



The Ingestion and Perspective of Magnesium Consumption by Medicine Students: An Observational Brazilian Study

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Abstract: Magnesium is an important nutrient for the organism present in several enzymatic reactions. The reduced daily intake of this mineral (below 310 to 320 mg, for women, and 400 to 420 mg, for men) is associated with several chronic diseases. Thus, based on the hypothesis that medical students have a deficient intake of the mineral, this study sought to examine the intake of macronutrients by medical students at a college in the northwest of São Paulo and their thinking about the importance of the presence of the mineral of the diet. This research is a cross-sectional quali-quantitative study. The data used were obtained through a virtual questionnaire that contained several questions to identify gender, the notion of the importance of correct magnesium intake and the frequency of food consumption. The questionnaire was made available to academics between July and August 2020. The responses to the questionnaire were validated only after acceptance of the informed consent form. Thus, 147 responses were validated, with 92 responses from women and 55 from men. Then, from the amounts of magnesium present in food and the minimum and maximum frequencies of magnesium intake by students, the minimum (male 133.2 mg and female 128.5 mg) and maximum (male 232, 8 and female 229.5) of the daily magnesium intake by the students analyzed and their respective standard deviations, using these data, the Figure of the normal distribution for each type of daily average intake was plotted. Also, an opinion was obtained about the importance of magnesium intake on a scale of 1 to 5 (1 being irrelevant and 5 essential) and, from these data, it was observed that those who considered magnesium intake to be irrelevant (3 responses) presented a minimum and a maximum average (57.03 mg / day and 149.4 mg/day, respectively) of daily mineral intake below the 64 that considered it essential (140.06 mg/day and 238 mg / day) day, respectively). Finally, it is noted that the consumption of both sexes of the interviewees is close and both the maximum mean daily magnesium intake resides below the recommended amounts for daily consumption - mainly individuals of the sex but culino, who have a recommended intake value higher daily dose (400 to 420 mg/day) than females (300 to 310 mg). Thus, this data supports the initial hypothesis of the existence of a deficient daily consumption of magnesium by medical students, also, it can be related to a lower importance attributed to the presence of magnesium in the diet to a lower average daily intake.

Keywords: Magnesium. Food Consumption. Magnesium deficiency.

1. Introduction

Magnesium is a cofactor present in more than 300 enzymatic reactions [1,2]. For example, the macronutrient is important both for the generation of anaerobic and aerobic energy and for glycolysis, either indirectly participating in the Mg-ATP complex or directly as an activator of several enzymes [3]. As a consequence of its relevance in various reactions in the

body, hypomagnesemia can be related to muscle atrophy, osteoporosis, hyperglycemia, hyperlipemia and depression of the immune function [4]. Also, magnesium deficiency is associated with several chronic diseases, such as migraines, Alzheimer's disease, stroke (stroke), hypertension, cardiovascular disease, and type 2 diabetes mellitus [5,6].



The main sources of the mineral present in the diet include: green leafy vegetables - such as spinach and broccoli, whole grains, nuts - such as almonds and cashews, fruits, vegetables and tubers - such as potatoes [7,8]. The recommended daily intake of magnesium is 310 to 320 mg for women and 400 to 420 mg for men [9-12].

Despite the notoriety of this macronutrient for the body, studies show a reduced consumption of the mineral [13,14]. Thus, to contribute to the understanding of the relationship between knowledge of the need for magnesium in the diet and mineral intake, this study aimed to examine the macronutrient intake by medical school students from a college in the northwest of São Paulo and its thinking about the importance of the presence of the mineral in the diet to confirm that there is a reduced intake of the mineral by these academics. For this, the data obtained on the average daily macronutrient intake were compared with the daily magnesium intake values, and related to the students' opinion about the importance of mineral consumption in the diet.

2. Methods

2.1 Study Design

The research is a cross-sectional qualitative and quantitative observational study based on data from a virtual questionnaire, made available to students from a college in the northwest of São Paulo during July to August 2020, following the STROBE rules (Strengthening the Reporting of Observational Studies in Epidemiology - <https://www.strobe-statement.org/index.php?id=strobe-home>) [15].

In this questionnaire, several questions were used to identify, in the interviewees, their sex, their opinion regarding the importance of magnesium intake and their weekly frequency of consumption of portions of foods considered rich in magnesium. The foods present in the questionnaire, as well as their reference portions and the amount of magnesium per serving are shown in the table below (Table 1) [9]. The survey included a free and informed consent term that should be accepted to validate the respondent's answers.

2.2 Obtaining Results

To obtain the results, the 147 were analyzed individually. At first, the responses were separated according to the gender of the interviewees, totaling 92 responses from women and 55 from men. Then,

using the foods and their respective portions shown in Table 1, the frequencies of weekly consumption of portions of each food were obtained (Figure 1) and the amount of magnesium present in the food portions was calculated the minimum and maximum daily magnesium intake of each student. Subsequently, the average minimum and maximum daily intake for each sex was calculated (Table 2), the standard deviation for minimum and maximum intake for both sexes and the normal distribution of mineral intake for each sex (Figures 2 and 3). Furthermore, from the data obtained from the questioning about the students' opinion on the importance - 1 being irrelevant and 5 essential - of the presence of magnesium in the diet, the minimum and maximum mean of those who considered magnesium intake to be irrelevant for the compare with the averages of those who considered ingesting it as essential (Table 2).

3. Results

The sample analyzed in the study consisted of 147 participants, where 62.6% (92) were female and 37.4% (55) were male. It is worth mentioning that, based on the data analysis, it was possible to obtain which foods rich in magnesium have their most frequent consumption and are most relevant in the respondents' diet, with the biggest contributors being cooked beans, brown rice, milk, bananas, wholemeal bread, among others.

In addition to these data obtained, a spectrum was made between the responses obtained between male and female people, thus obtaining a comparison between the average daily values of magnesium intake by both, with the minimum daily average intake being 133.2 mg and the maximum 232.8 mg respectively, the mean daily female minimum intake 128.5 mg and the maximum 229.5, respectively (Table 2).

Still, it was possible to obtain an opinion about the importance of magnesium intake on a scale of 1 to 5 (1 being irrelevant and 5 essential) (Figure 1). In the meantime, it was analyzed that those who considered magnesium intake as irrelevant had a minimum mean intake of 57.03 mg / day and a maximum average of 149.4 mg/day, whereas those who considered it essential obtained a minimum average intake of 140.06 mg/day and a maximum mean intake of 238 mg/day (Table 2).

From the mean and standard deviation, the following Figures were plotted for normal distribution (Figure 2 and 3).



Table 1 Selected Magnesium Food Sources [9]

| Food | Food Amount of Magnesium (in milligrams) per Serving |
|---------------------------------|--|
| 30g Almonds | 80 |
| 30g of Cashew Nuts | 74 |
| 1/4 cup peanuts | 63 |
| 2 tablespoons Peanut Butter | 49 |
| Half a Glass of Brown Rice | 42 |
| Half a Glass of Cooked Beans | 35 |
| 2 Slices of Brown Bread | 46 |
| 100g of Baked Potato | 43 |
| 100g of Grilled Chicken Breast | 22 |
| 100g of cooked salmon | 26 |
| 1 glass of milk | 27 |
| 1 Glass of Soy Milk | 61 |
| Half a Glass of Cooked Spinach | 78 |
| Half a glass of cooked broccoli | 12 |
| 1 medium-sized banana | 32 |
| 1 Medium-sized Apple | 9 |
| Half a glass of avocado | 22 |

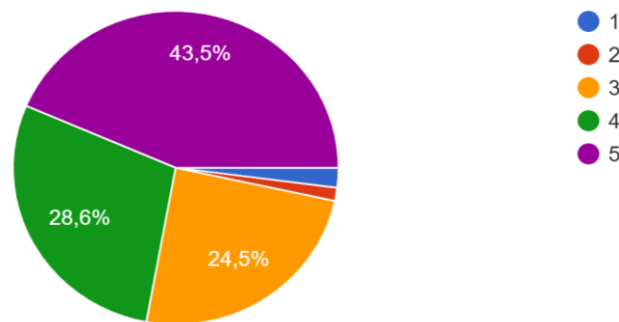


Figure 1. Academics' Opinion on the Importance of Magnesium in the Diet (1 being irrelevant and 5 essential).

Table 2 Minimum and maximum daily mean intake of magnesium (in mg/day) by sex of students.

| Gender of Students | Minimum Daily Average Intake | Maximum Daily Average Intake |
|--------------------|---|------------------------------|
| Male | 133,2±64,3 mg | 232,8±76,8 mg |
| Female | 128,5±59,2 mg | 229,5±68,3 mg |
| ***** | Considered the presence of magnesium in the diet | |
| | Minimum Daily Average Intake | Maximum Daily Average Intake |
| Irrelevant | 57 | 149,4 |
| Essential | 140 | 238 |

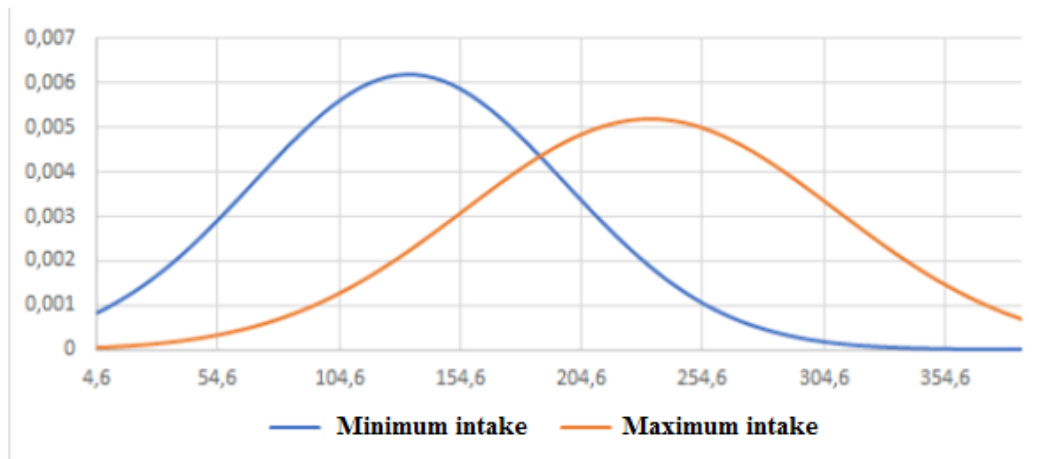


Figure 2. Normal Distribution of Daily Magnesium Intake by Male Students

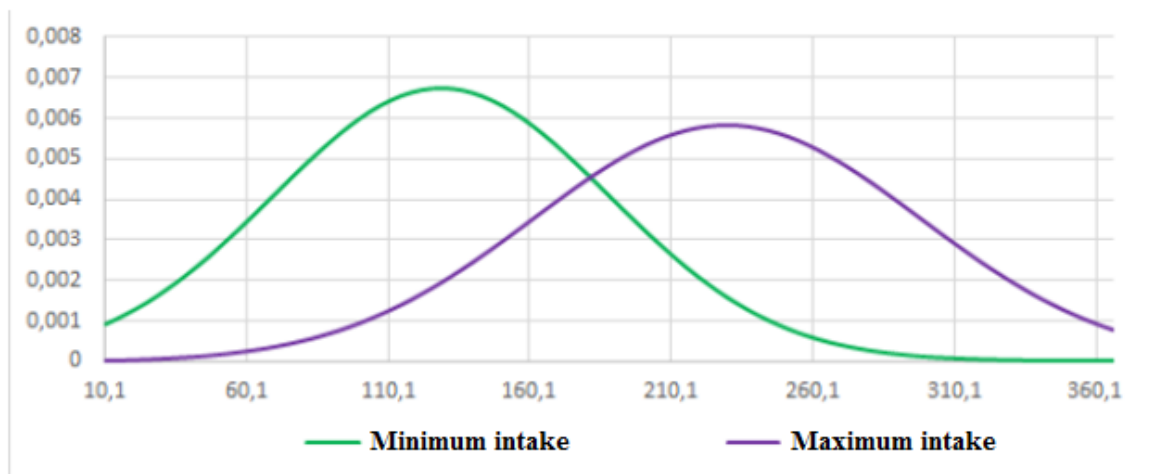


Figure 3. Normal Distribution of Daily Magnesium Intake by Female Students.

4. Discussion

The present study examined magnesium intake by students, measures their opinion on the importance of the presence of the mineral in the diet and compares the values obtained to the recommended standards of 310 to 320 mg for women and 400 to 420 for men. In the questionnaire, 147 responses were obtained - gradually evaluating the importance of magnesium consumption in the diet, varying between 1 irrelevant and 5 essential, 3 (2%) of the participants declared to find it irrelevant, and only 64 (43.5%) participants considered essential, the others scored between levels 2.3 and 4 (Figure 1).

In this study, a minimum mean consumption of 133.2 mg was obtained for men - with a standard deviation of 64.3. While for women the value of the minimum average of 128.6 mg - with a standard deviation of 59.2, while the male and female maximum were established at, respectively: 238.8 mg - with a

standard deviation of 76.8 - and 229.5 mg - with a standard deviation of 68.3 (Table 2). Thus, it is noted that although the minimum male and female averages, and male and female maximum are close together, they are still below the recommended daily magnesium intake values, a fact that is even more worrying in male individuals. analyzed, as they have a higher recommended value (400 to 420 mg/day) than females (300 to 310 mg/day).

In a second step, it was observed that those who considered magnesium intake irrelevant in the diet, had the minimum and maximum averages of daily consumption of the mineral lower than those who considered the presence of the nutrient in the diet essential (Table 2). Therefore, from the data presented, it is observed that the consumption of both sexes of the interviewees lies below the recommended amounts for daily consumption, and therefore allows



us to infer that the average consumption of the participants is below the ideal intake. As it corroborates with the initial hypothesis of the existence of a deficient daily consumption of magnesium by students.

To link these findings with the literature, a meta-analysis study with 12 articles indicated that high magnesium intake was not associated with an increased risk of fracture; however, a marginally significant positive correlation was found between magnesium intake and bone mineral density (BMD) in the total hip, as well as in the femoral neck. Although there is some evidence about the association between magnesium intake, BMD and fractures, no previous study has summarized the findings in this regard. It was found that high magnesium intake was not significantly associated with the risk of total hip fractures or total fractures. There was a significant positive correlation between magnesium intake and total BMD [16].

Also, a study of university students, $n = 49$, women (78%), single (76%), average age of 28 years and white (49%), observed the impact of a new food scholarship program on nutrient intake and diet quality. Fruits, vegetables, dairy products, meat products and non-perishable foods were distributed twice a month. Follow-up was up to 10 weeks. The intake of proteins, ($p = 0.001$), niacin ($p = 0.002$), magnesium ($p = 0.034$), phosphorus ($p = 0.039$), potassium ($p = 0.019$) and portions of vegetables ($p = 0.034$) increased. The increase in the intake of some nutrients and portions of vegetables has been achieved [1].

Thus, it is necessary to apply information programs in universities to increase the intake of the mineral magnesium by improving the quality of the diet.

5. Conclusion

Finally, after conducting the research and examining the data obtained, it is concluded that the students questioned are deficient concerning the presence of magnesium in the diet if compared with the recommended values of daily intake of the nutrient, reiterating the initial thesis of deficient consumption of the mineral by the respondents. It is interesting to note that this deficit in magnesium consumption may have future implications, already mentioned above. Also, the research shows that there is a correlation between the lower importance attributed to Magnesium and a low average daily

intake, explaining the significance of knowledge about exercising a diet rich in the analyzed mineral.

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Authors Contribution

Data collection, analysis and preparation of initial draft (OFLA, OBD, YBBM, GP, FAC, MCsS, DRF & AVGR); Designing the study, data collection, analysis, preparation and finalizing the manuscript (IJZF). All the authors read and approved the manuscript.

Data sharing statement

No additional data are available

Ethics Approval

This study was approved by institutional ethics committee

Informed consent

Written consent was obtained from the patient

Conflict of interest

The authors declare no conflict of interest.

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