	0.113
9 and 10	665	43.4	329	46.8	
Type of school					
Public	932	60.9	357	50.7	<0.001
Municipal	516	33.7	154	21.9	
State	370	24.2	187	26.7	
Federal	46	3.1	16	2.1	
Private	599	39.1	346	49.3	
Grade					
1st and 2nd	536	35.0	291	41.4	0.004
3rd and 4th	773	50.5	304	43.3	
5th and 6th	222	14.5	108	15.3	

* *p*-value for chi-square test; ** n calculated based on complex sample, considering the layer and weight sample.

Table 2

Distribuition of the maternal and students from 7 to 10 years characteristics and association with body fat excess. Florianópolis, SC, 2012/2013.

Charateristics	N*	%	Body fat excess % (CI95%)	*p*#
Maternal**				
BMI (kg/m²), $\bar{X}$ ± SD	1,424	100.0	25.0±4.5***	-
BMI				<0.001
Low weight (<18.5 kg/m²)	23	1.6	18.5 (2.9;34.2)	
Normal weight (18.5 to 24.9 kg/m²)	788	55.8	30.8 (27.5;34.1)	
Overweight (25.0 to 29.9 kg/m²)	403	28.5	48.0 (43.2;52.8)	
Obesity (>30.0 kg/m²)	199	14.1	48.0 (41.1;55.0)	
Age (years), $\bar{X}$ ± SD	1,443	100.0	36.2±6.9***	-
Age (years)				0.010
< 15	8	0.6	75.0 (36.3;113.7)	
15 to 19	0	0.0	0.0 (0.0;0.0)	
20 to 39	1,000	69.3	36.1 (33.1;39.1)	
40 or more	435	30.1	42.2 (37.5;46.8)	
Schooling	1,477	100.0		0.222
Never studied	12	0.8	56.3 (29.9;83.6)	
Elementary school	316	21.4	34.7 (29.7;39.6)	
High School	525	35.5	39.4 (35.2;43.5)	
Higher Education	624	42.3	38.3 (34.3;42.3)	
Total monthly Family income (R$)	1,324	100.0	2000 [1500;4000] ****	-
Monthly Family income				0.146
1st tercile	474	35.8	34.8 (30.5;39.1)	
2nd tercile	435	32.9	41.1 (36.4;45.7)	
3rd tercile	415	31.3	38.8 (34.1;43.6)	

*N calculated based on complex sample, considering the layer and weight sample.**Every maternal and students variable had their data ignored;***Mean and standard deviation of independent variable; ****Median and interquartile interval of independent variable;#*p*-value for chi-square test of association each variable with body fat excess prevalence.

continue

Table 2 **concluded**

Distribuition of the maternal and students from 7 to 10 years characteristics and association with body fat excess. Florianópolis, SC, 2012/2013.

Charateristics	N*	%	Body fat excess % (CI95%)	*p*#
Students**				
Gender	1,531			
Female	844	55.1	36.1 (32.8;39.4)	0.127
Male	687	44.9	39.9 (36.3;43.5)	
Age (years), $\bar{X}$ ± SD	1,429	100.0	8.99±1.16***	-
Age (years)				<0.001
7 and 8	727	50.9	33.5 (30.0;36.9)	
9 and 10	702	49.1	43.0 (39.3;46.7)	
Birth weight (g), $\bar{X}$ ± SD	1,447	100.0	3,220.0±540***	-
Birth weight				0.020
Extremelow weight (< 1kg)	2	0.1	100.0 (100.0;100.0)	
Very low weight (1 to 1.499kg)	10	0.7	30.0 (-4.6;64.6)	
Low weight (1.5 to 2.499kg)	129	8.9	38.8 (30.2;47.3)	
Normal weight (2.5 to 3.99kg)	1,228	84.9	37.0 (34.3;39.7)	
Macrosomia (≥ 4.0kg)	78	5.4	53.3 (41.8;64.6)	
Prematurity (<37 weeks)	1,520	100.0		
No	1,260	82.9	38.2 (35.4;41.0)	0.637
Yes	260	17.1	36.8 (31.6;42.0)	
Duration of exclusive breastfeeding	1,475	100.0		0.072
Never breastfed	314	21.3	31.4 (25.6;37.3)	
<1 month	92	6.2	38.1 (28.7;47.5)	
1 to 3 months	540	36.6	39.6 (35.7;43.6)	
4 to 6 months	451	30.6	36.5 (32.2;40.7)	
7 months	78	5.3	64.7 (39.4;90.0)	

* N calculated based on complex sample, considering the layer and weight sample.**Every maternal and students variable had their data ignored;***Mean and standard deviation of independent variable; ****Median and interquartile interval of independent variable;#p-value for chi-square test of association each variable with body fat excess prevalence

Table 3

Prevalence of body fat excess for time of exclusive breastfeeding and association in students from 7 to 10 years old. Florianópolis, Sc, 2012/2013.

Variables		Prevalence of body fat excess	Crude analysis	*p***	Adjusted analysis*	*p***
	n	% (CI95%)	PR (CI95%)		PR (CI95%)	
Time of EBF						
Never breastfed	77	31.43 (25.57;37.28)	1.00	0.004	1.00	0.015
<1 month	40	38.10 (28.65;47.54)	1.58 (1.07;2.32)		1.61 (1.07;2.42)	
1 to 3 months	237	39.63 (35.70;43.56)	1.65 (1.19;2.29)		1.66 (1.16;2.37)	
4 to 6 months	182	36.47 (32.24;40.71)	1.35 (0.97;1.88)		1.31 (0.92;1.88)	
7 months	11	64.71 (39.38;90.03)	2.53 (1.59;4.02)		2.34 (1.44;3.81)	

%: Prevalence; CI95% = confidence interval; PR= Prevalence Ratio;
* Adjusted for variables with *p*< 0.20 and mother age, family income and birth weight, gender and age of the student; **Wald Test

Table 4

Prevalence of body fat excess according to the type of food and age of introduction in the complementary feeding. Florianópolis, SC, 2012/2013.

Type of food	N*	%	Body fat excess % (CI95%)	*p*#
Water and teas				
<6 months	938	63.6	37.4 (34.3;40.6)	0.849
6 to 11 months	497	33.7	36.9 (32.7;41.2)	
≥12 months	40	2.7	42.7 (24.7;58.6)	
Other milks				
<6 months	642	43.5	37.7 (33.7; 41.7)	0.544
6 to 11 months	438	29.7	38.8 (34.4; 43.2)	
≥12 months	395	26.8	35.3 (30.6; 39.9)	
Fruit juices				
<6 months	751	50.9	40.4 (36.8; 44.0)	0.058
6 to 11 months	680	46.1	34.3 (30.8; 37.8)	
≥12 months	44	3.0	39.0 (23.4; 54.6)	
Fruit				
<6 months	702	47.6	40.5 (36.7; 44.3)	0.085
6 to 11 months	720	48.8	34.8 (31.5; 38.2)	
≥12 months	53	3.6	35.6 (21.0; 50.1)	
Vegetables				
<6 months	534	36.2	40.7 (36.2; 45.1)	0.185
6 to 11 months	879	59.6	35.7 (32.6; 38.8)	
≥12 months	62	4.2	37.3 (24.6; 50.0)	
Cereals				
<6 months	302	20.5	44.9 (38.5; 51.3)	0.033
6 to 11 months	1,008	68.3	36.1 (33.2; 39.0)	
≥12 months	165	11.2	34.8 (27.8; 41.9)	
Legumes				
<6 months	150	1.0	39.3 (31.7; 46.8)	0.698
6 to 11 months	1,111	75.3	36.7 (33.8; 39.6)	
≥12 months	214	14.5	39.1 (32.6; 45.6)	
Meats				
<6 months	142	9.6	40.4 (32.7; 48.0)	0.689
6 to 11 months	976	66.2	37.3 (34.2; 40.3)	
≥12 months	357	24.2	36.5 (31.5; 41.5)	
Non-healthy food				
<6 months	41	2.8	34.6 (21.6; 47.5)	0.755
6 to 11 months	319	21.6	36.2 (31.2; 41.3)	
≥12 months	1,115	75.6	38.0 (35.1; 40.9)	

* N calculated based on complex sample, considering the layer and weight sample. #*p*-value for chi-square test of association each variable with body fat excess prevalence.

Table 5

Analysis of prevalence of body fat excess and Poisson regression for age of introduction of cereals in the complementary feeding and excess of body fat in students from 7 to 10 years old. Florianópolis, SC, 2012/2013.

Variables		Body fat excess	Crude analysis	*p***	Adjusted analysis*	*p***
	N	% (CI95%)	PR (CI95%)		PR (CI95%)	
Age of introduction of cereals						
<6 months	105	44.87 (38.45;51.29)	1.00	0.220	1.00	0.076
6 to 11 months	380	36.12 (33.21;39.03)	0.85 (0.66;1.08)		0.79 (0.61;1.01)	
≥12 months	62	34.83 (27.76;41.89)	0.83 (0.59-1.17)		0.75 (0.51;1.10)	

N = presented total (with and without excess of body fat); %= Prevalence; CI95% = 95% confidence interval; PR = Prevalence Ratio;

* Adjusted for variables with *p*< 0.20 and mother age, family income and birth weight, gender and age of the student; **Wald Test

another types of milk before the children reached six months old. Infant formulas present higher caloric density and higher amount of protein/nitrogen, which can lead to an increase of insulin secretion and Insulin Growth Factor 1 (IGF-1), leading to the early and excessive gain of body weight.[22]

EBF for over six months also has been associated to the body fat excess, even after adjustment for confounding factors. This result can be explained by the fact that children in EBF after six months may not reach their nutritional needs, situation which can lead to a nutritional deficiency and insufficient gain of body weight. With the introduction of complementary food and the adequation of the nutritional supply, the hypothesis of these children may be developing catch-up growth, resulting in an excessive accumulation of body fat.[23]

The hypothesis that breastfeeding may have a protective effect against obesity has been investigated in several studies. Systematic reviews provide evidence about the protective effect of BF over obesity,[2] however, they also suggest a null effect in this association,[24] generating contradictory results. The divergences in the survey results may be explained by differences on the protocol designs, in the variables used to control biases of confusion and also the outcome age range, in the case, the obesity. Woo *et al.*,[2] analyzing data from six systematic reviews (total of 81 articles), concluded that besides designs and distinct methods, the adjusted variables were different[25] or were not controlled in the majority of the included studies. In the same way, the medium age of the individuals on the endpoint screening surveys varied from 4 months to 62 years old.

Another reasons can be highlighted regarding the divergence of results found in literature, amongst them the heterogeneity of studies, with different ages from the evaluated individuals, locations of research, criteria for both EBF and body fat excess,[2] as well as the applied way of questioning. Five studies which evaluated this association were found, and they have utilized other parameters for obtaining body fat level than BMI.[5-9] Solely two of them[5-8] have found association between time of breastfeeding and minor body fat levels.

The socioeconomic situation has also been evidenced as responsible for residual confounding in the association between breastfeeding and nutritional status. In a study which compared the results of two birth cohorts, one being from England and another in Pelotas, southern Brazil, the breastfeeding duration was inversely associated with the first study, whilst the second one did not have association.[26] In the present study, aiming to reduce the effects of residual confounding results, more than one socioeconomic variable were considered as possible factors of confusion: maternal age, family income and variables from the student (birth weight, gender and age). The EBF was directly associated with family income (correspondent values passed from two months in the inferior quartile to five months in the superior quartile; *p* of tendency <0.001) and with maternal schooling (EBF median passed from 1.5 months between those who never studied to five months between mothers with higher education; *p* of tendency <0.001), which was also

observed in other studies.[27] Systematic review which searched for factors associated to EBF has observed that every studies which investigated association between maternal schooling and EBF had concluded that low schooling is associated with EBF interruption.[27]

The frequency of introduction of another kinds of milk before six months in the study population (43.5%) was lower than the one observed in a study conducted with kindergarten children in São Paulo (53.2%),[28] in which the prevalence of early introduction of fruits was also higher (66.4%) than the one observed in this study (47.6%).

It was observed that 24.4% of parents had already introduced non-healthy food in their children diet before twelve months old, such as sweets or candies (39.1%), soft drinks and artificial juices (30.5%) and snacks (16.9%). Although the introduction of this kind of food was not associated with the body fat excess in the sample, they presented high amount of simple carbohydrates, fat and/or salt. Besides,the early introduction of solid food in children is also a undesirable practice. The food intake preferences are defined in the early years of life and tend to form food patterns which can be maintained to adult life.[29] Thus, the early offer food which is considered non-healthy can stimulate the setting of non-healthy food habits.

In this study, the prevalence of body fat excess was higher in the group of children which had cereal introduction before six months old, being contrary to the WHO recommendations,[14] but did not have significant difference on Possion regression. However, it is worth of attention the fact of the introduction of solid food is occurring early, which indicates the need of developing public policy of promotion, protection and support to exclusive breastfeeding until six months old. It is worth pointing out , yet, that the instrument used for data collect on food consumption did not allow differing integral cereals and processed and/or sugared ones.

Limitations and potentialities of the study

Although the present study has utilized an extensive period of reminder for data collect about breastfeeding and age of CF introduction (which can reach ten years, observing the children's age range), the EBF median found (90 days) was similar to that of the II Research of Breastfeeding Prevalence, executed in 2008, which showed that in Florianópolis the EBF median was of 86.5 days (CI95% 79.4=93.2).[19] In this way, it is believed that the reminder error did not affect the results, once the used questionnaire for data collect was composed by detailed questions of 11 food groups, besides two questions about breastfeeding, all of them with answer options which facilitated information registry. Additionally, comparing low birth weight prevalence and prematurity based on parent's answers with data from a birth cohort executed in southern Brazil in 2004, the values are similar.[30] This suggests reliability also for the data related to breastfeeding and food introduction, subject to the same reminder period. The absence of information about the amount of food consumption and lack of physical activity between children can also be pointed as a limitation, considering the multi causality of the researched outcome (body fat excess). Yet, the utilized instrument for data collect concerning CF introduction does not allow the identification the type of cereal introduced in children's feeding.

As strong points of this study, it can be related, first, the extension of the sample with representative data on the students population in Florianópolis. This makes possible that the conclusions can be extrapolated for the population, observing the range of the study. The anthropometric evaluation is also a relevant point, wich included standardizing of evaluators for measurement of the researched population, attempting to minimize the bias of standardization. Alongside with the double data entry, in order to avoid the compilation bias, these are methodological advantages which indicate rigor and reliability on the results, in the way they are exposed.

The process of sample selection and the careful criteria of data collect permit an external validation on the study. Thus, these results can be extended to other populations with the same age range. However, the execution of prospective studies is desirable in order to reduce biases related to the instruments from this research.

The prevalence of 35.9% of body fat excess, identified in students from the municipality, is concerning due to its strong relation with the risk factors for chronic non-transmittable diseases. The results of this study yet show that the prevalence of EBF until six months is low (30.6%), showing that the WHO goals have not yet been met.

It is believed that the EBF association for under 4 months to the higher prevalence to BF excess is justified by the early offer of another types of milk as a complementation to breast milk. The association of EBF for over six months to a higher prevalence of BF excess can be a consequence of catch-up growth.

The introduction of several food groups in the complementary feeding does not show association with body fat excess.

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