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The Use of Dietary Supplements Among Public High School Students in North Cyprus

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BACKGROUND/AIMS
The use of dietary supplements is common among adolescents in many countries. This study aimed to determine the prevalence and underlying reasons of usage and sources of information about dietary supplements among public high school students in North Cyprus.

MATERIAL and METHODS
A structured survey measuring behaviors about dietary supplements was administered to 1131 students (514 male and 617 female, aged from 14 to 18). Statistical differences between sex, age group and sports participation were done by using a Chi-square analysis. Differences were considered significant at a p-value <0.05.

RESULTS
Dietary supplements use prevalence was 6,4 % among public high school students, with a higher rate in males (10.7 %) compared to females (2.8 %), and athletes (9.3 %) compared to non-athletes (3.0 %). The most common reason for using dietary supplements was 'building muscle' (61.8 %) for males and 'burning fat' (29.4 %) for females. The most common source of information was trainers (52.8 %), followed by internet (29.2 %) and other athletes (23.6 %).

CONCLUSION
According to our results, although the rate of dietary supplement use among adolescents in North Cyprus was much less compared to other countries, the behaviors of adolescents about dietary supplements were similar. Therefore, education of the adolescents should be the priority for the intervention programs and the legal regulations must also be done to protect the adolescents from excess, unnecessary and inappropriate use of dietary supplements.

Keywords: Adolescent, athletes, nutritional supplements, motivation

INTRODUCTION

The US Food and Drug Administration (FDA) definition of a dietary supplement was included in the Dietary Supplement Health and Education Act (DSHEA) of 1994 (1). A dietary supplement is a product taken by mouth that contains a "dietary ingredient" intended to supplement the diet. The DSHEA places dietary supplements, whatever their physical form, in a special category under the general umbrella of "foods," not drugs, and requires that every supplement be labelled a dietary supplement.

Dietary supplements are prevalent all over the world and have a market value of more than US$100 billion annually. It is reported that up to 50 % of adults and about one-third of children in economically advanced countries are using supplements (2).

Dietary supplements companies have a large variety of claims for their products, including improvements in overall health, improved cognitive or physical performance and energy, weight loss, increased lean body mass, pain management and many other favorable effects (3).

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There are many studies that have been showing increased amount of dietary supplements use in many countries such as the United States (4, 5), European countries (6, 7), Australia (8) and Japan (9, 10). Studies mostly focus on the adult population while recent research on the adolescents is limited. Existing literature surveys mainly focused on the prevalence of dietary supplements use, source of information, awareness and knowledge about these products, the types of supplements used and finally if gender, age or exercise status influences supplements use (10-14).

Although the increasing usage all over the world, acute and chronic potential side effects and drug interactions with active ingredients are still unknown. This situation is becoming a public health issue. Although all the recommended manufacturers' dosage is arranged for adults, it seems that the recommended doses are often exceeded (12) and never defined for adolescents.

Moreover, most of the time, this consumption is not prescribed or supervised by medical professionals but as a result of suggestions from classmates, teammates, magazines, websites, coaches, and friends attending gyms. The aim of this study was to determine the prevalence and underlying reasons of usage and sources of information about dietary supplements among public high school students in North Cyprus. In our knowledge, this is the first study conducted in North Cyprus regarding dietary supplements consumption among adolescents.

MATERIAL and METHODS

Sample

We conducted a self-administered questionnaire survey with 1131 students from 15 public high schools in North Cyprus. The sample size was calculated based on the total population size (6610) according to the reports obtained from the Ministry of Education, TRNC. From these 15 public schools, calculated sample size was allocated proportional to the reported school and class sizes provided by Ministry of Education. Also, within each class, female and male students were represented proportional to their numbers. Afterwards, class lists were used as sampling frame and selection was randomly performed. For a confidence level of 95 % and a confidence interval of 2.5 %; the required sample size was calculated as 1123. The study covered more students to ensure the statistical power to remain over 80 %. Calculations were performed with G*Power (for Mac Version 3.1.9.3). Informed consents were obtained from the subjects and their parents prior to the questionnaire being applied. The study was conducted according to the Declaration of Helsinki and approved by the Near East University Scientific Researches, Evaluation and Ethics Commission (YDU/2018/57-553).

Main Points:

- The use of dietary supplements among adolescents is increasing all over the world, especially in developed countries.
- Acute and chronic potential side effects and drug interactions with active ingredients are still unknown.
- There is no defined dosage for adolescents and even the recommended doses for adults are often exceeded.
- Adolescents are likely to believe unsubstantiated information from coaches, internet and friends about supplements instead of health care professionals.
- In the light of these facts, the regulation and control on dietary supplements must be improved in order to regulate the sale of supplements to adolescents.

Study Survey

A questionnaire was developed based on the questionnaires used in previous studies to collect data about dietary supplements (10, 12, 13). The questionnaire was self-administered to all the participants and answered anonymously. The questionnaire was exploring the following domains: use of dietary supplements, commonly used dietary supplements, from where or from whom information about supplements was obtained, the motivations behind the use of dietary supplements and from whom or where dietary supplements were purchased. To conduct the survey in all public high schools, an official permission (TTD.0.00.03-12-16/383) was received from the Directorate of Secondary Education. School administrations were called up and an appointment was requested for the proper time and date. The survey was conducted in 15 high schools, and a total of 1131 students completed the survey accurately.

Statistical Analysis

The prevalence of dietary supplements use was reported by sex, age group, and sports participation. The characteristics of the participants were reported as supplements users and non-users among male and female students. Statistical differences between sex, age group, and sports participation were done using a Chi-square analysis. Differences were considered significant at a $p<0.05$. Throughout the text, data for all subjects were presented as mean ± standard deviation (± SD), percentages and frequencies. Questionnaires with missing values were excluded from the present analysis. Statistical analysis was performed using Statistical Package for the Social Sciences 18.0 statistical software (SPSS Inc., Chicago, IL, USA).

RESULTS

We investigated the dietary supplements use; the motivation behind the use; most commonly used products; source of information and purchase for the supplements in public high school students in North Cyprus. A total of 1131 students (male: 514, 45.4%) (female: 617, 54.6%) aged between 14-18 (16.2±1.1) contributed in the research. 72 (6.4%) subjects declared that they were using dietary supplements and 1059 (93.6%) subjects stated that they were not using dietary supplements.

The use of dietary supplements according to age groups, gender and sports participation was shown in Table 1.

There was no statistically significant difference between age groups 14-16 (7.6%) and 17-18 (5.9%). Dietary supplements use was found higher in males (10.7%) compared to females (2.8%) ($p<0.001$) and higher in subjects who were participating in sports (9.3%) compared to non-participants (3.0%) ($p<0.001$).

TABLE I. The use of dietary supplements according to age groups, gender and sports participation

		Not Using	Using	Total
Age Group	14-16	767 (94.1%)	48 (5.9%)	815 (100%)
	17-18	292 (92.4%)	24 (7.6%)	316 (100%)
Gender	Male	459 (89.3%)	*55 (10.7%)	514 (100%)
	Female	600 (97.2%)	*17 (2.8%)	617 (100%)
Sports Participation	Participate	547 (90.7%)	*56 (9.3%)	603 (100%)
	Does Not Participate	512 (97%)	*16 (3%)	528 (100%)
Total		1059 (93.6%)	72 (6.4%)	1131 (100%)

* <0,001

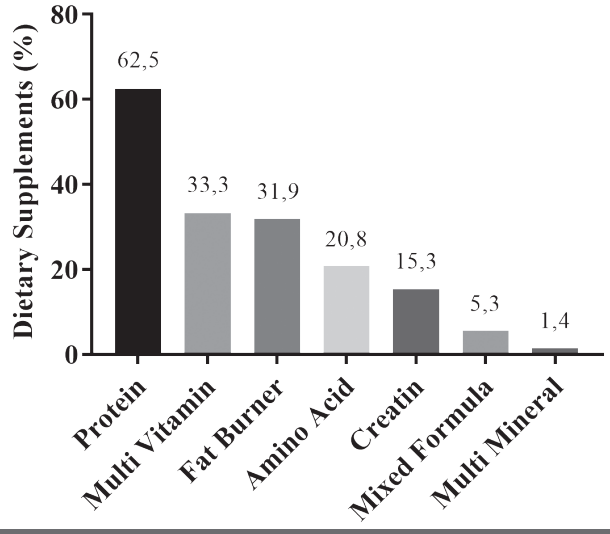

FIGURE I. Frequently used dietary supplements

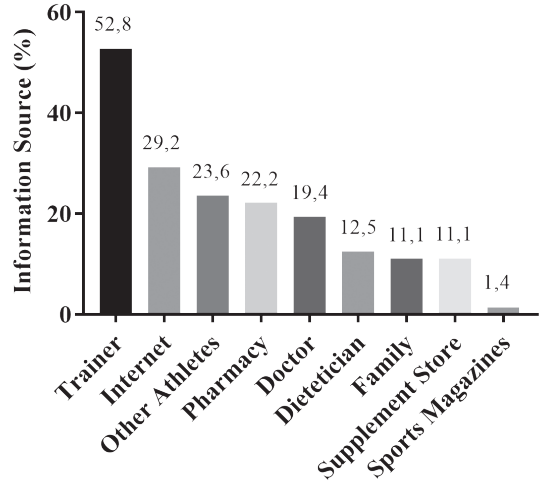

FIGURE 3. Sources for gathering information about dietary supplements

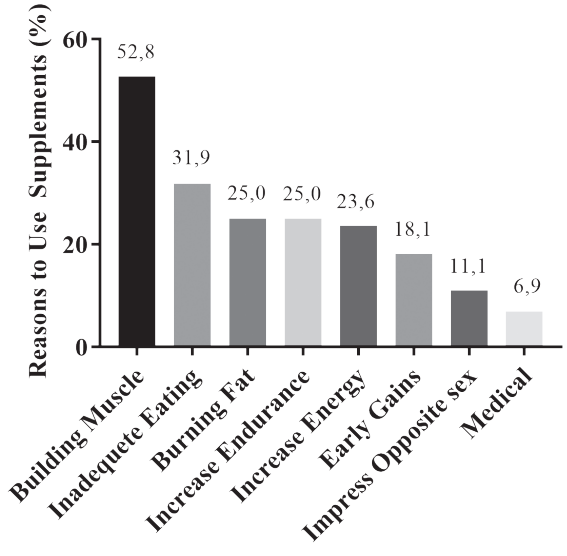

FIGURE 2. Reasons for using dietary supplements

Figure I shows the frequently used dietary supplements according to their frequency of use. Most commonly used supplements were found as proteins (62.5%) followed by multi-vitamins (33.3%), fat burners (31.9%), amino acids (20.8%), creatine (15.3%), mixed formulas (5.6%) and multi-minerals (1.4%).

According to the gender of the participants; proteins were found as the most frequently used dietary supplements (74.5%) followed by multi-vitamins (30.9%), amino acids (25.5%), fat burners (29.1%), creatine (20%), mixed formulas (7.3%) and multi-minerals (1.8%) in male students. In female students, fat burners (41.2%) and multi-vitamins (41.2%) were found as the most frequently used dietary supplements. Proteins (23.5%) and amino acids (5.9%) followed this. There was no creatine, mixed formula and multi-mineral consumption stated by the female students.

Figure 2 shows the reasons for using dietary supplements. The most common reason was building muscle (52.8%) followed by inadequate nutrition (3.9%), burning fat (25%), increasing endurance (25%), increasing energy (23.6%), early gains (18.1%), impressing opposite sex (11.1%) and medical reasons (6.9%).

Building muscle (61.8%) was found as the most frequent reason for dietary supplements use for male students. Inadequate nutrition (36.4%), increasing endurance (27.3%), increasing energy (23.6%), burning fat (23.6%), early gains (18.2%) and impressing opposite sex (14.5%) followed this. For the female students burning fat (29.4%) was found as the most frequent reason for dietary supplements use. Increase energy (23.5%), building muscle (23.5%), inadequate eating (17.6%), increase endurance (17.6%), early gains (17.6%) and medical reasons (17.6%) followed this. Female population stated that they were not using dietary supplements for impressing the opposite sex.

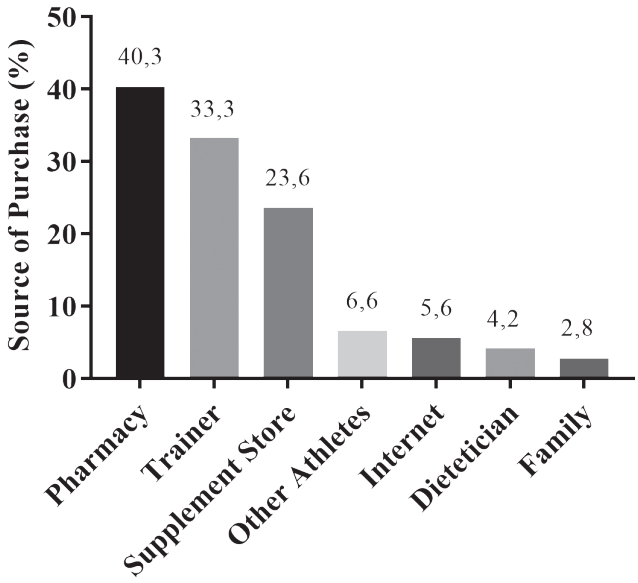

FIGURE 4. Source of purchase for dietary supplements

Figure 3 shows the sources for gathering information about dietary supplements. Trainers (52.8%) were identified as the mostly used sources of information and followed by internet (29.2%), other athletes (23.6%), pharmacies (22.2%), doctors (19.4%), dieticians (12.5%), supplements stores (11.1%), families (11.1%) and sports magazines (1.4%).

Figure 4 shows the source of purchase for dietary supplements. Pharmacies (40.3%) were found as the most common source of purchase of dietary supplements. Trainers (33.3%), supplements stores (23.6%),other athletes (6.6%), internet (5.6%), dieticians (4.2%) and family members (2.8%) followed this.

DISCUSSION

This is the first study investigating dietary supplements use in Turkish Cypriot adolescent population. We investigated the prevalence of dietary supplements use among public high school students. We found that 6.4 % of public high school students were using dietary supplements. This rate was lower compared to other similar surveys conducted in Korea (31%), the United States of America (27.4% to 32.4%), Italy (35%) and Japan (16.8%) (9, 11). The low rates might be due to the method used to assess supplement use in high school students. Although it was clearly explained that the questionnaire was for a scientific study and all answers would be anonymous, students might have felt that it was more of an interrogation rather than a survey. This might have resulted in the under-reporting of supplements used by the students. However, it is still possible that the reported prevalence is the real representation of supplements use in adolescents.

Besides, it is a well-known fact that socio-economic status and income levels are important determinants of supplements use (13, 15, 16) and most of the data on supplements use are from developed and high-income countries whereas North Cyprus is an unrecognized country with a relatively low-income level. Moreover, as a limitation of our study, it was conducted in public high schools, and private high schools were excluded due to the difficulty of obtaining permission from the school administrations. Private high schools are quite expensive while public high schools are free. Hence, children of low income families mostly attend public high schools.

There are many studies showing that the use of dietary supplements increases with age to maintain body weight, building muscle, enhance performance and health purposes (4, 10, 13, 17, 18). Evans et al. (17) stated that dietary supplements use increases with age for those who started sports early because of the performance expectations. These expectations forces them to use different methods, one of which being the use of dietary supplements. In our study dietary supplement use increased with age, but it was not statistically significant. The low number of dietary supplement users might have concealed the increase with age.

There are many studies in the literature showing that the use of dietary supplements use is higher in males compared to females (14, 15, 19, 20). Our results are consistent with these studies. Kotnik et al. (21) explained this difference with the eager nature of the men to reach their goals as immediate as possible. Similarly, Kotnik et al. (21) stated that male Slovenian adolescents tend to use dietary supplements in order to benefit from sports performance-enhancing effects of dietary supplements.

Sports participation is a well-known factor affecting dietary supplement use. We have found that the use of dietary supplements was higher in sports participants compared to non-participant adolescents. Male and female athletes tend to use dietary supplements because they believe that their regular diet is not sufficient and therefore need supplements to cover their additional needs arising from sports (14). Grm et al. (11) reported that the prevalence of nutritional supplements use was significantly higher for sports participant adolescents (24.6%) than non-participants (16.2%). They emphasised that the athletes might be more susceptible to advertising or encouragement to engage in the use of nutritional supplements. Similarly, Kotnik et al. (21) stated that adolescent athletes could be pressured by their coaches and/or teammates to use dietary supplements and this may explain an increase in dietary supplements use in adolescent athletes.

Results of our study revealed that the most commonly used supplement among all adolescents was proteins. The choice for supplements use is influenced by the motivations behind. For this study, the most common motivation for supplements use was for the building of muscles. Manufacturers of protein supplements mainly claim increased muscle mass and strength with their products. The most commonly used supplements were different for male and female subjects. Proteins were the most common supplements among male subjects while fat burners were the most common among females. The reason might be that female adolescents give more importance to their appearance and weight while male adolescents prefer to have a muscular physique. There are many studies in the literature showing that the adolescent males who are willing to build muscle and increase muscle strength tend to use protein supplements(3, 10, 17, 22-25) while the female adolescents tend to use fat burners for losing weight(10, 20).

Sources of information regarding food supplements are significant because it affects the subjects decision for using and choosing the specific supplement. In our study, the most common source of information was found as trainers (52.8%) followed by internet (29.2%) and other athletes (23.6%). Most trainers are not educated about supplements, and their knowledge about the supplements are mostly anecdotal or coming from their personal experience. This situation is also valid for athletes as a common source of information. Moreover, information gathered from internet makes this situation even more complicated because it may give inadequate or false information about dietary supplements. Most of the time there are no filter or control as to whether the information is correct or misleading.

Additionally, many web sites or blogs are commercial and advertise their merchandise. As a result, much of the information may be inaccurate, incorrect, or indeed, potentially harmful. Lieberman et al. (13) noted that the information on dietary supplements from media sources such as websites, TV or printed media is widely available, but the information is often inconsistent and confusing.

According to Balzo et al. (12), the most common sources of information about dietary supplements are coaches and other athletes. This situation is worrying as dietary supplementation should be started under the prescription and the supervision of health care professionals (e.g. physician, pharmacist, nutritionist). We also found that the health care professionals were much less consulted for information about supplements compared to coaches, internet and other athletes. Unfortunately, it is a well know fact that adolescents are likely to believe unsubstantiated information about supplements instead of expert opinions (19, 21).

Interestingly pharmacies were the most common suppliers for dietary supplements (40,3 %) followed by trainers (33.3%) and supplement stores (23.6%). It shows that adolescents are choosing to buy the supplements from pharmacies but they do not consult to pharmacists as much. Trainers were the most common source of information and the second most common suppliers. In this case, trainers may encourage the athletes to use the supplements that they sell, and that is not only unethical but also potentially harmful. Unfortunately there are not enough regulation and control on dietary supplements, and it is straightforward to reach any type of supplements even for minors. This is another concern which must be addressed by health authorities in order to regulate or limit the sale of supplements to adolescent population.

As a preliminary study in North Cyprus there were some limitations of our study. The main limitation was the limited number of variables. There was no socio economic variable such as income status. Moreover, it was conducted in public high schools, and private high schools were excluded due to the difficulty of obtaining permission from the school administrations. This might have understated the real presentation of supplement use in general adolescent population.

In conclusion, it is crucial to understand the motivation for using supplements and to specify the source of information about supplements for developing prevention and public health intervention strategies to target specific groups. According to the results of this study, education of the adolescent athletes and their coaches should be the priority for the intervention programs. The legal regulations must also be done to protect the adolescents from excess, unnecessary and inappropriate use of dietary supplements.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Near East University Scientific Researches, Evaluation and Ethics Commission (YDU/2018/57-553).

Informed Consent: Written informed consent was obtained from students who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - D.E., H.U.Y.; Design - D.E., H.U.Y.; Supervision - H.U.Y.; Resources - D.E., H.U.Y.; Materials - D.E.; Data Collection and/or Processing - D.E., Ö.T.; Analysis and/or Interpretation - D.E., Ö.T.; Literature Search - D.E.; Writing Manuscript - D.E., H.U.Y.; Critical Review - D.E., H.U.Y., Ö.T.

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Conflict of Interest: The authors have no conflicts of interest to declare.

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