



## Vegetarian nourishment in school meals and their relationship with the child nutritional status

### *Alimentação vegetariana na merenda escolar e sua relação com o estado nutricional infantil*

Elen Lúcia Bagatini Saud Ferro<sup>1</sup>, Luciana Mateus de Aquino<sup>2</sup>, Isabela Barbosa de Paula Sandoval<sup>2</sup>, Claudia Haddad Calceiro Pereira<sup>1</sup>, Marina Garcia Manochio-Pina<sup>3</sup>, Carolina Cristina de Freitas<sup>1</sup>

<sup>1</sup> Postgraduate Program in Health Promotion, Universidade de Franca (UNIFRAN), Franca SP Brazil.

<sup>2</sup> Undergraduate Course, Universidade de Franca (UNIFRAN), Franca SP Brazil.

<sup>3</sup> Department of Nutrition, Course of Nutrition. Universidade de Franca (UNIFRAN), Franca SP Brazil.

\*Corresponding author: Elen Lúcia Bagatini Saud Ferro - E-mail: elensaud@yahoo.com.br

#### ABSTRACT

Evaluate the reflex of vegetarian nourishment in the nutritional status of children from a private school that adopts such food in the lunch; check the opinion of parents and children about the institution's menu. The nutritional status was obtained through the Body Mass Index and the parents' opinion about the meal through a questionnaire. The nutritional value of the menu was obtained using the DIET PRO 5<sup>®</sup> software. Students' opinions about school meals were obtained through a hedonic scale. It was observed inadequacy in all macro and micronutrients, on at least one day of the week. Meals were well accepted by the children, 75% of whom had normal weight. 87% of families thought vegetarian lunches were a good idea; 3% had the opposite opinion and 10% were indifferent. Despite the good acceptance of vegetarian meals and the predominance of eutrophy, the professional monitoring is important, avoiding possible nutritional deficiencies.

**Keywords:** Diet. Nutritional Status. School Feeding. Vegetarian.

#### RESUMO

Avaliar o reflexo da alimentação vegetariana no estado nutricional de crianças de uma escola privada que adota tal alimentação na merenda; verificar a opinião dos pais e das crianças sobre o cardápio da instituição. Obteve-se o estado nutricional através do Índice de Massa Corpórea e a opinião dos pais sobre a merenda através de questionário. O valor nutricional do cardápio foi obtido através do software DIET PRO 5<sup>®</sup>. Obteve-se a opinião dos estudantes sobre a merenda através de escala hedônica. Observou-se inadequação em todos os macro e micronutrientes, em ao menos um dia da semana. As refeições eram bem aceitas pelas crianças, das quais 75% apresentaram eutrofia. 87% das famílias achavam a merenda vegetariana uma boa ideia; 3% tinham a opinião contrária e 10% eram indiferentes. Apesar da boa aceitação da merenda vegetariana e predominância da eutrofia, o acompanhamento profissional é importante, evitando possíveis deficiências nutricionais.

**Palavras-chave:** Alimentação escolar. Dieta vegetariana. Estado nutricional.

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## INTRODUCTION

The practice of vegetarianism is not something of the current times, since ancient times this diet has been mentioned by philosophers such as Plato and Pythagoras. The term “vegetarian” appeared only in the 19th century, being associated with several health benefits.<sup>1,2</sup>

Vegetarianism is a dietary pattern in which all types of meat are excluded from the individual's diet and which encompasses a set of spiritual and environmental beliefs and attitudes, as well as health and moral concerns.<sup>3</sup> Furthermore, vegetarian practices are much more plural and are based not only on restricting the consumption of certain foods, but also on encouraging the consumption of other products than those of animal origin.<sup>3</sup>

There are several types of variants within vegetarianism, the most common being: ovolactovegetarianism, which includes eggs, milk and cheese in the diet; lactovegetarianism, whose adepts do not consume eggs, but do ingest milk and dairy products, ovovegetarianism, which allows the consumption of eggs, but not dairy products, vegetarianism, which does not allow the consumption of animal products, and veganism, which, besides prohibiting animal derived foods, excludes from the individual's habits other products of the same origin, such as clothes, cosmetics, etc., in addition to suggesting that its practitioners do not attend any amusement environment at the expense of animal exposure.<sup>4</sup>

In the last ten years, the popularity of the vegetarian diet in the Western world has increased, including among children. In 2018, a survey by the Brazilian Institute of Public Opinion (IBOPE) revealed that almost 30 million Brazilians declared themselves vegetarians, which corresponds to 14% of the Brazilian population. In Canada, data from 2002 revealed that 4% of adults opt for vegetarianism, and in the USA, 2% of the population aged 6 to 17 are vegetarians.<sup>5,6</sup>

For the American Dietetic Association (ADA), the American Academy of Pediatrics (AAP), and the Canadian Pediatric Society (SCP), a balanced vegetarian diet for children and adolescents is capable of promoting adequate growth and development. Children are more vulnerable to developing nutrient deficiencies, so they should be properly monitored and supplemented when necessary, since the risk is higher due to the smaller variety of food groups consumed. The absence of consumption of animal foods and dairy products contributes to lower intakes of iron, vitamin B12, calcium and zinc. In general, the energy value of vegetarian diets is lower, as well as the proportion of saturated fats per meal. The fiber, fruit and vegetable content is higher.<sup>7,8</sup>

As children spend a lot of time at school, the meals taken there can provide them with well-being during this period, with the main objective of partially supplying their nutritional needs, besides improving their learning capacity, reducing dropout, and helping them to form healthy eating habits, and vegetarian preparations are being offered more and more at school.<sup>9</sup>

Thus, the present study aimed to evaluate the impact of vegetarian food on the nutritional status of children from a private school that adopts such food in its lunch and to verify the opinion of parents and children on the institution's menu.

## METHODOLOGY

A cross-sectional research was developed with 68 children of both genders, aged between 2 and 5 years, who attended, in 2019, a full time private school in the interior of São Paulo that uses the vegetarian diet as standard in the school lunch offered. Authorization from the educational institution was requested for the research to be conducted there, and after approval by the Research Ethics Committee - CEPE of the University of France, under protocol

CAAE n° 08122219.3.0000.5495 and opinion n° 3.804.788, those responsible for the children signed a Free and Informed Consent Form authorizing their children to participate on the research before data collection was carried out. The children also signed an informed consent form, confirming that they were willing to participate in the study. Data collection with students was carried out at the institution itself during the interval of school activities, being carried out individually and in a reserved place, so that there would be no embarrassment. The nutritional status of the participants was evaluated by calculating the Body Mass Index (BMI), so the children were weighed and measured. The measurement of height, was used a stadiometer, was carried out with the children barefoot and without unadorned (hat, cap, barrettes, etc.). The weight was established using a calibrated scientific scale, on which the students were also placed without shoes and wearing light clothes. Both equipments were arranged in a plan local. These procedures followed the guidelines contained in the Technical Standard of the Food and Nutrition Surveillance System (SISVAN), of the Ministry of Health.<sup>10</sup>

In order to know the parents' opinion about the food offered at school, they had to answer a questionnaire containing multiple choice and open questions about their children's food at home and about what they thought about the vegetarian diet and its offer of this in school lunches, the questionnaire was sent to the parents through their children.

For the analysis of the nutritional value of the meal offered, the institution's weekly menu was analyzed, which was prepared by a nutritionist who provided assistance on the school once a week. Regarding the quality, was considered the preparations that were actually offered to the children, as the menu sent by the nutritionist suffered changes at the time of preparation, mainly due to the lack of some foods, which were not purchased by the institution. As for the quantities, was followed the recommendations determined by the professional. The nutritional value

was calculated using the DIET PRO 5® software. To verify the nutritional balance of the menus offered, the data obtained were compared to the recommendations of the Ministry of Education, which follows the indications of the following agencies: FAO (2001) for energy; World Health Organization (WHO / 2003) for carbohydrates, proteins and lipids and Dietary Intake Reference (DRI) for fibers, vitamins and minerals. Were analyzed: energy value, proteins (PTN), carbohydrates (CHO), lipids (LIP), calcium (Ca), sodium (Na), vitamin A (Vit.A), folic acid (Ac. Folic), iron ( Fe), Vitamin B12 and zinc. In order to know the students' opinion about the meal, a hedonic scale questionnaire was used.

To define the parametric or nonparametric nature of the statistical significance tests, the data were submitted to the Chi-square ( $\chi^2$ ) statistic. The significance level of the statistical tests was fixed at 5.0% ( $\alpha = 0.05$ ) and the tests were performed using the GraphPad Prism 5.0 software.

## RESULTS

Were evaluated 68 children, 44.1% ( $n = 30$ ) were female and 55.9% ( $n = 38$ ) male. It was found, through the analysis of BMI / age, that the vast majority of respondents (75%,  $n = 51$ ) presented eutrophy, as shown in Figure 1, which also shows the nutritional status of children categorized by sex. The number of eutrophic individuals was significantly higher ( $p < 0.0001$ ) than the number of overweight children. The total number of eutrophic boys was higher than the number of girls, whereas the overweight index was the same for both genders (11.76%,  $n = 8$ ).

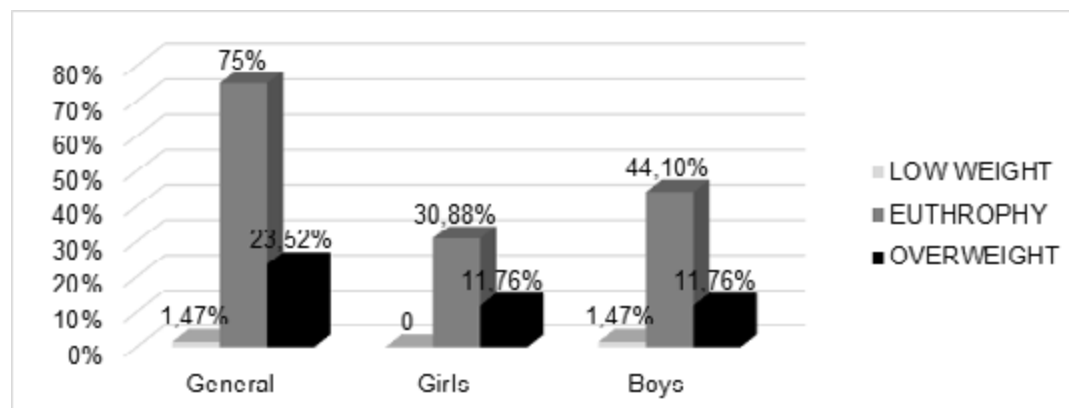


Figure 1. Evaluation of General Nutritional Status and by Sex.

Regarding the parents' opinion about vegetarian snacks being healthier, it was found that 73.5% ( $n = 50$ ) of them had a positive opinion about this type of food, i.e., they considered it healthier for children. The same occurred when the recommendation for an adult population was questioned, but in a slightly higher proportion (90%). The proportion of parents who consider the vegetarian diet healthier for adults did not differ significantly from the proportion of parents who consider it a healthier diet for children ( $p = 0.7718$ ).

Despite the higher positive indexes related to the vegetarian diet, when asked if anyone in the family or a child was vegetarian, it was found that only 8.82% followed the diet, and these found were all from male sex ( $n = 6$ ).

When questioned about the inclusion of the vegetarian diets in school meals, 86.76% ( $n = 59$ ) of the families answered that they thought it was a good idea; 2.9% ( $n = 2$ ) had the opposite opinion and for 10.3% ( $n = 7$ ) it made no difference. The proportion of parents in favor of including a vegetarian diet in the lunch was significantly higher than the proportion of parents who were against or indifferent to such inclusion ( $p < 0.0001$ ).

Parents also evaluated the importance of preparing and monitoring vegetarian food at school by a nutritionist. In this regard, 88.5% ( $n = 60$ ) recognized the importance of such monitoring, for the

others (11.5%,  $n = 8$ ) this question was unnecessary. The number of favorable parents is significantly higher than the proportion of parents who are against or indifferent to such inclusion ( $p < 0.0001$ ).

Regarding the nutritional value, i.e., if through the vegetarian diet it would be possible to supply the need for nutrients such as iron, vitamin B12, etc., 67.7% ( $n = 46$ ) of the parents reported that yes, however, for 32.3% ( $n = 22$ ) only by the consumption of meat and other animal products, the nutritional requirements would be achieved. The proportion of parents who believed that the vegetarian diet achieves the children's nutritional needs is significantly higher than the proportion of parents who had the opposite opinion or were indifferent (33.0%); ( $p < 0.0041$ ).

It was also questioned whether those responsible, if they could, would change something in their children's meals and it was found that 89.7% ( $n = 61$ ) declared themselves totally satisfied with what was offered, and only 10.3% ( $n = 7$ ) of them would like to change some menu item. Regarding what they would like to change, if they could, the main suggestions were: meat inclusion (42.8%,  $n = 3$ ); changes related to fruits, such as, the exchange of some fruits for others of a different kind or inserting more vitamin fruit in certain periods (28.6%,  $n = 2$ ); reduce the supply of soy-based foods (14.3%,  $n = 1$ ) and increase the amount of food offered (14.3%,  $n = 1$ ). Regarding the children's acceptance of snacks,

85.3% (n = 58) of the parents stated that it was positive and 14.7% (n = 10) said they did not know if the child liked the food offered. The children's food preferences, in the parents' opinion, are described in Table 1.

**Table 1.** Children's food preferences with regard to school meals in the opinion of parents

Food	Acceptance Ratio	
	%	N
<b>CARBOIDRATES</b>	<b>39,7</b>	<b>27</b>
Rice	29,6	8
Potato/puré	26	7
Pasta	18,5	5
Bread	18,5	5
Crumbs	3,7	1
Cake	3,7	1
<b>VITAMINS AND MINERALS (FRUIT)</b>	<b>14,7</b>	<b>10</b>
Banana	50	5
Pineapple	20	2
Apple	20	2
Watermelon	10	1
<b>VITAMINS AND MINERALS (VEGETABLES)</b>	<b>14,7</b>	<b>10</b>
Salad (greens)	50	5
Tomato	20	2
Vegetables in general	10	1
Aubergine	10	1
Broccoli	10	1
<b>ANIMAL PROTEIN</b>	<b>10,3</b>	<b>7</b>
Eggs	85,7	6
Yogurt	14,3	1
<b>VEGETABLE PROTEIN</b>	<b>1,5</b>	<b>1</b>
Soy	100	1
All	11,7	8
I Don't Know	7,3	5

It should be noted that the most mentioned food group was carbohydrates, with the emphasis on rice, followed by mashed potatoes. In second place were vitamins and minerals, which obtained a total of 29.4% (n = 20) of preference, 14.7% (n = 10) for fruits and 14.7% (n = 10) for vegetables and

greens. Among the fruits, the children's favorite was the banana (50%, n = 5). Among vegetables, 50% (n = 5) preferred, according to those responsible, greens. Animal protein (eggs and milk products) was mentioned more (10.3%, n = 7) than vegetable protein, as only 1.5% (n = 1) alluded to it. The other

guardians claimed not to know or that the child liked everything that was served at the institution.

Regarding the children’s preferences outside school, it can be seen in Figure 2 that, according to the parents, the food preferred by the children at home is meat (red and chicken), followed by sweets and in the same proportion by eggs and stuffed cookies.

The vegetable proteins mentioned (soy and soy-based beverages) were in the last positions.

The analysis of the menu offered by the researched institution showed that the diet offered to all students, called by the institution as vegetarian, was in fact ovolactovegetarian. Chart 1 shows the details and menu per capita prepared by the nutritionist.

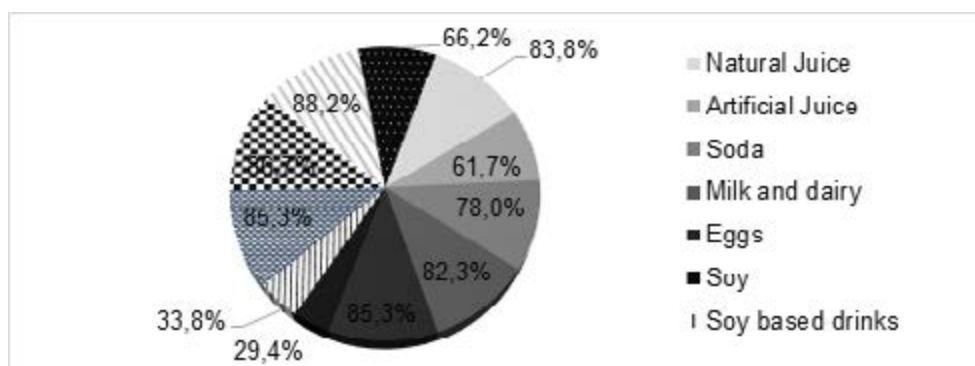


Figure 2. Children’s Preference Outside School.

Chart 1. Menu and per capita prepared by the institution’s nutritionist

Meals Days of week	Breakfast 7:15 to 8:10	Per Capita	Collation 8:50 to 9:35	Per Capita	Lunch 10:15 to 11:30	Per Capita	Snack 1 14:30 to 15:50	Per Capita	Snack 2 16:30	Per Capita
Monday	Fruit in nature	40 g	Fruit in nature	40 g	Rice	80 g	French Bread	30 g	Fruit in nature	40 g
	Milk powder with chocolate	150 ml		Beans	90 g	Yogurt	200 ml			
	French Bread	30 g		Cassava puree	30 g	Margarine	20 g			
Tuesday	Milk Powder Vitamin with Papaya	200 ml	Fruit in nature	40 g	Rice	80 g	French Bread	30 g	Fruit in nature	40 g
	Carrot Cake	60 g		Beans	90 g	Pineapple juice	150 ml			
				Mini Kebab	45 g	Soy mayonnaise	20 g			
				Vinaigrette	30 g					
Wednesday	Fruit in nature	40 g	Fruit in nature	40 g	Rice	80 g	Apple and Oatmeal Cake	40 g	Fruit in nature	40 g
	Milk powder with chocolate	150 ml		*PVT Stroganoff	82 g	Yogurt	200 ml			
	French Bread	30 g		Straw potatoes	20 g					
	Guava	10 g		Lettuce Salad	20 g					
				Beet	15 g					
				Orange	20 g					
Thursday	Milk powder with chocolate	150 ml	Fruit in nature	40 g	Rice with carrots	80 g	Pasta Salad	50 g	Fruit in nature	40 g
	Homemade bagel	90 g		Beans	90 g	Carrot Juice with Lemon	150 ml			
				Potatoes au gratin with boiled eggs and cheese	80 g					
				Tomato	30 g					
Friday	Fruit in nature	40 g	Fruit in nature	40 g	Chicory salad	20 g	Toast	50 g	Fruit in nature	40 g
	Milk powder with chocolate	150 ml		Rice	80 g	Fruit Vitamin with Beets	200 ml			
	French Bread	30 g		Beans	90 g					
	Margarine	20 g		**Glüten with tomato sauce	65 g					
				Kabotiá	40 g					
		Lettuce Salad	20 g							
		Orange	20 g							

\* PVT: Textured Vegetable Protein; \*\* Gluten: dough prepared with flour and water

**Chart 2.** Menu observed during the research

	Monday	Tuesday	Wednesday	Thursday	Friday
Breakfast 07:15 to 08:10	Milk powder/ chocolate Bread with margarine Watermelon	Vitamin powdered milk/mammon Carrot cake Banana	Watermelon Powder Milk/Co chocolate Bread with Guava	Powdered milk/ chocolate milk Homemade bagel Papaya	Apple  Powdered milk / chocolate Bread with margarine Banana
Lunch 10:15 to 11:15	Rice Beans Boiled cassava Simple omelet Lettuce and tomato salad	Rice Beans Mini-quiche Vinaigrette Potato salad with egg	Rice Beans Stroganofe de *PVT Straw potatoes Lettuce salad Orange beet	Rice Beans Gratinated potatoes Tomatoes Chicory salad	Rice Beans *Gluten with tomato sauce Kabotía Lettuce salad Orange
Afternoon snack 1 14:30 to 15:50	Bread with margarine Yogurt	Bread with margarine Pineapple juice	Apple and oatmeal cake Yogurt	Bread with margarine Lemonade	Toast Fruit Vitamin with beet
Afternoon snack 2 16:30	Apple	Papaya	Banana	Apple	Papaya

\* PVT: Textured Vegetable Protein; \*\* Gluten: dough prepared with flour and water.

Due to the short time between breakfast and lunch, the fruit that should be served in the collation was served together with breakfast. Regarding the nutritional value, the Ministry of Education recommends that 70% of the daily nutritional needs

of children enrolled in full-time education should be met by school meals<sup>17</sup>. However, it was observed that all the nutrients analyzed (macro and micronutrients) on at least one day of the week, were not compliant with the Ministry's recommendations, as shown in Table 2.

**Table 2.** Comparison of the nutritional value of the preparations observed with the nutritional value recommended by the FNDE and the DRI's

Nutrients	Days of Week									
	CHO (g)	PTN (g)	LIP (g)	Na (mg)	Fe (mg)	Ca (mg)	Vit. A (mg)	Vit. B12 (mcg)	Zn (mg)	
Monday	130,07	27,72	44,24	1616,96	4,12	465,73	0	0,42	2,12	
Tuesday	167,92	22,60	79,78	1678,31	5,61	246,31	140,24	0,09	2,01	
Wednesday	154,87	43,96	20,64	632,91	4,09	802,87	22,81	0	1,80	
Thursday	91,25	12,22	6,53	707,13	3,61	119,72	0,96	0	1,64	
Friday	164,92	29,20	30,71	1196,54	4,91	416,06	60	0	2,11	
Total of the week	709,03	135,7	181,9	5831,85	22,34	2050,7	224,01	0,51	9,68	
Weekly average	141,80	27,14	36,38	1166,37	4,46	410,13	44,80	0,10	1,93	
Daily Recommendation 1-3 years*	114,9**	21,9**	17,5**	1000**	4,9**	350**	210**	0,63**	2,1**	
Daily Recommendation 4-5 years*	154,4**	29,7**	23,8**	1200**	7,0**	560**	280**	0,84**	3,5**	

\* Source: Dietary Intake Reference (DRI) / American Institute of Medicine (IOM), 1997 - 2000 - 2001: Vitamin B12. FNDE - Guidance manual for school meals in early childhood education, elementary school, high school and education of young people and adults: other nutrients.  
\*\* Values corresponding to 70% of daily recommendation.

In the case of macronutrients, carbohydrate (CHO), for example, was inadequate, on all days, with regard to the recommendations for children between four and five years of age, were below the recommended values. For children between 1 and 3 years old, only on Thursday, the values were below the recommendations.

Protein (PTN) was below the recommendations on four days of the week for children aged 4 to 5 years and only on Thursday for younger children. It drew attention, the amount of protein offered on Wednesday, which corresponded to practically twice the recommendation for children aged 1 to 3 years. As for lipids, intended for this public, there was an inadequacy on all days, and only on one day the values were lower, while on the others days there was exceeded the recommended values. For older children, there was also an offer below the recommendations, but on two days.

In regard to micronutrients, it is noted that only sodium (Na) remained adequate on most days observed, exceeding the recommendations only on Monday and Tuesday.

The amount of Iron (Fe) offered in the menu was below the recommended on all days of the week

for children over 4 years old, as well as vitamin A (Vit. A), vitamin B12 (Vit. B12) and zinc (Zn). In the case of Calcium (Ca), there was adjustment in only one day of the week. Regarding to younger children, Iron and Zinc were adequate in two days, while Vitamin A, the fact did not occur any day of the week and Calcium was in accordance with the recommendations in three days.

The study also analyzed the acceptance of the preparations by children and it is observed in Table 3 that, in general, all preparations were well accepted. The one with the highest acceptance rate was the fruit vitamin (97.05%, n = 66), followed by papaya and gluten with tomato sauce (a type of pasta prepared with white flour and water) which had the same acceptance rates (95.58%, n = 65). Papaya also figured as the fruit preferred by children. The least accepted food was bread with guava, which was rejected by 69.11% (n = 47) of those surveyed.

Six foods were below the percentage considered as positive for the acceptability test determined by the Ministry of Education: bread with guava, powdered milk with chocolate, banana, PVT stroganoff, watermelon and apple.<sup>11</sup>

**Table 3.** Acceptance rates of the preparations offered

Preparation	Acceptance		Low acceptance (hated/disliked)		Good acceptance (loved it / liked it)	
			%	n	%	n
Papaya			4,41	3	95,58	65
Watermelon			18,75	12	81,25	52
Apple			18,75	12	81,28	52
Banana			27,94	19	72,05	49
Milk (powder)/chocolate			36,36	24	63,63	42
Fruit Vitamin			2,94	2	97,05	66
Mini Kebab			9,09	6	90,90	60
Carrot Cake			6,03	4	93,93	62
Bread with Guava			69,11	47	30,88	21
PVT stroganoff			22,05	15	77,94	53
Bread with Margarine			13,23	9	86,76	59
Gluten with tomato sauce			4,41	3	95,58	65



## DISCUSSION

In general, the vegetarian diet, especially when it is followed by children, causes doubts and discussions. The nutritional analysis verified a high percentage of eutrophic children (75%,  $n = 51$ ), rates higher than those obtained by the Food and Nutritional Surveillance System - SISVAN19 in Brazil in 2019, which obtained 62% for such classification and 30.84 % of overweight, a value also higher than that verified in the present study (23.52%,  $n = 16$ ). The same occurred with the study conducted in the interior of São Paulo, which obtained 43% of excess weight in children up to 4 years of age.<sup>12,13</sup>

These results prove that the ovo-lacto-vegetarian diet can contribute positively in the fight against overweight, since the aforementioned studies were conducted in schools that offered conventional school meals. In a study conducted with 32 vegetarian children aged 2 to 10 years, the authors concluded that the diet did not interfere in the physical development of the studied children, which contradicts the results of the present study.<sup>14</sup>

Children who are raised on healthy vegetarian diets have a reduced risk of developing heart disease, cancer, obesity, diabetes and other conditions, and often find it easier to maintain a healthy weight. They also have less problems with acne, allergies, and gastrointestinal problems than their peers who eat animal products. This type of diet, when carefully implemented, can result in a normal child development.<sup>15</sup>

Regarding the parents' opinion about the inclusion of the vegetarian diet offered to the surveyed children and its nutritional factor, it was observed that most of them were favorable, especially when the focus of the diet was on the adult population. However, most of them, as well as their children, did not follow the diet at home. It was also observed that at home, the children's favorite food of children, according to their parents, was meat (88.2%). Soy, a food commonly used in vegetarian diets to replace

animal protein, as it has a biological value close to animal protein, meeting protein needs effectively, ranked the last position both in the preference at home and in school meals. In a study conducted with students from a school in Rio Grande do Sul that evaluated the acceptance of soy-based foods during school lunches, they obtained a good acceptance. When well seasoned and properly prepared, soy-based preparations have a good acceptability and can be included in school meals. However, for some people, the taste of soy is the main obstacle to greater intake, but if it is introduced early, the acceptance of this food tends to increase, as the child will be already used to it and will not be surprised.<sup>16,17,18</sup>

Since energy and nutrient requirements are higher in relation to body weight during growth, babies, children and adolescents are particularly vulnerable and are at a greater risk of nutrient inadequacy than adults. In addition, some of these potential critical nutrients have a particular importance during youth, for example, the dietary protein which provides the amino acids necessary for the body's protein synthesis during growth, and the production of other nitrogenous compounds, such as some hormones or neurotransmitters. Iron is also essential for the growth and development of the central nervous system, particularly during the first year of life, due to its role in myelination, neurotransmitter function or, hippocampal endritogenesis. Thus, the adoption of a vegetarian diet in school meals for children, should consider important factors, aiming to avoid nutritional risks, by providing a nutritionally rich and varied diet, which is adequate and attractive.<sup>19</sup>

A cross-sectional study carried out through a literature review, which aimed to evaluate the food intake and nutritional status of vegetarian children and adolescents, concluded that the beneficial effects of the vegetarian diet reported in the literature were: higher fiber intake, magnesium, potassium, vitamin C, among others. However, the risk of possible nutritional deficiencies in an unbalanced vegetarian diet, due to the absence of nutrients, should not be

underestimated, therefore, it must be carried out in a planned manner and with appropriate supplements, if necessary.<sup>16, 20</sup>

Regarding the consumption of rich iron foods, a cross-sectional study with 22 children concluded that a vegetarian diet in childhood increases the risk of iron deficiency, despite the high intakes of vitamin C, which can lead to the development of anemia, which is highly prevalent among schoolchildren, being considered a public health problem.<sup>20</sup>

The vegetarian diet can bring several benefits to human health, including for children, being considered an alternative to change habits for this purpose. However, it is also important to emphasize the need for guidance for the population that practices or is interested in adopting vegetarianism without the risk of developing nutritional deficiencies. The nutritionist is the health professional qualified to prescribe diets with the objective of health promotion and the adequacy to individual needs of all macronutrients, micronutrients, and energy, without the risk of nutritional deficiencies. Despite this, in the present study, 11.5% of the parents reported that it was unnecessary to have lunch monitoring and menu prepared by a nutritionist.<sup>21,22</sup>

It was observed in the study, that the institution had some difficulty in naming the diet offered, called by them as vegetarian, when in fact it was an ovolactovegetarian diet. The confusion is justified due to the wide variety of dietary practices that the term vegetarian can encompass. The authors emphasize the importance of knowing the individual's dietary intake to classify it and not only take into account the way the diet calls itself.<sup>23</sup>

Nutritional inadequacies in the preparations offered in school meals are quite common, as evidenced by a study that verify an energy deficient diet, not reaching 70% of the recommendations for the age group surveyed. Another research conducted in Rio Grande do Sul, which introduced preparations based on Textured Soy Protein on the menu of a school with an omnivorous diet, it also found that,

with regard to the amount of macronutrients, the preparations did not meet the recommendations of the National School Feeding Program.<sup>17</sup>

Concerning to vegetarian food, the problem is even more serious, as, as observed in the present study, practically all nutrients were below the recommended levels. A study with young people enrolled in an institution that offered egg-vegetable nutrition, evaluated their nutritional status and found that 70% of them had anemia, 38% of whom had iron deficiency. The authors highlighted the importance that educational institutions, whose diet is based on restrictive philosophies with regard to the products of animal origin, include in their administrative routine evaluation and systematic monitoring of the nutritional status of students, especially with regard to iron, since children and adolescents are at higher risk due to age and diet.<sup>24</sup>

In the case of the present study, it is noteworthy that, when observing the distribution of meals, it was noted that the quantities of some foods offered were lower than recommended, in addition, children also did not eat the whole portion offered of some foods, which can cause an intake even lower than calculated.

There is yet another aggravating factor, which is the fact that the menu calculated by the nutritionist undergoes changes at the time of preparation, mainly due to the non-acquisition of some ingredients and, with that, having its balance changed. The analysis of 210 menus from municipal schools in Belo Horizonte also detected nutrients alterations in 79% of the menus that were actually served in relation to the menus planned by nutritionists. The main causes for such changes, according to the authors, are: lack of ingredients, the low acceptance of certain preparations, the use of ingredients close to the expiration date, the lack of pre-preparation planning, and the lack of equipment.<sup>25</sup>

Non-compliance and nutritional inadequacies of the menus offered may not guarantee the adequate nutritional intake in different age groups, especially

with regard to certain nutrients that have greater bioavailability when present in foods of animal origin.<sup>16</sup>

Such deficiencies deserve continuous attention by diet supporters and health professionals. Lactovegetarian and ovolactovegetarian diets do not present significant risks as the vegetarian or vegan diets, which are much more restrictive, presenting a real risk of nutritional deficiency.<sup>16</sup>

Vegetarian diets are reported to contain less saturated fatty acids, animal proteins and cholesterol and more folate, fiber, antioxidants, phytochemicals and carotenoids. However, such diets are low in essential micronutrients, such as iron, zinc, vitamin B 12, vitamin D, omega-3 fatty acids, calcium and iodine. Consequently, the risk of adverse effects due to micronutrient deficiencies that lead to the risk of malnutrition should not be underestimated.<sup>26</sup>

The health professional must know how the restrictions of vegetarian diets can influence in the short and long term individual's health, especially children and adolescents, in order to be able to guide families adequately. However, in most cases only this nutritional guidance it is not enough, many times it will be necessary to supplement nutrients such as: calcium, iron, zinc, vitamins D, B1, B2, B6 and B12.<sup>27</sup>

In the case of iron, for example, supplementation is recommended only if the status is low by appropriate blood tests. Iron in vegetarian diets is in the non-heme form, which is less bioavailability than the heme forms from animal sources. However, if properly planned, a vegetarian diet can meet the needs of this nutrient. Some culinary considerations and food preparations can also improve iron absorption. Studies show that the incidence of iron deficiency anemia in vegetarians and non-vegetarians is similar.<sup>25,18</sup>

Concerning to other nutrients such as calcium, omega 3, zinc, etc., in the case of ovolactovegetarians, it is possible to achieve the recommendations, as long as the diet provided is quite varied and planned. The greatest difficulty is in the diets followed by strict vegetarians and vegans, especially with regard to vitamin B12, as seen previously.<sup>27</sup>

Regarding proteins, a study conducted in a private school in the city of Porto in Portugal, found a caloric intake from this nutrient in vegan, vegetarian, and especially in ovolactovegetarian diets, around 10 to 11.9%, making them reach the recommendations. However, it highlights that among omnivores, a higher intake of this nutrient was found.<sup>28</sup>

For the acceptance of the ovolactovegetarian school meals in the present study, it was found to be positive, since several foods analyzed were well accepted by children and remained above the rate of 85% determined by the Ministry of Education. The acceptance of most fruits, however, was below this percentage, with only papaya and vitamin fruit standing out positively. Usually, there is some resistance to the vegetarian diet and constraints of daily life related to this type of food. However, a study that evaluated the acceptance of the ovolactovegetarian and vegan diets in a school, found greater acceptance of the vegan diet over the vegetarian, which is more permissive. It is recommended that the introduction of new foods be done gradually, which is no different with the vegetarian diet and its variants.<sup>11,3,29,30</sup>

Soy (PVT), one of the common foods in the vegetarian diets, as it effectively replaces animal protein due to the proximity of its biological value, was among the least accepted in the present study. In a research conducted in Rio Grande do Sul, the authors obtained good acceptance of this food and state that, when well prepared and seasoned, soy-based dishes have good acceptability. The taste of food is the main incentive for its consumption, and in the case of soy, its flavor can be a barrier to its ingestion, however, it is emphasized that the sooner it is introduced, the better its acceptance. Fruits were also not well accepted, as verified by the present study, contrary to a research that evaluated the food consumption and nutritional status of vegetarian children and adolescents through a literature review and found that they had a higher consumption of fruits, vegetables, and starch, when compared to omnivorous individuals.<sup>17,16,18</sup>

**CONCLUSION**

The present study obtained eutrophic indices significantly higher than those of overweight, however, the inadequacy of macro and micronutrients was observed, which makes monitoring by a professional, especially the nutritionist, essential for the success of such a diet. Regarding the inclusion of vegetarian food and its aspects in school meals, it was evident here that it was well accepted by most parents, even if they and their children did not follow it at home.

For children who study full time, school meals must supply 70% of their daily nutritional needs, which was not observed, since the menu offered at the institution did not meet this percentage, on most days. Regarding the acceptance of the foods offered, it was verified that this was positive, however, fruits were among the least accepted, as well as textured vegetable protein, both common foods in variations of vegetarian diets. This highlights the importance and the need for care, both with the choice and with the strict monitoring of the menu and the incentive to consume the foods offered, thus avoiding the lack or insufficiency of nutrients.

**REFERENCES**

1. Mathieu S, Dorard G. Végétarisme, végétalisme, véganisme: aspects motivationnels et psychologiques associés à l'alimentation sélective. *Presse Med* [periódico na Internet]. 2016 [acesso em 2 fev 2019];45(9):726–33. Disponível em: <https://www.sciencedirect.com/science/article/pii/S0755498216302019>
2. Fox N, Ward KJ. You are what you eat? Vegetarianism, health and identity. *SocSci Med*. [periódico na Internet]. 2008 [acesso em 2 fev 2019];66(12):2585–95. Disponível em: <https://www.ncbi.nlm.nih.gov/pubmed/18378056>
3. Abonizio J. Conflitos à mesa: vegetarianos, consumo e identidade. *Rev. bras. Ci. Soc.* [periódico na Internet]. 2016 [acesso em 5 fev 2019];31(90):115-36. Disponível em: [http://www.scielo.br/scielo.php?pid=S0102-69092016000100115&script=sci\\_abstract&tlng=pt](http://www.scielo.br/scielo.php?pid=S0102-69092016000100115&script=sci_abstract&tlng=pt)
4. Amit M. Vegetarian diets in children and adolescents. *Paediatr Child Health* [periódico na Internet]. 2010 [acesso em 03 fev 2019];15(5):303-14. Disponível em: <https://www.ncbi.nlm.nih.gov/pubmed/21532796>
5. Craig WJ, Mangels AR, American Dietetic Association. Position of the American Dietetic Association: vegetarian diets. *J Am Diet Assoc* [periódico na Internet]. 2009 [acesso em 3 fev 2019];109:1266-82. Disponível em: <https://www.ncbi.nlm.nih.gov/pubmed/19562864>.
6. Sociedade Vegetariana Brasileira [homepage na Internet]. Pesquisa do IBOPE aponta crescimento histórico no número de vegetarianos no Brasil. 2018 [acesso em 06 fev 2019]. Disponível em: <https://www.svb.org.br/2469-pesquisa-do-ibope-aponta-crescimento-historico-no-numero-de-vegetarianos-no-brasil>
7. Mangels AR, Messina V. Considerations in planning vegan diets: infants. *J Am Diet Assoc*. [periódico na Internet]. 2001 [acesso em: 4 fev 2019];101(6):670-77. Disponível em: <https://pdfs.semanticscholar.org/4ee7/a0e8fa43217acf1d182f4e8f6d7ab33317e3.pdf>.
8. Kleinman RE, Greer FR. Nutritional Aspects of Vegetarian Diets. *Pediatric Nutrition*, 7a ed, American Academy of Pediatrics, 2014; p. 241-264.
9. Pontes R, Slompo RB, Luz PA, Passoni CMS. Influência da merenda escolar no estado nutricional. *Cadernos da escola de saúde* [periódico na Internet]. 2010 [acesso em: 4 fev 2019]; 2(4):64-77. Disponível em: <http://portaldeperiodicos.unibrasil.com.br/index.php/cadernossaude/article/view/2305/1878>
10. Brasil. Ministério da Saúde. Norma técnica do sistema de vigilância alimentar e nutricional-SISVAN. Brasília; 2011.
11. Brasil. Ministério da Educação. Manual para aplicação dos testes de aceitabilidade no Programa Nacional de Alimentação Escolar

- (PNAE) / organizadoras Ana Luiza Sander Scarparo, Gabriela Rodrigues Bratkowski ; revisão e atualização CECANE UFRGS. 2. ed. Brasília: Ministério da Educação, 2017.
12. Sistema de vigilância Alimentar e Nutricional-SISVAN. [homepage na internet]. Relatórios do Estado nutricional dos indivíduos acompanhados por período, fase do ciclo da vida e índice. 2019 [acesso em 22 set 2019]. Disponível em: <http://sisaps.saude.gov.br/sisvan/relatoriopublico/estadonutricional>
  13. Silva JO, Avi CM. Avaliação do estado nutricional de pré escolares de uma escola municipal de Bebedouro – SP. *Revista Ciências Nutricionais Online* [periódico na internet]. 2017. [acesso em 23 ago 2019] 1(1):1-10. Disponível em: <http://unifafibe.com.br/revistasonline/arquivos/cienciasnutricionaisonline/sumario/46/27032017152026.pdf>
  14. Ambroszkiewicz J, Klemarczyk W, Chelchowska M et al. (2006) Serum homocysteine, folate, vitamin B12 and total antioxidant status in vegetarian children. [periódico da internet] 2006. [acesso em: 20 agos 2019]. *Adv Med Sci* 51:265–268. Disponível em: <https://pdfs.semanticscholar.org/a704/842ec4f683cedaf9f1ba68e9a3ffdb0097fb.pdf>
  15. Craig, WJ. Nutrition concerns and health effects of vegetarian diets. 2010. *Nutr. Clin. Pract.* 25, 613–620.
  16. Velasco XEC. Estado Nutricional e Consumo alimentar de crianças e adolescentes vegetarianos. [trabalho de graduação de curso de nutrição] Porto Alegre, 2011. [acesso em 21 agos. 2019] Disponível em: <https://www.lume.ufrgs.br/bitstream/handle/10183/37206/000820488.pdf?sequence=1>
  17. Woynick RP, Ghisleni CP. Aceitação da proteína texturizada de soja em uma escola municipal rural de Barão de Cotegipe, RS. In: *Anais da VI Jornada de Nutrição e V Encontro de Pesquisa Científica em Nutrição*; 12-15 jun 2012; Erechim, BR. Erechim: Universidade Regional Integrada do Alto Uruguai e das Missões-URI; 2012. 1-10.
  18. Raposo ACRV. Análise qualitativa e quantitativa das ementas ovo-lacto-vegetarianas servidas no almoço do Colégio Adventista de Oliveira do Douro [Dissertação]. Porto: Faculdade de Ciências da Nutrição e Alimentação da Universidade do Porto; 2007. Disponível em: [https://repositorio-aberto.up.pt/bitstream/10216/54619/3/115464\\_0729TCD29.pdf](https://repositorio-aberto.up.pt/bitstream/10216/54619/3/115464_0729TCD29.pdf)
  19. Kleinman RE. *Pediatric nutrition handbook*, 6th ed. American Academy of Pediatrics, Elk Grove Village, IL, 2009.
  20. Gorczyca D, Prescha A, Szeremeta K et al. Iron status and dietary iron intake of vegetarian children from Poland. [periodico da internet] 2013. [acesso em: 21 agos 2019]. *Ann Nutr Metab* 62(4):291–297. Disponível em: <file:///C:/Users/user/Downloads/GorczycaetalVegetarianAnemia.pdf>
  21. Elorinne AL et al. Food and Nutrient Intake and Nutritional Status of Finnish Vegans and Non-Vegetarians. *PLoS One* [periódico na internet]. 2016. [acesso em 20 ago 2019] 11(2). Disponível em: <https://www.ncbi.nlm.nih.gov/pubmed/26840251>
  22. Fabres NMMR. Dieta vegetariana: razões e impactos na saúde. [Trabalho de Conclusão de Curso]. Rio de Janeiro: Centro Universitário IBMR – Laureate International Universities Curso de Nutrição; 2016.
  23. Couceiro P, Slywitch E, Lenz F. Padrão alimentar da dieta vegetariana. *Einstein*. [periódico na internet]. 2008 [acesso em 18 ago 2019]; 3(6):365-73. Disponível em: <http://apps.einstein.br/revista/arquivos/PDF/518-v6n3aRW518portp365-73.pdf>
  24. Quintaes KD, Amaya-Farfan J. Avaliação do estado nutricional em ferro de jovens estudantes em regime de alimentação ovolactovegetariana. *Rev. Ciênc. Méd.* [periódico na internet]. 2006 [Acesso em: 12 ago 2019]. 15(2):109-116. Disponível em: <https://seer.sis.puc-campinas.edu.br/seer/index.php/cienciasmedicas/article/view/1121/1096>
  25. Issa RC et al. Alimentação escolar: planejamento, produção, distribuição e adequação. Universidade Federal de Minas Gerais (UFMG), Departamento

- de Nutrição, Belo Horizonte (MG), Brasil. 2015. [Acesso em 17 set 2019]. Disponível em: [https://www.scielo.org/scielo.php?pid=S1020-49892014000200003&script=sci\\_arttext&tlng=en](https://www.scielo.org/scielo.php?pid=S1020-49892014000200003&script=sci_arttext&tlng=en)
26. Position of the American Dietetic Association: Vegetarian diets. *J. Amer. Diet. Assoc.* 2009; 109:1266–1282.
27. Cavalheiro EC, Fernandes NM. Dieta vegetariana e os efeitos da perda de peso: revisão Bibliográfica. [trabalho de conclusão de curso] Universidade Estadual de Campinas, Limeira, 2015. [acesso em: 21 ago 2019] Disponível em: <file:///C:/Users/user/Downloads/EMILYFACINCAVALHEIROeNAT%C3%81LIAMATOSFERNANDES.pdf>
28. Castillo XE, Castro K, Rockett FC, Guerra LT, Perry IDS. Consumo alimentar e estado nutricional de crianças e adolescentes vegetarianos: uma revisão. [Trabalho de Conclusão de Curso]. Porto Alegre: Universidade Federal do Rio Grande do Sul; 2011. Disponível em: <https://www.lume.ufrgs.br/bitstream/handle/10183/37206/000820488.pdf?sequence=1>
29. França JFM. Refeições vegan em ambiente escolar Lei n.º 11/2017 e as suas implicações em Unidades de Alimentação e Nutrição [Dissertação]. Porto: Faculdade de Ciências da Nutrição e Alimentação da Universidade do Porto; 2017. Disponível em: <https://repositorio-aberto.up.pt/bitstream/10216/107054/2/210281.pdf>
30. Silva AI, Aguiar HG. Diversificação alimentar no primeiro ano de vida. *Acta Med Port.* [periódico na internet]. 2011. [acesso em 22 set 2019] 24(4):1035-1040. Disponível em: <http://www.fein-gold.org/Research/PDFstudies/Silva2011-open.pdf>