Revista Brasileira de Pesquisa em Ciências da Saúde

ORIGINAL ARTICLE

Evaluation of the consumption of omega 3 fatty acid in Brazilian pregnant women: a cross-sectional study

Avaliação do consumo de ácido graxo ômega 3 em gestantes brasileiras: um estudo transversal

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ABSTRACT

Objective: To evaluate the consumption of essential fatty acid ω3 in pregnant women. **Methods:** Cross-sectional, descriptive, and quantitative study conducted with 90 pregnant women out of four Basic Health Units in Tianguá, Ceará, Brazil. Dietary intake and the use of fatty acid supplements based on ω3 lipids were verified. The values of these nutrients were estimated through a food frequency questionnaire and the food chemical composition table of the Brazilian Institute of Geography and Statistics. The amounts of fatty acids and their food sources were shown in grams and percentages in tables and graphs. **Results:** 70% of pregnant women had daily consumption of this family of essential fatty acids as recommended by the Institute of Medicine. It was also observed that 100% of pregnant women did not use any supplement of ω3 nor did they consume good dietary sources of this lipid. **Conclusion:** Pregnant women had dietary use of ω3 in accordance with the international recommendation without supplementation. Soybean oil was the most consumed source of this ω3 fatty acid, possibly justified by low cost and easy access, a fact not verified in the study. Socioeconomic conditions were suggested because they are determinant in the lack of access by pregnant women to good food sources of ω3, as salmon, tuna, and fish oil. It is suggested to continue to investigate and deepen other aspects present in pregnant women (physical, anthropometric, dietary) and the actions performed by the nutritionist during prenatal care, especially in intake of ω3.

RESUMO

Objetivo: Avaliar o consumo do ácido graxo essencial ω3 em gestantes. **Métodos:** Estudo transversal, descritivo e quantitativo realizado com 90 gestantes de quatro Unidades Básicas de Saúde do município de Tianguá, Ceará, Brasil. Foram verificados o consumo dietético e o uso de suplementos à base de lipídios ω3. Os valores desses nutrientes foram estimados através de um questionário de frequência alimentar e pela tabela de composição química de alimentos do Instituto Brasileiro de Geografia e Estatística. As quantidades de ácidos graxos e suas fontes alimentares foram expostos em gramas e em percentuais nas tabelas e gráficos. **Resultados:** 70% das gestantes apresentaram consumo diário de ácidos graxos ω3 de acordo com o recomendado pelo *Institute of Medicine*. Observou-se também que 100% das gestantes não usavam qualquer suplemento de ω3 e nem ingeriam boas fontes dietéticas desse lipídio. **Conclusão:** As gestantes apresentaram uso dietético de ω3 de acordo com a recomendação internacional sem suplementação. O óleo de soja foi o alimento fonte desse ácido graxo ω3 mais consumido, justificado possivelmente pelo baixo custo e fácil acesso, fato não verificado no estudo. Condições socioeconômicas foram sugeridas por serem determinantes no não acesso pelas gestantes a boas fontes alimentares de ω3, como o salmão, o atum e o óleo de peixe. Sugere-se continuar a investigar e aprofundar outros aspectos presentes nas gestantes (físicos, antropométricos, dietéticos) e as ações desempenhadas pelo nutricionista durante o pré-natal, especialmente, na ingestão de ω3.

ARTICLE HISTORY
Submitted: 9 May 2021
Approved: 16 April 2022
Published: 27 June 2022

KEYWORDS
Fatty acids, omega-3; Alpha-Linolenic Acid; Pregnant Women; Food Consumption

Introduction

Pregnancy is a physiological process characterized by several changes that occur in a woman's body, from hormonal to physical changes. In this life cycle is essential to pay special and comprehensive attention to the mother-child binomial, that is, to the health of the woman and the fetus, highlighting the regular profile of nutrients acquired from the balanced consumption of food. Thus, a healthy diet with an adequate intake of macronutrients and micronutrients is essential during this period, to also prevent physiological complications and maternal and child diseases[1,2].

Lipids are macronutrients that have enormous functional and chemical diversity and are associated with a harmonious pregnancy. They are the main ways of storing potentially energetic molecules for many living organisms, including humans. These organic compounds are mainly represented by hydrophobic carboxylic acids, fatty acids, and important biological components for the development of the fetus, as they participate in the structure of cell membranes, in bioenergetic activity, and are precursors of many bioactive substances with intracellular functionality[3,4].

The daily dietary recommendation of total lipids for pregnant women is 20% to 30% of their total energy value, considering the presence of saturated, monounsaturated, and polyunsaturated fatty acids – PUFAs, whether from the omega 3, 6, or 9 families. The importance of PUFAs for human survival, the Institute of Medicine (IOM) has recommended the consumption of 13 g/day of these omega 6 fatty acids and 1.4 g/day for omega 5 fatty acid[3].

The adequate consumption of the essential fatty acid omega 3 – ω3, during the gestational period, provides numerous benefits for the pregnant woman and the fetus, being decisive in the gestation period and the prevention of depressive symptoms in the pregnant

woman. Furthermore, this lipid can ensure functional excellence in fetal growth, brain development, and visual acuity; and decrease the inflammatory response in the child, especially when the pregnant woman ingests very long-chain polyunsaturated fatty acids[2].

Considering the importance and benefits of ω3 consumption for good gestational development, the following question was elaborated: is the dietary intake of omega 3 in pregnant women in accordance with what is recommended?

The present investigation aimed to evaluate the consumption of ω3 essential fatty acid in a group of pregnant women followed up at Unidades Básicas de Saúde (UBS), in the city of Tianguá, Ceará.

Methods

It consisted of a cross-sectional study carried out in four UBS in the municipality of Tianguá, Ceará, with pregnant women who met the following inclusion criteria: gestational trimester between the 1st and 3rd; age between 20 and 40 years old; nulliparous, primiparous or multiparous states; with any level of education; and with acceptance of the participation in the research after reading and signing the Free and Informed Consent Form. Those who did not complete the survey due to withdrawal were excluded. As the UBS assisted 115 pregnant women, considering a sampling error of 5% ($p<0.05$), a sample number of 90 pregnant women (n=90) was defined, according to Fontelles et al.[6], to participate in the research. The study was carried out after being analyzed by the Research Ethics Committee of the University center INTA and approved according to no. 2.596.646/2018 and CAAE 82746518.9.0000.8133.

Data collection was carried out between April and July 2018, in which dietary intake and ω3 supplementation were evaluated through the application of a food frequency questionnaire - FFQ. When using this tool, information could be obtained in two ways: the direct interview, in which the person being evaluated reports to the interviewer how frequent the dietary consumption of each listed product is; and the self-registration, in which the investigated person writes down his food consumption[7]. In this work, the questionnaire was applied in the form of a direct interview by an academic from the 9th period of the Bachelor's Degree in Nutrition, supervised by a professor nutritionist.

The interview began after the researcher had introduced herself to each pregnant woman in the UBS waiting room, on the day established for the appointment, in each of the four UBS. At this point, the research was explained. Pregnant women who were interested were instructed to read and sign the informed consent and were given a copy of this document. After signing the informed consent in a private room/office, the assessment was performed using the FFQ. Upon entering the room, the interview began with the researcher asking the questions and filling in the FFQ according to the pregnant woman's answers.

The answers obtained by the FFQ were inserted into spreadsheets for the presentation of the main results and discussion. Foods whose consumption was reported less than once a week ended up being disregarded from the research, because, in this case, the daily intake value of ω3 was considered negligible. The values of these fatty acids were calculated in grams (g) for each 100g of food source. Then, the total amounts of ω3 consumed by pregnant women (and per food) were determined by the direct sum of each. The percentages of food and fish most consumed were also calculated. The percentages of ω3 consumed were found and classified into two groups: those with values lower than those recommended by the IOM; and those with expressions greater than what is stipulated by the IOM.

The data were analyzed considering the food composition table made by the Brazilian Institute of Geography and Statistics - IBGE8 from the Family Budget Survey - FBS 2008-2009. The IBGE table took into account the Brazilian Food Composition Table – TACO, prepared by the Center for Studies and Research in Food at the State University of Campinas – NEPA/UNICAMP[9]. However, it was necessary to complement the TACO, since it does not include all the foods mentioned in the FBS, various regional preparations, such as “feijoada”, “mocotó”, oxtail, and the various forms of preparation for meats, vegetables, etc. Furthermore, the composition of meats, vegetables, rice, and beans, all cooked, and available at TACO, does not include the addition of any type of ingredients, such as salt, oil, and condiments[8].

For some foods, it was observed that the amount of ω3 contained in the IBGE table presents a significant difference in value when compared to TACO, as the second disregards some ingredients in the preparation. Therefore, a comparison was made between the amount of ω3 present in the IBGE table and TACO.

The FFQ applied was divided into the following categories: soups and pasta; meat and fish; milk and derivatives; legumes and eggs; rice and tubers; greens and vegetables; fats; fruits; drinks; bread and cookies; and seeds and oilseeds. In all, the questionnaire included 120 foods, considering the method of preparation (cooked, roasted, among others). Thus, the participants answered which foods they consumed, the frequency of consumption, and the size/volume of the ingested portion in grams (g) or milligrams (mL). In the tables of TACO and IBGE, the reference values of ω3 in each food are given, justifying how the daily consumption (DC) and the value of ω3 ingested by the pregnant women could be obtained. Thus, the DC of

each food could be determined by the expression DC = (Ns x P) / D, where Ns is the number of times the food is consumed in the week; P is the amount of the portion consumed in g or mL; and D refers to the number of days in a week, that is, D=78.[9].

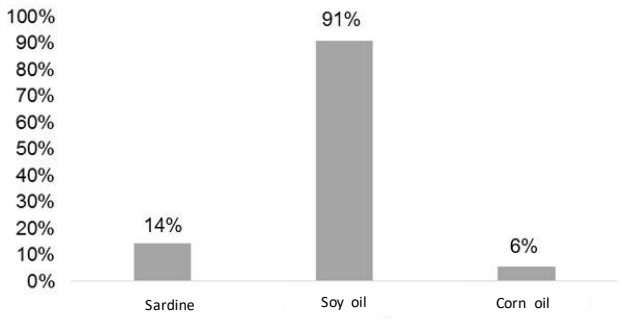
The value of omega 3 consumption (Cω3) obtained from each food was determined according to the formula Cω3 = (DC x RV) / 100, where RV is the reference value of ω3 for each 100g of food in the tables. Therefore, the Cω3 value of each pregnant woman was obtained by adding the intake of this fatty acid from each food[9].

Data were presented in tables and graphs, prepared using software Excel 2016. However, unfortunately, the age, weight, and height of pregnant women were not included, as they were lost during data analysis.

Results

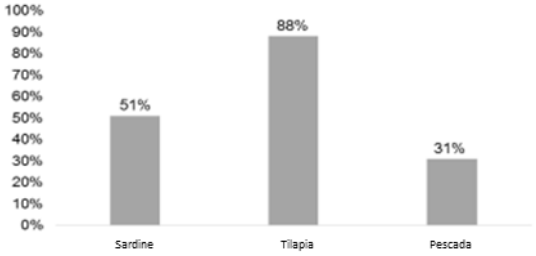
Figure 1 presents data from the main sources of ω3 consumed by the pregnant women interviewed. Of the fish that are considered a source of ω3, only sardines are consumed by pregnant women.

Figure 1. Percentage of consumption of the main food sources of omega 3 by pregnant women (n=90). Tianguá, Ceará, Brazil. 2018



It was observed that 61.1% of the participants did not consume any type of fish. Therefore, only 35 pregnant women have fish in their diets, mainly during some days of the week. Figure 2 shows a graph of fish consumption by pregnant women, highlighting the three most accessible types in the region. Thus, the highlight was the expressive food use of tilapia, a captive freshwater fish.

Figure 2. Fish consumed by pregnant women (n=35). Tianguá, Ceará, Brazil. 2018.



The amount of ω3 in grams, present in each 100g of the edible part of the fish that the pregnant women reported using, considering the method of preparation, was as follows: canned sardines =0.99; fried sardines = 0.43; hake =0.41; fried freshwater fish =0.19; and cooked freshwater fish =0.02. The ω3 values of the first three fish were taken from TACO (NEPA, 2011) and the remaining two from the IBGE table (2011). The value of ω3 in tilapia was not specified in the tables since, in the IBGE table, for example, there is a general quantity of this fatty acid for freshwater fish.

Table 1 shows some foods consumed by pregnant women whose values of ω3 present a considerable difference between the IBGE table and the TACO.

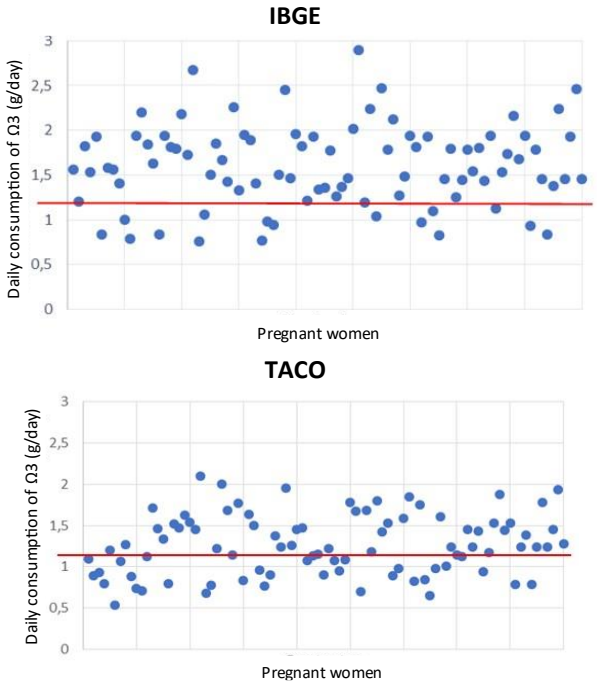
Table 1. Amount of ω3 (g) for each 100g of foods contained in the IBGE and TACO tables.

Food	IBGE	TACO
Cooked beef	0,16	0,02
Fried Beef	0,34	0,03
Pork chop	0,11	0,32
Sausage	0,32	0,11
Ham	0,16	0,04
Mortadella	0,44	0,28
Canned sardines	0,50	0,99
Hake	0,19	0,41
Mozzarella cheese	0,21	0,08
Curd cheese	0,26	0,11
Fried egg	0,45	0,33
French fries	0,93	0,30
Boiled potato	0,01	0,30
Vegetable salad with mayonnaise	0,93	0,36

NEPA (2011); IBGE (2011).

The daily consumption values of ω3 of the interviewed pregnant women according to the IBGE table and the TACO are presented by the scatter plots given in Figure 3.

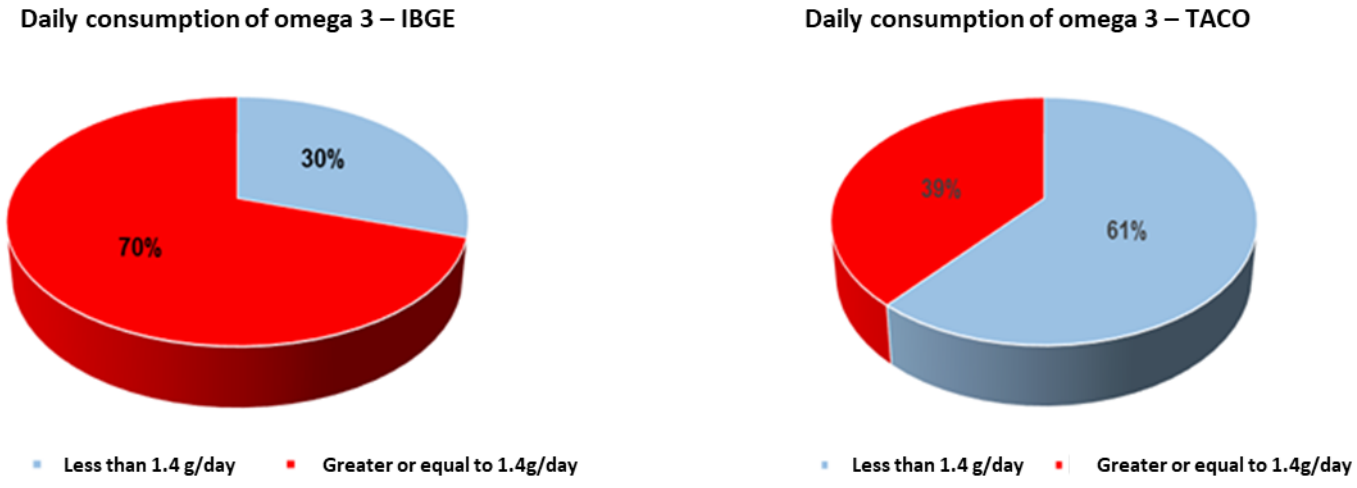
Figure 3. Dispersion of the daily consumption of ω3 (g/day), according to the IBGE and TACO Tables by pregnant women (n=90). Tianguá, Ceará, Brazil. 2018



The figure above shows that the average consumption of ω3 of the interviewed pregnant women was 1.60 g/day in the IBGE table, with a minimum of 0.76 g/day and a maximum of 2.90 g/day. Judging from the TACO values, the average consumption was 1.26 g/day, with a minimum of 0.54 g/day and a maximum of 2.10 g/day.

Considering the information via the IBGE table, 63 pregnant women had a daily consumption of ω3 equal to or greater than the recommended 1.4 g/day. Thus, 27 pregnant women had a daily consumption of ω3 lower than recommended, as illustrated by the graph in Figure 4. Using the TACO, 35 pregnant women had consumption according to the recommended, while 55 pregnant women showed consumption below 1.4 g/day, as also shown in Figure 4.

Figure 4. Percentage distribution of daily consumption of ω3 by pregnant women (n=90) considering the IBGE Table and TACO. Tianguá, Ceará, Brazil. 2018



Discussion

In this study, high consumption of vegetable oils by pregnant women was observed. However, vegetable oils have greater amounts of linoleic acid (linoleic acid, LA), a component of the ω6 family, than alpha-linolenic acid (ALA), representative of ω3. This situation is related to the increased consumption of ultra-processed foods, a factor that reduces the food and nutritional quality present in the diets of pregnant women[10]. Within this context, Gibson, Muhlhasler and Makrides[11] and Santos et al.[12] states that ALA is converted into eicosapentaenoic acid (eicosapentaenoic acid, EPA) and docosahexaenoic acid (docosahexaenoic acid, DHA), as there is competition between LA and ALA for delta-6-desaturase enzyme that converts LA into arachidonic acid (AA) and ALA into EPA and DHA. Therefore, these researchers claim that diets low in ω6 allow better endogenous conversion of alpha-linolenic acid to EPA and DHA; and allow better accumulation of ω3 in the tissues.

In this study, although consumption of ω3 was adequate to the IOM standard in 70% of the pregnant women using the IBGE table, in only 39% of the calculated using the TACO, the ingested omega 3 values were following the IOM. Furthermore, as it was not the objective of this study to evaluate the consumption of ω6, it was not possible to verify the relationship with ω3.

The presence of tilapia, the type of fish most consumed by the sample evaluated, is something alarming, as the IBGE table showed that this food has the lowest amount of ω3, but is rich in minerals and vitamins such as potassium, phosphorus, selenium, cobalamin, pyridoxine, and niacin. Tsujii[13] states that the lipid quality of fatty acids in Nile tilapia (Oreochromis niloticus) raised in ponds, tilapia farming, can improve the ω6/ω3 ratio by increasing the diet of these fish. However, the greater consumption of tilapia in Tianguá is related to the regional and socioeconomic aspects of pregnant women, as saltwater fish are more expensive than freshwater fish since the city is located in a mountainous region, far from the coast. In addition, the other fish rich in ω3 come from coastal regions (or from other countries) and the fluctuation of the dollar in imports and transport are other factors that contribute to the higher cost of this food.

Gomes et al.[14] comments that pregnant women still consume foods fried in vegetable oil, especially in snacks and during the first trimester of pregnancy. When vegetable oils are used for frying, the concentration of polyunsaturated fatty acids is reduced and the concentration of saturated fatty acids rises[15] and changes if used improperly, reducing their quality and beneficial effects on health, is recommended to increase the frequency of exchange. of oil in frying, not reusing it in other foods[16]. In this research, it was not possible to assess the oxidation and conditions of the vegetable oil consumed, but the pregnant women who reported consuming them (at least 5 mL) used them every day of the week to fry, sauté and cook food. There was no direct consumption of this amount of oil, only indirectly through the reports of the participants of this study when preparing meals, which were then divided with the other members of the family group.

Curcho[17] analyzed the concentration of ω3 in fish commercially available for consumption in the municipalities of Cananéia and Cubatão (coast of Sao Paulo), such as dimples, “perna-de-moça”, hake, sardines, sea bass, and mullet. Large variations in ω3 concentrations were identified within the same species and between different species, but sardines had the highest concentration index of this lipid. However, in the present study, the concentration of fatty acid contained in foods via FFQ was not evaluated in laboratories but estimated indirectly.

Vasconcelos et al.[18] investigated the diets of pregnant women in the city of Botucatu – SP and identified the average consumption of alpha-linolenic fatty acid of 1.8 g/day - a minimum of 0.14 g/day and a maximum of 6.97 g /day. These authors found that 32.5% of pregnant women ingested ω3 below the recommended 1.4 g/day. The researchers did not use food composition tables, but the Nutrition Data System, 2010 version, University of Minnesota, United States. Another issue addressed by the researchers was associating socioeconomic conditions with inadequate consumption of ω3, especially for pregnant women from lower social classes. Thus, there was a similarity between the study of these researchers and the non-consumption of ω3 by pregnant women in Tianguá, considering the IBGE table, despite the use of indirect methods in two very different countries with the United States and Brazil.

Judge et al.[19] carried out a study on the dietary intake of DHA by North American pregnant women. The researchers observed that pregnant women who consumed the fish oil capsules with 300 mg of DHA had fewer symptoms of postpartum depression when compared to the group that did not receive DHA. In the case of the current study, none of the pregnant women supplemented the diet with ω3, as the participants were not in the habit of consuming any nutritional supplements during pregnancy, nor were they encouraged by health professionals and family members; nor did they have the financial means to maintain the consumption of these fatty acids until the end of pregnancy.

Nishimura et al.[20] evaluated the fatty acid composition of breast milk in women who attended five UBS in Ribeirão Preto – Sao Paulo. Low levels of DHA in breast milk can be observed in women who lived in the city and, according to the dialectic of the literature, the findings were considered one of the lowest in the world. The concentration of EPA was higher than that found in previous studies in Brazil. In addition, high concentrations of trans fatty acids present in this mammary secretion

were also observed. Unfortunately, in the pregnant women in this study, the determination of DHA and EPA was not performed as it was not part of the research design.

The study carried out by Magalhães[21] evaluated the consumption of ω3 in 92 pregnant women between the 32nd and 40th week of pregnancy, the period of greatest need for this fatty acid for fetal brain development. The research found that pregnant women without nutritional monitoring and consumption of supplements had a low intake of EPA and DHA. Despite the similar sample size between the study by Magalhães and this one, again the amount of EPA and DHA was not determined in this study.

Given the importance of ω3 for the functioning of the uteroplacental system and the development of the nervous and visual system of the fetus and infant, it can be said that the daily presence of foods that are sources of this fatty acid must be guaranteed in the pregnant woman's diet[22,23]. It was observed, through the result of the FFQ, that the participants of this research did not consume good dietary sources of ω3. Even so, considering the IBGE table, the average daily consumption of ω3 by most pregnant women reached the IOM recommendation of 1.4 g per day.

As this was considered the first study to identify the dietary consumption of these lipids in this region of Ceará to be carried out by an academic with a bachelor's degree in Nutrition, it served as a basis to deepen, in a more intense way, the next investigations on the subject, using: a greater number of participants according to the plurality of ages; basic physical conditions, such as measuring blood pressure, temperature, pulse; anthropometric aspects, such as pre-gestational weight, current weight, height, body mass index; all of this can be obtained through the pregnant woman's card and medical records at the UBS. In addition, it is necessary to deepen the dietary assessment through the FFQ associated with another method such as a food record or 24-hour recall on alternate days including a weekend. Also, the use of a laboratory evaluation, especially of triglycerides, total cholesterol, and fractions, could collaborate for better results and minimization of biases.

Another limitation was the failure to collect information on the socio-economic aspects of the participants in this study. With this, it would be possible to affirm that these conditions could be decisive for pregnant women to have access to good sources of ω3 such as salmon, tuna, and fish oil.

Finally, the presence of dietary and nutritional guidance to be implemented in pregnant women throughout the prenatal period was also not verified. Therefore, verifying the accessibility of pregnant women to the nutritionist and the educational actions performed by this health professional during this cycle of these women's lives could be implemented in other studies, highlighting the impact performed by this bachelor on the consumption of ω3 by pregnant women.

Conclusion

The pregnant women interviewed, although not supplemented and not consuming good food sources of ω3, showed an intake of this fatty acid according to the international recommendation. As the first study in the country of Ceará state covering pregnant women and ω3 intake, it will serve as a basis for other research involving this theme, bringing physical, nutritional, immunological, metabolic, and even behavioral benefits to the mother-child binomial during pregnancy and the puerperium.

Conflict of interest

The authors declare that there is no potential conflict of interest.

Funding

There was no funding or supply of equipment and materials.

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