

Magnesium, Stress, and Environmental Responsibility: Optimizing Dispensing in Pharmacy Stores in Tiaret

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ABSTRACT

Introduction: Magnesium is an essential mineral involved in various physiological and neurological functions, particularly in stress management and the development of intellectual abilities. This study aims to demonstrate the benefits of magnesium in managing stress in community pharmacies.

Materials and Methods: This is a comprehensive descriptive cross-sectional study covering all pharmacies in the municipality of Tiaret. The survey was conducted from December 1, 2024, to February 28, 2025, among 99 pharmacies. This approach made it possible to draw up a precise inventory of magnesium use by the local population.

Results: The data collected show an improvement in 98% of patients who used magnesium, mainly to treat stress, fatigue, insomnia, anxiety and depression (60% of cases). Adverse effects, although rare (7%), mainly include digestive disorders such as diarrhea and abdominal pain. A statistical analysis using the chi-square test highlighted a significant correlation between the patients' profession and the type of magnesium delivery. However, no relationship was established between the duration of treatment and the improvement of stress.

Conclusion: Magnesium has demonstrated its effectiveness in managing stress conditions. It is the pharmacist's responsibility to raise patient awareness about its use, provide appropriate counseling, and ensure regular follow-up. The delivery of magnesium supplements requires the use of advanced biotechnologies to purify the environment of pharmaceutical waste, while taking into account the therapeutic benefits for humans.

Keywords: Magnesium, Stress, Magnesium Supplementation

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Introduction

Magnesium is an essential mineral used in the human body as a cofactor in more than 300 biochemical reactions needed to maintain homeostasis [1].

Therefore, it is considered a fundamental nutrient, crucial for human health [2]. Numerous physiological mechanisms make regular reference to it. This vital mineral cannot be synthesized by the human body. It is prevalent in both terrestrial and marine environments; inadequate consumption can lead to adverse effects on an individual's

well-being. In this context, it is imperative to ascertain whether the suggested daily consumption aligns with the physiological requirements of the body or if it is requisite to rectify an established deficiency [3].

Magnesium deficiency is also a common condition among the populace in industrialized nations and can increase the risk of physical and mental illness over time [2, 3]. Symptoms of magnesium deficiency and stress are very similar, most common being fatigue, irritability and mild anxiety [2].

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That is why the magnesium is at the heart of a booming drugstore request. Multitudinous products are available, with new bones arising every time. The pharmacist is the primary contact for magnesium recommendations [3].

The environmental impact of magnesium reprocessing by chemical means is part of a growing nuisance related to pharmaceutical residues, which contaminate wastewater through human excrement, direct discharges, and unrecycled packaging waste, thereby disrupting aquatic ecosystems and sensitive agricultural soils [4,5]. In Algeria, studies highlight how active ingredients, such as magnesium salts, persist in wastewater treatment plant effluents, generating ecotoxicological risks. This has led to a significant increase in the use of biodegradable formulations, campaigns to replenish unsold stock, and pharmacists' inability to reduce the carbon footprint [6]. This ecological trend aligns with local medicinal customs and global suggestions for enduring pharmaceuticals.

Materials and Methods

We conducted an exhaustive cross-sectional descriptive study encompassing all the pharmacies in the municipality of Tiaret.

The investigation took place from December 1, 2024, to February 28, 2025.

Our study population includes all the pharmacy staff, targeting the entire population regardless of their age or gender. Our data collection support is represented by a self-administered questionnaire consisting of several components:

- Participant metrics.
- Patient demography.
- Prescription and issuance.
- Practices and knowledge.
- Obstacles and needs.

The software used for data entry and processing is Microsoft Excel 2019 and the IBM SPSS Statistics (Statistical Package for the Social Sciences) version 26.0 software.

Results

In our study, women represent 49% of the population consuming magnesium, while men only make up 28%.

Odds Ratio (OR): 28/49

OR = 0.571

According to our results, women consume much more magnesium than men (Figure.1).

Based on the findings from the survey we administered, the age range of individuals utilizing magnesium spans from 15 to 80 years. It is evident that a significant proportion, specifically 88%, of these consumers are adults; the elderly population and children exhibit minimal engagement with magnesium supplementation (Figure.2).

From the graph, we note that 67% of the participants stated that they had already received information about magnesium, while 33% declared that they had never received any (Figure.3).

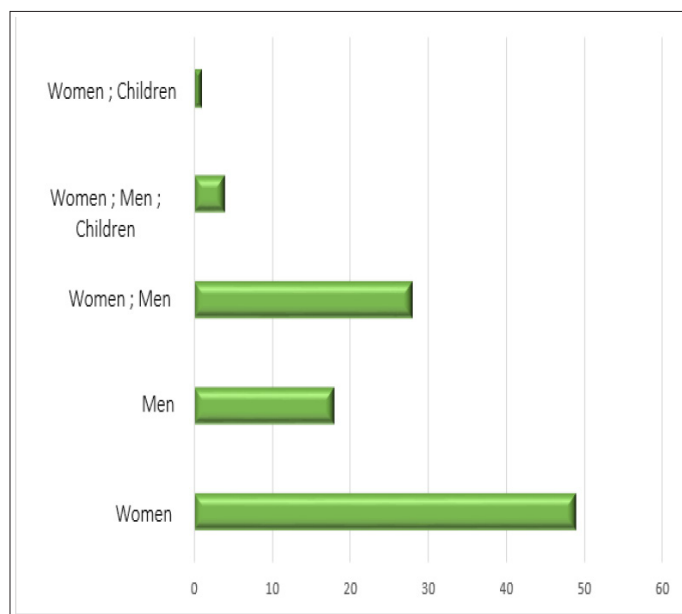


Figure 1: Magnesium delivery by gender

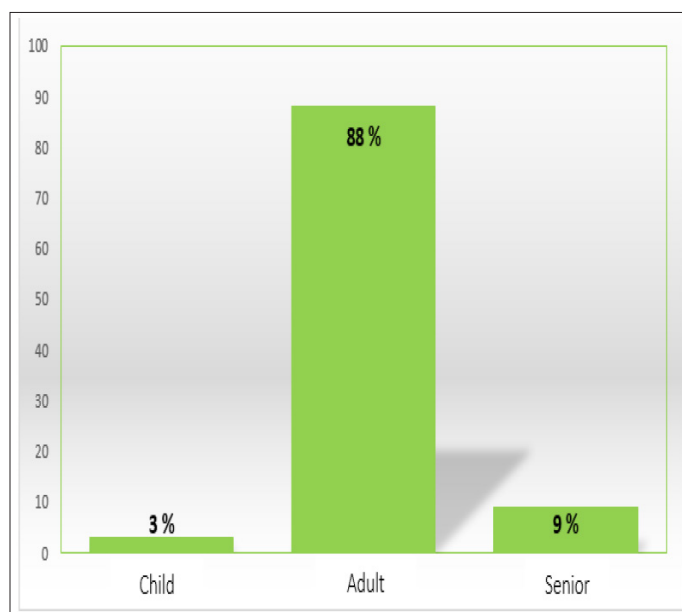


Figure 2: Distribution of patients according to the age of magnesium consumers

The results of our study showed that 68% of the participants prefer to recommend magnesium in combination with vitamin B6, and 12% advocate its association with vitamin D. Taurine, zinc, and vitamin C are also recommended in combination (Figure. 4).

The data collected shows that 60% of cases involved the use of magnesium, primarily to treat stress, fatigue, insomnia, anxiety, and depression (Table I).

Almost all (98%) of the participants report an improvement in stress status after magnesium supplementation (Figure. 5).

Adverse effects, although rare (7%), mainly include digestive disorders such as diarrhea and abdominal pain (Figure. 6).

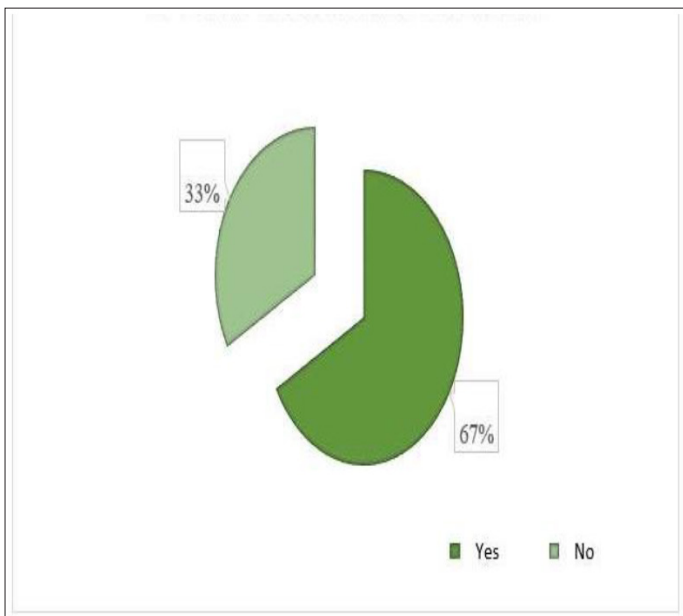


Figure 3: Staff knowledge about magnesium

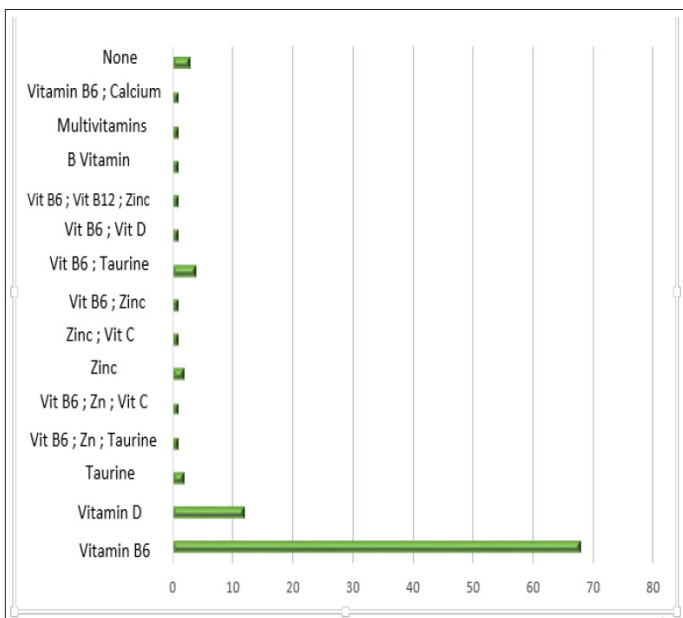


Figure 4: Supplementary substances to magnesium

Table I: Frequency of magnesium dispensing according to the reasons for magnesium supplementation

Reasons for magnesium supplementation	Frequency of delivery (% of cases)
Stress, fatigue, insomnia, anxiety and depression	60
Cardiovascular diseases, muscle cramps and diabetes	33
Kidney stones	7

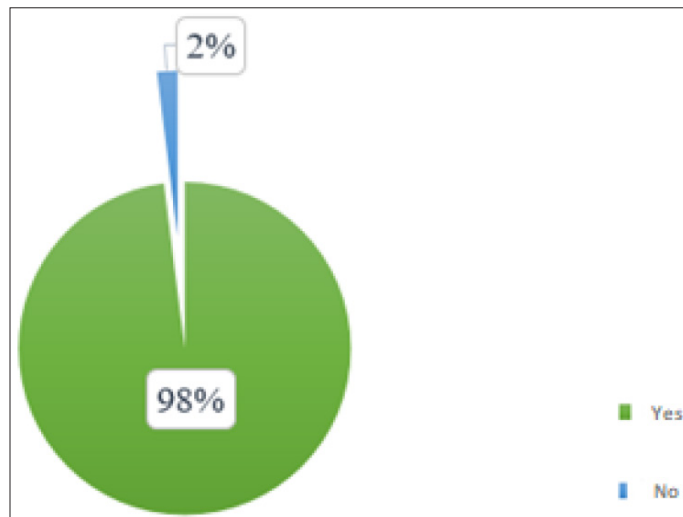


Figure 5: Improvement in stress levels after magnesium supplementation

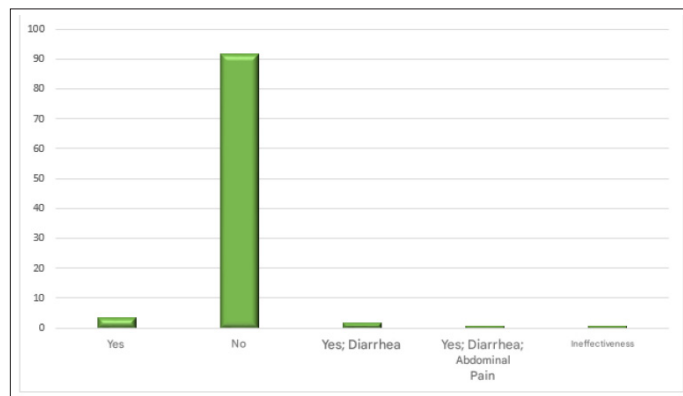


Figure 6: Side effects of magnesium supplementation

In our investigation, we used SPSS software to calculate the chi-square test, given that all our variables are categorical.

First Crossover

The null hypothesis (H0): there is no association between occupation and the type of magnesium dispensing.

The alternative hypothesis (Ha): the two are correlated.

The observed chi-square value was 14.818 with ddl 6 and a p-value = 0.022.

The reference chi-square value was 5.99 with alpha = 0.05.

According to the chi-square reference table, we note that the significance level is lower than alpha, so we reject the null hypothesis H0. Therefore, there is an association between occupation and the type of magnesium dispensing.

We thus observe that the pharmacist plays an important role in magnesium dispensing.

Second Crossover

The null hypothesis (H0): there is no link between the recommended duration of self-medication and the improvement in patients' stress levels.

The alternative hypothesis (Ha): the two are correlated.

The observed chi-square statistic was 1.148 with ddl 2 and a p-value = 0.563.

The reference chi-square statistic was 5.99 with an alpha of 0.05.

According to the reference chi-square table, the significance level is greater than the alpha; therefore, the alternative hypothesis, Ha, is rejected.

Contrary to expectations, we found that there is no relationship between the recommended duration of self-medication and the improvement in patients' stress levels.

Discussion

Our study shows a difference in magnesium consumption based on gender: women represent 49% of magnesium consumers, while only 28% of men use it. These results are consistent with those of a 2021 study conducted by the University of Blida [7], which indicates that 77% of magnesium consumers are women.

This can be explained by the fact that women are more frequently exposed to stressful situations due to hormonal changes. Women tend to supplement with magnesium to cope with daily challenges and to manage more specific situations, such as pregnancy premenstrual syndrome, or to prevent osteoporosis.

On the other hand, men who consult pharmacies for magnesium supplements have other reasons: muscle cramps and insomnia.

Regarding age, our survey reveals that 88% of magnesium users are adults between 18 and 60 years old. This finding aligns with the conclusions of a 2017 study conducted by the University of Lorraine, where the majority of magnesium users were between 18 and 51 years old [8].

This predominance can be explained by the fact that this period of life is marked by high levels of stress, making supplementation necessary.

According to our results, 67% of the staff surveyed have knowledge about magnesium. Among them, 19% acquired this knowledge through pharmaceutical companies; 10% reported having obtained information from medical journals; 10% attended university conferences on the subject, while 7% stated that they were self-taught. In parallel with the study conducted by students at the University of Blida in 2021, 92% of respondents reported having information about magnesium, with a different distribution depending on the source [7]. 36.68% stated that pharmaceutical companies were their primary source of information. 36.51% reported using medical journals to deepen their knowledge, while 17.46% attended university conferences on magnesium. Comparing our two studies, we found that the percentage of people with knowledge acquired through university conferences is relatively low compared to other methods. We observe that university education needs to pay much more attention to this subject.

Magnesium is frequently associated with pyridoxine (vitamin B6) in 68% of cases to have an optimal effect, while in 12% of situations, vitamin D is the most recommended.

Vitamin B6 plays a key role in facilitating cellular absorption of magnesium, which is mainly an intracellular cation, thereby limiting its excretion and increasing its effectiveness [9].

In 2% of cases, magnesium is recommended in combination with taurine, a Sulphur amino acid derivative essential for proper brain function. It acts on the dopaminergic system, where it improves the penetration of magnesium into the cell, and is beneficial for managing all types of stress [3].

Magnesium deficiency leads to endocrine disorders of the hypothalamic-pituitary-adrenal axis, involved in the pathophysiology of anxiety disorders [10].

Further research has reported a beneficial impact of magnesium supplementation on stress indicators and symptoms. In a randomised, double-blind study of 46 healthy adults aged 60 to 75, magnesium supplementation (500 mg of magnesium daily in the form of magnesium oxide tablets for 8 weeks) helped improve subjective indicators of insomnia, a recognised symptom of stress [11,12]. Magnesium supplementation over a one-month period (500 mg daily in the form of magnesium oxide tablets) has also been shown to significantly reduce baseline cortisol levels, a stress indicator, in students [13].

In light of the numerous studies and the role of magnesium in various conditions, recommendations regarding magnesium may change. In addition to stress and fatigue, pharmacists may also suggest taking magnesium for other symptoms, such as migraines. However, these instructions are not included on supplements, which are awaiting approval from the relevant authorities [8].

Our results show that 98% of staff notice a clear improvement in stress status after magnesium supplementation.

The survey we conducted concludes that in 92% of cases no adverse effects were reported, while 7% mention the occurrence of diarrhea and abdominal pain. These results align with those of the University of Lorraine, where 15% of consumers reported the occurrence of the same adverse effects [8].

This manifestation of adverse effects in one part of the population and not in another is explained by the notion of interindividual variability.

After conducting a chi-square test to correlate the pharmacist profession with the type of magnesium dispensing, we found that pharmacists, as primary healthcare professionals, play a strategic role in magnesium dispensing. Their training and expertise allow them to assess and determine the need for magnesium supplementation based on the patient's health status.

They must ensure they provide appropriate advice to guarantee an optimal therapeutic effect.

In summary, magnesium plays a vital role in stress regulation, acting as a regulator of the nervous system and contributing to hormonal balance. Its effects on muscle relaxation and emotional stability make it a key element in managing daily stress.

Conclusion

Stress disrupts homeostasis, leading to a state of anxiety and mental and physical tension. If this disruption becomes chronic, it can have detrimental health consequences, ranging from anxiety disorders to metabolic disturbances.

To address this issue, magnesium supplementation has proven effective.

This strategy requires the use of advanced biotechnologies to purify the environment from pharmaceutical waste so that nature is not harmed due to the therapeutic benefit to humans.

Conflicts of Interest

The authors declare no conflict of interest and did not benefit from any funding likely to influence the results.

Ethical Considerations

This study was carried out in accordance with the ethical principles of the Declaration of Helsinki. Participants were informed of the study objectives, and informed consent was obtained prior to participation. The confidentiality and anonymity of the data were guaranteed.

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