Journal of Molecular Science

Journal of Molecular Science
Volume 36 Issue 1, Year of Publication 2026, Page 79-85
DoI-10.004687/1000-9035.2026.011

Journal of Molecular Science
www.jmolecularsci.com ISSN:1000-9035

Magnesium Supplements in Focus: Knowledge and Attitudes and Practice Aspects Related to Mg+2 Supplements in Fourth-Year Pharmacy College Students in Basrah

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Article Information
Received: 06-11-2025
Revised: 12-12-2025
Accepted: 22-01-2026
Published: 25-02-2026

Keywords
Dietary supplements, Mg+2, pharmacy students, Magnesium Supplements

ABSTRACT

Background: A proper diet provides adequate nutrients, minerals, and vitamins. Dietary supplements, on the other hand, can be sold in many countries without being regulated. Completion of course work in complementary approaches in pharmacy programs may be an effective method to successfully improve pharmacy students' knowledge about these methods. **Aim:** to provide complementary information about the perspective of pharmacy students regarding their utilization, knowledge, attitude, and practice on magnesium supplements (Mg^{+2}). **Methodology:** Surveys were distributed via email among 800 pharmacy students in 4th stage in five colleges of pharmacy in Iraq. It comprised four sections being (1) demographics; (2) knowledge assessment; (3) attitude assessment and 4) practice assessment regarding Mg^{+2} supplements. **Results:** Among students, there were 31.3% having good knowledge and 40.3%, having fair knowledge and 23.9%, 4.5% having poor and no knowledge. 43.3% revealed that they did not receive a specific education or information about the risk and benefits of magnesium supplements while 17.9% reported that they received educational information about magnesium supplements. **Conclusion:** Our findings highlight unsatisfying knowledge regarding dietary supplements and the need of providing accurate and up-to-date courses regarding supplementary products for pharmacy students.

INTRODUCTION:

By United States (US) and European Union (EU) law, dietary supplements are products that contain 'a dietary ingredient' intended to supplement the diet: 'a vitamin, a mineral, an herb or other botanical, an amino acid, a dietary substance for use by man to supplement the diet by increasing the total dietary intake, or a concentrate, metabolite, constituent, extract, or combination of any of the aforementioned ingredients.' Dietary supplements are developed to be consumed in small, measured amounts and are available in various formulations like pills, capsules, tablets and others [1]. Even though they are often delivered, and look much like modern medicines, dietary supplements are ingestible, not drugs. Although supplement users are presumably consumers rather than patients, it is as yet uncertain whether the primary user group

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should be healthy or unhealthy individuals. An established diet supplement for prevention of disease and as a therapy is magnesium (Mg^{2+}). In contrast, the efficacy and the mode of action of Mg^{2+} has been controversial for most disorders because of conflicting literature reports [2]. Low magnesium intakes in combination with high calcium intakes and/or high ratios of calcium-to-magnesium (Ca: Mg) intakes have been associated with increased metabolic syndrome and cardiovascular disease (CVD) risk[3-4] colorectal and prostate cancers [5-6] and cancer mortality [7] and survival after breast cancer [8] as well as with vitamin D status [9-10]. The dietary calcium-to-magnesium ratio appears to be increasing globally [11], as traditional diets are replaced by processed foods on a world scale; at the same time, global dietary magnesium intakes are declining from food processing, particularly of grains [12]. As the most accessible health care professionals, pharmacists often engage customers who are seeking advice in a variety of complementary and alternative medicines modalities. They are also offered in most of the community pharmacies. The most products sold as complementary and alternative medicines products in pharmacies in Croatia are those that are advertised as dietary supplements of herbal origin [13]. In an Australian pharmacist' survey, safety concerns associated with ignorance, perceived lack of evidence, and lack of time to communicate with the patient were identified as the major barriers to the provision of complementary and alternative medicines advice by pharmacists [14]. It has been proposed that complementary and alternative medicines education be integrated into pharmacy curriculum to promote safe and rational use of them and provide the users in the community with scientific base for the use. Pharmacy programs in pharmacy schools include classes that cover complementary approaches, and these can be effective in terms of increasing the knowledge about those amongst pharmacy students. Therefore, this survey-based study was designed to capture the identical insights of pharmacy students regarding Mg^{+2} use, knowledge and practice (KAP). Based on these data, the intention was to determine any knowledge gaps and why such gaps existed in order to develop curricula that better meet patient's needs.

METHODOLOGY:

Study design:

A formal approval was obtained to conduct this cross-sectional study using descriptive survey questionnaires (pharmacy students) as approved by the University of Basrah, College of Pharmacy. The questionnaire was investigator-developed using a comprehensive literature review of this area and the corresponding author's experience in clinical practice. The questionnaire was pre-tested on a small number of pharmacy students prior to conducting the survey, with feedback from the participants on clarity and comprehensiveness incorporated into the final questionnaire tool.

Participant characteristics

The surveys were sent by E-mail to students (February the 2nd to May the 8th. The sample consisted of pharmacy students in year four.

Surveys

The questionnaire included the following sections:

(1) Demographics
(2) Knowledge Assessment about magnesium dietary products
(3) Attitude Assessment
(4) Practice Assessment.

Questions for closed ended demographics included name, age and gender. A survey consisting 11 items was developed to collect information from the students based on elements from four pilot studies and questionnaire. The first four questions were about whether students had known about magnesium supplements before. The next three question were about the attitude of students. The last 4 questions explored their approach toward use of dietary magnesium supplements.

Sample size:

Out of 800, only 536 students responded and participated in the questionnaires.

Ethical issues:

Respondents were treated confidentially so that names or other identifying information was maintained as a closely guarded secret.

RESULTS:

Demographics characteristics:

Among pharmacy students participated in the study, 85% were 22 to 24 years of age, (Figure 1). Regarding sex, 68.7% of the responders were women and 31.3% were men, (Figure 2).

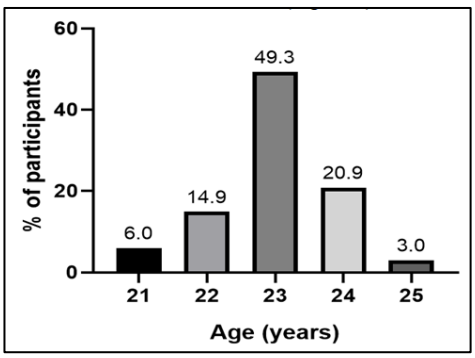

Figure 1: Demographics characteristics (Age)

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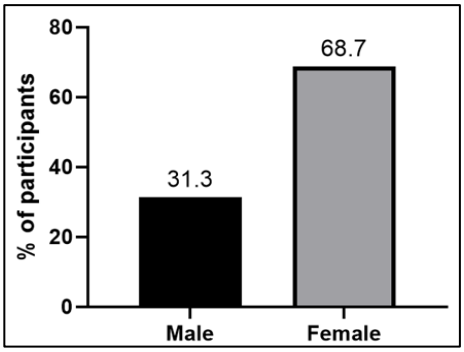

Figure 2: Demographics characteristics (Gender)

Knowledge Assessment:

On a self-rated scale of knowledge on magnesium supplements 31.3% of students showed good knowledge and 40.3% reported fair knowledge while 23.9% reported poor knowledge with 4.5% indicated no awareness regarding Mg^{+2} use, (Figure 3). Students were also asked to report if they had received formal education or training about the benefits and risks of magnesium supplementation in their pharmacy bachelor's program. Of the respondents 43.3% indicated that they had not been provided with any particular education in this area, and 17.9% said they had received some information. The other 38.8% were undecided (Figure 4).

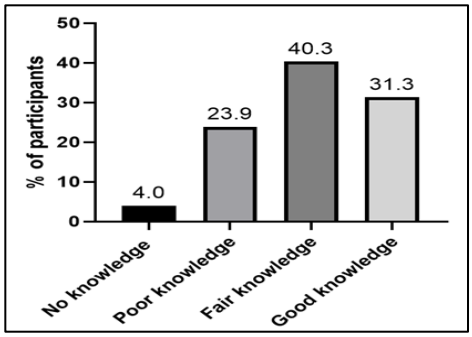

Figure 3: Student knowledge rating assessment about magnesium supplements

Whether students received formal education or training courses regarding Mg^{+2}, Figure 1 demonstrates the distribution of responses to this survey question. Most of the participants 43.3% responded in the negative and literally answered "No". A significant proportion 38.8% replied as "Unsure", which indicates a high degree of uncertainty or ambiguity from respondents. Meanwhile, only 17.9% of the participants answered "Yes" (indicated a minority who agreed or consented). This indicates that with slightly more people opposed than sitting on the fence, a 50/50 split of those who are against and those who did not express an opinion has occurred. It's possible that the relatively large share of uncertainty may have stemmed from insufficient knowledge, ambiguity in the question context, or differing levels of understanding among respondents. This pattern highlights the necessity of further research to elucidate the elements that contribute to uncertainty and resistance.

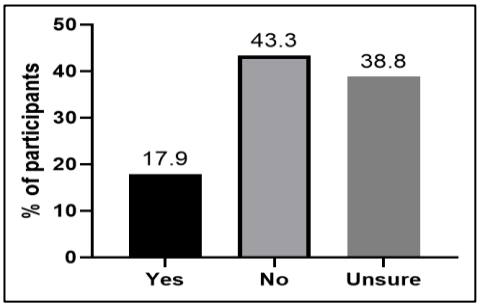

Figure 4: Student responses regarding the possibility of receiving formal education or training on the benefits and risks of magnesium supplements during their pharmacy college bachelor's degree study

Students' perceptions regarding specific health conditions that may benefit from magnesium supplementation are summarized in (Figure 5). The most frequently reported indication was muscle cramps, cited by 41.8% of respondents. This was followed by osteoporosis 29.9% and all listed indications 17.9%, reflecting a broader recognition of magnesium's potential benefits across multiple conditions. In contrast, only 6% of students associated magnesium supplementation with insomnia, while a minimal proportion mentioned anxiety, indicating limited awareness of its potential role in neurological or psychological health. These findings demonstrate that pharmacy students predominantly link magnesium supplementation with musculoskeletal health, particularly in the management of cramps, whereas its relevance in neurological and sleep-related disorders appears to be under recognized. This distribution suggests gaps in knowledge regarding the diverse therapeutic applications of magnesium, highlighting the need for targeted educational interventions to expand student understanding of its broader clinical significance.

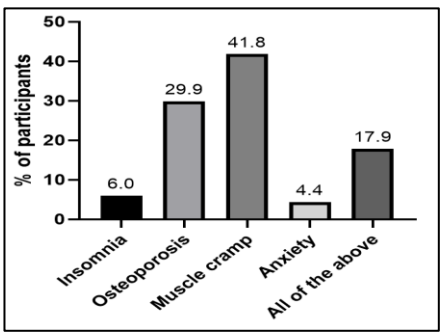

Figure 5: Student responses regarding their information about health conditions or situations they believe may benefit from magnesium supplementation

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Attitude Assessment:

As depicted in (Figure 6), a high proportion of students, 46.3%, reported to have a neutral opinion regarding the fact that magnesium may be useful for some conditions. This, while 43.3% had an optimistic attitude about this means that they are of the opinion that the addition of magnesium might actually be helpful. On the other hand, just 9% of respondents thought it was a very good idea, there was thus a fairly restrained enthusiasm among this set. Only a small 1.5% had a negative view towards the possible benefit of magnesium. These results indicate a high level of interest and appreciation of the potential health role of magnesium between the sub-cohorts, although attitudes vary substantially. Big note on this is people also aren't aware of what it can actually help with (muscle cramps, heart related issues, brain health effects) so for as many people as you get who are informed, you get 10 who say "I don't know." Additional investigations could also seek to determine factors associated with students' perceptions and the way in which education interventions shift misconceptions or increase awareness regarding magnesium's therapeutic use.

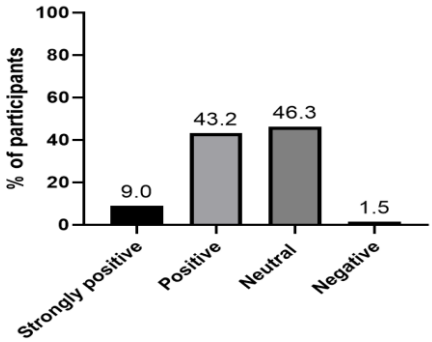

Figure 6: Student general attitude towards the use of magnesium dietary supplements

When assessed students' perceptions regarding health conditions or situations they believe could benefit from magnesium supplementation, as illustrated in (Figure 7). The figure depicts the distribution of responses across four belief categories: normal belief, neutral belief, strongly believed, and disbelief. The majority of students, accounting for 53.7%, held a normal belief about magnesium's potential efficacy, indicating a moderate level of awareness or acceptance. A substantial proportion, 32.8%, expressed a neutral belief, suggesting uncertainty or ambivalence regarding magnesium's efficacy. Conversely, only 10.4% of respondents strongly believed in magnesium's benefits, reflecting a smaller but confident segment of students who perceive clear advantages. A minimal 3% of participants expressed disbelief, indicating skepticism about magnesium's health benefits. These findings highlight that while most students maintain a neutral or moderate stance on magnesium supplementation, a minority strongly believe in its benefits, and very few are skeptical. This pattern underscores the importance of targeted educational efforts to enhance understanding of magnesium's potential role in managing health conditions. Further research could explore the factors influencing these perceptions and how informational interventions might shift attitudes toward more evidence-based beliefs.

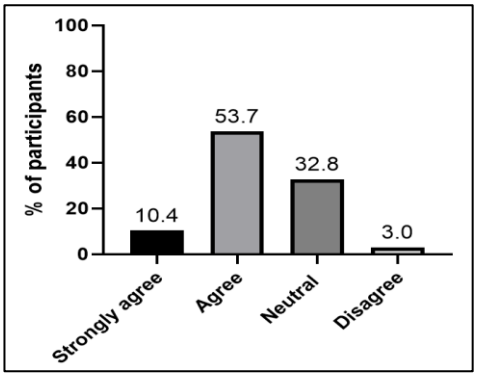

Figure 7: Student general attitude towards the efficacy of magnesium dietary supplements

This study evaluated the students' opinions regarding the recommendation of Mg^{2+} supplements to patients, as depicted in (Figure 8). As illustrated the distribution of responses across four categories: "yes, sometimes," "always," "never," and "rarely." The majority of students, comprising 52.2%, indicated that they would recommend Mg^{2+} supplements to patients "sometimes," reflecting a cautious but generally favorable attitude towards occasional use. A significant portion, 40.3%, responded with "rarely," suggesting that many students are hesitant to routinely recommend magnesium supplements. A small percentage, 6%, expressed that they would "never" recommend such supplements, indicating strong reservations or skepticism. An even smaller fraction, 1.5%, stated they would "always" recommend Mg^{2+} supplements, representing a very optimistic or confident subgroup. These results suggest that most students adopt a moderate stance, favoring occasional recommendation rather than routine use. The relatively low percentage of students who would "always" recommend magnesium indicates potential reservations or the need for further evidence before endorsing widespread use. Future research should explore the underlying reasons for these attitudes and identify educational strategies to inform appropriate clinical recommendations regarding magnesium supplementation.

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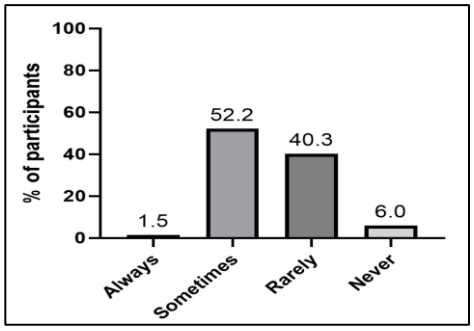

Figure 8: Student general attitude towards the recommendation of Mg^{+2} supplements to the patients

Practice Assessment:

The survey results demonstrated a notably low prevalence of personal use of magnesium supplements among the respondents. As illustrated in (Figure 9), only 11.9% of participants reported that they personally use Mg^{2+} supplements, whereas the majority, 88.1%, indicated no personal use. This finding suggests that despite the potential health benefits of magnesium supplementation reported in the literature, the actual adoption of these supplements among the surveyed group remains limited. Such a low utilization rate may reflect a lack of awareness regarding magnesium's role in health, reliance on dietary intake as the main source, or possible concerns regarding supplement safety and efficacy. These results highlight the need for increased educational initiatives to raise awareness about the potential benefits of magnesium supplementation, particularly in populations at risk of magnesium deficiency.

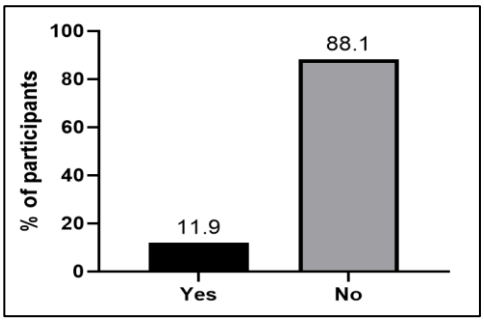

Figure 9: Response toward the personal use of Mg^{+2} supplements

Figure (10) illustrates the distribution of information sources utilized by respondents regarding Mg^{+2} supplements. The majority of participants reported relying on online resources as their primary source of information (37.3%), highlighting the increasing role of internet-based platforms in shaping health-related knowledge. Academic textbooks represented the second most common source 26.8%, suggesting that traditional educational materials still play an important role, particularly among students and professionals in structured learning environments. A smaller proportion of respondents 19.4% indicated that they obtained their information from healthcare professionals, while only 16.41% relied on scientific journals. This pattern underscores a reliance on easily accessible digital platforms over more evidence-based resources such as peer-reviewed journals. The relatively lower engagement with healthcare professionals and scientific literature may reflect barriers such as accessibility, subscription costs, or limited direct interaction with experts. These findings raise important considerations for educational strategies, emphasizing the need to bridge the gap between readily available online information and rigorously validated scientific evidence, ensuring that knowledge about magnesium supplementation is both accurate and reliable.

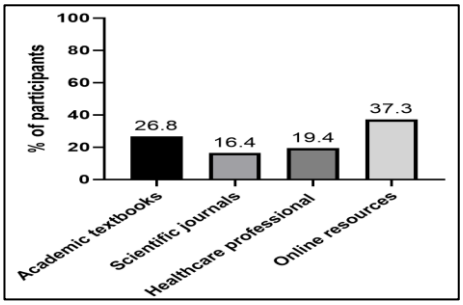

Figure 10: Population general practice toward the source of information through which the student stays informed about magnesium supplements

DISCUSSION:

The objectives of this study were to investigate the knowledge, attitudes, and practice of pharmacy students regarding magnesium supplementation, to understand the level of familiarity and readiness of students to recommend its use in a clinical setting. The findings point to specific strengths and deficiencies in student understanding, as well as demonstrating the importance of focused teaching to inform evidence-based perceptions and actions. Most respondents were aged 22-24, which reflects the standard age profile of the undergraduate pharmacy student demographic. Of note, sex (a majority of respondents, over 70%, were female) did not significantly affect knowledge or attitudes toward magnesium supplementation. The general level of knowledge was considered to be low, where the majority of students claimed to have fair 40.3% or poor knowledge 23.9% on the matter, with a few acknowledging no knowledge at all. This corroborates previous studies demonstrating poor knowledge on dietary supplement use by healthcare students [15-18]. Moreover, the 43.3% rates of no formal education on magnesium supplementation and the nearly 39% who were not sure if they had, highlight a significant curricular deficit. Ambiguity in these responses may also indicate a potential lack of focus of magnesium

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content in, or differences in the delivery of, coursework. Further, according to the students, magnesium supplementation was predominantly related to the musculoskeletal system, and in particular muscle cramps 41.8%. Osteoporosis was also noted 29.9% however, few were aware of magnesium's oral neurological implications such as insomnia, or an anxiety state. This result highlights an incomplete comprehension of additional therapeutic properties of magnesium in cardiovascular, metabolic and neuropsychiatric fields, as reported in clinical research studies [19-20]. Low awareness regarding neurological effects of magnesium indicates, however, that the curriculum may prioritize more traditional uses, while underrepresenting new findings. Students generally have favorable, yet cautious, attitudes towards magnesium supplementation. Almost half of the students surveyed 46.3% said they feel neutral, while 43.3% feel positive. Just a small fraction 1.5% were openly negative. This manifests as willingness to consider the possibility of benefit from magnesium but with uncertain confidence in supporting evidence. Likewise, when queried on efficacy, less than half of all respondents appointed a "normal belief" about effectiveness with only 10.4% strongly believing in the wonders of magnesium. So, walking away, clearly there is not much of skepticism, but there also isn't strong confidence – which is probably more because of ignorance than genuine denial. Most respondents would recommend magnesium "sometimes" 52.2%, and a substantial number "rarely" 40.3%. The proportion who reported that they "never" and "always" would recommend supplementation was very low. This wariness is perhaps not surprising when the relatively limited knowledge and uncertainty seen elsewhere in the survey are taken into account. Pharmacy students may be aware of the therapeutic value of magnesium, but are not being trained to weigh this against the risks of over-supplementation in their clinical recommendations. Published research surrounding student and professional recommendations for dietary supplements has also identified a lack of knowledge as key barriers to confidently recommending [21]. Considering their status as future healthcare workers, 11.9% students were consuming magnesium supplements in their daily lives. This rather low prevalence compared to international findings, which indicated low rates of supplement consumption in healthcare students, regardless of the general population [22]. The discrepancy between belief and personal practice may be explained by the trust in dietary recommendations, general skepticism of effectiveness, or absence of perceived necessity. Online platforms were the most common sources of information 37.3%, followed by textbooks 26.8%. Alarming, 16.4% trusted peer-reviewed scientific journals, and under 20% health care professionals. This use of digital media, not always based on evidence-based content, underlines an urgent need for improved capacities for critical appraisal of sources and to promote the use of original scientific articles. Similar trends have also been noted in other student populations in that accessibility takes precedence over reliability in health information seeking behavior [23] (O'Carroll et al., 2015). These data suggest that there is a clear role for formal educational intervention within the pharmacy program. Some dedicated modules or workshops to dietary supplements, especially those with solid evidence like magnesium, could improve confidence and knowledge of students. Because pharmacists are usually the first port of call for patients looking to discuss supplements, it is important that pharmacy graduates have strong evidence-based knowledge in this area. Furthermore, teaching students how to critically evaluate and apply high-quality evidence from the literature will reduce the necessity to rely on on-line resources and enhance their position as trusted healthcare advisors. The generalizability of this study may be limited, since the sample consists of only one student population. Bias may also be introduced through use of self-reported measures, especially for knowledge and attitude. Future research should incorporate objective measures of knowledge and may compare pharmacy students' perspectives with medical or nursing students. Furthermore, assessing the influence of targeted educational interventions on knowledge and recommendation practices would also yield invaluable evidence for shaping the curricula.

CONCLUSION:

Pharmacy students in the current study showed poor knowledge and conservative behavior for magnesium supplementation, and they had little experience in this domain and obtained information mainly through the internet. The results demonstrate a significant education gap, in particular, for the wider clinical use of magnesium and the role of evidence-based information sources. Given these gaps in pharmacy education, it is imperative to address the needs so as to adequately train future pharmacists to counsel patients on the safe and effective use of supplements.

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