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PATTERNS OF DIETARY SUPPLEMENT CONSUMPTION AMONG THE STUDENTS OF BIOMEDICAL SCIENCES

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Abstract. Dietary supplement term includes everything from individual nutrients — vitamins A, B, C, D, E, and K and minerals like calcium — to multivitamins and specialized "senior" formulas that contain various combinations of vitamins, minerals, phytonutrients, and other compounds. Dietary supplements can be beneficial to the health, but they can also involve health risks. Side effects from dietary supplements happen most often if people take high doses or use them instead of medicines prescribed by their health care provider. Taking many different supplements can increase the risk of side effects and drug interactions. The aim of the study was to analyze the patterns of dietary supplement consumption among the students of biomedical sciences. The tasks: to reveal the motivations for taking dietary supplements, to detect the most popular dietary supplements, to estimate the duration of supplement consumption and perceptions of safety, to assess the beneficial and harmful effects. Conclusions: The dietary supplements were taken for maintaining good physical and academic performance, for better sports results, for faster recuperation after disease or due to disease or health condition and for weight loss or control. The most frequently used vitamins included D, C, and B, while minerals like magnesium, calcium, and potassium were also popular. Caffeine, protein supplements, probiotics, complex supplements for sports, and weight management products were most frequently cited by the respondents. The most common duration of taking dietary supplements was one-six months. Over half of the respondents reported using multiple supplements simultaneously, with a majority adhering to recommended doses. However, fewer than half regularly checked for the compatibility or had the recommendations from health professionals. The majority of respondents purchase dietary supplements at pharmacies or online from certified suppliers. There is a significant lack of awareness regarding the potential health risks associated with consumption of dietary supplements among the students. The most common beneficial effects reported were enhanced immunity, gaining more energy and stamina, better academic performance. The main harmful health effects were sleep impairments, headache and obstipation.

Keywords: dietary supplements; biomedical students; supplement consumption patterns; health risks; motivation for supplement use

INTRODUCTION

The global dietary supplement market is forecast to reach a market value of 185.1 billion U.S. dollars in 2025. In 2021, it was estimated to be worth around 137 billion U.S. dollars. The market has been growing since 2018 and is expected to continue to grow up to 300 billion USD till 2028 (STATISTA, 2023). The European Food Safety Authority (EFSA) defines food supplements as concentrated sources of nutrients aimed at supplementing normal diets (EFSA, 2017). While multivitamins are generally safe at recommended doses, high doses of single vitamins may lead to adverse effects, such as gastrointestinal disturbances and more severe health complications (Biesalski & Tinz, 2017). Motivations for supplement use include disease prevention, enhanced physical performance, and compensation for dietary deficiencies (Frey, Hoffmann, & Heuer, 2017). Although consumers often assume these supplements are safe, excessive consumption of supplements may have deleterious effects. Such vitamin supplements include vitamin A, niacin, biotin, vitamin D, and vitamin E, and specific mineral supplements include zinc, copper, and iron. These supplements may have a number of potential adverse effects (Anselmo, & Driscoll, 2021). It should be stated that dietary supplements are not recommended for everyone to be used to generally support health and reduce the risk of diseases, but rather to be used by those people with a prolonged nutrient deficiency in their diet or a previously diagnosed deficiency in the body (Wierzejska, 2021). Only 50% of food supplement users were advised by a medical doctor, while others were often influenced by sport coaches, friends, or the internet and other media (Sirico et al., 2018). Despite the increase in supplement use, research indicates that many individuals, particularly in the general population, are often influenced by non-medical sources rather than healthcare professionals (Bailey, Gahche, Miller, Thomas, & Dwyer, 2013). There is an urgent need for better regulations regarding food supplement labeling and a more robust understanding of nutrition among healthcare providers (Sirico et al., 2018).

Object of the Study: The patterns of dietary supplement consumption among the students of biomedical sciences

Objective of the Study: to analyze the dietary supplement consumption patterns among the students of biomedical sciences.

The specific tasks include:

To identify the reasons for using dietary supplements.

To determine the most commonly consumed supplements.

To estimate the duration of supplement consumption and perceptions of safety.

To assess the awareness of the health effects, both beneficial and harmful.

THE RESEARCH METHOD

The study employed a quantitative approach, surveying the second-year students of biomedical sciences from September to October 2024. It was decided to select this particular group of respondents, as first year students only start studying biomedical sciences and lack specific knowledge. A total of 93 respondents were randomly selected, and data from 92 questionnaires were analyzed. Only those students who are consuming or had consumed at least one dietary supplement were recruited. The majority of respondents (74%) were females. The biggest part of participant's ages were ranging from 18 to 39 years. Data were collected through social media and direct contact, and analyzed using Microsoft Office Excel.

THE RESULTS AND DISCUSSION

The survey results indicated that 68 respondents were female (74 %) and 24 (26 %) were male. Most respondents fell within the 18-39 age group (87%), see Figure 1:

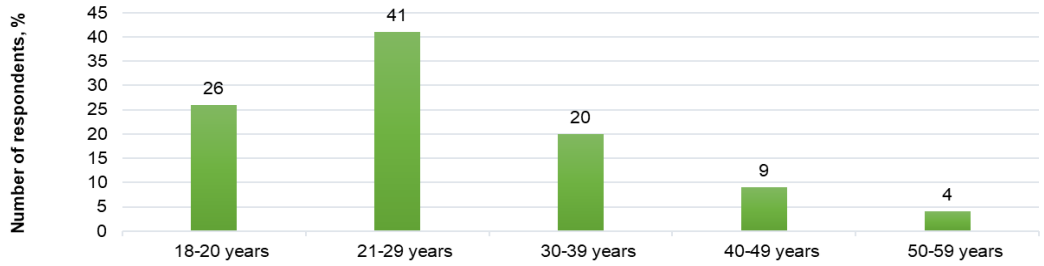

Figure 1. **The age**

Discussing the occupation of the respondents, the results revealed that half were both students and employees, less than half were only students. The minority reported being on maternity or paternity leave (see Figure 2).

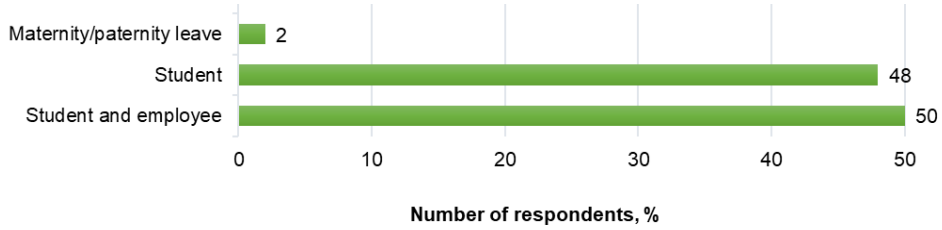

Figure 2. **The occupation**

People consuming dietary supplements are mainly divided into two groups; The first group wants to insure themselves against future illnesses, and the second are those who seek treatment for their current state of health (Lam et al., 2022). In physiological conditions, the supply of the required amount of nutrients is usually met by a normal diet (i.e. a regular diet that includes all foods and meets the energy and nutrient needs of healthy people). Based on the definition of food supplements and considering their physiological effects on different metabolic processes, the decision regarding their use should be taken carefully and be justified by the increased physiological demands or insufficient intake of nutrients from dietary sources (Sirico et al., 2017). The results of the study revealed that the majority of respondents were healthy and active physically, doing sports. One fourth of the participants reported having disease or specific health conditions, one fifth are losing weight. The respondents reported various motivations for supplement use, including maintaining good physical and academic performance, for better sports results, for faster recuperation after disease or due to existing disease or health condition, and for weight management (see Figure 3).

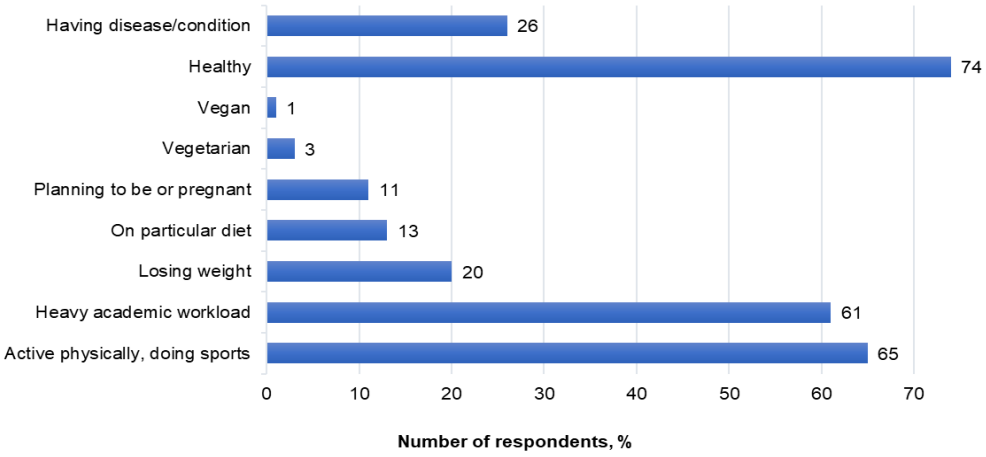

Figure 3. **The motivation due to the lifestyle and health condition**

The most popular supplements were divided into two groups (group 1 and group 2). The results revealed that in group 1 the most popular were vitamins D, C, and B, along with minerals such as magnesium, calcium, and potassium (see Figure 4).

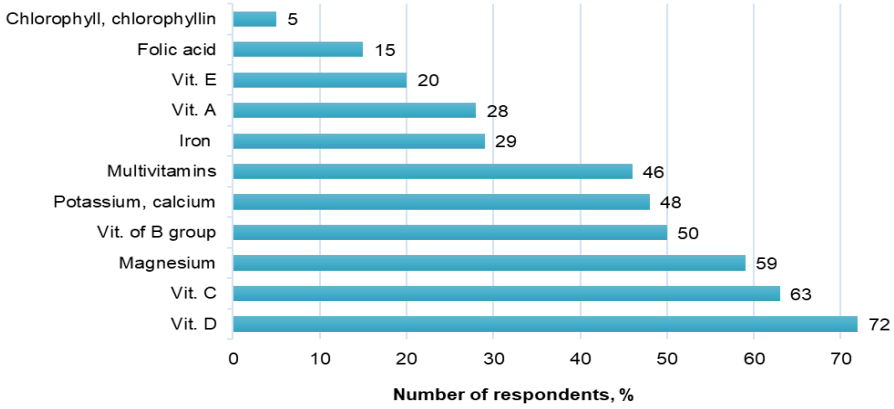

Figure 4. **The dietary supplements group 1**

According to Sirico et al., (2017), food supplement use was more common among university students (in particular, those in health professional graduate courses) than high school students. Individual sport practice, rather than team sport, was associated with higher likelihood of food supplement use. Multivitamins were most commonly used, while weight-loss formulations were the least popular. Strikingly, filling nutrient gaps was statistically not considered the main reason for taking food supplements. Instead, they were used to enhance mental performance or enhance well-being. The survey answers indicate that the participants had consumed or are consuming caffeine, protein supplements, complex supplements for sports, weight management, amino acid, ginkgo biloba supplements, and supplements for eye health. It can be stated, that caffeine, protein supplements, probiotics, complex supplements for sports, and weight management products were most frequently cited from the supplement group 2 (see Figure 5):

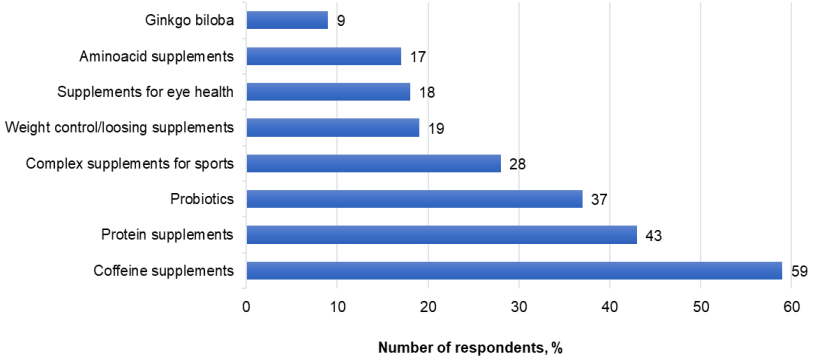

Figure 5. **The dietary supplements group 2**

The results revealed that the majority of students consumed only the recommended dose, more than half reported having consumed two or more dietary supplements at time, due to health conditions or the disease. Less than

half of the participants are always checking the compatibility between the supplements and other medications or had recommendations from the health care professional (see Figure 6).

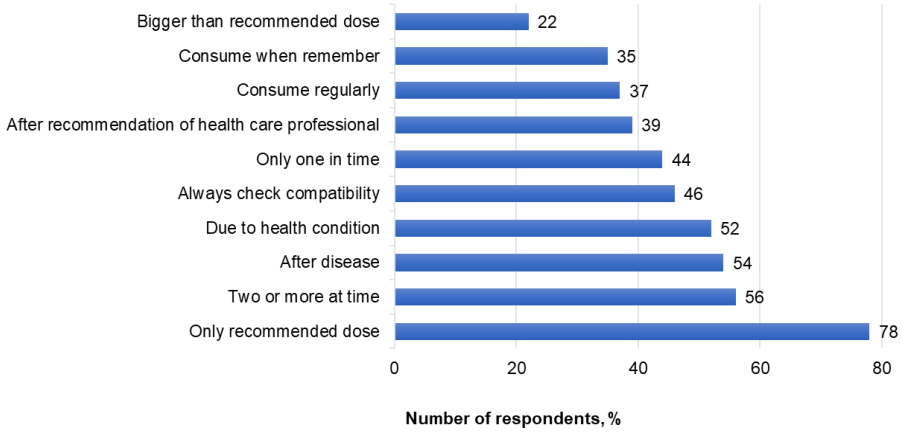

Figure 6. **The consuming regimen**

Discussing the duration of the supplement consumption, more than one third of the respondents stated that they are consuming or had consumed no longer than for one month, more than one third reported consuming or had consumed for 1-6 months, and more than one fourth stated consuming or had consumed for 6-12 months. The results indicate that the most common duration of dietary supplement's consumption was from one to six months (see Figure 7):

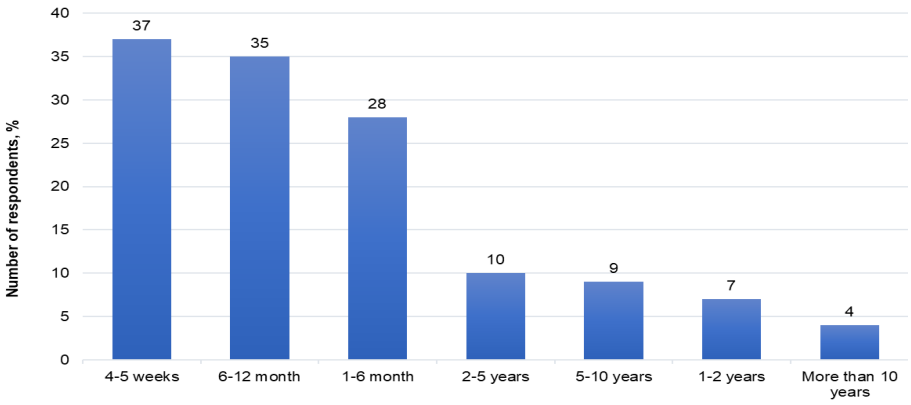

Figure 7. **The duration of consumption**

Ang, Ooi, Abd Aziz, & Tong, (2023) highlighted consumers' considerations when making online purchases of health supplements and natural products in both product-related and process-related domains: (1) product effectiveness, (2) product safety, (3) purchase convenience, (4) fair purchase and (5) online security, suggesting that consumers ultimately take an acceptable level of risk to make the decision to purchase health supplements and natural products online. As the results of the survey indicate, the majority of participants purchase the dietary supplements at pharmacies or online, but from the certified suppliers (see Figure 8):

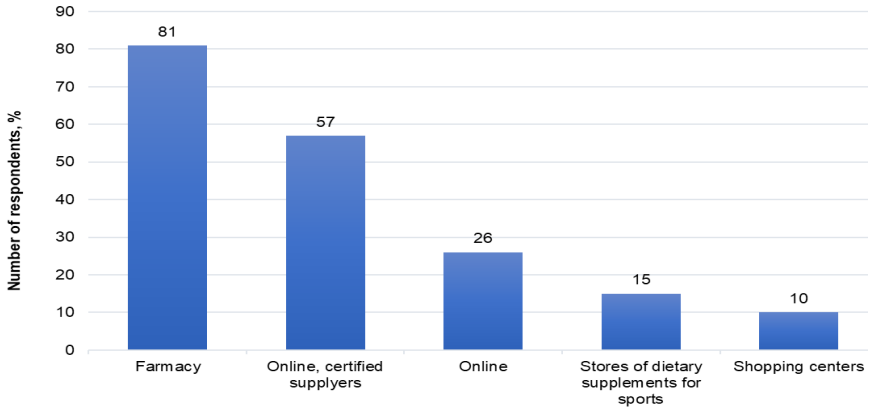

Figure 8. **The places of purchase**

However, dietary supplements and nutraceuticals are not necessarily safe for everybody. Like regular drugs, supplements with active ingredients that provide a physiological or pharmacological effect are likely to also cause adverse effects in susceptible individuals. More attention to adverse effects and potential interactions is needed to avoid serious

medical outcomes. Users and physicians alike should consult updated literature before beginning or advising a regimen involving these substances. Medical providers should be aware that a large fraction of the general population takes dietary supplements. They should therefore request information from patients about their supplement intake to provide optimal medical care (Ronis, Pedersen, & Watt, 2018). Adverse effects related to dietary supplement use were found to be associated with having respiratory disorders (asthma) and digestive disorders (AlTarrah, ElSamra, Daher, AlKhas, & Alzafiri, 2024). High doses of magnesium often result in diarrhea, nausea and abdominal cramping due to the osmotic effect. Calcium carbonate salt can cause gastric reflux and constipation (Moses, 2021). Iron deficiency anemia is a worldwide healthcare problem affecting approximately 25% of the global population. The most common iron deficiency anemia treatment is oral iron supplementation, which has been associated with gastrointestinal side effects such as constipation and bloating (Bloor, Schutte, & Hobson, 2021). Typical adverse effects of therapeutic iron doses, such as 100–200 mg/day include abdominal pain, nausea, vomiting, constipation, diarrhea and black discoloration of feces (Moses, 2021). Vitamin and mineral supplements do not lower the risk of cardiovascular diseases and cancer, while the role of omega-3 fatty acids in the prevention of cardiological diseases is not conclusively agreed. The use of weight loss supplements is either of marginal benefit or is completely ineffective, while the side effects and the risk of adulteration with illegal substances constitute serious grounds for caution to be advised (Wierzejska, 2021). Discussing the beneficial health effects, supplementation is warranted in the setting of established deficiency as well as prevention in individuals at risk; however, fortification (adding vitamins and minerals to common foods) is also an effective strategy for prevention that has been shown to decrease the burden of micronutrient deficiencies at the population level (Bailey, West, & Black, 2015). The most common beneficial health effects reported by the respondents were higher immunity, having more energy and stamina, better academic performance, normalized Hb and ferritin levels, and improved digestion. The most common adverse effects were sleep impairments (drowsiness or insomnia), headache, obstipation or diarrhea, and allergic reactions (see Figure 9).

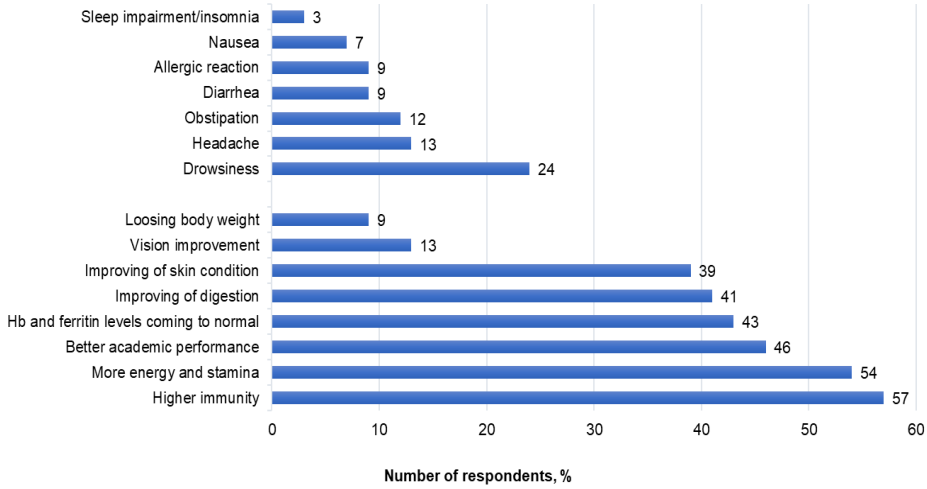

Figure 9. **The harmful and beneficial health effects**

The results of the survey suggest that attitudes of interviewed students of medical and health professional programs are not always based on medical evidence. These future health care professionals should be able to make recommendations supported by scientific data and food safety authority regulations. It is advisable to include specific courses or lectures covering the indications, interactions, and potential adverse effects of common food supplements in health care studies programs. As scientific knowledge about this topic is expected to increase in the future, medical education courses for clinicians and therapists should be organized.

CONCLUSIONS

1. **The Reasons for use:** students predominantly used dietary supplements for physical and academic performance enhancement, disease or health condition management, and weight management.The dietary supplements were taken for maintaining good physical and academic performance, for better sports results, for faster recuperation after disease or due to existing disease or health condition, and for weight management.
2. **The most common supplements:** the most frequently used vitamins included D, C, and B, while minerals like magnesium, calcium, and potassium were also popular. Caffeine, protein supplements, probiotics, complex supplements for sports, and weight management products were most frequently cited by the respondents.
3. **Usage practices:** over half of the respondents reported using multiple supplements simultaneously, with a majority adhering to recommended doses. However, fewer than half regularly checked for the compatibility or had the recommendations from health professionals. The majority of respondents purchase dietary supplements at pharmacies or online from certified suppliers. There is a significant lack of awareness regarding the potential health risks associated with consumption of dietary supplements among the students.

4. **Awareness:** the most common beneficial effects reported were enhanced immunity, gaining more energy and stamina, better academic performance. The main harmful health effects were sleep impairments, headache and obstipation.

Recommendations

To address these gaps, it is recommended that health care education programs include specific courses on dietary supplements, their indications, interactions, and potential adverse effects. Additionally, continuous medical education for clinicians on the risks associated with drug and food supplement compatibility, interactions and side effects should be prioritized.

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