Currently, the consumption of Omega 3 (w3) and 6 (w6) has been drawing attention, since they are fundamental for various functions in the body. They act in equilibrium and in an antagonistic way, where w3 can suppress the inflammatory response and w6 increases this process. However, when this consumption is disproportionate (increased consumption of w6), suppression of the modulation of the inflammatory response can be inhibited. This study aimed to collect data by means of an integrative review of the literature on the consumption of omega w3 and omega w6 fatty acids in Brazil. The search strategy was delineated in the databases of Scientific Electronic Library Online (SciELO) and Medical Literature Analysis and Retrieval System Online (MedLine). In the search process, the Boolean operator AND was used in the association of the following descriptors: Fatty Acid; Omega-3 fatty acids; Omega-6 fatty acids; Chronic diseases. The reference were studies published in the last seven years, resulting in the final sample of 10 articles. Based on the results, w3 has the ability to help prevent the onset of chronic diseases by modulating the suppression of inflammatory components and prevent cardiovascular diseases. However, the consumption of Omega 3 by the Brazilian population is still far from the indication parameters. Moreover, the ratio between w6 and w3 is quite disproportionate to the recommendations indicated by the world’s health organizations.

**Key words:** Ácidos graxos; Ácidos graxos ômega-3; Ácidos graxos ômega-6; Doenças Crônicas.
INTRODUCTION

The consumption of foods rich in fats provides essential nutrients for physiological maintenance. In addition, foods rich in lipids present different types of vitamins that use fat as a property to be absorbed, as in the case of the liposoluble vitamins (A, D, E and K). The lipids are important to complement the total calorie rate and function as energy reserve for food disturbances.

The fats are found in different foods, presenting several variations of concentrations in different food classes. However, they have different classifications according to the double bonds (unsaturations) between the carbon chains (monounsaturated, poly-unsaturated). Saturation is when the chain has no double bonds. Still, the size of the carbon chains determines whether the fatty acids (FA) have short, medium, long and very long chain.

Omega 3 and 6 fatty acids represent two distinct classes of polyunsaturated FA, w6 (linoleic and arachidonic) and w3 (α-linolenic acids, eicosapentaenoic-EPA and docohexaenoic-DHA). They can be found in the same food in different concentrations, however, their quantities must be controlled, highlighting the increase in the consumption of w3 fatty acids and reduction of w6.

The physiological effects after the consumption of these types of lipids are analyzed in the context of public health. Each type has recommendations for consumption in different quantities. Currently, the proportion in the consumption of omega 3 (w3) and 6 (w6) has been drawing attention, since they are fundamental for many functions in the body. However, the deregulation in the consumption of these fatty acids is a factor that contributes strongly to trigger various chronic diseases.

Omega 3 and 6 fatty acids have a connection with the immune system. Omega 6 is capable of synthesizing eicosanoids from the cell membrane and is responsible for triggering and modulating some of the immune responses through the activation of components of the immune system (macrophages, lymphocytes). However, they both act in balance and in an antagonistic manner: w3 can suppress this response and w6 increases the inflammatory process. Nevertheless, a disproportionate consumption (increased consumption of w6) can inhibit the suppression of the modulation of the inflammatory response.

The World Health Organization (WHO) recommends a consumption proportion of w6:w3 until 5:1; however, the diets in Western countries differ from this recommendation due to their high consumption of industrialized products rich in Omega 6 fatty acids, which is essential for the body, but, in high concentrations, tend to generate chronic inflammation conditions in the individual.

The effects on the consumption of Omega 3 are being extensively studied and the benefits have been highly disseminated to the population in an attempt to awaken them the interest in seeking food containing with it. The main benefits of w3 fatty acids found in the literature are: reduction of cardiovascular diseases, reduction of chronic inflammation and onset of non-communicable chronic diseases (NCCD).

In this way, the guiding question was: what is the relationship between the consumption of omega w3 and w6 and non-transmissible chronic diseases?

In Brazil, the high consumption of w6 is rooted in current conventional diets. For this reason, the inflammatory state increases and, consequently, this factor is an adjuvant in the development of NCCD. Since normal physiological parameters for the consumption must be within a proportion for the fatty acids to act in cohesion.

In Brazil, the high consumption of w6 is rooted in current conventional diets. For this reason, the individual has a deregulation in the inflammatory condition, since the consumption should be present in a proportion where a fatty acid is able to perform its physiological effect and keep the body in normality.

Therefore, the objective of this study was to raise data through an integrative review of the literature on the consumption of omegas 3 and 6 fatty acids in Brazil and make possible associations with chronic diseases.

METHODS

This study is an integrative review of literature, whose search strategy was outlined in the databases Scientific Electronic Library Online (Scielo) and Medical Literature Analysis and Retrieval System Online (Medline), via the Virtual Health Library (VHL). The descriptors were defined by using the DeCS (Health Sciences Descriptors), a dictionary of indexing of terms created by Bireme. The search was performed between March and November, 2017.

In this process, the Boolean operator AND was used in the association of the following descriptors: Fatty Acids; Omega-3 fatty acids; Omega-6 fatty acids; Chronic Diseases.

Then, there was the screening of the studies identified by reading the abstract. For this, a matrix spreadsheet was used to control all articles found in the databases, with the following discrimination: author and year, title, journal, sample, country, main findings, conclusion, database, reason for exclusion.

Subsequently, inclusion and exclusion criteria were applied, discarding duplicate abstracts. The inclusion criteria of the articles were: 1) being fully available; 2) Studies conducted in Brazil; 3) articles published in peer-reviewed journals and 4) published in the last seven years (2011-2017). This period was established due to the scarcity of content in the literature regarding the research subject. The exclusion criteria were article that were not original, dissertations and monographs.

The articles that remained in the sample after applying the criteria for identification and selection were printed and analyzed by means of a critical reading of the study in its entirety. After this, the main points of approach of these studies were highlighted regarding their relevance to this review, since the studies were still subject to being removed from the research. Then, the studies that showed an important outcome for this study remained in the sample, thus completing the step of eligibility and inclusion in the final results.
RESULTS

After applying the aforementioned descriptors, 84 articles appeared, referring to the association of searched terms. After assessing the matrix spreadsheet, deleting duplicates and applying inclusion and exclusion criteria, the remaining 12 works were printed for reading in its entirety. Of these, two articles were excluded because they did not fit the research theme, leaving 10 studies. This final sample had 10% of gray literature, since there is a thesis of great importance for the development of this review. Figure 1 shows the search and selection process.

Finally, for presenting the results, these articles were entered in a spreadsheet, discriminating the following items: authors, year, title, type of study, sample and main findings. Subsequently, there was a descriptive analysis of the sample and qualitative analysis of the results of evaluations, followed by discussion of the material (Table 1).

DISCUSSION

Currently, the population has had a more conscious perception about the consumption of Omega 3 (w3), awakening the desire to check the consumption of this nutrient in different contexts. This practice provides several benefits, such as increased quality of life and prevention of chronic diseases, especially cardiovascular diseases. The most common form of consumption of this nutrient is through the consumption of fish and supplementation by capsules, still, some seeds have w3 in their composition, but in smaller quantities.

With the food transition process suffered by the western population, the search for industrialized foods (processed and ultra-processed) has been introducing deregulation in the consumption of fatty acids, the ratio between Omega 6: Omega 3, which leads to an inflammatory condition and contributes to triggering chronic diseases5.

One of the main effects of Omega 3 is its ability to reduce inflammation. A randomized clinical trial conducted in rats observed that the effect of supplementation of omega 3/1mg.kg in comparison with anti-inflammatory (tenoxicam) 200mg.kg showed no differences on the suppression of inflammation. The authors reported that supplementation of omega 3 is of great value, especially for people who have chronic processes of inflammation4.

Another clinical, prospective, randomized trial with mice (Wiss) found that the dosage of Omega 3 is able to reduce the phosphorylation of proteins linked to the state of chronic inflammation. The sample (50 mice) was divided into 5 groups according to the amount of Omega 3 that would be introduced (control-water, 1mg, 90mg, 10mg and 50mg). The analysis remained for 21 days. The researchers found that the dose of 10mg is able to act by reducing the concentration of pro-inflammatory proteins. In addition to these findings, the glycemic levels of mice that received 10mg were lower than the other groups, by increasing the stimulation in insulin receptors10.

The evidence suggests that the low consumption of this substance relates to the appearance of cardiovascular diseases. Although there is not only low consumption of omega 3, the search for healthy food makes this nutrient more present.
in diets, even so, the choices of food types to compose the food routine are healthier11.

A study conducted with 238 women (>20 years) in Basic Health Units (BHU) of Belo Horizonte, Minas Gerais, showed an inadequate consumption of total lipids in total caloric rates and suppression in the consumption of omega-3 fatty acids. Through the analysis of Food Frequency questionnaire, the researchers identified a high prevalence of consumption of industrialized foods (ultra-processed) that directly reflect on body composition and weight increase. The average number of participants present Body Mass Index (BMI) > 33.0, dyslipidemia, in addition to the presence of chronic diseases (diabetes, hypertension)22.

By means of the Family Budget Survey (FBS), a study identified dietary patterns of 12,527 individuals aged from 15 to 35 years. These were separated into three dietary patterns (P1, P2, P3). The groups consisted of certain classes of foods and the population was distributed according to the most eaten type of food. They established the w6/w3 ration as an index of diet quality as a ratio >10:1. Individuals with a higher economic class had a higher frequency of consumption of industrialized foods. Since most individuals had an income >3 minimum wages, the most commonly found pattern was characterized by P1 or Pro-inflammatory foods group. The w6/w3 ratio was fully irregular by the high amount of processed meats, bakery products, dairy products, oils and fats13.

One of the most popular foods that presents Omega 3 in their composition are fishes. However, the various species of fish have significant differences in the concentration of w3. A research that analyzed 10 fish species commonly consumed in Brazil reported that the concentration of omega-3 varied from 0.01g/100g (Whiting) to 0.900g/100g (Cornish salmon). Based on these results, in order to obtain the daily recommendation 250mg/day of omega-3, it would be necessary the consumption of 222 g/day of Cornish salmon, followed by 253g/day of Salmon. The supplementation becomes more practical to consume this nutrient in amounts necessary to prevent the onset of cardiovascular diseases, since considerable amounts of omega-3 in certain fish species would require the consumption of an amount >1kg/day14.

In populations at risk for developing cardiovascular diseases, the supplementation of omega-3 can be used as a strategy to modify lipid parameters. A clinical, randomized, double-blind trial performed with 33 smokers showed that nutritional therapy with supplementation of omega-3 during 8 weeks (1 capsule 3x/day) was able to positively change the fractions of high-density lipoproteins. Changing the rates of cholesterol, providing increased high-density lipoprotein-cholesterol (HDL) and reduction of low-density lipoprotein-cholesterol (LDL), resulting in a reduction in the occurrence of cardiovascular complications15.

Oilsseeds can also serve as a form of supplement to obtain the necessary daily amounts of omega 3, but, due to the low value of this nutrient in their composition, the necessary amount for consumption from this food becomes impracticable to obtain this value. A study evaluating the lipid profile of the pulp and almond of guaranara palm tree found, in the oil form, higher concentration of saturated fatty acids (89.2%); the pulp presented 24.84% of monounsaturated fatty acids and 33.25% of poly-unsaturated, having a greater presence of omega-6 and omega-9 and smaller present of omega-3, 31.94%, 19.15% and 1.31%, respectively. Based on these results, the consumption of pulp may not be as beneficial when assessing the w6:w3 ratio, since there is a high concentration of omega-6 in relation to omega-316.

The supplementation of Omega represents a more feasible way to obtain the recommended amounts of this nutrient. Since the consumption of certain foods requires a specific knowledge in relation to the type of food and concentration, an information that the population often does not have. However, the search to keep the consumption within the w6:w3 ratio can stimulate a healthier diet and provide benefits not only in cardiovascular and inflammatory problems, but also in preventing several diseases related to food consumption.

This study was limited to the perspective to contextualize the proportion ratio in the consumption of omega 3 and 6 by the Brazilian population and seek to link this problem with NCCD in different contexts. With this, not all studies included in this review showed a direct relationship of these fatty acids in individuals with chronic non-communicable diseases. Nonetheless, in those that did it, the interventions used mainly with omega 3 resulted in improved activity and modulation of inflammatory components, which trigger the emergence of NCCD.
<table>
<thead>
<tr>
<th>Author/year</th>
<th>Title</th>
<th>Type of study</th>
<th>Sample</th>
<th>Main findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pappiani &amp; Damasceno 2016</td>
<td>Impact of omega-3 fatty acid supplementation on high density lipoprotein subfractions of smokers</td>
<td>Randomized, double-blind clinical trial</td>
<td>Assessed the effect of omega-3 supplementation on high-density lipoprotein subfractions in 33 smokers aged 30 through 60 years for two months.</td>
<td>The omega-3 group positively modified the lipid profile and high-density lipoprotein subfractions of the smokers.</td>
</tr>
<tr>
<td>Scherr et al. 2015</td>
<td>Fatty Acid and Cholesterol Concentrations in Usually Consumed Fish in Brazil</td>
<td>Cross-sectional</td>
<td>Beneficial effects of fish consumption on the cardiovascular system, due to the presence of polyunsaturated fatty acids in these foods. It analyzed the composition and amount of cholesterol and fatty acids of Brazilian fish and captive salmon.</td>
<td>The highest cholesterol content was in the grouper (107.6 mg/100 g), and the lowest was in the whiting (70 mg/100 g). The omega-3 concentration varied from 0.01 g/100 g in the whiting to 0.900 g/100 g in the Cornish salmon. The saturated fat varied from 0.687 g/100 g in the pirarucu fish to 4.530 g/100 g in the cub. When evaluated the omega 6/3 ratios, the best were those of whiting (2,22) and butterlifish (1,19), however these species present very little omega-3.</td>
</tr>
<tr>
<td>Soares et al. 2014</td>
<td>Alimentary Habits, Physical Activity, and Framingham Global Risk Score in Metabolic Syndrome</td>
<td>Randomized clinical trial</td>
<td>They evaluated the effect of a lifestyle modification program on the Framingham Global Cardiovascular Risk Score in individuals’ metabolic syndrome.</td>
<td>Participants were randomized into four groups: nutritional intervention + placebo (NIP), nutritional intervention + supplementation of omega 3 fatty acids (3g/day of fish oil) (NIS3), nutritional intervention + physical activity + placebo (NIEP) and intervention nutritional + physical activity + omega 3 fatty acid supplementation (NIES3). There was a reduction to intermediate risk in 25.7% of subjects.</td>
</tr>
<tr>
<td>Nishimura et al. 2013</td>
<td>Breast milk fatty acid composition of women living far from the coastal area in Brazil</td>
<td>Cohort study</td>
<td>It evaluated the fatty acid composition of mature human milk from women living in an area far from the Brazilian coast. Samples of mature breast milk were obtained from 47 lactating women aged between 18 and 35 years, who had full-term deliveries and with exclusive or predominant breastfeeding. The milk was collected from the 5th postpartum week through manual milking.</td>
<td>The concentration of eicosapentaenoic (0.08%) was higher than that observed in previous Brazilian studies. However, the content of docosahexaenoic (0.09%) found in human milk was one of the lowest in the world. The content of trans fatty acids (2.05%) was similar to that reported in national studies prior to the obligation to declare their content on food labels, suggesting that this measure did not have an effect on reducing their content in the usual diet of women.</td>
</tr>
<tr>
<td>Luz et al. 2012</td>
<td>Polyunsaturated fatty acids omega-3 supplementation reduces inflammatory markers and improves insulin action in liver of mice</td>
<td>Randomized, prospective clinical trial</td>
<td>It evaluated the effects of omega-3 (w3) polyunsaturated fatty acid supplementation on insulin signaling and proinflammatory pathway in the hepatic tissue of mice. Dose of 10mg induced a greater reduction in</td>
<td>Omega-3 induces an improvement in the insulin-signaling pathway in the liver of mice, at least in part, by reducing inflammation.</td>
</tr>
<tr>
<td>Authors</td>
<td>Title</td>
<td>Study Design</td>
<td>Objective</td>
<td>Observation/Result</td>
</tr>
<tr>
<td>------------------</td>
<td>----------------------------------------------------------------------</td>
<td>-------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Mesquita et al.</td>
<td>Anti-inflammatory effect of dietary supplementation with omega-3 fatty acids in rats</td>
<td>Non-randomized case-control</td>
<td>To compare the analgesic/anti-inflammatory effect of dietary supplementation with omega-3 fatty acid (ω-3) and tenoxicam in rats</td>
<td>Tenoxicam and omega-3 groups were not statistically different when compared in the modified formalin test phase.</td>
</tr>
<tr>
<td>Ambrosi et al.</td>
<td>Factors associated with changes in energy intake of women after treatment for breast cancer</td>
<td>Non-randomized clinical trial</td>
<td>Non-randomized clinical study conducted on 53 patients at a hospital of the public health network. Dietary information was collected with a food frequency questionnaire.</td>
<td>Increased energy intake during the treatment and increased fruits and legumes intake was associated with significant increases in the energy intake. There was a significant increase in the daily consumption of energy, fats, calcium, iron, copper, poly-unsaturated fatty acids, omega-6 and omega-3, and a significant decrease of B2 vitamin.</td>
</tr>
<tr>
<td>Nozaki et al.</td>
<td>Nutritional quality of oil and almond guarirova pulp</td>
<td>Cross-sectional</td>
<td>To determine and identify and quantify the major fatty acids present in the lipid fraction of pulp and almond of guarirova fruits, species Syagrus oleracea (Mart.) Becc.</td>
<td>The pulp showed concentrations above 50% of monounsaturated and poly-unsaturated fatty acids, with greater percentage of omega-6 and omega-9; and smaller percentage of omega-3.</td>
</tr>
<tr>
<td>Carmo et al.</td>
<td>Dietary Lipid Profile of women assisted at two Primary Health Care Units</td>
<td>Cross-sectional</td>
<td>There were high prevalences of morbidities (arterial hypertension: 53.0%; dyslipidemia: 29.1%), excessive consumption of total lipids (40.0%), PUFA (46.7%) and SFA (32.6%), and of the inadequate intake of MUFA (62.2%).</td>
<td>This high inadequacy in lipid food intake and the fatty acids profile indicate the importance of nutritional interventions in the Primary Health Care that contemplate this subject.</td>
</tr>
<tr>
<td>Mainardi</td>
<td>6/3 ratio as a quality indicator of the Brazilian diet and its relation with chronic diseases.</td>
<td>Cross-sectional</td>
<td>In the sample of 12,527 individuals, there were 3 food patterns (P).</td>
<td>The P3 characterized by the consumption of mixed preparations, pizza/sandwiches, vitamins/yoghurts, sweets, sundries and soft drinks presented reduction effect in 6/3 of the diet; the proinflammatory P1 characterized by processed meats, bread products, dairy products, oils and fats showed an increase in the 6/3 ratio, this pattern is the most common.</td>
</tr>
</tbody>
</table>
CONCLUSION
The Brazilian population has a wrong pattern of food consumption of w6 and w3 poly-unsaturated fatty acids when compared to recommendations by health organizations. Supplementation with omega-3 fatty acids proves beneficial in populations of cardiovascular risk. In view of these findings, the prolonged deregulation in the consumption of fatty acids w6:w3 can be a precursor to the emergence of non-communicable chronic diseases.

REFERENCES

DOI: 10.19095/rec.v6i2.571