

INCREASED MAGNESIUM INTAKE IN THE DIET ASSOCIATED WITH CHRONIC PAIN REDUCTION: A SYSTEMATIC REVIEW

AUMENTO DA INGESTA DE MAGNÉSIO NA DIETA ASSOCIADA À REDUÇÃO DA DOR CRÔNICA: UMA REVISÃO SISTEMÁTICA

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ABSTRACT

Objectives: To perform a systematic review that addressed the association between increased intake in the diet of magnesium (Mg) and chronic pain reduction. **Methods:** A systematic review was developed from August to September 2018 using PubMed, BIREME, and LILACS databases through DeCS/MeSH descriptors; studies in English, Portuguese, and Spanish languages addressing the Mg intake in the diet of individuals with chronic pain were included. **Results:** Of the total studies selected, three met the inclusion criteria; of these, one was not significant ($p > 0.05$). In women with fibromyalgia aged between 18 and 60 years, Mg and calcium intake were positively correlated with the pain threshold ($r = 0.25$, $p = 0.01$ and $r = 0.32$, $p = 0.01$, respectively) and negatively correlated with tender points ($r = -0.23$, $p = 0.02$ and $r = -0.28$, $p = 0.03$, respectively). The intensity of migraine pain was significantly reduced in the supplementation group (Mg, riboflavin, and coenzyme Q10) compared with the placebo group ($p = 0.03$). Of the 90 women with rheumatoid arthritis, the nutrient intake and disease activity scores were not significantly correlated. **Conclusion:** The increased Mg intake was correlated with chronic pain reduction, reinforcing the relevance of nutritional care to improve the quality of life.

Keywords: Chronic pain; Diet; Magnesium.

RESUMO

Objetivos: Realização de uma revisão sistemática que aborda a associação entre o aumento da ingestão de magnésio, através da dieta, com a redução da dor crônica. **Métodos:** Foi desenvolvida uma revisão sistemática a partir das bases de dados, PubMed, BIREME e LILACS, via descritores DeCS/MeSH; incluindo estudos que abordassem a temática da ingestão de magnésio na dieta de indivíduos com dor crônica. Utilizando os idiomas inglês, português e espanhol. O levantamento bibliográfico foi realizado no período entre agosto e setembro de 2018. **Resultados:** Do total de artigos selecionados, 3 atenderam aos critérios de inclusão, sendo que em 1 não houve significância ($p > 0,05$). Em mulheres com fibromialgia (FM), entre 18-60 anos, a ingestão de magnésio e cálcio apresentou correlação positiva com o limiar da dor ($r=0,25$; $p=0,01$ e $r=0,32$; $p=0,01$, respectivamente) e correlação negativa com os TP ($r=-0,23$; $p=0,02$ e $r=-0,28$; $p=0,03$, respectivamente). A intensidade da enxaqueca foi significativamente reduzida no grupo de suplementação (magnésio, riboflavina e coenzima Q10), comparado ao placebo ($p = 0,03$). Nas 90 mulheres com artrite reumatoide (AR), não houve significativa relação entre a ingestão de nutrientes e escore de atividade da doença. **Conclusão:** Definiu-se que há uma correlação no aumento da ingestão de magnésio com a redução da dor crônica, reforçando a relevância do cuidado nutricional para melhora da qualidade de vida.

Palavras-chave: Dor crônica. Dieta. Magnésio.

INTRODUCTION

Chronic pain is associated with certain chronic pathogenic processes, ranging from months to years; pain is the primary complaint in many cases, impairing the quality of life of individuals¹. Some authors report that patients with chronic pain often exhibit inadequate intake of vitamins and minerals².

Recent studies have emphasized the importance of including magnesium (Mg) supplementation in improving the quality of life of individuals with chronic pain. As the second most abundant intracellular ion, Mg plays a key role in ATP synthesis and is involved in numerous metabolic functions, participating in the activity of over 300 enzymes^{3,4}.

In this context, Mg is also important in cell membrane permeability, electrical activity, bone mineralization, muscle relaxation, and neurotransmission. Its deficiency reduces energy levels, promoting excessive muscle tension that causes spasms and contributes to muscle fatigue⁵.

Mg deficiency has been associated with several conditions, including headache disorders, migraines, fibromyalgia (FM), as well as metabolic and cardiovascular alterations⁵.

For individuals with chronic pain, Mg supplementation is being discussed to establish stronger evidence of its efficacy. However, consistent data remains scarce in the literature. Therefore, this systematic review aimed to examine the association between increased dietary Mg intake and chronic pain reduction.

METHODS

As part of the systematic review research strategy, the search was conducted using the following databases: Latin American and Caribbean Health Sciences Literature (LILACS), US National Library of Medicine/National Institutes of Health (PubMed), and Virtual Health Library (VHL-BIREME) using the Descriptors in Health Sciences (DeCS) and Medical Subject Headings (MeSH) terms. The search was conducted between August and September 2018.

The descriptors used were chronic pain, diet, and magnesium. The inclusion criteria comprised studies examining dietary Mg intake in individuals with chronic pain published in English, Portuguese, and Spanish languages. Only those involving individuals aged 20 years or older were considered. Exclusion criteria included studies that evaluated the

efficacy of Mg administered intravenously or that focused on conditions other than chronic pain.

For data analysis, the studies across different databases were selected in three stages. In the first stage, titles of the studies identified by the combination of descriptors were screened, and those that did not meet the inclusion criteria or were deemed ambiguous were excluded. In the second stage, abstracts of the remaining studies were reviewed, and those not aligned with the inclusion criteria were excluded. In the third stage, the full texts of the remaining studies were read to determine their inclusion in this review.

In the PubMed database, 11 articles were retrieved. Of these, seven were excluded based on their titles. The abstracts of the remaining four studies were reviewed, and two were excluded, leaving two eligible abstracts. In the BIREME database, three studies were initially identified, with one excluded after title screening. The remaining two abstracts were examined, and only one was included for full-text review. No relevant studies were found in the LILACS database after descriptor cross-referencing.

RESULTS

Table 1 presents the main information from the three included studies. Andretta (2015)⁵ analyzed serum levels of Mg and calcium (Ca) in women with FM aged from 18 to 60 years. The study was conducted in two phases and included anthropometric assessment via body mass index, physical examination to determine pain perception threshold and count of tender points (TP), blood collection to measure Mg, Ca, and C-reactive protein (CRP), completion of the Fibromyalgia Impact Questionnaire and the Patient Health Questionnaire-9, and submission dietary record from the last three days. In the FM group, dietary intake of Mg and Ca were positively correlated with pain threshold ($r = 0.25$, $p = 0.01$ and $r = 0.32$, $p = 0.01$, respectively) and negatively correlated with the number of TP ($r = -0.23$, $p = 0.02$ and $r = -0.28$, $p = 0.03$, respectively). CRP levels were inversely correlated with serum Mg ($r = -0.29$, $p = 0.03$). The study concluded that women with FM consumed less Mg and Ca than the control group, indicating a direct relationship between their intake and the pain threshold. Additionally, Mg and Ca intake and the number of TP were inversely correlated⁵.

In another study, Hejazi et al. (2011)⁶ studied

90 women with rheumatoid arthritis (RA), randomly selected from 200 individuals. Using questionnaires, they provided information about their diets and underwent a clinical examination by a rheumatologist. A Disease Activity Score (DAS-28) was calculated, which included the number of tender and swollen joints, a visual analogue scale, and CRP serological testing. The study found that the individuals consumed lower than recommended amounts of several micronutrients, including Mg. However, no significant association was observed between the intake of various nutrients or food groups and DAS-28, malondialdehyde levels, total antioxidant capacity, or CRP values ($p > 0.05$)⁶.

Gaul et al. (2015)⁷, in a multicenter, randomized, double-blind, placebo-controlled study, evaluated the use of Mg combined with riboflavin and coenzyme Q10 to assess potential reductions in migraine incidence (frequency and intensity) and their

impact on pain. The number of migraine days per month decreased from 6.2 days during the baseline period to 4.4 days in the supplementation group and from 6.2 to 5.2 days in the placebo group ($p = 0.23$ compared with placebo). Migraine pain intensity was significantly reduced in the supplement group compared with the placebo group ($p = 0.03$). The total score on the Headache Impact Test (HIT-6) decreased by 4.8 points, from 61.9 to 57.1 in the supplementation group, compared with a 2-point reduction in the placebo group ($p = 0.01$). Patient-reported efficacy ratings were also significantly higher in the supplementation group than in the placebo group ($p = 0.01$). Although no significant difference was observed in the reduction of migraine days between groups, the supplement group showed statistically significant improvements in pain intensity and migraine-related life impact compared with the placebo group⁷.

Table 1. Selected studies, their respective objectives, and results.

Author/year	Sample size	Assessment of the procedure studied	P-value of the study	Individualized p-value	
Gaul <i>et al.</i> (2015) ⁷	130	Improvement in migraine with supplementation (Mg, CoQ10, and riboflavin)	P = 0.01	Intensity	P = 0.03
				N° of days	P = 0.23
				Effectiveness	P = 0.01
Andretta (2015) ⁵	103	Relationship between serum levels of Mg and Ca in women with FM	P = 0.01	Mg	
Hejazi <i>et al.</i> (2011) ⁶	90	Nutritional relationship with RA	P > 0.05	No statistical significance observed	

DISCUSSION

Based on the results, few studies addressed the relationship between Mg intake and chronic pain reduction. The included studies exhibited considerable heterogeneity, complicating direct comparisons due to divergent variables. Nevertheless, with one exception, these studies demonstrated that increased dietary Mg intake led to statistically significant reductions in chronic pain in individuals.

FM, a rheumatic disorder characterized by widespread chronic pain and multiple symptoms, such as fatigue and headache, appears to have Mg as an important factor in its pathogenesis, making it potentially effective in managing chronic pain⁸. Andretta (2015)⁵ observed that Mg and Ca intake was significantly lower in women with FM than control

individuals ($p = 0.03$ and $p = 0.003$, respectively). No significant differences were found in serum levels of Mg and Ca between groups. In the FM group, dietary intake of Mg and Ca showed an inverse correlation with the number of TP ($r = -0.23$, $p = 0.02$ and $r = -0.28$, $p = 0.03$, respectively) and a direct correlation with pain threshold ($r = 0.25$, $p = 0.01$ and $r = 0.32$, $p = 0.01$, respectively). CRP levels were inversely correlated with serum Mg levels ($r = -0.29$, $p = 0.03$)⁵.

Hejazi et al. (2011)⁶ demonstrated that the consumption of micronutrients, particularly Mg, among individuals was substantially below the recommended levels. These results are consistent with those of Andretta (2015)⁵, who reported a reduced dietary intake of Mg among women with FM, sug-

gesting that individuals with chronic pain, including FM and RA, may exhibit decreased Mg levels in their diets. However, Hejazi *et al.* (2011)⁶ found no significant associations ($p > 0.05$) between the intake of various nutrients or food groups, DAS-28, and biochemical markers, including malondialdehyde, CRP, and total antioxidant levels.

Gaul *et al.* (2015)⁷ demonstrated that the treatment reduced the number of migraine days from 6.2 days at baseline to 4.4 days after three months of treatment, representing a reduction of 1.8 days. However, this reduction was not statistically significant compared with the placebo group ($p = 0.23$). Nevertheless, migraine intensity significantly reduced after three months of treatment compared with the placebo group ($p = 0.03$). The percentage of individuals reporting severe pain was lower, and the percentage reporting mild pain was higher at the end of the treatment phase in the active group than in the placebo group. The HIT-6 score in the active group decreased significantly by 4.8 points ($p = 0.01$). Patient-reported treatment efficacy was also statistically superior to the placebo group ($p = 0.01$) after three months. The incidence of adverse effects was higher in the active group (23.8%) than in the placebo group (4.8%), with gastrointestinal disorders being the most common in the active (17.7%) and placebo (3.2%) groups. Although the supplementation did not significantly reduce the number of migraine days, the combination of Mg, riboflavin, and coenzyme Q10 effectively reduced migraine intensity and the overall impact of pain in individuals from the active group⁷. A limitation of this systematic review is that the included studies did not isolate the influence of dietary Mg intake in individuals with chronic pain. Rather, they evaluated Mg consumption combined with other micronutrients. Therefore, future studies must be conducted to specifically evaluate the impact of increased dietary Mg intake in individuals with chronic pain, with or without correlation to improvements in pain symptoms.

CONCLUSION

The analysis established a correlation between increased Mg intake and chronic pain reduction, reinforcing the importance of nutritional care in improving quality of life.

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