UDK 615.322:635.71]:575.125 **Review Paper**
Doi 10.7251/SANUS2503041S

FOOD SUPPLEMENTS, IMPACT ON HEALTH AND POSSIBLE FRAUDS

Milka Stijepić[1]
[1]PI College of Health Sciences Prijedor, Nikole Pašića 4a, Prijedor, Republic of Srpska, Bosnia and Hercegovina

Abstract. *Due to the global poor quality of food, as well as the accelerated pace of life in the modern world, it is increasingly difficult to resist the challenges of maintaining a balanced diet. It often happens that certain nutrients are lacking in the diet, which can lead to a number of different health problems such as fatigue, weakened immune system function, weak bones and muscles, nerve dysfunction, and more. Therefore, dietary supplements, although not a medicine and as such cannot have a defined pharmacological, immunological or metabolic effect, can often, with proper use, represent a key factor in supporting both physical and mental health. In our country, similar to the European Union (EU), dietary supplements (nutritional supplements) are defined as food products whose purpose is to supplement the usual diet, and which represent a concentrated source of nutrients or other substances with nutritional or physiological effects, individually or in combination, which are placed on the market in dosage form such as capsules, lozenges, tablets, pills, sachets of powder, ampoules of liquid, dropper bottles and in other similar forms for use in measured small quantities. Existing EU regulations have mainly focused on vitamins and minerals, as well as substances used as their sources. For ingredients other than vitamins and minerals, the European Commission has established harmonised rules to ensure that food supplements are safe and properly labelled, and to protect consumers from possible health risks. The established rules prohibit attributing properties of treatment, diagnosis, alleviation, prevention, or cure of diseases to dietary products through declarations, presentations, or advertising. A wide range of nutrients and other ingredients may be present in supplements, where in addition to vitamins (B-complex, vitamins A, D and K, folic acid, biotin) and minerals (magnesium, potassium, sodium, zinc, iron, copper), fatty acids (linoleic, linolenic, EPA, DHA, arachidonic, alpha-lipoic), protein concentrates (milk, soy, egg, amino acids), plant extracts and live cultures of microorganisms may be included. In addition, supplements include edible mushrooms, algae, bee products, and other substances with nutritional or physiological effects. When talking about supplements, their potential benefits are usually emphasized, and attention is rarely paid to what is related to the risks, namely, their side effects. Some literature data suggests that supplements are increasingly being used inappropriately, most often without a doctor's recommendation and with little knowledge about their possible harmful effects. Namely, it is not uncommon for users to ignore recommendations and take supplements at their own discretion, most often in increased quantities, which can cause corresponding health risks. Supplements are increasingly popular on the market, usually have a high resale value and because of that they are an ideal target for fraud. The most common frauds are: in product declaration (inadequate representation of the production process, false geographical origin, incomplete list of ingredients); replacing a higher quality (more expensive) ingredient with a lower quality one; adding undeclared ingredients to improve their quality; copying a brand; the gray area (e.g. selling excess unreported*

product); prohibited health claims about treating diseases; internet fraud (fake ads with fictional studies and websites full of fake reviews, identity theft, etc.). As with any other food commodity, managing supplement fraud requires a systematic approach to ensure safety and meet established product quality standards. The aim of the paper is to present the most important dietary supplements in the diet, their impact on health and possible fraud related to them.

Key words: *supplements, vitamins, minerals, health, risks, frauds*

Introduction

It is widely known that a a precondition for maintaining good health is a proper and varied diet that can satisfy all the body's needs for vitamins, minerals and other nutrients. However, rapid urbanization, changes in lifestyle, and increased production of processed food have influenced the changes in the food pattern of modern man. High-calorie foods rich in fat, sugar, and salt are consumed daily, and most people do not consume enough fresh fruits, vegetables, and whole grains [1].

The fast tempo of life, stress, and the deteriorating nutritional quality of food are linked to the increase in chronic non-infectious diseases of the modern era. In this context, supplements (food additives) that containing vitamins, minerals, amino acids, plant extracts and other bioactive substances are becoming increasingly popular as a means of supplementing nutrition and improving overall health. The need for supplementation exists especially among risk groups such as women and the elderly, and the goal is certainly to prolong life, achieve and maintain good health, prevent disease, and increase strength and endurance. In addition, potential users of dietary supplements are children, pregnant women, athletes, people with increased nutritional needs, people with reduced intake of certain food ingredients, and people who want to achieve a certain physiological effect. With their active ingredients, dietary supplements can help, enhance and assist in strengthening the body's natural functions. However, in order to help your body, you need to know who needs which dietary supplements, in what form and in what dosage. Although supplements mainly consist of natural substances and nutrients and they are safe to eat, there are also those on the market that may contain pharmacologically active ingredients and various substances that are not listed in the declaration. So, there are risks to using dietary supplements and they are real. In this regard, unwanted allergic reactions to some of the components may occur, as well as interactions with other foods or other medications that are being used, as well as interactions between the supplements themselves.

Despite all the risks and important medical and ethical issues regarding the efficacy and safety of dietary supplements, recent years have seen a steady increase in their consumption, as well as their increasing number on the market. Considering that they are, among other things, supported by massive marketing promotions, their widespread use is not surprising, especially considering the fact that users consider them reliable and secure. Thus, the National Health and Nutrition Examination Survey from 1999 to 2012 showed that about half of American adults regularly use

dietary supplements. That number increased to 58% in 2017–2018, with women aged 60 and over making up the largest group of beneficiaries (80%).

In the same survey, 34% of children and adolescents up to 19 years of age stated that they use supplements [2, 3]. In 2020, the global nutritional supplement market is estimated at $140.3 billion. Projections are that the annual growth rate in the period from 2021 to 2028 will be 8.6%, and the largest proportion is made up of vitamins (31.4%), followed by herbal preparations, minerals, and proteins, amino acids and creatine [4].

Consumers generally consider dietary supplements safe to use. Thus, 84% of Americans and 69% of Europeans trust dietary supplement manufacturers.

However, according to some studies, only 23% of all dietary supplements are used on the recommendation of a doctor [5]. On the other hand, their use may be partly motivated by evidence suggesting that increased intake of some dietary components may be associated with a reduced risk of developing, for example, cancer or cardiovascular disease [6].

Despite this, some studies have given mixed results regarding the health benefits of individual dietary supplements. Thus, clinical trials conducted on arbitrarily selected samples have often failed to demonstrate the benefits of these dietary supplements, although the duration of many randomized clinical trials may not have been long enough to detect beneficial effects [7,8].

Furthermore, some research suggests that the use of selected dietary supplements in high doses may have adverse effects, which creates some skepticism regarding their use [9].

The aim of this review is to examine the effects of dietary supplements on human health based on the available scientific literature. Special emphasis is placed on their benefits, potential risks and side effects, as well as on the frequency and forms of fraud in their promotion and sale. The paper also aims to provide a critical review of regulations and recommendations related to the use of supplements, in order to enable a better understanding of their role in modern nutrition and consumer protection.

Definition and regulation of dietary supplements

Dietary or nutritional supplements are products that supplement the normal diet and contain one or more concentrated nutrients (vitamins, minerals and other substances with a nutritional or physiological effect), and they are coming to the market in dosage pharmaceutical forms designed to be taken in measured small quantities (capsules, tablets, lozenges, sachets of powder, ampoules of liquid, drops, etc.) [10].

This category of foods was first regulated in detail in the United States (US) by the Dietary Supplement Health and Education Act (DSHEA) of 1994 [11]. According to this law, the FDA (Food and Drug Administration) [12] defines supplements as products intended to supplement the food consumed and containing one or more nutritional ingredients such as vitamins, minerals, herbal preparations, amino acids, substances that favorably affect food intake, concentrates, metabolites, constituents,

extracts, or their combinations. Dietary supplements are not used as conventional food, cannot replace individual meals, and they are labeled as "dietary supplement". Supplements in the US can be sold without the need to provide pre-market evidence of their effectiveness or safety, as long as the manufacturer does not claim specific medicinal properties of their products.

In the European Union (EU), member states' regulations on dietary supplements are not fully harmonized due to local regulations and guidelines, and the biggest differences are in the maximum permitted amounts of vitamins and minerals. In fact, the harmonization of regulations on dietary supplements began with the Framework Directive 2002/46 EC (consolidated version 30/03/2021) on the harmonisation of the laws of the EU Member States relating to dietary supplements [13]. This directive establishes a list of permitted vitamins and minerals, the substances that may be used as their sources (e.g. only L–ascorbic acid, L–sodium ascorbate, L–calcium ascorbate, L–potassium ascorbate or L–ascorbyl palmitate may be used as a source of vitamin C), the units for labelling and the permitted forms for dietary supplements. To avoid confusion, the EU no longer uses international units (IU) to label the amount of vitamins and minerals in supplements, but only weight units (mg or μg). In order to inform and protect consumers, all products in the dietary supplement category must be properly labeled, presented, and adequately marketed. The Nutrition Labelling Directive (90/466/EEC) [14] only prescribes RDA values for adults, while RDA values for infants and children have not yet been harmonised, and national recommendations differ somewhat. The aforementioned EU Directive on Dietary Supplements requires that the safety of supplements be proven, both in terms of dosage and purity [13]. Only those supplements that have been proven to be safe may be sold in the EU without a prescription. As a food category, dietary supplements cannot be labeled with drug claims, but may carry health and nutritional claims [15].

Regulatory procedures vary from country to country, but the framework covering product quality and manufacturing quality is similar worldwide. However, there are very few prospective, randomized clinical trials worldwide that address the safety and efficacy of dietary supplements, which is a growing concern for regulatory authorities in certain countries.

In the EU and the US, the labeling of dietary supplements must adhere to strict regulations designed to ensure safety and clarity of information for consumers. However, detailed regulations on their composition, labeling and acceptable health claims vary significantly between regions. Thus, in the EU, greater emphasis is placed on health claims due to potential risks and precautions, while in the US there is more flexibility in presenting the health benefits of supplements as long as they are not advertised as medical products.

In BiH, food supplements are regulated by the Food Law [16] and several rulebooks related to food supplements, but with full inclusion of EU guidelines. The adopted regulations in our country are under the jurisdiction of the Ministries of Health of the entities and the Brčko District of BiH. In the Republika Srpska, the Rulebook on Food Supplements was adopted in 2024 [10], and in the Federation of BiH, the Rulebook on the Health Safety of Dietary Foods [17]. Dietary supplements on the market of the

Republika Srpska must be registered in the Register of the Ministry of Health and Social Welfare. The Public Health Institution Institute of the Republic of Srpska is responsible for providing an expert opinion on the registration and analytical report on the health safety of the listed products, based on which the Ministry approves entry into the relevant Register.

The request for registration in the database is submitted by the manufacturer or importer of the dietary supplement before placing it on the market, i.e. before the actual import. When the same product is registered in multiple countries, documentation is prepared, that is almost the same everywhere. However, the declaration is adapted to local regulations, where the regulatory authorities of a particular country prescribe the mandatory content of the text on the box and instructions for use.

Classification of dietary supplements

Dietary supplements can be classified in several ways: by composition (active ingredients), by purpose, by dosage form, by origin, and by legal framework [13, 18].

According to composition and active components, supplements are divided into:

- Dietary supplements containing vitamins, minerals and other nutrients (individually or in combinations),
- Dietary supplements containing substances of botanical origin (plants) and other origin (enzymes, probiotics).

According to their purpose, supplements can be divided into several groups, and they are most often used for:

- improving immunity and protection against infectious diseases,
- protection against osteoporosis,
- diseases of the cardiovascular system,
- improving the health of skin, hair, nails and joints,
- protection against cancer, memory loss and bad mood,
- increase in muscle mass and endurance,
- easier recovery from acute conditions, and protection from stress.

According to dosage form, dietary supplements are divided into: tablets, capsules, powders, liquid forms (syrups, drops), drink mixes, and gummies.

The original dietary supplements were limited to vitamins (B-complex, vitamins A, D, and K, folic acid, biotin) and minerals (magnesium, potassium, sodium, zinc, iron, copper), which still represent a classic example of nutritional supplementation with essential nutrients [19]. After that, a wide range of nutrients found their way into dietary supplements, including fatty acids (linoleic, linolenic, EPA, DHA, arachidonic, GLA, alpha-lipoic) [20], amino acids and isolated proteins and protein concentrates (from milk, soy, and eggs) [21], as well as certain carbohydrates (e.g., beta-glucan).Subsequently, supplements containing enzymes, plant extracts [22], live cultures of microorganisms, and even, conditionally, hormones were introduced.

Following scientific evidence of their beneficial effects on the body, bee products, edible mushrooms, algae, and other substances with nutritional or physiological effects (carotenoids, Q10, bioflavonoids, etc.) have also been added to supplements.

Vitamins and minerals as supplements can play a useful role in preventing and correcting nutritional deficiencies, but their use must be based on individual needs, taking into account general health, lifestyle habits, and diet. For example, vitamin D supplementation is often recommended during the winter months or for people who rarely spend time in the sun, since this vitamin is synthesized in the skin under the influence of UV rays. Women of childbearing age are advised to take folic acid to reduce the risk of neural tube defects in the fetus. Iron, zinc, calcium, vitamin B12, and magnesium are also common supplements, especially for people with specific health conditions, vegetarians, vegans, athletes, and the elderly.

Protein supplements are an effective and practical way to meet the increased needs of the body, especially in physically active individuals and in specific physiological or pathological conditions. They participate in building muscle tissue, synthesizing enzymes and hormones, strengthening the immune system, and tissue regeneration. Protein supplements are usually in powder form, such as whey protein, casein, soy, pea or rice protein. Whey proteins, due to their quality (content of essential amino acids), rapid absorption and effectiveness, occupy a significant place in the world of sports nutrition [23] and healthy eating. It is most often used in the form of powder concentrates and isolates, they are easy to prepare and can be mixed into water, milk, smoothies or oatmeal. Also, whey protein concentrates can be used in the production of various functional products, including traditional and probiotic yogurt [24, 25, 26].

Essential fatty acids (EFAs), such as omega-3 and omega-6, are nutritionally important fats that the body cannot produce on its own, so it is necessary to obtain them through food or supplements. The most commonly used supplements are omega-3 fatty acids (ALA, EPA, and DHA), which contribute to heart, brain, eye, and immune system health. EMF supplementation may be particularly beneficial for people who do not consume enough fish, have chronic inflammation, elevated blood fats, or neurological problems. They are most often found in capsule form or in liquid form (fish oil with EPA and DHA, krill oil contains antioxidants, algae with DHA which are suitable for vegans and vegetarians). It is important to choose quality products, purified from toxins and rich in active ingredients.

Potential risks of using dietary supplements

In addition to the benefits that supplementation can bring, there are also numerous challenges and potential risks related to the inadequate use of these products. These risks include toxicity due to overdose, drug interactions, the presence of untested or harmful ingredients, lack of standardization in the composition and quality of the products themselves, and false labeling.

Vitamins and minerals often work synergistically, but sometimes they can reduce each other's absorption or effectiveness. Taking large amounts of one vitamin or mineral leads to an imbalance of other vitamins and minerals (Figure 1).

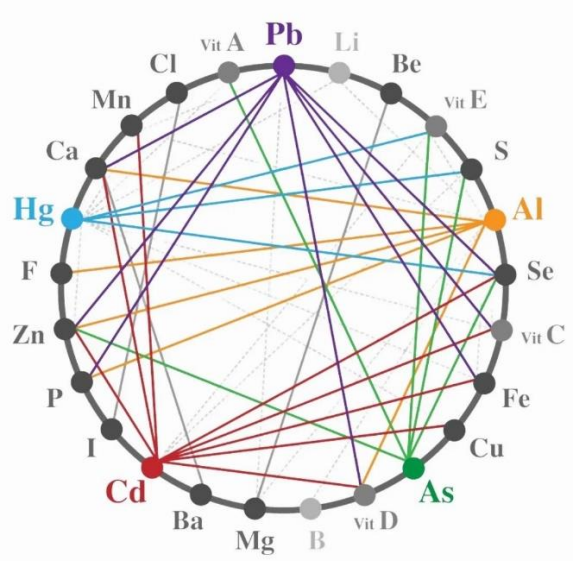

Figure 1. Interaction between vitamins and minerals

One of the most obvious risks is hypervitaminosis, especially with fat-soluble vitamins (A, D, E and K), which accumulate in the body and can cause toxic effects at high doses [27]. For example, excessive intake of vitamin A can lead to hepatotoxicity, osteoporosis, and teratogenic effects, while excessive amounts of vitamin D (over 100 μg/day in adults) can cause hypercalcemia and kidney damage. α-Tocopherol is a form of vitamin E, which doses at 800–1200 mg/day can lead to bleeding associated with antiplatelet effects, and doses above 1200 mg/day can lead to diarrhea, weakness, and blurred vision [28, 29]. Minerals can also cause toxic effects in overdose. Thus, an overdose of iron (45 mg/day) can cause gastrointestinal disorders and oxidative stress (especially dangerous for children) [30], while doses of e.g. selenium, greater than 300 μg/day, can lead to hair loss, brittle nails and neurological symptoms [31]. The maximum allowed amount and recommended daily intake of vitamins and minerals are shown in Table 1.

Interactions between supplements and drugs also pose a significant clinical problem. For example, ginkgo (Ginkgo biloba) supplements may increase the risk of bleeding in patients taking anticoagulants, while iron, calcium, and magnesium supplements may reduce the absorption of certain antibiotics. These interactions are often insufficiently known to patients and healthcare professionals [32].

Some supplements can cause *allergic reactions* (rash, itching, swelling, difficulty breathing), especially those containing proteins (from eggs, milk, soy, shellfish) or plant extracts with potentially allergenic ingredients.

One of the problem that can occur is hepatoxicity (liver damage). The liver is the primary organ for the metabolism of many supplements, and excessive use of them can lead to hepatitis, cholestasis, or liver failure. Ingredients associated with liver

damage may include green tea (in high doses), coffee, and bodybuilding supplements with anabolic steroids. A particular problem is the lack of regulation and quality control of dietary supplements on the market. Because they are available without a prescription, many products do not undergo the rigorous testing that drugs do. Studies have shown that some supplements may contain unlabeled active pharmaceutical ingredients, heavy metals (lead, mercury, arsenic), pesticides, or other harmful contaminants.

Table 1. Maximum allowed amount and recommended daily intake of vitamins and minerals [10]

Vitamins	Maximum allowed quantity	Recommended Daily Intake (RDA)	**Minerals**	Maximum allowed quantity	Recommended Daily Intake (RDA)
A	1500 μg	800 μg	Calcium	1500 mg	800 mg
D	10 μg	5 μg	Phosphorus	1400 mg	700 mg
E	200 mg	20 mg	Magnesium	375 mg	375 mg
C	800 mg	80 mg	Iron	30 mg	14 mg
K	100 μg	75 μg	Zinc	15 mg	10 mg
B_1	25 mg	1,1 mg	Fluorine	10 mg	3,5 mg
B_2	25 mg	1,4 mg	Iodine	225 μg	150 μg
B_3	35 mg	16 mg	Selenium	100 μg	55 μg
B_6	20 mg	1,4 mg	Copper	3 mg	1 mg
Folic acid	600 μg	200 μg	Manganese	4 mg	2 mg
B_{12}	25 μg	2,5 μg	Molybdenum	100 μg	50 μg
Pantothenic acid	18 mg	6 mg	Potassium	2000 mg	2000 mg

Labeling of dietary supplements and permitted statements (claims)

Although dietary supplements are products that fall into the food category, their effectiveness and pharmaceutical form are much closer to drugs. This similarity with medicines is not only in appearance, but also in composition. Namely, supplements and medicines contain the same substances, such as, for example, vitamins, minerals, glucosamine sulfate, chondroitin sulfate, and others. The difference is usually in the administered doses and the method of use or purpose [33].

Table 2. Difference between dietary supplements and drugs [33]

Difference field	**Dietary supplements**	**Medications**
Legislation	food	medicine
Users	everyone	sick
Security	risk	risk/benefit
Sales	free	in pharmacies
Request	reduced risk	treatment of disease

European Union legislation [33] ensures that all health claims made on food labels are supported by sound scientific evidence. A health claim is any statement that associates a food or ingredient with a specific health benefit.

Although dietary supplements are not a medicine, they can be claimed to have beneficial effects on the health of the user and are therefore desirable in the diet. They usually carry health claims related to their proclaimed potential to boost immunity, support physiological processes in the body, and combat various health conditions (diseases). However, their declarations cannot contain statements (claims) that the dietary supplement is intended for the purpose of diagnosing, treating, or preventing any disease or condition. Also, the labeling, presentation and advertising of supplements must not contain any statement suggesting or claiming that a balanced and varied diet cannot provide adequate amounts of nutrients [34]. Furthermore, it is not permitted to make nutritional and health claims if the average consumer cannot understand the beneficial effects stated in the claim.

The European legislative framework requires certain details regarding the labeling of dietary supplements, including a statement regarding the recommended daily dose and purity and a warning to consumers not to exceed it [13].

Health claims are approved only after a rigorous scientific assessment conducted by the European Food Safety Authority EFSA [29]. There can be a health claim on the packaging, for example: "reduces body weight", "strengthens immunity" or "maintains normal muscle function". Only those dietary supplements that have been proven to be safe can be marketed and sold without a doctor's prescription.

In addition to health claims, which refer to the connection between food and health, nutritional claims emphasize the composition of a food (e.g. “high in fiber,” “low in fat,” or “no added sugar”).

Since a doctor's prescription is not required, dietary supplements are easily available to consumers in pharmacies, drugstores, and health food stores, as well as through online sales. Certainly, on each label of a dietary supplement must include: product name, list of ingredients, information on the content of active components in the recommended daily dose in 100 g of the product, nutritional information, information on the method of use, information on the shelf life, storage method, serial number and information on the manufacturer.

When purchasing dietary supplements, consumers should check whether the product packaging contains information about the manufacturer and the holder of registration in the database of dietary supplements, as well as the number and date of registration of the product in the database of the Ministries of Health of the entities of BiH. Only products that carry this information are legally available on the market in our country and can be confidently claimed to be correct. Pharmacies and specialized stores, as registered places for the sale of this category of products, are not allowed to have products in their assortment that have not undergone the approval procedure of the competent institutions.

Dietary supplement scams

Supplements have become an indispensable part of modern nutrition and health culture. However, growing demand is accompanied by an increase in unethical practices in the industry, including fraud that occurs at various stages – from product composition to advertising and distribution methods. Unlike medicines, dietary supplements in many countries are not subject to strict approval and efficacy testing procedures before they reach the market. Manufacturers often do not have to prove that a product is safe or contains what is stated on the label. This gap in the legal regulation allows differnet dishonest companies to market products that, for example:

- contain fewer active ingredients than declared,
- contain illegal or even dangerous substances (such as steroids, stimulants or drugs),
- they have false claims about medicinal effects that have not been scientifically confirmed.

Dietary supplement scams not only mislead consumers with serious health consequences, but can often also financially harm the consumer by purchasing expensive products that have no real effect. In many countries, inspectorates do not have the capacity to regularly control all products on the market. Often, response comes only after health problems or consumer complaints arise. This is usually followed by mild penalties or none at all, while the damage to public health is far-reaching. In addition, online sales make control even more difficult, as many products come from abroad and they are not subject to local laws.

There are various forms of fraud associated with dietary supplements:

- *False declaration of composition* means that many supplements on the market do not contain the amounts of active ingredients stated on the label. Sometimes these amounts are significantly smaller, and sometimes they are completely left out (e.g., a supplement states that it contains 500 mg of green tea extract, but laboratory analysis shows only 50 mg or none at all) [29].
- *The presence of illegal substances* is a common way of defrauding consumers. Thus, some manufacturers add illegal or unregistered substances (e.g. drugs, steroids, stimulants) to enhance the effects of supplements without stating this on the label (e.g., the label states that a weight loss supplement contains sibutramine (a drug withdrawn from the market due to the risk of heart problems), even though this is not stated [35].
- *False advertising or claims without evidence*, where manufacturers often advertise supplements as medicinal or even as a substitute for therapy, although there is no scientific evidence for these claims (eg, the advertisement claims that the supplement cures diabetes, kills cancer cells or 100% guarantees weight loss without dieting) [29].
- *Fake reviews and testimonials*, where many sites use fabricated user testimonials, fake reviews or paid influencers to create the impression that the product is effective (e.g. "This supplement saved my life!", with a photo of a person who does not exist or is taken from the Internet) [36].

- *Online sales fraud*, where purchasing supplements from unregulated online platforms carries a high risk, often selling counterfeit products, expired products, or illegal supplements from abroad (e.g. purchasing a "testosterone booster" from an unknown website, containing unlabeled hormones) [35].
- *Use of false certificates and quality marks*, where some products display non-existent certificates on the label or misuse the logos of institutions such as FDA, EFSA, ISO, etc. (e.g., the product is labeled "FDA approved" – even though the FDA does not approve dietary supplements (only drugs) [37].

Conclusion

Supplements can play an important role in maintaining health, especially when there is a lack of certain nutrients in the diet or increased needs of the body. Properly selected and high-quality supplements, with professional guidance, can contribute to better function of the immune system, heart, bones, and brain. However, uncritical or excessive use may carry risks, such as side effects, drug interactions or overdose. The supplement market is often inadequately regulated, which opens up space for numerous scams and misleading claims. Many products are advertised with unrealistic promises of rapid weight loss, disease cures, or "miraculous" effects, without scientific basis or clinical evidence. Also, some supplements may contain untested and even harmful ingredients, or not contain what is stated on the label. Therefore, it is important for consumers to be informed, to purchase supplements only from trusted manufacturers, and to consult with health professionals before use. A critical approach and caution can help maximize benefits while avoiding health risks and financial fraud.

References

[1] Neuhouser ML. The importance of healthy dietary patterns in chronic disease prevention. Nutr Res. 2019;70:3-6.
[2] Mishra S, Stierman B, Gahche JJ, Potischman N. Dietary supplement use among adults: United States, 2017–2018. NCHS Data Brief, no 399. Hyattsville, MD: National Center for Health Statistics. 2021.
[3] Stierman B, Mishra S, Gahche JJ, Potischman N, Hales CM. Dietary Supplement Use in Children and Adolescents Aged ≤19 Years - United States, 2017-2018. MMWR Morb Mortal Wkly Rep. 2020 Oct 30;69(43):1557-1562. doi: 10.15585/mmwr.mm6943a1.
[4] Grand View Research (GVR): Dietary Supplements Market Size, Share & Trends Analysis Report by Ingredient (Vitamins, Minerals), By Form, By Application, By End User, By Distribution Channel, and Segment Forecasts, 2021 – 2028. GVR, 2020 https://www.grandviewresearch.com/industry-analysis/dietary-supplements-market
[5] Bailey RL, Gahche JJ, Miller PE, Thomas PR, Dwyer JT. Why US adults use dietary supplements. JAMA Intern Med. 2013;173(5):355-361.
[6] Giovannucci E, Rimm EB, Liu Y, Stampfer MJ, Willett WC. A prospective study of tomato products, lycopene, and prostate cancer risk. J Natl Cancer Inst. 2002;94(5):391-398.
[7] Rautiainen S, Rist PM, Glynn RJ, Buring JE, Gaziano JM, Sesso HD. Multivitamin use and the risk of cardiovascular disease in men. J Nutr. 2016;146(6):1235-1240.
[8] Sesso HD, Christen WG, Bubes V, et al. Multivitamins in the prevention of cardiovascular disease in men: the Physicians' Health Study II randomized controlled trial. JAMA. 2012;308(17):1751-1760.

[9] Guallar E, Stranges S, Mulrow C, Appel LJ, Miller ER III. Enough is enough: stop wasting money on vitamin and mineral supplements. Ann Intern Med. 2013;159(12):850-851.
[10] Pravilnik o dodacima ishrani (Službeni glasnik RS, br.45/2024)
[11] Dietary Supplement Health and Education Act (DSHEA), Federal registar 42 USC 287C-11; 1994.
[12] U.S. Food and Drug Administration (FDA) – "Dietary Supplement Ingredient Advisory List" https://www.fda.gov
[13] Directive 2002/46/EC of the European Parliament and of the Council of 10 June 2002 on the approximation of the laws of the Member States relating to food supplements. Off J EC. 2002;L183:1-14.
[14] Council Directive on nutritional labelling for foodstuffs 90/466/EEC, OJ 1991/2, 1991;
[15] European Commission website: Food Safety – Labelling & Nutrition – Health & Nutrition Claims. Ec.europa.eu. Retrieved 5 December 2012.
[16] Zakon o hrani ("Službeni glasnik BiH", broj 50/04)
[17] Pravilnik o zdravstvenoj ispravnosti dijetetskih namirnica („Službene novine FBiH" br.96/17).
[18] Codex Alimentarius (FAO/WHO): https://www.fao.org/fao-who-codexalimentarius/en/
[19] National Institutes of Health (NIH) Office of Dietary Supplements. (2021).
[20] Calder PC. Marine omega-3 fatty acids and inflammatory processes: Effects, mechanisms and clinical relevance. Biochim Biophys Acta. 2015 Apr;1851(4):469-84. doi: 10.1016/j.bbalip.2014.08.010.
[21] Phillips SM. The impact of protein quality on the promotion of resistance exercise-induced changes in muscle mass. Nutr Metab. 2016;13:64. https://doi.org/10.1186/s12986-016-0124-8
[22] Panossian A, Wikman G. Effects of Adaptogens on the Central Nervous System and the Molecular Mechanisms Associated with Their Stress-Protective Activity. Pharmaceuticals (Basel). 2010 Jan 19;3(1):188-224. doi: 10.3390/ph3010188.
[23] Stijepić I, Malinović N, Vujasinović D, Stijepić M. 2023. Possibilities of using whey protein as supplements in the nutrition of athletes. Scientific conference SANUS 2023, PI College of Health Sciences Prijedor, Republic of Srpska, Bosnia and Herzegovina June 23rd-24th, 2023 Proceedings, 177-190. doi: 10.7251/ZSAN2302177S
[24] Stijepić M, Grujić R, Malinović N. Effects of goat whey protein concentrate on syneresis of acidophilus milk. Journal of Hygienic Engineering and Desing. 2021; 37, 95-101.
[25] Stijepić M, Milanović S, Djurdjević-Milošević D, Djurić M, Glušac J, Kanurić K, Vukić V. Effects of honey and whey protein concentrate addition on textural and sensory properties of probiotic yoghurt. Milchwissenschaft - Milk Science International. 2012;67(3):277-80.
[26] Stijepić M, Đurđević Milošević D, Glušac J. Production of low fat yoghurt enriched with different functional ingredients, Quality of Life. 2012; 3 (1-2):5-12. doi: https://doi.org/10.7251/QOL1201005S
[27] Mulholland CA, and Benford DJ. "What is known about the safety of multivitamin-multimineral supplements for the generally healthy population? Theoretical basis for harm." The American journal of clinical nutrition. 2007: 318S-322S.
[28] Institute of Medicine (2000). Dietary Reference Intakes for Vitamin C, Vitamin E, Selenium, and Carotenoids
[29] European Food Safety Authority (EFSA) – „Health Claims Regulations" https://www.efsa.europa.eu
[30] Institute of Medicine (2001), EFSA NDA Panel (2015)

[31] EFSA Panel on Dietetic Products, Nutrition and Allergies (NDA), 2014
[32] Asher GN, Corbett AH, Hawke RL. Common Herbal Dietary Supplement-Drug Interactions. Am Fam Physician. 2017; 96(2):101-7. doi: 10.1177/011542650502000133.
[33] Regulation of the European Parliament and Council on nutritional and health claims made on food, (EC) no. 1924/2006, Official Journal of the European Union, 2006.
[34] Soni MG, Thurmond TS, Miller III ER, Spriggs T, Bendich A, Omaye ST. Safety of vitamins and minerals: controversies and perspective. Toxicol Sci. 2010;118(2):34855. doi:10.1093/toxsci/ kfq293
[35] World Health Organization (WHO) – "Substandard and Falsified Products" https://www.who.int
[36] Federal Trade Commission (FTC) – "Advertising and Marketing on the Internet: Rules of the Road"https://www.ftc.gov
[37] FDA – "Fraudulent Claims" https://www.fda.gov/consumers/consumer-updates/beware-fraudulent-dietary-supplement-products

SUPLEMENTI U ISHRANI, UTICAJ NA ZDRAVLJE I MOGUĆE PREVARE

Milka Stijepić[1]
[1]JU Visoka medicinska škola Prijedor, Nikole Pašića 4a, Prijedor, Republika Srpska, Bosna i Hercegovina

Sažetak. *Zbog globalno lošijeg kvaliteta namirnica, ali i ubrzanog tempa života u savremenom svijetu, sve je teže odolijevati izazovima u održavanju uravnotežene ishrane. Često se događa da u ishrani nedostaju određeni hranljivi sastojci, što može dovesti do niza različitih zdravstvenih problema kao što su npr. umor, oslabljena funkcija imunog sistema, slabe kosti i mišići, poremećaj nervne funkcije i drugo. Zbog toga, dijetetski suplementi, iako nisu lijek i kao takvi ne mogu imati definisano farmakološko, imunološko ili metaboličko djelovanje, često, uz pravilno korištenje, mogu predstavljati ključni faktor za podršku, kako fizičkom tako i mentalnom zdravlju čovjeka. Kod nas su, slično kao u Evropskoj Uniji (EU), dijetetski suplementi (dodaci ishrani) definisani kao prehrambeni proizvodi čija je svrha dopuna uobičajenoj ishrani, a predstavljaju koncentrovani izvor hranljivih materija ili drugih materija prehrambenog ili fiziološkog dejstva, pojedinačno ili u kombinaciji, koji se stavljaju na tržište u doziranom obliku kao što su kapsule, pastile, tablete, pilule, vrećice praha, ampule tečnosti, bočice na kapaljku i u drugim sličnim oblicima za korištenje u odmjerenim malim količinama. Postojeća regulativa EU se uglavnom fokusirala na vitamine i minerale, kao i materije koje se koriste kao njihovi izvori. Za sastojke koji nisu vitamini i minerali, Evropska komisija je uspostavila usklađena pravila kako bi se osiguralo da su dodaci ishrani sigurno i propisno označeni, te da se potrošači zaštite od mogućih zdravstvenih rizika. Uspostavljenim pravilima zabranjuje se da se deklaracijom, prezentacijom i reklamiranjem, dijetetskim proizvodima pripisuju svojstva liječenja, dijagnostikovanja, ublažavanja, sprečavanja ili izliječenja bolesti. Širok raspon hranjivih materija i drugih sastojaka može biti prisutan u suplementima, gdje pored vitamina (B-kompleks, vitamini A, D i K, folna kiselina, biotin) i minerala (magnezijum, kalijum, natrijum, cink, željezo, bakar), mogu biti uključene masne kiseline (linolna, linolenska, EPA, DHA, arahidonska, alfa-lipoinska), proteinski*

koncentrati (mliječni, sojini, od jaja, aminokiseline), biljni ekstrakti i žive kulture mikroorganizama. Osim toga, suplementi podrazumijevaju i jestive gljive, alge, pčelinje proizvode i druge materije sa hranljivim ili fiziološkim učinkom. Govoreći o suplementima obično se tu podrazumijevaju njegove potencijalne prednosti, a rijetko se obraća pažnja na ono što je u vezi s rizicima, odnosno njihovim neželjenim efektima. Neki literaturni podaci govore da se suplementi sve više neosnovano koriste, najčešće bez preporuke ljekara i uz oskudno znanje o njihovim eventualnim štetnim efektima. Naime, nerijetki su slučajevi da korisnici ignorišu preporuke i suplemente uzimaju po vlastitoj procjeni, najčešće u povećanoj količini što može izazvati odgovarajuće rizike po zdravlje. Suplementi su sve popularniji na tržištu, obično imaju visoku prodajnu vrijednost i stoga su idealna meta za prevare. Najčešće prevare su: kod deklarisanja proizvoda (neadekvatno predstavljanje proizvodnog procesa, neistinito geografsko porijeklo, nepotpuna lista sastojaka); zamjena kvalitetnijeg (skupljeg) sastojka manje kvalitetnim; dodavanje neprijavljenih sastojaka radi poboljšanja njihovog kvaliteta; kopiranje brenda; siva zona (npr. prodaja viška neprijavljenog proizvoda); zabranjene zdravstvene tvrdnje o liječenju bolesti; internet prevare (lažni oglasi sa izmišljenim studijima i veb sajtovi puni lažnih recenzija, krađe identiteta i drugo). Kao i kod svake druge prehrambene robe, upravljanje prevarama u vezi sa suplementima zahtijeva sistematski pristup kako bi se osigurala sigurnost i ispunili utvrđeni standardi kvaliteta proizvoda. Cilj rada je da se predstave najznačajniji dijetetski suplementi u ishrani, njihov uticaj na zdravlje i moguće prevare u vezi s tim.

***Ključne riječi**: suplementi, vitamini, minerali, zdravlje, rizici, prevare*