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COMMENT ON SELENIUM SUPPLEMENTATION IN BRAZILIAN CARDIAC PATIENTS

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ABSTRACT

Background: Selenium is an essential element for human health, possessing antioxidant role and present in several selenoproteins. **Objective:** This manuscript aims to make a commentary from the survey of the mortality rate of cardiac patients in the last years and to evaluate the decision making of studies on the intake of selenium in Brazilian cardiac patients. **Methods:** We searched Medline, Pubmed, and SciELO for studies evaluating selenium and cardiovascular outcomes in patients. So we select and extract the data.**Results:** The results show that the average mortality rates in Brazil have increased in the last years. The studies revealed that there are no significance levels in daily supplements and levels of Tolerable Superior Ingestion for cardiac patients. In fact, recommended daily (RDI) and tolerable upper intake (UL) are standardized for healthy people. **Conclusion:** Studies should be performed to determine the RDI dose and UL for cardiac patients of various age ranges.

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INTRODUCTION

Selenium (Se) is a chemical element that is involved in several metabolic functions and is important for maintaining human health.Selenium combined with CoQ10 has the ability to reduce cardiovascular mortality (Alehagen *et al.* 2013; Salonen, *et al.,* 1982), increase immune system resistance (Hoffmann *et al.,* 2018), maximize thyroid function (Ventura *et al.,* 2017), and reduce inflammation (Duntas *et al*., 2009). Selenium is also present in the selenoproteins that play a key role in the cell's antioxidant defense system. According to studies, Se may confer benefits in patients with inflammatory infectious diseases, such as HIV (Duntas *et al.,* 2009).

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On the other hand, there is no convincing evidence that selenium supplements can prevent cancer in human (Dennert *et al*. 2012). Selenium is a trace element found in beef, pork and some foods. Soil is the main factor influencing selenium levels in reared animals and plants grown on selenium rich soils(Conor Reilly, 1996).In nature there are two forms of selenium compounds: organic and inorganic. Plants absorb selenium in its inorganic form from the soil which is converted to the organic form.Selenium is essential for animals and humans, however, selenium salts are toxic in large amounts. This element is also part of the composition of antioxidant enzymes such as glutathione peroxidase and thioredoxinreductase. Selenium is also present in selenomethionine, ie it contains molecularly integrated selenium instead of sulfur in the methionine molecule (Brenneisen *et al*. 2005). There are selenium intake recommendations for the healthy population. According to the

RDI (Daily Reference Intake) there are values of intake for humans, that is, these values are adjusted to the population, based on all ages and sex groups (Institute of Medicine (US), 2000). This manuscript is a brief comment on the need for studies involving the ingestion of selenium in Brazilian cardiac patients. Despite the existence of several studies that prove the efficacy of selenium supplementation in several metabolic diseases, studies involving the supplementation of this element in Brazil are still scarce.

METHODS

It is a systematic review of the literature, in the databases Medline, Pubmed, Lilacs, SciELO involving the evolution of mortality and selenium supplementation in Brazilian cardiac patients. In the search strategy, the following keywords were used: selenium supplementation, cardiac diseases and supplementation, Brazilian cardiac population. The bibliographic search, according to the established strategy, resulted in few articles published. In the end, we investigated the opinions, results and studies carried out by the researchers.

RESULTS AND DISCUSSION

The data illustrated in Figure 1, make it clear that as a result of the number of hospitalizations and surgeries, it is necessary to carry out studies involving nutritional monitoring of the patients, that is, supplementation of nutritional elements such as selenium. It is interesting to note that in Brazil, the average number of deaths decreases over the years, since the number of hospital stays (in days) increased. Figure 1 shows the average length of hospital stay (in days), as well as the average mortality rates for surgical revascularizations, in the years 2007 to 2015 in Brazil and in the year of processing. According to the Recommended Dietary Allowance (RDA), supplementation for children aged 7-12 years is 275 mg/day. For men, women and pregnant aged 31-50 years is 700 mg/day.A relevant issue to be highlighted is that in countries such as the United States or Canada, although selenium intake varies according to geographic location, average consumption is not below the RDA thresholds (Institute of medicine (US), 2000). In Maryland adults consumed an average of 81 µg/day of selenium (Welsh, *et al.* 1981). In addition, Canadians ingest 113 to 220 µg/day(Thompson, *et al.* 1975). The Tolerable Upper Intake Level (UL) for adults is set at 400 µg/day based on selenose as the adverse effect. Based on previous information, the mean intakes of non-vegetarian adults in different countries are 28-61 µg/day (Belgium), 41-57 µg/day (Denmark), 100-110 µg/day (Finland), 29-43 µg/day (France), 63 µg/day (United Kingdom), 40-54 µg/day (The Netherlands),28-89 µg/day (Norway), 79 µg/day (Spain), and 24-35 µg/day (Sweden) (Alexander, *et al*. 1995; Van Dokkum, *et al.* 1992; Johansson, *et al*. 1999).The maximum values in terms of percentage of consumption of some countries are presented in Figure 2.We can observe (Figure.2) that the intake is higher in Finland and lower in Sweden. On the other hand, the consumption of selenium in Brazil varies with the region, the Amazon region having the largest variety of selenium-rich nuts (Marinados, *et al.* 2017). According to the study published by Duntas*et al*. (2009), there are several key mechanisms of the anti-inflammatory action of selenium, and its supplementation should be performed as a modulator of the inflammatory response in infectious and autoimmune diseases. In the 1980s it was discovered in China that patients with chronic selenium deficiency suffered from progressive cardiomyopathy, which resulted in extensive fibrosis and degenerative changes, now known as Keshan's disease (Yang, *et al.* 1988; *Mac Farquhar et al.* 2010). Figure 1. shows the average length of hospital stay (in days), as well as the average mortality rates for surgical revascularizations, in the years 2007 to 2015 in Brazil and in the year of processing.

Figure 1. Average length of stay in hospitals (%), average mortality rates (day), both as a function of years, Brazil (Bienert, *et al*. 2017)

Figure 2.Is higher in Finland and lower in Sweden. On the other hand, the consumption of selenium in Brazil varies with the region, the Amazon region having the largest variety of selenium-rich nuts (Marinados, *et al.* 2017).

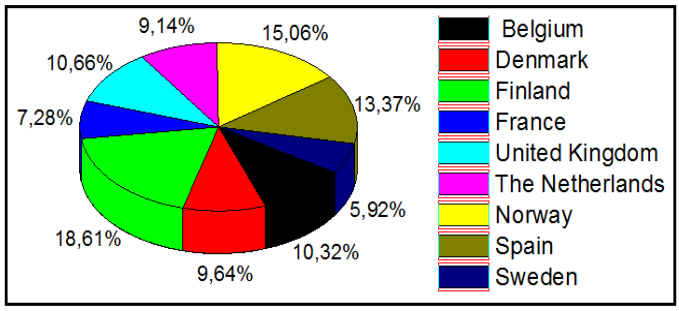

Figure 2. Maximum value in percentage of intake of Se for non-vegetarian adults in different countries

On the other hand, the inclusion foods such as nuts provided to children with already high dietary Se intakes increased Se levels and may result in an increased risk for toxicity (Martens, *et al*. 2015). Selenium supplementation was performed in hemodialysis patients who are deficient in this element. In this study Brazil nut was effective in increasing the nutritional status parameters of Se (Stockler-Pinto, *et al.* 2012). Although there are studies some observational epidemiological studies that showing an observational association between low levels of selenium in the blood and high risk of cardiovascular disease such as myocardial infarction primarily, for authors as Carina Benstoem *et al.* (2015), observational and interventional studies of selenium supplementation remain inconclusive. Although there are scientific controversies regarding selenium supplementation in patients, the issue is that in cardiac surgery selenium plays an important role and is related to oxidative stress. According to some clinical studies, selenium acts as an efficient biomarker of oxidative stress in childhood cardiac surgery (Ulbrecht, *et al.* 2018). In Brazil

efforts have been made using selenium supplementation in patients with heart disease. The Institute of Clinical Research EvandroChagas (Ipec) of Fiocruz since 2007 develops projects on the effect of selenium treatment on the progression of heart disease in Chagas' disease. The project involves clinical trials in chronic patients, with the purpose of reducing morbidity of the disease in the country. Although in the literature there are scientific results suggesting that diet is an important factor in the prognosis and treatment of patients with heart disease, daily intake values for men, women, pregnant women, adolescents and children have not yet been established. There are no tolerable upper limits (UL) of selenium intake for cardiopathies, that is, the highest level of continuous intake of a nutrient that, with a given probability, presents no risk of toxicity. In fact, the intake limits stipulated by RDI were developed to meet the need for healthy people. In Brazil, as well as in other countries, nutritional and cardiological research should be developed, including clinical trials with adequate numbers of adult, elderly, adolescent and child participants. According to Dylewski*et al* (2010), dietary selenium (Se) requirements during critical illness are not well known. However, the dietary selenium supplementation through one Brazil nut was effective in raising selenium plasma levels in hemodialysis patients. As result of study, there was improved GPx activity and thyroid hormone profile after intervention (Stockler-Pinto *et al*, 2015). On the other hand, according to Van Zuuren *et al* (2014), the evidence to support or refute the efficacy of selenium supplementation in people with Hashimoto's thyroiditis is incomplete and not reliable to help inform clinical decision making. As we have seen previously, there are conflicting opinions about selenium supplementation in other types of diseases.Due to the low number of clinical studies involving selenium supplementation in Brazilian patients with heart disease, and due to the increased mortality rate (Figure 1), studies involving selenium supplementation in patients with heart disease are needed.

Conclusion

As mentioned earlier, there are studies that claim that selenium supplementation is effective and necessary but can cause toxicity. Research should be performed to determine the recommended daily intake dosage and Tolerable Upper Intake Level (UL). These should be extremely important factors when it involves the ingestion of minerals in elderly people and children suffering from cadiological diseases. In fact, from such research involving the intake of selenium in various age groups, health professionals will be able to know and prescribe the daily intake necessary to safely treat patients with heart disease. In Brazil, as there are a large number of cardiac patients, scientific investments in research aimed at supplementation should be developed.

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