

Validation of a food frequency questionnaire for pregnant women attending primary care facilities

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Abstract

Introduction: The Food Consumption Frequency Questionnaire (FCFQ) is a tool for assessing food consumption. However, to be used in pregnant women, it must be submitted to validation. The food consumption of pregnant women can impact on maternal and child health, becoming a public health issue. The questionnaire applied during pregnancy can create parameters for better prenatal care.

Objective: To validate a FCFQ for pregnant women attended at primary health care units.

Methods: The Food Consumption Frequency Questionnaire and two 24-hour recall were applied to 155 pregnant women from the municipality of Montes Claros, Minas Gerais, Brazil. The questionnaire results were contrasted with the average of the two 24-hour recall using the chi-square test. The mean of the differences were estimated by limits of agreement. Pearson's correlation test and Intraclass Correlation Coefficient as well were used. Food consumption medians and quartiles were calculated.

Results: The value of estimate energy consumption and most nutrients was higher by the questionnaire. The concordance between the methods in the classification in quartiles of consumption was variable, being similar for 26.11% and opposite for 12.1%. After adjusting for energy, the correlation coefficient ranged from -0.144 (carbohydrate) to 0.337 (potassium). The questionnaire estimated values were approximately 1.94 higher than the 24 hour recall, corresponding to 20% higher for almost all nutrients.

Conclusion: The FCFQ showed to be a good instrument to be considered clinically as well as for research purposes in Brazilian pregnant women, this tool measures appropriately food intake which is fundamental for establishing health conditions during pregnancy, helping to assess the association between diet, nutrition and health.

Keywords: questionnaires, pregnant woman, validation studies, food consumption.

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Authors summary

Why was this study done?

This study was carried out with the perspective of validating an instrument for assessing food consumption for pregnant women. There is still a limited number of studies validating the use of Food Consumption Frequency Questionnaire for pregnant women in the different regions of Brazil. In view of the importance and the need for adequate methods of assessing food consumption, this questionnaire can be a valuable tool to be used in the surveillance of dietary practices during pregnancy in public health.

What did the researchers do and find?

The food consumption of 155 pregnant women attended at basic health units was assessed by the Food Consumption Frequency Questionnaire and the average of two 24-hour recalls was used as a reference method. The results indicated that the instrument showed evidence of validity for the investigated population.

What do these findings mean?

The Food Consumption Frequency Questionnaire showed to be a good instrument to be considered clinically as well as for research purposes with Brazilian pregnant women, this tool capable of properly measuring food intake is fundamental for establishing health conditions during pregnancy, helping to assess the association between diet, nutrition and health.

INTRODUCTION

Adequate nutrition during the gestational period may favor the development and fetal growth promoting a better pregnancy outcome^{1,2}. Decision making in the context of prenatal nutrition and definitions of actions to promote healthy eating for pregnant women should, however, be based on reliable information about their eating habits. For that purpose, specific nutritional assessment instruments for this group should be sought^{2,3}.

In nutritional epidemiological studies, the food consumption frequency questionnaire (FCFQ) is the most widely used method to estimate food intake. The FCFQ is an advantageous tool for monitoring eating habits and calculating the nutritional value of diets and possible nutritional deficiencies because, in addition to its relatively low cost, it makes it possible to gather information on a large number of foods and can be applied to large groups^{4,5}.

For a FCFQ to be an instrument capable of properly measuring food intake, validation is an important area of study. In a previous study, the FCFQ was considered a valid and reliable instrument to assess nutrient or food intake during pregnancy^{2,6-9}. The FCFQ must be adjusted and validated for use in the specific population where it will be applied, since the items that compose it need to consider ethnicity, customs, dietary taboos, food availability and socioeconomic conditions^{4,5}.

It is essential that this instrument is sensitive to estimate food consumption in this population, which may undergo changes in diet due to the physiological and metabolic adjustments that occurred during pregnancy^{10,11}. The lack of a specific instrument for assessing food consumption during pregnancy compromises the identification of dietary deficiencies or any association between diet and pregnancy results^{10,11} and, therefore, the need for accurate measures in this assessment.

Thus, this study aims to validate a food consumption frequency questionnaire for pregnant women attended at basic health units in the municipality of Montes Claros, Minas Gerais, Brazil.

METHODS

Study design and sampling

This is a cross-sectional study¹², conducted from May to July of 2015, with pregnant women attended at

15 Basic Health Units (BHU) chosen at random in the Municipality of Montes Claros, Minas Gerais, Brazil. The BHU are part of the primary health care network. The protocol and the Free and Informed Consent Term were previously approved by the Ethics and Research Committee of the State University of Montes Claros under protocol n^o. 911,577.

The sample composed of 155 pregnant women. The size of it was based on the recommendation of 100 pregnant women to validate food consumption assessment instruments^{13,14}. The exclusion criteria considered, maternal age below 18 years and any diagnosis of diseases that can alter food intake during pregnancy (for example, gestational diabetes, heart disease, kidney disease and hypertension).

Application of instruments and nutritional assessment

The pregnant women were approached in the waiting room for prenatal care at the BHU. The individual interviews were first based on the FCFQ and then on the 24-hours recall (24h-R), this sequence was established to prevent the response to the recall affects the response to the questionnaire. The second 24h-R was applied by telephone, after an interval of 15 days. The instruments for assessing food consumption were not applied after Sundays and holidays, meaning, atypical days.

The FCFQ applied was based on the version validated by Ribeiro *et al.*¹⁵. In this instrument, foods were split in seven groups: cereals and legumes, oils and fats, desserts and snacks, meat and eggs, milk and dairy products, vegetables and fruits and drinks. The instrument consisted of 52 items. The FCFQ offered seven consumption options for each food: never; less than once a month; 1 to 3 times a month; Once a week; 2 to 4 times a week; Once per day; Twice or more per day.

The monthly and weekly frequencies obtained from FCFQ were transformed to a daily basis, dividing by 30 and 7 days, respectively. This result was multiplied by the number of times the interviewee reported have ingested that food on the day, by the number of portions and by the weight of the portion to obtain daily consumption. The 24h-R consisted of reporting the food items consumed the previous day. A photo album was used to assist the

interviewees in describing the amount of food consumed¹⁶.

A pilot study with the application of the FCFQ and the two 24h-R was carried out with a sample of 10 pregnant women in order to practice and improve the procedures. In this phase, a researcher was trained to apply the instruments, following instructions on personal behavior and guidelines to conduct the interview. The data obtained in the pilot study did not integrate the final analysis.

A database was built containing the nutritional composition of foods based on the Brazilian Food Composition Table¹⁷ and the Chemical Food Composition Table¹⁸. For some foods, the composition was based on the consultation of labels, and for others it was necessary to search for recipes, identifying ingredients and quantities used in their preparation.

The consumption of energy and the following nutrients was evaluated: carbohydrates, proteins, lipids, saturated fats, monounsaturated fats, polyunsaturated fats, cholesterol, calcium, iron, potassium, retinol, vitamin B6, vitamin B12, vitamin C, vitamin D, thiamine, riboflavin, niacin, zinc and folic acid.

Statistical Analysis

For each item, the results of the FCFQ were compared with the average of the two 24h-R. Categorical variables were compared using the chi-square test. The average difference between the instruments and the limits of agreement (LOA) were calculated using the methodology proposed by Bland and Altman¹⁹. Pregnant women were classified into quartiles according to consumption.

The caloric and nutrient consumption data were transformed into logarithms for normalization before applying Pearson's correlation tests. Correlations were

applied to the raw data and also to the corrected data for total caloric consumption. The correlation adjusted for caloric consumption consisted of the correlation between the standardized residues obtained by the FCFQ and the 24h-R.

The validity of the FCFQ was also tested using the Intraclass Correlation Coefficient (ICC), both for raw nutrients transformed into logarithms and for nutrients corrected by energy. The medians and quartiles Q1 and Q3 of the nutrient consumption data were calculated for both instruments. The ratio of the estimated nutrients between the instruments was obtained by dividing the average of nutrients calculated on the FCFQ by the average calculated from the 24h-R. For this, the data was used transforming into logarithms and adjusted for energy.

Statistical analyzes were performed using SPSS Software version 19, considering a significance level of 0.05.

RESULTS

The sample consisted of 155 pregnant women aged 20 to 42 years (mean 29 years) and gestational age of 12 to 38 weeks.

The descriptive data of Table 1 illustrates the analysis of the mean differences and the LOA between the two instruments (FCFQ and 24h-R). The estimate of energy consumption and most nutrients was higher by the FCFQ, with exceptions of consumption of polyunsaturated fatty acid, vitamin D, riboflavin, niacin and zinc. The minor differences between the instruments were in the estimate consumption of iron, vitamin B6 and thiamine. LOA were wide for most nutrients.

Table 1: Average nutritional data of the diet of pregnant women (n = 155) based on the food consumption frequency questionnaire (FCFQ) and 24-hour recall (24h-R). Montes Claros, MG-Brazil-2015.

Energy and nutrients	FCFQ	24h-R	Average difference	LOAs*
Energy (Kcal)	4227.4	1997.3	2230.1	1184.3; 3276.0
Carbohydrate (g)	493.3	290.1	203.2	129.2; 277.1
Protein (g)	128.0	85.5	41.5	29.3; 53.7
Lipids (g)	656.0	70.1	585.9	-3.1; 1174.9
Saturated fatty acid (g)	44.4	24.8	19.6	15.2; 24.0
Monounsaturated fatty acid (g)	40.5	19.8	20.7	16.4; 24.9
Polyunsaturated fatty acid (g)	19.5	106.0	-86.6	-254.9; 81.8
Cholesterol (mg)	642.0	192.8	449.2	159.3; 739.1
Calcium (mg)	1932.0	598.5	1333.5	-253.5; 2934.4
Iron (mg)	23.1	22.0	1.1	-3.5; 5.7
Potassium (mg)	5321.0	2503.9	2817.1	2005.8; 3628.4
Vit. A; equivalent of Retinol (mcg)	647.6	214.4	433.2	366.3; 500.0
Vit. B6 (mg)	3.9	2.6	1.3	-1; 2.5
Vit. B12 (mcg)	9.6	2.4	7.2	3.1; 11.4
Vit. C (mg)	367.3	84.4	282.9	240.6; 325.1
Vit. D (IU)	664.4	1333.7	530.7	-186.8; 1248.3
Thiamine (mg)	3.7	2.1	1.6	1.1; 2.0
Riboflavin (mg)	6.3	74.1	-67.8	-130.6; -4.9
Niacin (mg)	50.2	67.1	-16.9	-55.3; 21.4
Zinc (mg)	16.2	25.3	-9.1	-26.6; 8.5
Folic acid (mcg)	646.3	316.9	329.4	245.0; 413.8

24h-R = two reminders registered 15 days apart; LOAs = Limit of agreements (mean difference \pm 1.96 * standard deviation of the difference).

The compatibility between the instruments in the classification of pregnant women in consumption quartiles was variable (Table 2). On average, the classification obtained by the two instruments was similar for 26.11% of the comparisons, and in 12.1% of them the classification quartiles were opposite.

The raw values of the Pearson Correlation coefficient for log data ranged from -0.012 (iron) to 0.178 (potassium) before adjusting for caloric consumption and from -0.144 (carbohydrate) to 0.337 (potassium) after adjustment (Table 3). The ICCs ranged from -0.022

(iron) to 0.297 (potassium) before adjustment and -0.337 (carbohydrate) to 0.504 (potassium) after adjustment. With the exception of the ICC for potassium, no other correlation had a coefficient greater than 0.320.

Table 4 presents median and quartile values (Q1 and Q3) of consumption estimates based on the FCFQ and 24h-R, as well as the ratio between the results obtained with the two instruments. It was found that estimates from FCFQ were approximately 1.94 higher than those from 24h-R, with values 20% higher for almost all nutrients, except for riboflavin and polyunsaturated fatty acids.

Table 2: Number of pregnant women classified in the same quartile or in opposing quartiles by the two methods (FCFQ and 24h-R). Montes Claros, MG, Brazil-2015.

Items consumed by pregnant women	Same quartil		Opposite quartil	
	n	%	n	%
Energy (Kcal)	30	20	23	15.3
Carbohydrate (g)	28	19	19	12.8
Protein (g)	45	30	17	11.3
Lipids (g)	46	30.6	19	12.6
Saturated fatty acid (g)	42	28	18	12
Monounsaturated fatty acid (g)	31	21.1	15	10.2
Polyunsaturated fatty acid (g)	50	33.3	22	14.7
Cholesterol (mg)	41	27.4	17	11.3
Calcium (mg)	39	25.9	16	10.7
Iron (mg)	40	26.7	16	10.6
Potassium (mg)	44	29.3	7	11
Vit. A – equivalent of Retinol (mcg)	47	31.3	10	6.7
Vit. B6 (mg)	32	21.3	15	10
Vit. B12 (mcg)	37	24.6	26	17.3
Vit. C (mg)	40	26.6	15	10
Vit. D (IU)	36	24	19	12.7
Thiamine (mg)	40	26.7	20	13.3
Riboflavin (mg)	36	24	18	12
Niacin (mg)	36	24	14	9.3
Zinc (mg)	38	25.7	21	14.2
Folic acid (mcg)	49	25.7	23	15.3

Table 3: Pearson and Intraclass Correlation Coefficients contrasting the FCFQ and 24h-R methods, for data transformed into logarithm (log) or adjusted according to energy consumption (by calories).

Consumed items	Pearson		Intraclass	
	log	Per calories	log	Per calories
Energy (Kcal)	-0.199	-	-0.410	-
Carbohydrate (g)	-0.220**	-0.144	-0.556	-0.337
Protein (g)	0.128	0.148	0.121	0.111
Lipids (g)	-0.122	0.056	-0.214	0.106
Saturated fatty acid (g)	0.080	0.133	0.148	0.234*
Monounsaturated fatty acid (g)	0.013	0.054	0.025	0.102
Polyunsaturated fatty acid (g)	0.029	0.078	0.047	0.145
Cholesterol (mg)	0.066	0.103	0.123	0.187
Calcium (mg)	0.069	0.055	0.122	0.103
Iron (mg)	-0.012	0.065	-0.022	0.122
Potassium (mg)	0.178*	0.337**	0.297*	0.504**
Vit. A – equivalent of Retinol (mcg)	0.088	0.076	0.161	0.142
Vit. B6 (mg)	0.045	0.099	0.086	0.180
Vit. B12 (mcg)	0.047	0.088	0.090	0.161
Vit. C (mg)	0.111	0.173*	0.211*	0.295**
Vit. D (IU)	0.160	0.077	0.230*	0.143
Thiamine (mg)	-0.059	0.091	-0.125	0.167
Riboflavin (mg)	-0.030	0.043	-0.048	0.083
Niacin (mg)	0.141	0.184*	0.213	0.311**
Zinc (mg)	0.145	0.141	0.223*	0.248*
Folic acid (mcg)	-0.069	0.116	-0.144	0.208*

* P= 0.05 ** P= 0.01.

Table 4: Median and quartiles (Q1 and Q3) of the estimated energy and nutrients based on the FCFQ and 24h-R.

	FCFQ	24hR	FCFQ/24hR*
Energy (Kcal)	3182.5 (2439.0; 4282.0)	1914.3 (1608.0; 2409.0)	-
Carbohydrate (g)	444.3 (354.2; 543.6)	275.4 (234.2; 357.2)	1.60
Protein (g)	112.5 (81.4; 127.1)	84.9 (71.1; 106.8)	1.50
Lipids (g)	114.9 (85.4; 162.7)	62.9 (47.4; 85.5)	1.87
Saturated fatty acid (g)	39.1 (27.8; 56.8)	23.6 (17.2; 29.2)	1.73
Monounsaturated fatty acid (g)	35.7 (23.3; 55.0)	16.8 (13.6; 24.6)	2.05
Polyunsaturated fatty acid (g)	17.8 (12.7; 25.5)	12.4 (8.1; 18.3)	1.02
Cholesterol (mg)	333.4 (225.7; 519.8)	165.2 (125.1; 250.5)	2.45
Calcium (mg)	1090.9 (740.3; 1401.8)	573.0 (398.0; 746.8)	1.95
Iron (mg)	21.6 (17.2; 27.7)	18.3 (13.4; 22.7)	1.25
Potassium (mg)	4640.6(3147.5;6475.5)	2349.8 (1713.6; 3122.3)	1.99
Vit. A - equivalent of Retinol (mcg)	584.2 (391.9; 815.5)	167.2 (92.7; 289.7)	3.10
Vit. B6 (mg)	3.5 (2.6; 4.9)	1.8 (1.2; 2.6)	1.39
Vit. B12 (mcg)	5.4 (3.5; 8.0)	2.3 (1.0; 3.8)	4.43
Vit. C (mg)	319.8 (191.4; 481.8)	55.7 (27.6; 124.3)	4.39
Vit. D (IU)	247.8 (163.5; 394.2)	116.9 (52.5; 208.0)	2.30
Thiamine (mg)	3.2 (2.4; 4.6)	1.7 (1.4; 2.5)	1.67
Riboflavin (mg)	3.7 (2.5; 5.1)	1.8 (1.2; 2.6)	0.73
Niacin (mg)	48.1 (35.1; 65.4)	31.3 (24.9; 44.8)	1.39
Zinc (mg)	14.8 (10.9; 20.4)	10.2 (8.3; 12.9)	1.36
Folic acid (mcg)	551.9 (433.15; 770.9)	304.0 (231.3; 393.0)	2.04

* FCFQ values in logarithm and 24h-R adjusted for energy consumption.

DISCUSSION

This study evaluated the validity of a food consumption frequency questionnaire for assessing food consumption of pregnant women attended at basic health units. The data obtained support a partial validation of the questionnaire. Considering the importance of validating FCFQ for pregnant women, the results can contribute to portray the eating habits of this population as well as support the development of more robust versions of FCFQ for Brazilian pregnant women.

In the analysis of agreement between the FCFQ and 24h-R instruments, wide limits of values were observed. These differences have been already mentioned in the scientific literature about questionnaire validation for the assessment of food consumption^{20,21}, and may be caused, in part, by the inability of some participants to estimate their own diet. This result suggests the refinement of the instrument or even in the application procedures in order to minimize this type of error.

In the classification of pregnant women in consumption quartiles for each item, the average percentage of agreement was about 26%, ranging from 19% for carbohydrate consumption to 33.3% for consumption of poly-unsaturated fatty acids. Higher percentages of agreement in the same quartile, in the order of 70%, were reported in the estimate of nutrient consumption of pregnant women attended by the National Health System – SUS (Sistema Unico de Saúde) in Ribeirão Preto, São Paulo, Brazil¹⁰.

Similar to our findings, an study in Rio Grande do Sul reported a classification in the same consumption quartile in 30% of pregnant women attended by SUS²⁰. Still, studies with the pregnant population are limited, but there are examples with adult populations that validate FCFQ with concordance of classification in the same quartile in the range of 36%²². Likewise, the proportion of classification in opposite quartiles found in 12% of pregnant women of our study is similar to that reported in a research that validated a FCFQ for adults²³.

The Pearson's correlation coefficients found were below expectations. Low correlation was also found in studies of validation of FCFQ for pregnant women in Rio Grande do Sul²⁰ and Ribeirão Preto¹⁰. However, the coefficients in general increased when consumption was corrected by energy consumption. This same technique applied to validation studies of food frequency questionnaires for adolescents²⁴ and adults²¹ increased the correlations.

However, caloric consumption correction does not always increase the correlation coefficients, as shown in the work of Isobe *et al.*⁸. Adjustment to caloric consumption can increase correlation coefficients when the variability of nutrients consumed is related to energy and can decrease when the variability of nutrient consumption is subject to systematic errors of under or overestimation of consumption²⁵.

In the present study, Pearson's correlation coefficient for data corrected for caloric consumption was on average 0.099 (from -0.144 to 0.337). In a study with American pregnant women, the correlation coefficients between FCFQ and recalls varied between 0.03 and

0.52²⁶, and in an investigation with pregnant women in the United Kingdom, they were higher, from 0.19 to 0.47²⁷.

The ICCs of the present study were higher than those of Pearson, and the average of 0.160 (from -0.337 to 0.504 for data corrected for consumption). But compared to other studies, they were low. The range of ICCs in a questionnaire validation study for Chinese pregnant women was 0.32 for food groups and 0.44 for nutrients. Correlation coefficients suitable for questionnaire validation are considered above 0.42²³, but in the present study this minimum value was obtained only for ICC, referring to potassium consumption.

Correlation values between instruments should be analyzed with caution as they can be changed depending on how the data is organized. In a similar study carried out in China²⁸ in pregnant women, higher levels of correlations were observed with the grouping of foods due to the similarity of nutrients or culinary use²⁸. The grouping of nutrients according to the types of food can assist in a broader investigation of those that should be reinforced in the diet of pregnant women.

In general, the estimates of consumption obtained for pregnant women by the FCFQ were higher than those obtained by the 24h-R. Previous study obtained similar results and suggest that this condition is motivated by the desire for social acceptance of pregnant women and idealization of healthy eating, which are more pronounced in this phase²⁰.

It should be considered that a limitation of the study was the low number of recalls used in the population studied. According to Baer *et al.*²⁶, when the number of 24h-R employed as a standard of comparison is low, the intra-individual variability in the estimation of energy and nutrients during pregnancy increases, reducing the agreement between the instruments. In addition, gestational age by quarters was not considered in the sample^{10,11}.

Another point to be highlighted is that it is necessary to certify the adequacy of the list of foods and the portions. The accuracy of 24h-R depends on the interviewee's memory and the ability to remember and report the foods and portions consumed and even using statistical procedures that aim to correct the correlation coefficients, the instrument will present common sources of errors when compared to the FCFQ. Still, in the instruments of food frequency estimation it is common to have an error of memory bias between one and another interview^{10,11}.

FCFQ validation studies seek to quantify the measurement errors of the instrument, which can occur between two instruments that measure the same exposure, for a single instrument applied differently or even between different populations. Still, the development of a FCFQ is a dynamic process that requires constant improvement. In the present study, the FCFQ was based on an instrument originally validated for adults and adapted for the region. Therefore, the possibility of other adjustments to this questionnaire should be considered in order to better represent the set of foods consumed by the population studied.

The FCFQ is the most feasible tool to identify the relationship between diet, cardiovascular disease and diabetes²⁵. For pregnant women, this instrument can be valuable in detecting deficiencies in the consumption of specific foods, thus indicating the existence of nutritional problems and minimizing the incidence of diseases.

In addition, the FCFQ can be used to identify the dietary patterns of a population, currently considered a tool that has the potential to be used in assessing the relationship between diet and pregnancy results, in a comprehensive and complementary way²⁹.

However, its application for Brazilian pregnant women is still little explored, and most of the works that adopt the FCFQ use it without validating it for this specific population. An instrument capable of properly measuring food intake is a fundamental tool for establishing health conditions during pregnancy, helping to assess the association between diet, nutrition and health.

In this sense, the study by Oliveira *et al.*³, who was a pioneer in the validation of FCFQ for pregnant women

in Brazil, should be highlighted. Based on it, analyzes of reproducibility and relative validation of the FCFQ as developed in this study are still in progress and will allow the assessment of its accuracy for investigating the usual food intake of this population group.

Bearing in mind that food intake is not estimated without error, it is necessary to constantly improve instruments that measure it so that distortions between the instruments used are minimized.

In the area of maternal and child health, specifically in the assessment of growth and development, there is an increasing number of questionnaires available and, in this perspective, validation is an important field of study³⁰⁻³². The assessment of the quality of the instruments is essential for the legitimacy and credibility of the research results to support health professionals in their clinical practice.

Thus, this instrument has the potential to be used to assess food consumption in pregnant women in Brazil.

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Resumo

Introdução: O Questionário de Frequência de Consumo Alimentar (QFCA) é uma ferramenta para avaliação do consumo alimentar. No entanto, para ser empregado em gestantes, deve ser submetido a validação. O consumo alimentar de gestantes pode impactar na saúde materno-infantil, se tornando uma questão de saúde pública. O QFCA aplicado na gestação pode criar parâmetros para melhor assistência pré-natal.

Objetivo: Validar um Questionário de Frequência de Consumo Alimentar para gestantes atendidas em unidades básicas de saúde.

Método: O QFCA e dois recordatório 24 horas (R24h) foram aplicados a 155 gestantes de Montes Claros, MG. Foram contrastados os resultados do QFCA com a média dos dois R24h usando o teste de qui-quadrado. A média das diferenças foram estimadas pelos métodos por limites de concordância. Utilizou-se o teste de Correlação de Pearson e Coeficiente de Correlação Intraclasse (CCI). Foram calculados medianas e quartis do consumo alimentar.

Resultados: A estimativa do consumo de energia e da maioria dos nutrientes foi maior pelo QFCA. A concordância entre os métodos na classificação em quartis de consumo foi variável, sendo semelhante para 26,11% e oposta em 12,1%. Após o ajuste de energia, o coeficiente de correlação variou de -0,144 (carboidrato) a 0,337 (potássio). As estimativas do QFCA foram aproximadamente 1,94 maiores que as do R24h, correspondendo a valores 20% superiores para quase todos os nutrientes.

Conclusão: O estudo mostrou evidências de validação do QFCA, sugerindo que é instrumento potencial para ser usado na avaliação do consumo alimentar em gestantes.

Palavras-chave: questionários, gestantes, estudos de validação, consumo de alimentos.

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