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ASSESSMENT OF THE GLOBAL DIET QUALITY OF PRESCHOOL CHILDREN AT A NON-PROFIT DAY CARE CENTER: COMPARISON AT TWO TIME POINTS

EVALUACIÓN DE LA CALIDAD GLOBAL DE LA DIETA DE PREESCOLARES DE UN CENTRO DE CUIDADOS DIURNOS SIN FINES DE LUCRO: COMPARACIÓN EN DOS MOMENTOS

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ABSTRACT

The complexity of the human diet has instigated researchers to look for a more adequate way to qualitatively and quantitatively assess food consumption and nutrient adequacy, and to relate diet to health. The objective of this study was to assess the diet quality through the Healthy Eating Index (HEI) of 35 preschool children attending a non-profit day care center on Paquetá Island (state of Rio de Janeiro, Brazil) at the moment of enrolling and after six-month by comparing food consumption during weekdays and on the weekend. The dietary assessment was obtained by food history (at the moment of enrolling) using weighed food record method complementing it with information about nutrition at home (after the children's six-month attendance in the day care center) and by food records (on the weekend at home). Later, HEI was determined at the two time points. After the children's six-month attendance in the day care center the mean HEI showed that diet quality was good (score of 88.8). At the moment of enrolling and on weekends, the diet quality needed improvement. Despite the improvement of the diet quality during weekdays, this study demonstrated that the healthful dietary habits are not carried into the weekend at home.

Key words: Healthy Eating Index, day care center, preschool children

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RESUMEN

La complejidad de la dieta humana incita a los investigadores a buscar los medios más adecuados para evaluar cualitativa y cuantitativamente no sólo el consumo de los alimentos y

la adecuación de nutrientes, sino relacionar la ausencia de salud con la dieta. El objetivo de este estudio fue evaluar la calidad de la dieta a través del uso del Indice de Alimentación Saludable (IAS) [Healthy Eating Index - HEI] de 35 preescolares de una guardería filantrópica, en el acto de matrícula y después de 6 meses de frecuencia. Se comparó el consumo dietético durante y al final de la semana. La evaluación dietética se obtuvo con la historia alimentaria (preguntada al momento de matricularse) con el método de pesaje directo de los alimentos, complementada con el consumo alimentario en casa (después de 6 meses en la guardería) y por el registro de alimentación del fin de semana. Se determinó el IAS en los dos momentos de la investigación (al matricularse y después de 6 meses en la guardería). Se observó después de 6 meses de frecuencia de los niños en la guardería que el promedio del IAS demostró una buena calidad de la dieta (puntuación 88,8). Al matricularse y en los finales de semana, quedó demostrado que es necesario mejorar la calidad de la dieta de los niños. Se concluye que a pesar de la mejor calidad dietética durante la semana este estudio demostró que los hábitos alimentarios saludables no se practican durante el fin de semana en su casa.

Palabras claves: Indice de alimentación saludable, guardería, preescolar.

Introduction

Studies to establish health conditions according to the dietary assessment are necessary to visualize risk levels and the vulnerability of the population to nutritional deficiencies. It is extremely important to change the diet or to propose intervention strategies which will guarantee health, specially for the population of less than five years of age. These children are in an age range where the growth speed and development are highly determined by the diet; therefore this is the perfect time to introduce healthy nutritional habits (1).

Many societies have a dietary pattern with high total fats, cholesterol and refined sugar intakes. The same diet is low in complex carbohydrates, fibers, fruits, and vegetables. This pattern, known as «the western diet», is completely related to sedentary life and risks of chronic diseases (CD). Countries as Brazil and China have very different nutritional patterns (excess and deficiencies) coexisting in the same population (2,3).

The complexity of the human diet has made researchers look for more adequate ways of assessing the quality and quantity of the consumed food (4).

The United States Department of Agriculture - USDA and the Center for Nutrition Policy and Promotion - CNPP developed the Healthy Eating Index (HEI) to assess the American diet. It is a global measure of diet quality which represents a wide potential tool to be used in nutritional epidemiology. The index is helpful for the description and also for monitoring the dietary pattern of the population.

According to Basiotis et al. (5) HEI has 10 components scored from 0 to 10. These components are the five groups of the USDA's Food Guide Pyramid (grains, fruits, vegetables, milk and meat), four nutrients (percentage of total fat and saturated fat, cholesterol and sodium intakes). The total fat and the saturated fat are related to the total energy intake of

the diet. The cholesterol and sodium intakes are related to the moderate consumption recommended by the Dietary Guideline for Americans, and the last component is food variety.

Many studies assess food consumption through macro and micro nutrients comparing them with the recommendations for each age level. Few studies assess food consumption by applying HEI, which is a simple method applied for monitoring the dietary intake of the USA population. USDA uses it to follow up any changes in the dietary intake of individuals along time, and as a base for activities which will promote health for the population (6).

The aim of this research was to assess the diet quality according to HEI in preschool children from a nonprofit day care center at the moment of enrolling and six months later. The food consumption during the weekdays and the weekend was compared.

Subjects and methods

All children enrolled in a nonprofit day care center on Paquetá island (Rio de Janeiro state - Brazil) in 2003/2004 took part in this study, making up a total of 35 children of both genders, aged 2 and 3. The study design was of the longitudinal type and children were followed up for a six-month period after enrolling. The dietary assessment was gathered in two different periods: at enrolling (initial moment) and after six-month attendance at the institution (later moment). This research was approved by the Research Ethics Committee of Pediatrics and the Child Care Institute of the Universidade Federal do Rio de Janeiro (Brazil).

At the moment of enrolling was used the food history. At that time, a kit containing several utensils was used in order to estimate the quantities and servings consumed by the children in a more trustworthy way. Also the food record of one day of the weekend was requested to parents or to the responsibles for the children.

After six months of the children's attendance at the day care center, the weighed food record method was used to assess the dietary intake of the meals served at the day care center (breakfast, mid-morning snack, lunch, mid-afternoon snack, dinner) for two non-consecutive days. According to Hoffmann et al. (2002) (7) two days are necessary to determine this result. The solid food was weighed on a Plena digital scale, with 1 g precision and with capacity up to 2 kg and the liquids offered were measured in graduated containers (with graduation range from 10 ml to 250 ml), and the resulting numbers were written down on specific forms. At the end of each meal the individual leftovers from each child's mug and dish were measured and weighed respectively. To obtain the leftovers from each prepared food served in a meal, the leftover weight was taken proportionally to the initial quantity portioned in the meal. After this calculation, the individual consumption of each food item was measured through the formula: individual food consumption = serving - individual leftover. During these two days, in order to estimate other possible food and beverage consumed by the children at their homes (before and after their hours of the child day care center), parents or the responsible were asked to describe the child's food consumption through household units, which complemented the daily intake.

After calculating the daily food consumption at the enrolling (initial moment) and after six months (later moment) the following nutrients were analyzed: total fat, saturated fat, cholesterol, and sodium. The Brazilian software Diet Pro 4.0 (8) was used to determine the intake of these nutrients.

The foods and preparation consumed by the children were transformed into servings according to the food groups proposed by the USDA Child Food Pyramid (1999) (9). The groups were milk (2 servings), meat (2 servings), vegetables (3 servings), fruits (2 servings), and grains (6 servings). The HEI from the food consumption of the children at both moments and also during the weekend was calculated later on. HEI is assessed adding up the ten components. Intermediate scores were computed proportionately. The recommended HEI criteria defining diet quality as good is when the score is higher than 80. Scores between 51 and 80 demonstrate that the diet quality needs improvement. Scores of less than 51 show a poor diet (5).

Table 1 demonstrates the criteria to establish the HEI scores ranging from 0 to 100.

Statistics analysis

In order to verify if there was concordance between the two methods (food history and weighed food record) it was applied the statistical method suggested by Bland & Altman (10) with 95% confidence interval.

The paired Student test (t) was applied to compare the score of the components in both periods. The significance level in both periods (enrolling and six months

later) was determined at 5%. The statistical analysis was performed with EPINFO 6.0.

Results

Figure 1 shows the concordance between the two dietary methods applied (food history and weighed food record) according to Bland & Altman (10). The estimate of the accuracy of the concordance for the lowest limits was 90.24 and -69.16, and for the highest the limits were 86.04 and 64.96. The limits of concordance (-22.83 and 26.35) are small enough, showing that both methods can be used to obtain food consumption.

The mean HEI score of the children after six months at the day care center demonstrated a good diet (HEI=88.8) as seen in table 2. The diet quality on the weekends and at the moment of enrolling demonstrated that it needs improvement. A significant improvement was seen in the components (vegetable, fruit and milk groups), and in the food variety during the weekdays after six months at the day care center.

In table 3 it was verified that after six months at the day care center, 94.2 % of the children consumed a good diet (HEI > 80 score). At the moment of enrolling 82.8% of the children needed improvement in their diet quality (HEI >51 and <80 score. The diet quality consumed by the children on weekends (initial moment and later moment) was not statistically significant.

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TABLE 1

Components of the Healthy Eating Index.

Components	Score ranges	Criteria for maximum score	Criteria for minimum score
Grain consumption	0 to 10	6 servings	0 servings
Vegetable consumption	0 to 10	3 servings	0 servings
Fruit consumption	0 to 10	2 servings	0 servings
Milk consumption	0 to 10	2 servings	0 servings
Meat consumption	0 a 10	2 servings	0 servings
Total fat intake	0 to 10	30% or less of total energy intake	45% or more of total energy intake
Saturated fat intake	0 to 10	Less than 10 % of total energy intake	15% or more of total energy intake
Cholesterol intake	0 to10	300 mg or less	450 mg or more
Sodium intake	0 to 10	2400 mg or less	4800 mg or more
Food variety	0 to 10	8 or more different items in a day	3 or fewer different items in a day

FIGURE 1

Difference against mean for the food consumption data

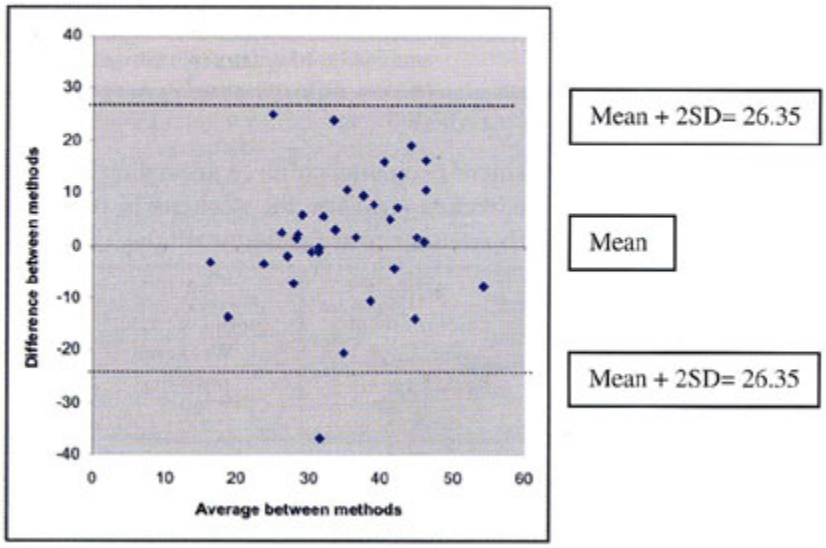

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TABLE 2

Healthy Eating Index (HEI)* of children registered in nonprofit day care center in two periods of time. During the weekdays and on the weekend (enrolling and after six-month attendance).

	Initial moment (enrolling) Weekdays Mean	Later moment (after six months) Weekdays Mean	Initial moment (enrolling) Weekend Mean	Later moment (after six months) Weekend Mean
HEI score	73.3 a*	90.1 b*	67.2	68.9 c*
Grain consumption	7.9	6.9	8.4	8.4
Vegetable consumption	2.1 a*	6.6 b*	1.3	1.6 c*
Fruit consumption	4.2 a*	9.3 b*	3.2	3.1 c*
Milk consumption	7.6	8.6	7.6	7.7
Meat consumption	9.0 a*	9.9 b*	7.4	8.8 c*
Total fat intake	9.9	10	9.3	9.0
Saturated fat intake	10	9.8	8.6	8.3
Cholesterol intake	10	9.7	9.9	10
Sodium intake	10	10	9.7	9.9
Food variety	2.6 a*	9.3 b*	1.8	2.1 c*

Subjects = 35 children *(Basiotis, 2002)
* Statistical difference ($p<0.05$) comparing components a and b
* Statistical difference ($p<0.05$) comparing components b and c

TABLE 3

Percentage distribution comparison of preschool children according to the HEI category (Basiotis, 2002) during the weekdays and on the weekend in two moments: at enrollment and after six-month attendance at the nonprofit day care center.

Diet quality classification	HEI Initial moment Weekdays (enrolling) %	HEI Later moment Weekdays (after six months) %	HEI Initial moment Weekend (enrolling) %	HEI Later moment Weekend (after six months) %
Poor diets	0	0	2.8	0
Needs improvement	82.8	5.8	91.4	91.4
Good	17.2	94.2	5.8	8.6

Discussion

This case study presents two limitations: the first is that the results obtained here can not be generalized and applied to public day care centers. The second is the fact that there is no

index in the country to assess the quality of the Brazilian diet; therefore we have applied an index which takes into consideration the American cultural standard.

According to Paterson et al. (1994) (11) HEI is a valid tool. This index is based on recent dietary recommendations making it possible to classify the diet quality in good, it needs improvements, or poor (12).

In table 2 the mean HEI has a significant improvement ($p<0.05$) of the initial moment compared with the later moment increasing from 73.3 to 90.1 achieving a good diet. Basiotis et al. (2002) (5) found a HEI of 75.7 among 2-3 year old children indicating that the diet quality needs improvement. These authors followed the trends of the index in the US population range during all the three years during which HEI was computed. In 1989, the mean HEI score was 61.5. In 1996 and 1999-2000, it was 63.4, only a 2.3 score increase since 1989. Among the factors which improved the HEI score were the saturated fat intake and the food variety (5). Pinheiro et al. (2005) (13) assessed the diet quality of school children (n=263) through the use of the HEI in the Chilean population. The mean HEI score was 58.4 and the components with low levels were the vegetable, fruit, milk and sodium groups. In Brazil, Fisberg et al. (2004) (14) applied the HEI to assess the diet quality of inhabitants from 1 to 60 years of age (n=50) in a city of the state of São Paulo and the mean HEI score was 51.5. According to Dwyer et al. (2002) (15) mean HEI score varies according to the state which is the focus of the study, being Minnesota the one which presents the highest score (64.8), then California (62.0), Texas (60.3) and Louisiana (57.3). The majority of the studies demonstrated that the diet quality of the population needs improvement.

Studies demonstrate that a diet with a large food variety is associated with longevity and the reduction in the risk of the major chronic diseases (16). One of the components assessed in the HEI is food variety. As it was demonstrated in table 2 there was a significant improvement in this component during the weekdays. There was an increase from 2.6 (the initial moment) to 9.3 (later moment). The diet during the week was considered good as regards the variety component, but it was not on the weekend and at enrolling because there is an inadequacy of consumption of all the food groups. Dwyer et al. (2002) (15) compared the diet quality of US American students who participated of the school lunch program with that of the non participants. The authors found a significant higher HEI score in the intervention group and also a higher score in all components (with the exception of the fruit consumption). The variety component also was a higher one. These results are similar to those found in this study demonstrating that at the day care center the children have more access to a wider food variety; hence having a higher HEI score during the weekdays.

Many studies have demonstrated a decreased consumption of the recommended fruit, vegetable and milk groups (17-19). In this study there was also a low score in the fruit, vegetable, milk and grain groups at enrolling and on weekends. There was a significant improvement in the consumption of fruits, vegetables and meat during the weekdays at the day care center as seen in the comparison of the initial moment and the later moment (table 2).

Similar findings are seen in the study of Lachapelle et al. (1989) (20) which compared the mean consumption of children of 11 years of age (n=549) during the weekdays and the weekend. The fruits, grains, milk and vegetables had a significant consumption decrease during the weekend. According to the authors these differences show the necessity to assess the weekends on the dietary assessment to avoid the overestimation of the food consumption and the diet quality. According to Nicklas et al. (1997) (21) the differences found in dietary

habits of children 10 years of age reflect the school impact on food consumption during the weekdays.

The World Health Organization (WHO) launched an initiative called «Global feeding, fitness activity and health strategy». This decision was approved by 192 countries including Brazil in May, 2004 (22). The aim is to prevent obesity and other chronic diseases linked to dietary habits. Among the recommendations of the global strategy there is a priority for the promotion of the consumption of fruits and vegetables. In the city of Rio de Janeiro (Brazil) a committee composed of several organizations and institutions works on this strategy. The group elected as its priority the increase of the consumption of fruits and vegetables by adopting the program «5-a day» to diffuse the WHO program (23).

The Secretary of Education of Rio de Janeiro together with the Instituto de Nutrição Annes Dias (Rio de Janeiro, Brazil) disseminated the program «5-a day» campaign by selecting the topic «Fruits and vegetables at least 5 servings a day» for the Semana da Alimentação Escolar (SAE) [School Feeding Week]. The selection of this topic shows the effort to promote the consumption of these food groups which contribute to promote health and prevent chronic diseases. This school feeding week campaign was introduced in the Brazilian public school net in 1959 and has the objective of complementing the actions to promote healthy dietary habits in the school environment (22).

Carlson et al. (2001) (24) assessed the HEI of American children in the 2-3 year old range (n=4011) and found 36% with a satisfactory diet quality while 60% demonstrated that it needs improvement. The diets achieved an improvement during the weekdays when compared with the weekend. During the week 94.2% of the children achieved a satisfactory diet quality. On weekends the percentage was only 8.6%, which demonstrates the impact of the day care center on the diet quality (table 3). The results revealed that the day care center did not have any influence on the children's weekend dietary habits.

According to Nicklas et al. (2001) (17) day care center's menus guarantee the access and opportunity to consume wide food variety. The authors also consider that schools have a great influence on the dietary habits. Bruening et al. (1999) (25) found that the diets consumed by the children at the day care center were superior in three nutrients (vitamin A, riboflavin, and calcium) and two food groups (milk and vegetables). The intake of fats and sugars was inferior.

Conclusion

The findings of the present study showed that the day care center had a positive impact on the food consumption of these children, by presenting the most crucial food groups, which were those of fruits, vegetables and milk. Another important finding was the fact of revealing that the initial moment is another crucial point.

Although there was a better quality diet during the week the study demonstrated that healthy dietary habits are not followed on weekends at home, which renders imperative the implementation of a work of nutritional education with the families so that changes in the children's food behavior can effectively occur. A day care center has to be a place to introduce nutritional education activities for parents and for the responsibles in order for them to improve the diets at home.

HEI permits adopting intervention strategies focusing on either specific nutrients or food groups. New studies are necessary to investigate children's diets because of the high incidence of diseases associated with inadequate dietary habits. Parents and the responsibles should be informed of the importance of healthy dietary habits for their children to have an adequate growth, thus preventing chronic diseases in adult life.

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