Observational Cross-Sectional Study on Dietary Supplementation among Adults in Eastern Croatia

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Abstract: The aim of the study was to gain insight into supplementation habits among adults in eastern Croatia. In cross-sectional study 466 adult participants were asked by anonymous survey about the type of supplement they take, the doses of the used supplement and the reasons and motivation for supplementation. Results revealed that participants most often chose essential nutrients (59 %) among which magnesium, multivitamins, B-complex vitamins, calcium and omega-3 fatty acids dominate. Supplementation is mostly aimed for disease treatment (46 %) and prevention (35 %) with musculoskeletal system and connective tissue diseases being the main cause followed by digestive system diseases. Most of the supplements were selected based on the recommendation of a health professional (76 %) and in line with recommendation by pharmacist or as stated at the product label (86 %).

Keywords: Dietary supplement, essential nutrients, non-essential nutrients, natural health products and extracts, adults.

1. INTRODUCTION

Dietary supplements are taken orally in specified doses in the form of pills, capsules, powders or liquid preparations. They are an addition to the normal balanced diet and do not contribute significantly to the energy or fluid intake. Most of them carry health claim for advertising purposes. Dietary supplements can be classified into three categories with essential nutrients encompassing the first one, nonessential nutrients and body metabolites the second and natural plant or animal products and their extracts the third one [1].

Dietary supplement use is more and more common. The mostly used are vitamins and minerals, but interest rises also for omega-3 fatty acids, antioxidants, dietary fibres and natural health products [2]. Supplement use increases with age and is higher in women than in men [3]. Population surveys indicate correlation between healthy lifestyle choices and dietary supplementation. The supplementation is aimed to fulfil daily recommendations and through that to contribute to general wellness [2]. The most often dietary supplements use is encouraged by an advertisement or friend recommendation while professional recommendation is less common. At the same time, many dietary supplements are purchased in pharmacies and therefore it has been argued that pharmacists are in the best position to provide potential users with evidence-based information on their purpose as well as their benefits and potential risks in case of misuse [4]. Most of the people consider dietary supplements as safe. In reality due to gaps in legislation products of lower quality with potential negative effects on health can also be found on the market. At the same time, misuse of those of highest quality can also lead to complications [5]. In such situation role of pharmacists becomes crucial. Only with professional guidance dietary supplements can result in optimal effects [6].

The prevalence of dietary supplement use varies largely among populations, and the diversity in supplement use across countries indicates that cultural and environmental factors could influence the use of dietary supplements [7]. The aim of this cross-sectional study was to gain insight into dietary supplementation habits among adults in eastern Croatia with special interest in types of supplements used and motivation for their use. Additionally, dosage of supplements was checked.

2. SUBJECTS AND METHODS

Cross sectional survey was conducted in summer period and encompassed 529 Tripolski Pharmacy users (8 drug stores in eastern Croatia). Inclusion criteria were that they have visited drug store to provide dietary supplement.

Preliminary check-up of collected surveys revealed some missing data in some of them. Altogether, 25

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surveys (5 % of all study participants) were excluded from the further analysis. 5 surveys (1 % of all study participants) were excluded due to missing age data and 20 surveys (4 % of all study participants) due to missing nutritional status data. Analysis presented in this paper also did not encompass surveys (38 surveys, 7 % of all study participants) regarding purchase of products for juvenile users. Following the exclusion as described above, data analysis encompassed 466 study participants (Table **1**).

Table 1: Characteristics of the Study Participants

		Number of participants
All participants		466
Gender	Males	148
	Females	318
Living area	Urban	207
	Rural	259
Nutritional status	Underweight (BMI <18.5)	11
	Normal (BMI 18.50 - 24.99)	183
	Overweight (BMI ≥25.00)	184
	Obese (BMI ≥30.00)	88
Age	19-30	60
	31-50	104
	51-70	179
	Above 70	123

Data were collected using single anonymous survey. Survey form included information about supplement user as well as those about supplement itself. Survey form was filled in by pharmacist through short interview. In case of dilemmas, pharmacists also provided additional explanation with the aim of receiving high quality information. Interview took 10 up to 20 minutes per participant.

In case when purpose of usage was to treat or prevent disease participant was asked to state medical condition to which he refers and the information was classified according the 10^{th} Revision of International Statistical Classification of Diseases and Related Health Problems (ICD-10) [8].

Daily dosage stated by producer of dietary supplement was used as a reference for comparison to declared participant practices.

Data analysis was performed using Microsoft Office Excel.

3. RESULTS AND DISCUSSION

Since the is no unique standardized approach for categorisation of dietary supplements, for the purpose of this study, and based on their chemical composition and biological function, dietary supplements were divided into three categories. First category encompassed essential nutrients (vitamins, minerals, trace elements, fatty acids and amino acids) and some antioxidants [1]. Second category encompasses compounds that are taken as dietary supplements but not essential compounds although they are normally present in human diet and produced by metabolic reactions in human body. Their functional roles are similar to those of vitamins but unlike vitamins can be synthetized in human body in amounts sufficient to satisfy physiological needs. Yet, their intake through supplements can be useful in case of increased needs or some pathological states. This group encompasses, among others, glucosamine and chondroitin sulphate, S-adenosylmethionine, lecithin and choline, L-carnitine, creatine and coenzyme Q_{10}. Most of them have shown positive effects, but all of them need further studies to confirm or deny their effect [1]. Third category of dietary supplements encompasses plant health products and extracts, bee products, some probiotics and products of fungi (for example β-glucans). Their quality on the market widely varies due to fairly simple registration and therefore selection of the one which is of appropriate quality is crucial. Since medicines are, unlike dietary supplements, subject to strict quality controls, one of the good quality criteria for dietary supplement is its inclusion in the medicines [1].

Obtained result revealed that the most often used supplements are those from the category of essential nutrients which are used by 59 % of study participants. They are followed by natural health products and extracts which are used by 37 % of study participants. The least used (used by 4 % of study participants) are nonessential compounds. Considering the presence of various products in pharmacies these results were not surprising.

The most often used specific products from the category of essential nutrients by their representation are presented on Figure **1**. Domination of magnesium, multi vitamins, B-complex vitamins, calcium, and omega-3 fatty acids is visible. Among other essential compounds which were chosen by altogether 11 % of the study participant's zinc, iron and vitamin C were noticed.

Obtained results are significantly different from those obtained in other studies which study dietary

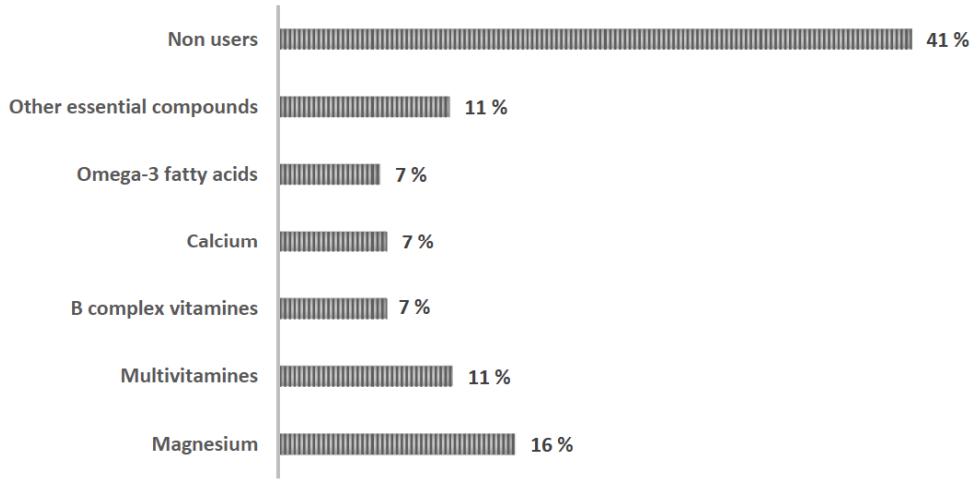

Figure 1: The most often used dietary supplements from the category of essential nutrients expressed as a % in relation to the whole studied population.

supplement use. Multivitamin formulations are typically the most common type of dietary supplement reported [9]. Multivitamins can be defined as dietary supplement which contains three or more vitamin compounds with the addition or without minerals. In NHANES study (National Health and Nutrition Examination Surveys) the most used dietary supplement used by 67 % in survey 1999-2000 and 74 % in survey 2003-2006 were multivitamins [2]. In Multi-ethnic Cohort Study in Hawaii and Los Angeles in 1993-196 on 215000 of 45-75 years old participants multivitamins were also the most often used supplement taken by 48 % of men and 56 % of women. Multivitamins were followed by vitamin C which was taken by 37 % of men and 43 % of women [10]. Study conducted on 243 participants in Croatia with the aim of determining their attitudes, opinions and knowledge about supplements reported that multivitamins are used by 63 % of study participants [6].

Supplement from the category of nonessential compounds was selected by just 19 study participants an in all cases the chosen product was glucosamine.

The most often used dietary supplements from the category of natural health products and extracts are presented in Figure **2**. Probiotics with 8 % of users are the most often choice. Gingko (*Ginkgo biloba*), sabal palm (*Serenoa repens*) and globe artichoke (*Cynara cardunculus* var. *scolymus*) combined with sylimarin are the most common choice of plant extracts. The same percentage of probiotic users was found in study conducted by Jurčić *et al*. [6].

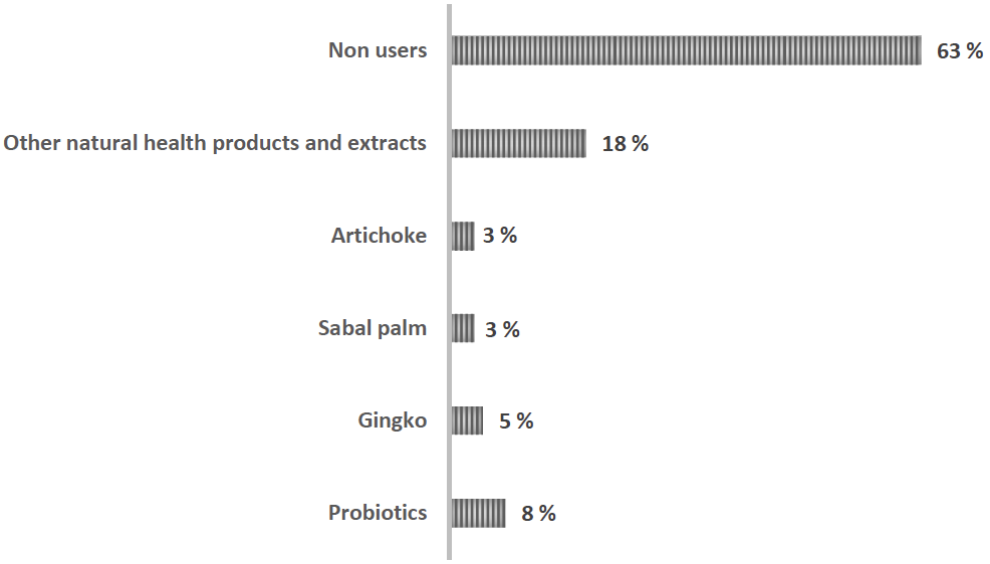

Figure 2: The most often used dietary supplements from the category of natural health products and extracts expressed as a % in relation to the whole studied population.

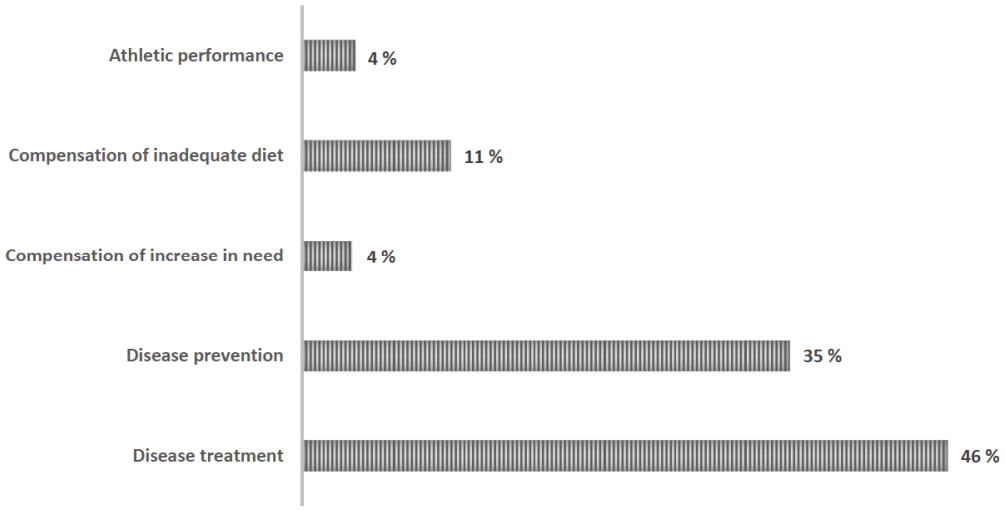

Figure 3: Reasons of supplementation in studied population.

Reasons of supplementation in studied population are presented in Figure **3**. Disease treatment dominates (46 % of study participants) followed by disease prevention (35 % of study participants). Compensation of perceived or potential inadequate diet was reported as reason for supplementation by 11 % of study participants while compensation of perceived increase in need and improvement of athletic performance were reason for supplementation reported by 4 % of study participants.

Other studies reported various results. 20 % of study participants in NHANES conducted 2007-2010, and 26 % of study participants in CRN (Council for Responsible Nutrition) conducted in 2011 reported supplement use for disease prevention. 45 % study participants in NHANES conducted 2007-2010 reported supplement use to improve overall health and 33 % for health maintenance. 53 % of study participants in CRN 2009 and 58 % of study participants in CRN 2011 reported use of supplements for overall health and wellbeing. 22 % of NHANES 2007-2010 and 42 % of CRN 2009 and 2011 study participants reported use of supplements to fill nutrient gaps (supplement the diet) [2]. Study conducted on 243 participants in Croatia reported that 65 % of study participants uses supplements to fill nutrient gaps due to poor nutrient density of diet, 62 % of study participants uses them to prevent disease while 45 % uses them for disease treatment [6].

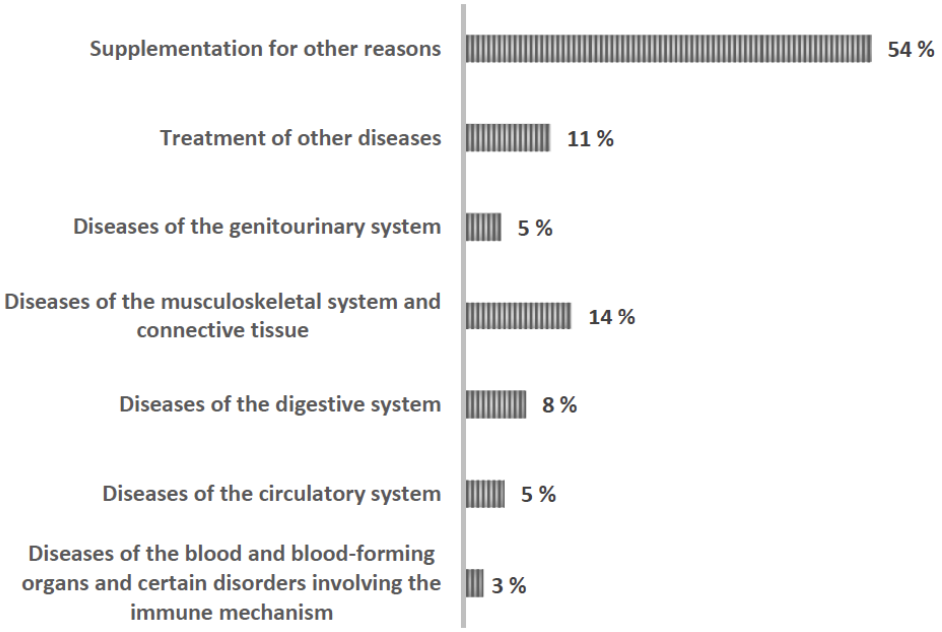

Figure 4: Categories of diseases and related health problems for which dietary supplements are most often used in studied population with the purpose of disease treatment.

The most often treated diseases (Figure **4**) were those of musculoskeletal system and connective tissue (14 %). Second are diseases of the digestive system. This explains choice of magnesium which is often used to treat cramps and constipation as well as the choice of probiotics. Third are diseases of the circulatory system which explains choice of omega-3 fatty acids.

In NHANES 2007-2010 dietary supplements were used for bone health by 25 %, for healthy joints and to prevent arthritis by 12 %, and for digestive (bowel or colon) health by 5 % of study participants. CRN study conducted 2011 reported supplement use for bone health by 30 %, for heart health by 29 %, for healthy joints and to prevent arthritis by 20 % and for digestive (bowel or colon) health by 15 % of study participants [2].

In supplementation with the purpose of disease prevention (Figure **5**) same health problems as in case of disease treatment are noticed with the exception of "Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified" which included fatigue, exhaustion and general wellbeing promotion. The most often choice to prevent fatigue were magnesium, B-complex vitamins and multivitamins. To boost immunity and prevent colds supplements were taken by 15 % and 32 % of study participants in NHANES 2007-2010 and CRN 2011 study, respectively [2]. In a present study supplements were taken for this reason by just 4 % of the study participants.

Motives for use of dietary supplements are presented on Figure **6**. The highest number of study participants (71 %) reported that it takes supplement based on a health professional recommendation (pharmacist 40 %, general practitioner 30 %, dietitian 1 %). 25 % of participants reported to take dietary supplements as a result of self-initiative while additional 4 % of study participant reported taking supplements based on the recommendation of nonprofessional. On one hand, self-initiative and "friendly" advice can be result of risen awareness and general public knowledge on the importance of nutrients in health and wellbeing as such good indicator. But, on the other hand, supplement use without professional guidance can result in their misuse and potentially harmful instead of positive effects.

Dickinson *et al*. reported that 96 % of the dietitians are supplement users either regularly (74 %) or occasionally/seasonally (22 %) and 97 % of them reported recommending dietary supplements to clients. Their study confirms that although "food first" approach to achieving nutritional adequacy is continuously

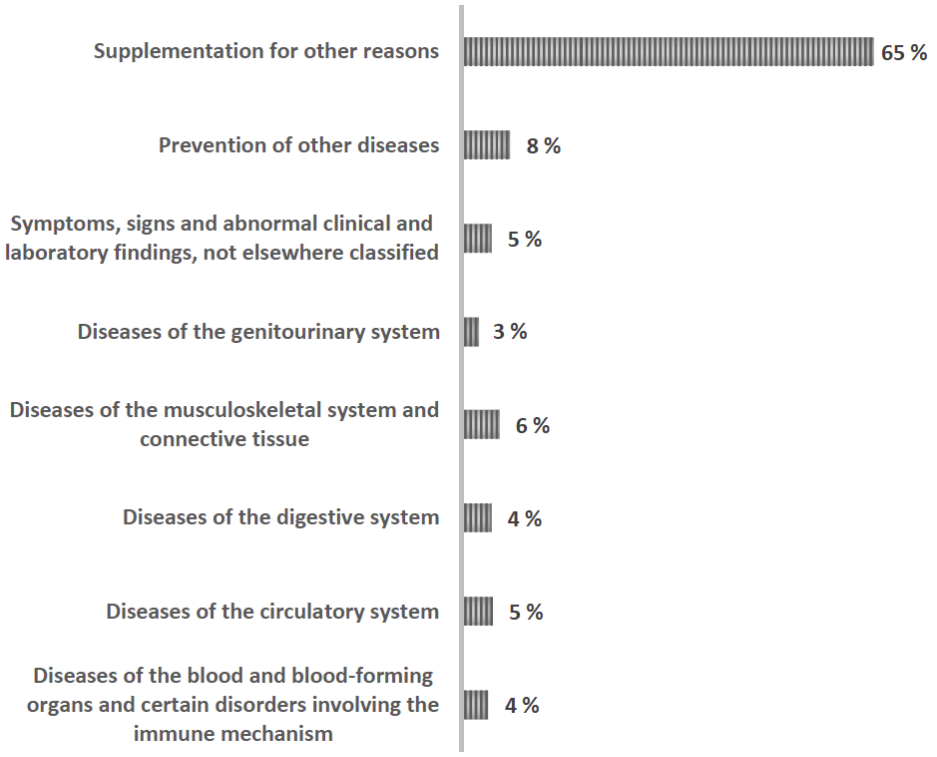

Figure 5: Categories of diseases and related health problems for which dietary supplements are most often used in studied population with the purpose of disease prevention.

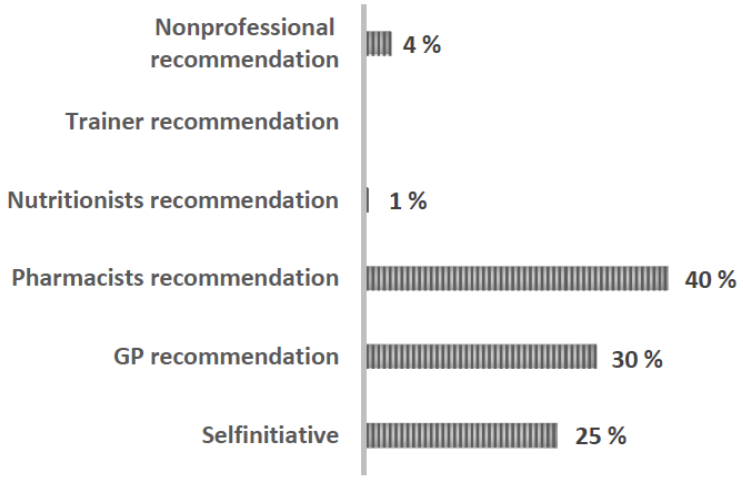

Figure 6: Motives for supplementation in studied population.

advocated among nutritionists, dietary supplements are also recognized and recommended to support health and wellness [11]. Low share of nutritionists' recommendation in a present study is not due to opposite opinion of nutritionists in Croatia but due to the fact that the profession of nutritionists is not well established in Croatia.

In a present study, 37 % of study participants reported regular use of dietary supplements. Regular use implied for the purpose of the study daily use during the period of minimum of previous three months. 86% of study participants reported use in line with recommendation given by pharmacist or stated at the label of the product and 76 % of participants reported use of only one dietary supplement. These results are encouraging since proper dosage and single use reduce potential negative interactions and side effects and purport aimed positive effects of chosen supplement.

In consideration of the results of the present study it is important to emphasize once more that data collection was performed in a summer period. Professional experience of pharmacists implies that different results could be expected for autumn and winter period due to higher demand for products used for prevention and treatment of diseases of the respiratory system, vitamin C and bee products.

4. CONCLUSIONS

Present study revealed that the most used dietary supplements are those belonging to the category of essential nutrients (59 %) with magnesium, multivitamins, B-complex vitamins, calcium, and omega-3 fatty acids being the most represented. Glucosamine was the only product selected by the study participants from the category of natural body metabolites and compounds present in the diet but not considered essential, while probiotics were the most often choice from the category of natural health products and extracts. Study participants dominantly (81 %) used dietary supplements for the prevention and treatment of diseases among which diseases of the musculoskeletal system and connective tissue, diseases of digestive system, diseases of the circulatory system and diseases of the genitourinary system prevailed. 76 % of study participants reported supplement use based on a health professional recommendation, 86 % of study participants reported use in line with recommendation given by pharmacist or stated at the label of the product and 76 % of participants reported use of only one dietary supplement.

Altogether, results are encouraging and show that studied adult population in eastern Croatia uses dietary supplements under the professional guidance and in line with the received advices.

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